ENCYCLOPEDIA OF KIMJONGILIA

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Kimjongilia

Preface

The history of flowers is even longer than that of humanity, and their numerous species have emerged on the globe during that period.

These beautiful flowers of different colours and shapes and with sweet fragrance have made human life more colourful and decorated human world in an attractive way.

Also, there appeared flowers named after famous people and flowers symbolic of ideals of human beings longing for love and happiness.

However, few of them are loved and adored by all people like Kimjongilia which was named after the great man.

Kamo Mototeru, a Japanese horticulturalist, named the flower of his newly bred species after the name of leader Kim Jong Il. This is a representation of reverence for the exploits Kim Jong Il accumulated for the cause of independence of humanity and also a reflection of the feelings of the Korean people and the world's progressive people.

The editorial board issues *Encyclopedia of Kimjongilia* by compiling the comprehensive data on Kimjongilia.

This book deals with how Kimjongilia came into being in the world, the successes registered in its cultivation and propagation, Kimjongilia festivals and exhibitions held in Korea and other countries every year, events held to mark the naming of the flower, its biological features and cultivation techniques Korean scientists and botanists have studied and perfected, representative literary and art works depicting Kimjongilia, some of the plants presented to leader Kim Jong Il from other countries, and common knowledge of flowers.

The editorial board hopes that this book will be of help to flower lovers and people all over the world who are eager to grow Kimjongilia.

Editorial Board

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Part I

Birth of Kimjongilia

Kimjongilia is the most beautiful red flower of the tuberous begonia which a Japanese horticulturalist Kamo Mototeru bred through 20-odd-year-long painstaking efforts, regarding it as his ideal to breed a flower, “guardian deity”, to defend justice, peace, truth, and bright future.

He named the flower after leader Kim Jong Il in reflection of deep reverence of the world progressive people and himself for Kim Jong Il.

Chapter 1
Story of Breeding Kimjongilia

Kamo Mototeru, a Japanese horticulturalist, had made in-depth studies and painstaking efforts to breed Kimjongilia.

In spite of repeated failures and setbacks, he finally succeeded in breeding a new variety of tuberous begonia and named it after Kim Jong Il**,** the great man whom he had revered, before presenting it to him.

This represents the feelings of not only a Japanese horticulturalist but the progressive peoples the world over who are revering the Korean leader.

Section 1. Horticulturalist Kamo Mototeru

Horticulturalist
Kamo Mototeru

Kamo Mototeru loved flowers very much. He had many hobbies: He was fond of flying a kite, making a model plane, playing the piano and practising gymnastics. Sometimes he would think up brilliant ideas.

However, none of them was stronger than his affection for flowers.

It might be attributed to the facts that what he saw first in his life was *Iris ensata* his mother has grown and that he was brought up in a family, which was called the house with a garden thick with *Iris ensata.*

His house was in Harasato village not far from Kakegawa City, Shizuoka Prefecture. It was an old-fashioned house in which the Kamo family had lived for several generations since his great-grandfather.

As an old building rare to be seen even in Shizuoka Prefecture, the house would draw a great number of visitors in flowering season when *Iris ensata* was in full bloom in its garden.

His grandmother had sowed *Iris ensata* in the garden. As a flower with strong seasonal impression, it was called a “cuckoo flower” or a “rice-transplanting-associated flower” by the people in the village. Not only peasants but many other people loved this flower, because it began to come into blossom in the sultry, rainy season and kept blooming even in the rain.

Iris ensata was the first flower Mototeru saw after his birth, so he began to have deep affection for it throughout his life.

His exceptional love for flowers was attributed partly to the influence of his mother who had also loved them so much.

While tending carefully *Iris ensata* that had been cultivated by the generation of his grandmother, his mother would breed some new varieties of it.

Iris Ensata Garden of the Kamos

The villagers were much pleased to see them and vied with one another in transplanting them to their gardens.

His family would give names to the new varieties, one of which was “Eternal Kamo” as desired by his mother. She named it so, wishing that the intention of the Kamo family of loving “kind heart” would be made known far and wide.

It thus became a custom of his family to name a new variety, a happy event of all his family members. His grandmother used to say about the need to breed a “guardian deity” flower to protect the Kamo family.

After the Pacific war, his mother took an active part in social activities.

A severe earthquake hit Kanto in 1923. At that time, many innocent Koreans were barbarously slaughtered by the Japanese who had been taken in by the government’s false information that Koreans committed arson and by the right-wing gangsters infected with national chauvinism. Witnessing the shuddering atrocities, his mother in

her girlhood felt sympathy for the Koreans.

In 1950 when the Korean war broke out, she attended a Japanese mothers' meeting with thousands of *Iris ensata*. Handing out the flowers to the peace-loving participants, she called on them to rise up for peace. War was an enemy to her, who loved flowers.

"Please take this *Iris ensata*, the flower of 'kind heart.' Let us fight in defence of peace with that mind."

So the participants decorated the venue of their meeting with the flowers. At that time, newspapers gave wide publicity to this fact.

Probably thereafter, people called his house the "house of *Iris ensata*" where the flower of "kind heart" comes into bloom.

The image of his mother left a deep impression on the mind of Kamo Mototeru, who was then a student.

One year after the Korean war came to a ceasefire, his mother said to him in the following vein, looking round the *Iris ensata* garden: Every time I see these irises blooming beautifully in spite of rainstorm, I think of the Korean people who defended their country in the teeth of the flames of war. Whenever I am told that they are building new cities and factories on the debris of war, I cannot repress my admiration at such eye-opening events. A people led by a great leader will come to greatness. Apart from the leadership of General Kim Il Sung, how could the Korean people emerge victorious in the war and register successes in the post-war rehabilitation? I want to present him with the *Iris ensata* that I have grown throughout my life. This is my lifelong wish and it will be the greatest honour to our family. But it is quite regrettable for me to fail to do so for the abnormal relations between Japan and the DPRK. I'm sure the bilateral relations will not last long, because many Japanese people hope for the friendship between the two countries. Sooner or later, the way to free traffic will be open. If I'm not alive by that time, I hope you to make my desire come true.

This was a cherished desire of Mototeru's mother as well as her last will.

Mototeru never forgot her words.

Later, his mother was included in a delegation of Japanese women to visit socialist countries. She was busy preparing for the trip when she suddenly fell ill and passed

away. At that time Mototeru picked a large number of *Iris ensata* to decorate her coffin.

In 1953 Mototeru came back home after graduation in economics from Rikkyo University. With a high ambition as a horticulturalist he began to enlarge the garden of *Iris ensata*.

In 1957 Kamo Mototeru took the initiative in building the Kamo *Iris Ensata* Garden and became its manager. Since then, the cultivation and breeding of *Iris ensata* were conducted in full swing.

He devoted his all for the garden.

He determined to make his mother's desire come true by breeding the most beautiful *Iris ensata* in the world.

His intention made him pay close attention naturally to Korea. His favourite books were not only about horticulture but about Korea.

Kamo Mototeru studying the work of leader Kim Jong Il

While reading the books about Korea, he came to discover an amazing world. The ideal world he had envisaged in the garden of flowers was just the reality of Korea whose people were leading happy life: All the people enjoy the benefit of free medical care; all the students receive free education; women have the right equal to men; all the people lead free socio-political life and bring their hope and ambitions into bloom to their heart's content**.** He was deeply impressed by the reality of Korea.

Especially while reading a book *Modern Korea and Secretary Kim Jong Il* written by Inoue Shuhachi, a professor at Rikkyo University who had been his teacher, he keenly felt the greatness of Kim Jong Il.

Since then, he began to devour several works of Kim Jong Il**.** In this course, he came to know that President Kim Il Sung and Secretary Kim Jong Il were fond of flowers. He realized such facts that they valued magnolia and other flowers that imbue the people with love for the country and the nation, grew them personally in their

gardens and made the flowers in full blossom across the country.

His desire to realize his mother's request became stronger as the days went by.

Mototeru presented *Iris ensata* to President Kim Il Sung on the occasion of his 70th birthday on April 15, 1982. The gift flowers were 14 improved varieties of *Iris ensata* including "Eternal Kamo" and "Spring Moon" his mother had cultivated throughout her life and "Evening Sun over an Old City" bred by himself.

Mototeru had an innate fondness for such flowers as morning glory, briar, forget-me-not and hosta. The flower he saw first was *Iris ensata*. The morning glory was the flower he loved first since he had heard a poem about it from his mother. The poem represents the feeling of a woman for a morning glory: She goes to the well to draw water early in the morning, where she sees a morning glory that coiled up the rope attached to the well bucket in a night. She does not dare to take the bucket for fear that it might harm the flower, so she goes to her neighbour for water.

He also began to love briar after he read a novel about it in his primary school days. The novel depicted a story that the frontier guards of two hostile countries finally share laughter and talk to each other with the help of a beautiful briar blooming on the borderline.

In his middle school days, he began to feel affection for forget-me-not, playing on the piano a famous song about a countryman who was drowned while attempting to pick the flower growing on a riverside cliff to please his girlfriend.

He once praised hosta while having a talk with TV audience about flowers. He said that, if he was asked to name a flower symbolic of the world, he would readily point out hosta, adding that he had seen the flower in front of Lenin's Mausoleum in Moscow, in the garden in front of the Queen's Palace in London and on the bank of the Taedong River in Pyongyang.

He loved many other flowers, too.

However, Mototeru presented the flowers that his mother and he had loved to the great man whom they respected most.

With a desire to send better varieties of *Iris ensata* to the DPRK, he dedicated himself to the research of the flower.

He travelled several countries to collect new varieties of *Iris ensata* and exchanged experience with horticulturalists there. In the course of this, he bred many new varieties, establishing his fame as a prominent horticulturalist in this field.

NHK often invited him as a lecturer on horticulture, and many horticulturalists at home and abroad visited him for his advice.

Whenever he met them, he always conceived an idea to breed the "guardian deity" flower which would defend justice, peace, truth and rosy future.

The "guardian deity" flower should represent the age and be loved by all people. That was his ideal.

Mototeru's first visit to Pyongyang in October 1985 served a momentous occasion for him to fully understand the greatness of Kim Jong Il.

Through several Japanese publications and the Korean residents in Japan, he had already known about the lofty virtues of President Kim Il Sung and Kim Jong Il, the immortal exploits and outstanding leadership they have performed in the revolution and construction and their contributions to the development of the world revolution. But his Korea visit added much to his impression.

In particular, he was moved once again while visiting the Central Botanical Garden. Unlike some foreign gardens with the main stress on ornamental value, it has been built into a plant propagation centre for educating the people in socialist patriotism and promoting their well-being. He also marvelled at the sight of gift plants presented to Kim Il Sung and Kim Jong Il by state heads, prominent political and social figures and horticulturalists from many countries around the world.

There are many botanical gardens with long history in the world, but he had not seen such a garden as the Central Botanical Garden in the DPRK that cultivates hundreds of varieties of gift plants.

When his guide told him that the *Iris ensata* he had presented to Kim Il Sung on his 70th birthday came into full bloom last summer to the delight of visitors, Mototeru could not contain himself for joy. He was all the more impressed at the fact that the DPRK's TV had given wide publicity to him, an ordinary horticulturalist, and his *Iris ensata*.

Looking round the greenhouse for the gift plants with joy, he stopped his step in

front of a show stand.

“Kimilsungia!” he exclaimed in spite of himself. The flower was a variety of orchid newly bred in Indonesia and Sukarno, the then President of Indonesia, named it after the august name of President Kim Il Sung.

He asked his guide: “As there is Kimilsungia, there must be Kimjongilia, too. Is that so?”

“Not yet, I’m afraid.”

“Don’t you think it must be?”

“ … ”

It was a sudden, unexpected question, but he felt the strong desire of the Korean people to see the birth of Kimjongilia. At that very moment, it occurred to him that the “guardian deity” flower he had long tried to breed should be Kimjongilia.

Kamo Mototeru visited the DPRK again in August 1987 and climbed Mt. Paektu, the ancestral mountain of Korea. Touring Kim Jong Il’s birthplace in the Paektusan secret camp, he came to realize what kind of flower should be the flower to represent the spiritual world of a great man.

This was how he resolved to cultivate Kimjongilia and shaped it into his faith.

Kim Jong Il’s birthplace in the Paektusan secret camp

Section 2. Newly-Bred Flower, “Guardian Deity”

After returning from his visit to the DPRK, Kamo Mototeru made painstaking efforts to perfect a new variety of tuberous begonia to which he had devoted himself for scores of years.

The tuberous begonia has a history of over 200-year-long cultivation and that of over 120-year-long breeding. Around 1920, a new strain with a flower nearly 20 centimetres in diameter was bred. There were varieties different in shape and in colour—red, yellow, pink and white.

Mototeru had started his studies with deep interest in the cultivation and breeding of tuberous begonia since 20-odd years ago.

Introduced below is his writing about the background of his breeding Kimjongilia:

I had long dreamed of breeding a new ideal flower that would represent the 20th century. Then, which should be its parent flower? As to this question, I did not hesitate to select the tuberous begonia.

One of my pioneers who taught me horticulture is Mr. Yoshie Seiro, who first studied and bred the tuberous begonia in Japan. Over 20 years ago he gave me the tuberous begonia and advised me to study it. This served as the starting point of my studying the tuberous begonia. Around that time, Mr. Jack Craig, an *Iris ensata* fancier in the United States, introduced me to Mr. Frank Reynolds in California, so I obtained the tuberous begonia from him.

But the tuberous begonia withered in three to four years for it was sultry in summer in Kakegawa City where I lived and for my poor breeding technique.

At that time the *Sankei* Newspaper Company asked me to build a garden in the skiing ground under its control, called Biwakobare, 1 000 metres high above the sea level. So I recommended to plant the tuberous begonia and proposed to assign the technical work to Mr. Yoshie and import the tuberous begonia from Mr. Reynolds. This was how a greenhouse for the tuberous begonia came into being for the first time

in Japan. The *Sankei* Newspaper Company set about building the Amagi Plateau Begonia Flower Garden on Mt. Amagi in Izu, and this resulted in instantly arousing the interest in the tuberous begonia in Japan.

At that time, I refrained myself from growing the tuberous begonia independently and took the attitude of helping my mentor Mr. Yoshie to succeed. While continuing my research, I made in-depth exchange with specialists in tuberous begonia in different countries.

Several years ago, Mr. Yoshie advised me to continue growing the tuberous begonia, as he could not do it for his old age and poor health. So I made up my mind to begin a new research into the tuberous begonia and the improvement of its breed, on the basis of not only the data of the Yoshie school but the worldwide achievements.

Thanks to the cooperation of Mr. Langdon in Bristol of England, Mr. Antonelli and Mr. Joba in California of the US and Mr. Rokerich of Belgium, my research work made so rapid progress that I could say with pride that I became an authority of this field in Japan.

This year I have built a tuberous begonia exhibition hall on an area of about 400 square metres in the central garden in Kakegawa City and put 2 000 potted begonia plants on display, which won a great popularity. At present, I am growing several thousands of the plants in the central garden and its branch garden with a total area of 1 500 square metres. Next year I plan to build a greenhouse with an area of 8 000 square metres so as to grow them on a large scale.

September 17, 1987….

A new variety of begonia bred by Kamo Mototeru was a unique, beautiful flower which could not be found in any florist’s shop or flower exhibition. He must have made a fortune if he had sold it. However, he could not weigh the value of this flower in the scale of money.

His 20-odd-year-long painstaking efforts produced six varieties of tuberous begonia. They had their own strengths and weaknesses respectively: The flower of a variety was beautiful but irregular in shape; another one, though beautiful and perfect in appearance, had weak stalk; the other was small in diameter and the other was not so bright red.

Mototeru thought that a new variety to be named after a great man must have the quality as the king of flowers, free from any weakness.

He made ceaseless researches. Carefully examining all the experiment records, observation logs, filmstrips and video films, he eliminated shortcomings one by one.

Kamo Mototeru growing Kimjongilia

One day during his intensive work, something unexpected happened.

When Mototeru was on a trip to Denmark, his wife Humiko sent him an urgent telegram that his greenhouse had been damaged.

He felt as if he had been heavily hit on the head. The telegram read the heating pipes went wrong and the cause of the accident was still uncertain. Rapidly-falling temperature, freezing plants in a moment.…

Moreover, nothing could assure him that no harm would have been done to the begonia which had to come into bloom in February.

It would take a few more days to reach an agreement on some issues, but he could no longer stay there.

During his flight, he had a bee in his bonnet about the greenhouse. How could he bring the frost-bitten flowers to life?

On his arrival, he found that the damage was more terrible than he had expected, as it happened during the coldest days in January.

The greenhouse with its heating pipes seriously damaged was, in fact, no better than a cold room.

Some of floral seedlings were frozen hard. If the accident had occurred in such an area as Hokkaido, which is called the land of snow, Mototeru must have never saved any of them.

He was dumbfounded for a while at the sight of the broken pipes.

As immediate measures were taken after the accident, some cold-resistant plants

were little damaged, but the seedlings with tender sprouts still gave a wretched sight akin to the frozen face of a newborn baby.

They would most likely get sick or fail to come into bloom properly even if they would.

But the tuberous begonias, which were timed to flower in February, were still lush, as they were little affected by the cold.

They stood it because he paid a special attention to them when they were young seedlings so that they had sturdy stems and leaves.

This unexpected luck brought a great delight to Mototeru. Despite the temperature far below normal in the greenhouse, they were little affected by the cold.

In the previous days he had not conducted particular experiments with them in temperature below normal in consideration of their parent plants of the Andes origin. Therefore, he was much delighted at the result of the accident, which meant a final experiment to it.

They were surely the flowering plants with a strong cold-resistance.

The fact that this flower can be cultivated not only in a greenhouse but in a room convinced him that it would be possible to grow it even in such coldest region of Japan as Hokkaido.

Finally there came a historic day when the flower of begonia as red as the sun came into bloom. The news spread like an arrow throughout Japan.

The number of people who came to see the new variety and asked for some tubers increased day by day.

However, Kamo Mototeru could not meet their request because he had not yet realized his earnest desire to name the flower after a great man whom he has revered from the bottom of his heart.

In this context, February 16, 1988, Mototeru had awaited was drawing nearer.

One day he got all his employees together to select a flower to be named after Kim Jong Il.

One of them suggested that Kamo Mototeru, the breeder of a new variety, should do it himself. Mototeru picked up a pot of red begonia among several ones. He met

unanimous approval.

He took measures to carry it to Korea safely so that it would never be damaged by cold or shock.

A liner, which took off Osaka Airport at noon on February 12, 1988, landed in Beijing.

Kamo Mototeru embraced those who greeted him there.

When a car drove him a little way off the airport, he felt hungry, for he ate nothing all day long.

In a room of Beijing Jianguo Hotel he began to write a letter to the DPRK leader Kim Jong Il, writing and reading one line after another.

The letter reads as follows:

"I have the honour to write this letter with a feeling of respect for the great leader Your Excellency Kim Jong Il.

"I respectfully present you with a tuberous begonia I have bred with sincerity, congratulating Your Excellency on your birthday and hoping for the friendly relations between Japan and the DPRK.

"I am very sorry that, although I had planned to carry the flower myself to Pyongyang, I was compelled to hand it over in Beijing due to the unjustifiable sanctions on exchange imposed by the Japanese government hand in glove with the United States and south Korea.

"I hardly venture to name my immature plant after the august name of Your Excellency, but I dared to denominate it Kimjongilia, wishing you longevity and the prosperity and development of the bright future.

"If you allow me to present this plant to Your Excellency, it will be an honour greater than I deserve.

"I sincerely wish Your Excellency Kim Jong Il long life in good health.

February 13, 1988, Kamo Mototeru"

At 10 a.m. on February 13, 1988, a meeting was held at the DPRK Embassy in China, at which Kamo Mototeru handed Kimjongilia to the DPRK ambassador amid loud applause.

On February 20, 1988, President Kim Il Sung personally looked at Kimjongilia. Noting that the flower was very beautiful, he expressed great satisfaction at the fact that it remains bloom for over four months. It is very good of a Japanese

Kamo Mototeru is present at a meeting of handing Kimjongilia over (February 1988)

horticulturalist to breed Kimjongilia and send it to us, he said, adding that wide publicity should be given to the flower and that it should be propagated and spread on a large scale.

The DPRK conferred an honorary doctorate in biology on Kamo Mototeru who has made painstaking efforts to breed Kimjongilia for over 20 years.

Wide varieties of flowering plants are being bred every year on this globe.

For this reason, an international plant nomenclature regulation and a species registration system have been established to name newly-bred varieties and register their species.

For such important flowering plants as begonia, orchid and tulip, there exists a species register system specialized for each flower.

The species belonging to the begonia family are to be examined and registered by the American Begonia Society.

Kimjongilia has already been admired and loved by the people before its registration as a new variety.

It was recognized as the king of flowers by winning top prizes several times in

flower exhibitions and horticultural expositions. With the researches into Kimjongilia deepened and the interest in it increased as the days went by, its international registration was raised as an important issue that brooks no more delay.

Ri Pyong Sang, chairman of the American Kimilsungia and Kimjongilia Association, charged himself with the work.

The American Begonia Society appreciated the unique horticultural value of Kimjongilia and decided on August 4, 2004, to register it as a new variety No. 991 of begonia, the scientific name of which is *Begonia* × *tuberhybrida* Voss 'Kimjongilhwa'.

AMERICAN BEGONIA SOCIETY

CERTIFICATE OF CULTIVAR REGISTRATION

Begonia B. 'Kimjongilhwa'

Seed Parent b. 'Scarlet

Pollen Parent b. 'Crimson'

Other Derivation

Originator Dr. Kawomatoteru

Reg. No. 991 Date 8-04-04

Signed

Certificate which registered Kimjongilia as a new variety No. 991 of the Begoniaceae

The November-December 2004 issue of the magazine *The Begonian* published by the American Begonia Society carried an article under the title "Begonia 'Kimjongilhwa' No. 991":

"Kimjongilia is a well-balanced flower, graceful and beautiful.

"This flower is named after the august name of General Kim Jong Il, the great leader of the Democratic People's Republic of Korea."

The Begonian, an American journal, introduces the registration of Kimjongilia

Section 3. Features of Kimjongilia

Today Kimjongilia has become a renowned flower taking after Kim Jong Il for the meanings its colour, shape, fragrance, leaves and stem carry.

Kamo Mototeru described the features of Kimjongilia in his writings as follows:

1. Its colour is shiny and bright red, which is an ideal pure colour.
2. It has the quality as the king of flowers for its well-balanced polypetalous lion-form flowering.
3. The flower is about 20 centimetres in diameter when in full bloom, and it looks vigorous.
4. Its stem and peduncle are thick and sturdy, thus showing an imposing appearance.
5. It is so strong against blights and harmful insects and easy to cultivate that it can be widely propagated.

This is not a simple explanation of the horticultural features of Kimjongilia. It reflects the call of the flower that brings the greatness of the sun home to the people, and the honest confession of a horticulturalist who has longed for the king of flowers embodying the milk of human kindness of a great man.

The beauty and value of Kimjongilia lie in the fact that it resembles the great characteristics of Kim Jong Il as they are.

The pure red colour of Kimjongilia is symbolic of his noble idea and faith and his unabated, extraordinary ardour. His favourite colour is red; he loves red flag most; he is very fond of enjoying the red sunrise over Mt. Paektu. Red colour means the red blood, which in turn indicates the passionate ardour spurting out of the heart. That is why they call red the colour of ardour.

Kim Jong Il is a man of extraordinary enthusiasm, the incarnation of ardour. Therefore, if a flower is to resemble the sun symbolic of extraordinary enthusiasm, it should naturally be bright red.

The gracefulness of Kimjongilia is clearly seen in the shape of big polypetalous flowering. When in full bloom, a big flower of 20–25 centimetres opens at the straight peduncle, and it is spontaneously declivous to the front as if it may not brook its weight. This shape goes well with the high prestige of Kim Jong Il. The big polypetalous flower looks like symbolizing the exploits he has performed in the revolution and construction, thus reminding one of his high prestige.

Kim Jong Il enjoys boundless respect and praise from the Korean people and the progressive peoples the world over as he has made great contributions to the times and history with his outstanding political ability and benevolent humanity. Even the people in those countries hostile to the DPRK adore him. Most of the respondents to the opinion polls held in the United States in 2003 and 2004 designated Kim Jong Il as the first one among the most popular men in the world. According to the poll by the weekly *Time*, which annually announces the persons steering the world, he ranked first of the outstanding leaders in 2006.

The thick, upright stalk reflects the courageous character of Kim Jong Il. Thickness and uprightness mean indomitability. Indomitable character is precisely the will, courage and self-confidence. His strong willpower, matchless grit and great courage have always evoked admiration of the international community.

The dark green, heart-shaped leaf also mirrors the great image of Kim Jong Il, as its shape represents the heart of all people and its colour symbolizes peace, friendship and justice.

As the flower symbolizes the traits of Kim Jong Il, it is quite natural that it is the symbol of his desire for justice and peace.

Kimjongilia is, in the true sense of the word, the flower symbolizing a great man for its distinguished features ranging from its colour to leaves.

Almost everyday a shower of requests to grow Kimjongilia poured into the Kamo Mototeru Flower Garden from Japan and other countries. Each time he got a request, Mototeru used to say: “It’s me who bred Kimjongilia, but I’ve already sent it to the DPRK. So if you are really eager to grow it, I suggest you to go to Pyongyang.”

It was not because he had not the flower in his garden. He would always say to the

people: “Never try to grow this flower, if you are attracted by it simply for its beauty. If you witness with your eyes the reality of socialist Korea where the working people have become the masters of the country, you’ll have an in-depth knowledge of the outstanding ideology, leadership and personality of Kim Jong Il and his great achievements made for the human cause of independence. Only then can you grow Kimjongilia with the most clean, honest heart.”

Flowers and Health

Flowers produce a beneficial effect on human body for their own colours, aroma and forms, to say nothing of beauty.

According to data, it is said that flowers add vigour to human life, for they have a balance of the negative and the positive. It is advisable to decorate the room or office with rose or lily belonging to positive plants when a man is in a low mood (negative), but when he is in good mood (positive) *Angelica Porhyrocaulis Nakai et Kitag* and stellaria belonging to negative plants are appropriate.

Rose: It is effective in setting the nerves at ease. The aroma emitting from its petals also produces a splendid effect of controlling humidity. The aroma also helps make the kidney strong, refresh the mind, relieve fatigue and invigorate the energy.

Lily: It is efficacious for removing the symptoms of thirst and weariness, peculiar to diabetes. The method is simple. Put a bundle of lilies in the room, then the air is laden with the aroma of lilies, removing the feeling of indisposition.

Therefore, when visiting a diabetic, it would be advisable to take the flowers.

Balsam: It has a marvelous effect on diarrhea and acts as an antidote.

In particular, pink balsam is highly efficacious for protecting the spleen and lungs.

When a bone of fish sticks on the throat, it will be soon removed if you eat its powdered seed. And if its extract is applied to the insect’s bite, it will heal up quickly.

Sunflower: Its fried seeds prevent coronary arteriosclerosis. If you drink liquor mixed with its yellow petals, stress will be eased. And liquor mixed with its leaves and stem helps cure headache and eye fatigue, and allay fever. According to data, sun-flower has been recognized as a highly effective remedy for treating lungs and liver, decreasing the amount of cholesterol in blood and killing ascarid in the body. The modern medical science has proved it to be very effective for the growth promotion.

Chapter 2
Kimjongilia in Full Bloom All over the World

Kimjongilia keeps on blooming not only in the DPRK but in different parts of the world right after it has come into the world. This is not simply because it has matchless beauty. It reflects the mind of all humankind fascinated by the greatness of Kim Jong Il who is admired as the great man.

Section 1. Good News

The news of the birth of Kimjongilia spread across the world through the mass media.

The Korean Central News Agency announced the birth of Kimjongilia on February 20, 1988. *Rodong Sinmun* and other major newspapers of the DPRK highlighted the news under the title of "Kimjongilia Has Come into the World!" They carried the details on the shape and features of the flower, explaining the background of Kimjongilia's birth.

They also introduced the letter Kamo Mototeru had sent to Kim Jong Il together with the flower.

《김정일화》가 세상에 나왔다

[평양 2월 20일발 조선중앙통신] 친애하는 김정일동지의 존함을 모신 불멸의 꽃 《김정일화》가 세상에 태어났다.

《김정일화》는 일본 시즈오까현 가께가와시 가모꽃창포원 주임인 가모 모또떼루가 다함없는 경모의 정을 안고 오랜 기간의 정력적인 탐구로 새로 육종해낸 아름답고 진귀한 꽃이다.

《김정일화》는 크고 탐스러운 붉은 꽃송이들이 120여일간에 걸쳐 차례로 련속 피여나 볼수록 사람들을 현혹케 하는 아름다운 꽃으로서 번식률이 강하고 가꾸기도 쉽다.

《김정일화》는 베고니아과에 속하는 여러해살이화초로서 줄기는 30~70센치메터 정도로 곧추 자라며 잎사귀는 비대칭이고 길죽하며 한포기에서 수꽃과 암꽃이 따로 피여나는데 수꽃이 훨씬 더 크고 화려하며 암꽃의 밑부분에는 씨앗집이 있다.

《김정일화》는 5~6번째 잎사귀에서부터 첫 꽃이 핀 다음 층층이 올라가면서 10-15개 정도의 꽃송이들이 여러달에 걸쳐 피여나는데 수꽃은 직경이 10~20센치메터이고 최고 25센치메터이상되는것도 있다.

김정일동지께 드리는 꽃과 함께 축하편지를 보내면서 원예업에 한생을 바쳐오는 가모 모또떼루는 가장 아름답고 진귀한 꽃을 길러 거기에 만민이 경모하는 절세의 위인의 존함을 모시여 후세에 길이 전할수 있게 하는것이 자기의 평생의 소망이였다고 말하였다.

그러면서 그는 위대한 령도력을 지니시고 조선인민을 이끌어주시며 조선인민과 일본인민들사이의 우호와 련대, 세계평화위업에 공헌하고계시는 친애하는 지도자 김정일각하께 2월 16일에 즈음하여 자기가 20여년간의 정력적인 노력끝에 새로 육종해낸 《김정일화》를 전하여드릴수 있게 된것을 무상의 영광과 기쁨으로 생각한다고 지적하고 그이께서 장수하시기를 축원한다고 말하였다.

대륙과 대양을 넘어온 《김일성화》와 함께 《김정일화》는 우리 인민들의 끝없는 사랑속에 륭성번영하는 주체조선의 대지에 뿌리내리고 누리에 영원토록 만발할것이다.

《김정일화》에 깃든 이야기

이 땅에 영원히 만발하리

Materials of Korean newspaper introduce the birth of Kimjongilia

On February 27 that year, a Japanese short-wave radio broadcast the birth of Kimjongilia in the following vein:

… Kimjongilia is a variety of begonia which Kamo Mototeru, manager of Kamo *Iris Ensata* Garden in Kakegawa City, Shizuoka Prefecture, donated to north Korea. Not available yet to us in Japan, it is a new variety of begonia with red flower, which has strong propagating power and is easy to cultivate. In north Korea, Kimilsungia named after President Kim Il Sung has been propagated across the country from several years ago. So it is also expected that this new variety of begonia named after His Excellency Kim Jong Il will be widely propagated ….

South Korean newspapers were no exception. They reported the facts that a Japanese horticulturalist in charge of a flower garden had bred a beautiful flowering plant through his protracted, strenuous research and named it after leader Kim Jong Il on the occasion of his birthday on February 16. Noting that this flower with strong prolific power is easy to grow, they explained its biological features as follows: As a perennial floral plant belonging to the begonia family, Kimjongilia grows 30–70 cm high. The first flower opens when the fifth or sixth leaf comes out and about 10–15 flowers bloom successively going upward at each node for more than 120 days. They are red in colour.

Indeed, the birth of Kimjongilia brought a great delight to the Korean people and humankind in the era of independence.

Section 2. In Order to Keep Kimjongilia in Fuller Bloom

Reflecting the desire of the Korean people to keep Kimjongilia in fuller bloom, a Kimjongilia greenhouse began to be built in the Central Botanical Garden in the DPRK.

A large number of builders and volunteers came to the spot at the news. The arrays of trucks loaded with equipment, building materials and humus streamed to the compound of the botanical garden.

Thanks to the great concern of the Korean people, the Kimjongilia Greenhouse, covering an area of over 1 000 square metres, sprang up at the foot of Mt. Taesong in the suburbs of Pyongyang and opened on April 10, 1988.

The greenhouse served as a breeding farm for propagating Kimjongilia throughout the country.

Part of the Kimjongilia Greenhouse

It was fully provided with a spacious room for cultivation, a hothouse for research, a dormancy room, a tuber-keeping room, an outdoor balcony, a refrigerating chamber and resting rooms so as to carry on the floriculture in a scientific and technical manner.

With the news reported, a large number of people from every part of the country visited the botanical garden to see Kimjongilia every day.

Poets, composers, artists and journalists described their excited feelings in their works. The workers of the Haeju Smeltery sent many fittings for the management of the greenhouse together with a letter reflecting their earnest request for growing Kimjongilia well.

A family in Kaephung-dong, Kaesong City, visited the greenhouse with fertile humus soil from Mt. Chonma and various instruments necessary for floriculture, and a farmer in Anbyon County, Kangwon Province sent a large amount of culture soil.

A Pakistani public figure contributed a bio-microscope and hygrothermographs necessary for the scientific research, in the hope that more Kimjongilias would be cultivated and sent to the people around the world.

In April 1989 Kamo Mototeru visited the DPRK again. Looking round the Kimjongilia Greenhouse, he expressed his admiration at the fact that a splendid greenhouse had been built in a short period of time and that Kimjongilia has been propagated across the country.

Later, Kimilsungia and Kimjongilia greenhouses were built in different parts of the country with the breeding farm in the Central Botanical Garden as a model. This was

the fruit of the desire and sincerity of the Korean soldiers and people to keep Kimilsungia and Kimjongilia in full bloom forever as the treasures of the country and the nation.

Kimjongilia was also in full bloom in the courtyard of Kim Jong Il's birthplace in the Paektusan secret camp, thanks to the painstaking efforts made by a discharged soldier Kim Kyong Bok working at the Kim Jong Suk County Management Station and his brothers.

He headed for the Paektusan area carrying six plants of Kimjongilia given by the Central Botanical Garden. He made experiments of cultivating them in Rimyongsu at the foot of Mt. Paektu for two years before transplanting them to the greenhouse in the Paektusan secret camp.

The weather of Mt. Paektu in winter was too terrible. Snow would pile up to the eaves of the greenhouse overnight and heavy snowstorms would cut off electric wires. Overcoming all sorts of difficulties, however, they finally succeeded in blooming 16 heads of Kimjongilia in the courtyard of the log cabin in the Paektusan secret camp.

There is a Korean saying that sincerity moves heaven.

They were ordinary ex-serviceman and workers who had received no professional education on flowering plants and lacked experience in floriculture, but they brought to success the cultivation of Kimjongilia in Mt. Paektu.

In summer of 1993 while touring the Paektusan area revolutionary battle site, President Kim Il Sung looked at Kimjongilia in full bloom in the courtyard of Kim Jong Il's birthplace in the Paektusan secret camp and said meaningfully that the flower there was more beautiful than that in other places. At that time, he met with Kim Kyong Hui and Kim Kyong Wol growing Kimjongilia there and had a photograph taken with them in overalls.

Every year the Kimjongilia festival is held in a grand way in the DPRK in celebration of the birthday of Kim Jong Il, capturing the imagination of visitors.

The Kimjongilia exhibition, which started according to the unanimous desire of the Korean service personnel and people, has become an annual event with its scale getting larger as the days go by. With the participation of various diplomatic missions, the missions of international organizations in the DPRK and friendship organizations, it has developed into an international flower festival.

It has been called Kimjongilia festival from its eighth exhibition.

During the period of the February holiday flags of the Kimjongilia festival are hoisted in many parts of Pyongyang and the festival song is widely disseminated.

The Kimilsungia and Kimjongilia Exhibition Hall began to be built on the picturesque bank of the Taedong River in October 1998 and was completed in April 2002.

The Kimilsungia festival and the Kimjongilia festival are held here every year to mark the birth anniversaries of President Kim Il Sung and Kim Jong Il.

The hall provided with an up-to-date tissue-culture room produces seedlings of Kimilsungia and Kimjongilia and sends them to different parts of the country and many countries and regions over the world. It also sponsors technical courses on the cultivation of Kimilsungia and Kimjongilia, presentations of experiences and practices for gardeners and horticulturalists.

Every year a great number of the Korean people, overseas compatriots and foreigners visit the hall to see Kimilsungia and Kimjongilia.

Vigorous scientific researches into Kimjongilia have been made to keep the flower in fuller bloom.

The scientists and technicians of the Central Botanical Garden have clarified the biological features of Kimjongilia in a comprehensive way and established a system of producing the seedlings of tuberous begonia by the way of tissue culture and a scientific growing method.

The competent scientists and technicians of botanical gardens in all provinces and the life science field were also involved in the research work.

They first buckled down to the study of growing Kimjongilia by the way of tissue culture. In fact, by that time, there were little research data on the tissue culture of tuberous begonia in the world as successes were registered only in the tissue culture of winter begonia with thick and hard leaf. Through their painstaking efforts and researches they found out a reasonable disinfecting method by way of prolonging the sterilizing time while lowering the concentration of disinfectant and succeeded in disinfecting all sorts of germs except those which infiltrated deep into the tissue and reviving a leaf and its leafstalk. But the settlement of disinfecting method did not mean that a bud could grow of its own accord from the leaf tissue.

It was essential to find out the composition of culture medium suited to Kimjongilia.

In the culture medium which was widely used for the tissue culture of a plant across the world, the leaf tissue did not get green but got brown before withering. Hundreds of tissues were inoculated, but only a few survived. The scientists attributed the reason to the osmotic pressure, and diminished by half the salt concentration of the culture medium. Then the leaf tissue began to get green and swell. Relying on their first success, they succeeded in finding out the recipe for the tissue culture of Kimjongilia by making a proper adjustment of various elements.

Botanists are interested in the cultivation of and research into Kimjongilia

They also invented and introduced into production a liquid-based culture method for increasing the multiplication rate more than twice.

Based themselves on those achievements, they went over to the stage of growing the multiplied sprouts into young seedlings in good time and to the stage of transplanting the seedlings grown in test tubes into flowerpots for their acclimatization.

Another important thing in the scientific research into Kimjongilia was to make clear the biological features of the flower and put its cultivation on a scientific basis.

They found out the most moderate luminous intensity suited to every growth stage and the optimal range of temperature between day and night. They also solved such scientific and technical problems necessary for growing Kimjongilia as the absorption rate of nutritive elements like nitrogen, phosphorus and potassium according to its growth stage, their mixing ratio and the form and anatomical structure of each organ of the plant. In this way they discovered the most reasonable methods for controlling temperature and nutritive conditions and handling the plant and introduced them into production.

Meanwhile, Kamo Mototeru, too, succeeded in the tissue culture of Kimjongilia almost at the same time with the Korean scientists. He decided to inform them of it on his next visit to the DPRK. But, in Pyongyang, he was quite surprised to see that they were conducting the tissue culture of Kimjongilia on larger scale than his. He gave unstinted praise to them, saying that it took him four to five years to grow the tuberous begonia for the first time, but they succeeded in the cultivation of Kimjongilia at one go.

Meanwhile, the botanists widely spread the cultivation technique of Kimjongilia.

Such books about the biological features of Kimjongilia and the methods of its cultivation, propagation and controlling its blooming as *Kimjongilia, the Immortal Flower*, *Biology of Kimjongilia* and *Cultivation of Kimjongilia* have been published, and over 100 essays and technical information made public, including "Study of Multiplication of Kimjongilia by Means of Tissue Culture" and "Characteristics in Growth of Kimjongilia."

Scores of scientific and technical presentations were made public at national festivals of science and technique, national symposiums for science and technology and international scientific seminars. More than 70 items of information were presented to the meetings for exchanging experiences on the cultivation of Kimjongilia held every year since 1997.

All these gave scientific and technical solutions to many knotty problems arising in the propagation and growth of Kimjongilia and the methods of controlling its blooming and exterminating harmful insects, registering achievements in the scientific research of the flower.

Several science films like *Kimjongilia* were produced to give people a rich knowledge of its biological features and the method of growing and multiplying the flower.

Since 2001, a quarterly magazine *The Immortal Flower* has been issued regularly with an aim at disseminating and publicizing the technique of cultivating Kimilsungia and Kimjongilia.

Today the scientific research into Kimjongilia in the DPRK is conducted on a new, higher stage centring on the Kimilsungia-Kimjongilia Study Centre and the Central Botanical Garden.

The study group is pressing ahead with the work to improve the ecological

characteristics of Kimjongilia including the drought resistance by applying the gene transfer technique and prevent and exterminate harmful insects by means of fresh biological agrochemicals, while making joint researches with related institutions.

It also organizes various work for encouraging and promoting scientific studies, including scientific seminars on Kimjongilia, examination on the introduction and invention of new technologies, show of scientific and technical achievements and so on.

It also carries on scientific and technical exchanges with research institutes and botanical gardens in different countries and regions of the world.

Form of Flower

Flower is a special reproductive organ of angiosperm which is the modification of leaves at the receptacle. To take tulip for instance, the flower has pistil in the centre and stamens, petals and sepals around it in a regular way. It is trimerous.

Flowers of lily and daffodil are the same in structure, but those of cherry and camellia are pentamerous and that of rape is tetramerous.

And flowers of pea and wisteria are butterfly-shaped, those of bellflower and morning glory are tubular, those of cherry and camellia are polypetalous, and that of morning glory is monopetalous.

To summarize the forms of flowers, indeterminate flowers now do not exist, but there are radial (star-like) flowers and bisymmetrical flowers like orchid flowers. Generally speaking, it is considered that flowers whose different parts make an integral whole are more evolved than the flowers whose parts are detached from each other and that bisymmetrical flowers are more evolved than the radial flowers.

Sunflower is aggregation of many flowers. In its centre there are tubular flowers which are surrounded by petals, which resemble the sun and look like one flower.

Such flowers are called capitate flowers in the sense that they resemble a head.

Generally speaking, there are plants with monoclinous flowers which have both androecium and gynoecium and those with diclinous flowers which have only androecium or gynoecium.

Azalea and daylily are plants with monoclinous flowers.

There are also dioecious plants whose male and female flowers bloom in different plants and monoecious ones whose male and female flowers bloom in the same plant.

Humulus japonica belongs to dioecious plant.

Section 3. Propagation of Kimjongilia and Its Festival

Kimjongilia, born among the blessing of the peoples around the world, got spread widely to many countries across the world in a short span of time.

In March 1995, when Kimjongilia became famous and made a big sensation in the floricultural world and among the peoples in many countries, the Nordic Kimjongilia Association was formed as an international organization, the first of its kind in history, aimed at propagating the flower and spreading its growing technique.

Ceremony of formation of the Nordic Kimjongilia Association (March 30, 1995)

In response to the initiative of the association, the activities to grow and propagate Kimjongilia became brisker among the peoples of many countries.

Out of boundless reverence for Kim Jong Il, the progressive figures of the European social and floricultural circles made a remarkable success. The botanical garden of Musée National d'Histoire Naturelle in Paris, France succeeded in the cultivation of Kimjongilia in 2001, and the Botanischer Garten und Botanisches Museum, Berlin-Dahlem, Germany in 2004.

The work of growing and propagating Kimjongilia got brisk in the Yanbian Korean autonomous region in China, too.

From March 1996, the Korean residents in China built a greenhouse for cultivating Kimjongilia in Yanji City and invited Korean floriculturists from October to December for cooperation in acclimatizing the flower to the local climate. Their efforts resulted in bringing hundreds of Kimjongilia into full bloom despite the rigorous winter in Yanji. The Kimjongilia Greenhouse (the China-Korea Friendship Flower Garden) in Yanji City was always crowded with the Korean residents in China

and the Chinese people. The Yanbian TV set a full-blown Kimjongilia as its fixed background when broadcasting current news everyday.

In October 1998, the delegation of forestation section of the People's Government of Yanji City, Yanbian Korean autonomous region visited the then Korea Kimjongilia Federation to discuss the technical problems for actively conducting the cultivation and propagation of the flower in the Yanbian area including Yanji. It also took part in the Kimjongilia festival, an annual event in the DPRK, to learn the techniques and experience in its cultivation. Late in 1998, cultivation and propagation of Kimjongilia were conducted more vigorously in the Yanbian area under the direct management of the government organs including the forestation section of the People's Government of Yanji City amid the growing fascination and admiration of Korean residents in China for the flower.

The ardent aspiration of Korean residents in China for growing and propagating the flower was not limited only to the Yanbian area.

In the Wangqing area along the Tuman River associated with the revolutionary history of President Kim Il Sung, the legendary hero of the anti-Japanese war, they began to build a Kimjongilia greenhouse in Dahonggou Zhen in 1998 and grew Kimjongilia together with the Korean floriculturists despite the severe winter in Northeast China.

Part of the hall of Kimjongilia Exhibition to Mark the 50th Anniversary of the Establishment of the Yanbian Korean Autonomous Region

On December 21, 1998, an opening ceremony of the Wangqin Anti-Japanese Guerrilla Base Friendship Greenhouse was held in the meeting hall of the government building in Dahonggou Zhen. Local party and government officials and a large number of Korean residents in China looked round the greenhouse.

From late August to early September 2002 the employees of forestation section of the Yanji City People's Government organized the Kimjongilia Exhibition to Mark the

50th Anniversary of the Establishment of the Yanbian Korean Autonomous Region amidst the great concern of the autonomous region and the people's government.

Marking the 7th anniversary of Kim Jong Il's assumption of the supreme commandership of the Korean People's Army on December 24, 1998, Dandong City hosted a grand

Dandong Kimjongilia Exhibition (December 24, 2004)

Citizens of Dandong looking round the exhibition hall

exhibition. On display there were hundreds of potted Kimjongilia cultivated by the officials of Liaohai Import and Export Company and other Chinese people and Korean residents in China. Kimjongilia exhibitions were held there consecutively in December 2003 and in December 2004 to mark the above-said historic day with a large attendance of Chinese people. On the occasion of the Day of the Sun and the 77th founding anniversary of the heroic Korean People's Army, Wang Dongping, general manager of the Dandong Kimilsungia and Kimjongilia Greenhouse sponsored the First Dandong Kimilsungia and Kimjongilia Exhibition in April 2009. Displayed there were 50 pots of Kimilsungia and 150 pots of Kimjongilia grown with sincerity by the above-said greenhouse. The Second Kimilsungia and Kimjongilia Exhibition was held on April 23 and 24, 2010, in Dandong.

This occasioned the Dandong area to be a hub of propagating Kimjongilia and a base for supplying its seedlings.

To mark the 80th anniversary of the formation of the Down-with-Imperialism Union in October 2006, the Kimilsungia and Kimjongilia Exhibition was held successfully under the auspices of the couple of Ri Chon Chu and Kim Yong Nyo, members of the Association of Supporters for Propagation of Kimilsungia and Kimjongilia, at the Jilin Yuwen Middle School associated with President Kim Il Sung's revolutionary activities in his early years.

Opening ceremony of the Kimilsungia and Kimjongilia Exhibition held at the Jilin Yuwen School, China

The cultivation and propagation of Kimjongilia were conducted successfully in many units of China including the China-Korea Flower Association, the Shenyang Chengjing Trade Company, the Beifang Huacheng Group, the Foreign Technique Service Centre of Yiwu City, Zhejiang Province and Mancheng Floriculture Co., Ltd. of Tianjin City. Kimjongilia was exhibited in the China Flower Expo held in Chengdu City in June 2005. This increased the interest in the flower and its propagation among the Chinese people. A Kimjongilia exhibition was opened in Shenyang in June 2001. In February 2009, the Chilbosan Hotel Co., Ltd. and the Korea Kimilsungia and Kimjongilia Cultivation and Propagation Centre in Shenyang co-sponsored the Shenyang Kimjongilia Exhibition in Celebration of February 16. The Shenyang Kimilsungia and Kimjongilia Exhibition to Mark the Day of the Sun was held in grand style under the co-sponsorship of the Kimilsungia and Kimjongilia Cultivation and Propagation Centre in Shenyang and the Shenyang Jihong Foreign Economic Trading Corporation in April 2009 at Chilbosan Hotel.

The Shenyang Korean Economic Trade and Investment Advisory Co., Ltd. sponsored the Kimilsungia and Kimjongilia Exhibition at Chilbosan Hotel on December 22, 2009, to mark the 18th anniversary of Kim Jong Il's assumption of the supreme commandership of the KPA and the 92nd birth anniversary of Kim Jong Suk, the anti-Japanese heroine.

The Kimjongilia Exhibition in Celebration of February 16, the Greatest National Holiday, was opened on February 2, 2010, at the Shenyang Cultural Palace under the auspices of the Federation of Korean Nationals in China, and the Shenyang Kimjongilia Exhibition in China under the sponsorship of the Shenyang Aircraft Digital Specialization Equipment Company on April 7, 2010.

Dalian Kimilsungia and Kimjongilia Exhibition in China (December 2007)

In December 2007 the Kimilsungia and Kimjongilia Exhibition was held in Dalian, China under the co-sponsorship of the Huashun Business Development Co., Ltd. in Beijing

and the Korea Kimilsungia and Kimjongilia Cultivation and Propagation Centre in Dalian on the occasions of the 16th anniversary of Kim Jong Il's assumption of the supreme commandership of the KPA and the 90th birth anniversary of Kim Jong Suk. In February 2008 a Kimjongilia exhibition was opened in Dalian to mark Kim Jong Il's birthday and the 20th anniversary of the naming of the Kimjongilia.

Second Hunchun Kimilsungia and Kimjongilia Exhibition in China (December 2008)

In December 2007 an opening ceremony of the Hunchun Kimilsungia and Kimjongilia Greenhouse and the Kimilsungia and Kimjongilia Exhibition were held in Hunchun, Jilin Province of China under the sponsorship of Yang Hongjun, manager of the Hunchun Luoming Economic Co., Ltd.

The Second Hunchun Kimilsungia and Kimjongilia Exhibition was hosted in December 2008 on the occasions of the 17th anniversary of Kim Jong Il's assumption of the supreme commandership of the KPA and the 91st birth anniversary of Kim Jong Suk. The Fourth Hunchun Kimilsungia and Kimjongilia Exhibition was held in September 2010.

The Huayang Haomu Group Ltd. in Beijing grew and spread more than 10 000 pots of Kimjongilia in the greenhouse with an area of 5 000 m^2 in cooperation with the Korean floriculturists in February 2009. Chinese newspapers and magazines, including *Green News*, a flower-related newspaper, gave a daily coverage of Kimjongilia in full bloom in Beijing.

In Japan, the birthplace of Kimjongilia, progressive figures made vigorous efforts for the propagation and dissemination of the flower.

Those from the Japanese political, social and academic circles formed a preparatory committee for founding the Kimjongilia Amateurs Association. They sent a delegation of the preparatory committee to the Second Kimjongilia Exhibition held in the DPRK in February 1998 to present a gift to Kim Jong Il on behalf of the delegation and conveyed potted Kimjongilia sent by Kamo Mototeru to the exhibition. They stepped

up the formation of their association through their participation in the exhibition.

In April 25, 1998, an inaugural ceremony of the formation of the Japanese Kimjongilia Amateurs Association took place in Tokyo amid the great concern of the Japanese people. It was attended by many Japanese figures and citizens including Inoue Shuhachi, then chief director of International Institute of Juche Idea, and Wakabayashi Hiroshi, secretary general of the Japanese Committee for Supporting the Independent and Peaceful Reunification of Korea. Inoue Shuhachi and Wakabayashi Hiroshi made speeches at the ceremony. Noting that it was a great pleasure to have formed the association, they called for contributing to the promotion of Japan-Korea friendship through the propagation of Kimjongilia. Kamo Mototeru gave a lecture titled “On the Cultivation of Kimjongilia.”

Since its inauguration, the association propagated Kimjongilia among the Japanese people and conducted various forms of activities including lectures and meetings for introducing the great personalities of Kim Jong Il and the reality of socialist Korea. It took part several times in the Kimjongilia festival held in Pyongyang every year and presented Kim Jong Il with gifts and congratulatory messages. It vigorously introduced to the Japanese people the achievements made by the Korean people in their efforts to build a prosperous and powerful socialist country and the facts that Kimjongilia is widely propagated among the world people.

Entering the new century, the adherents of the Juche idea and the progressive figures of the Japanese Amateurs Association set it as the main task to issue a bulletin of the association with the purpose of giving wide publicity to Kimjongilia. As a result, bulletin No. 1 of the association was issued in May 2004 thanks to their strenuous efforts. The association is reinforcing its ranks while organizing its activities to publish the bulletin, introduce Kimjongilia and support its propagation in diverse forms and ways. Today the association holds a full-fledged position as an international organization of supporters for propagating Kimjongilia, with the backing of the followers of the Juche idea and progressive people in Japan.

Kimjongilia is in full bloom on the American continent, too, thanks to Ri Pyong Sang, director of the Euclid Nursery and Landscaping in California of the United States and honorary chairman of the Association of Supporters for Propagation of

Kimilsungia and Kimjongilia, and other Korean residents in the US.

It was at the First Kimjongilia Exhibition held in February 1997 that Ri Pyong Sang came to know about the flower. He prided himself on having seen all the beautiful flowers in the world while engaging in the floriculture for scores of years. But he could not help expressing admiration at the sight of Kimjongilia. Charmed by the beauty of the flower, he had a strong urge to bring Kimjongilia into bloom on the American continent. So he took the tuberous begonia of Kimjongilia to America, and organized the Kimjongilia Association with Korean residents in the US and began to grow the flower with them. When the first Kimjongilia bloomed on the American continent, he took a photo of it and sent it to the DPRK. With an increase in its membership, he renamed the association the American Kimilsungia and Kimjongilia Association.

Kimjongilia came into flowers in Seoul, Pusan, Jonju and other parts of south Korea, too, backed by south Koreans from all walks of life who respect and follow Kim Jong Il.

A flower amateur in Pusan took Kimjongilia from abroad and grew it in full bloom in his house. He said to his visitors as follows: The birth of Kimjongilia in the world is a happy event and pride to the Korean nation. It is a great bliss of our nation to have such peerless great men as President Kim Il Sung and General Kim Jong Il, revered by the world people as the leaders of our nation. A florist, on reading an article about the birth of Kimjongilia in a newspaper, sent his son to Kamo Mototeru in Japan to get its seeds and tubers and learn its cultivating method. He grew them carefully and propagated hundreds of Kimjongilias. With a determination to carry the colour photo of Kimjongilia in a publication, a south Korean cameraman visited a florist's and took a photo of it. He said: Kimjongilia is the most beautiful flower in the world. It evokes unstinted praise of the great man among the world people, so it must be placed in the supremacy not only in the flower world but in the photo world.

Kimjongilia in full bloom reflects the boundless reverence of all people for Kim Jong Il. The Association of Supporters for Propagation of Kimjongilia, which was organized by the progressive personages in China, Japan and the US in 1998, launched its work vigorously.

Kimjongilia was awarded gold awards several times in international flower exhibitions and flower Expos.

Kimjongilia made its debut on the international flower theatre in May 1991 when the 12th International Flower Exhibition was held in Bratislava of then Czechoslovakia.

DPRK display booth of the 12th International Flower Exhibition held in Bratislava of then Czechoslovakia

On display in this biennial flower exhibition were over 820 species of flowers presented by 103 flower-producing companies, organizations and institutes from 13 countries including the Netherlands, Belgium, Austria, Bulgaria, then Czechoslovakia and the DPRK.

Kimjongilia presented by the DPRK was No. 647.

The flower exhibition was very popular among flower amateurs and people in Europe. The visitors to the DPRK's hall in the exhibition were carried away at the sight of scores of potted Kimjongilia on display.

"Could there be such a beautiful flower in the world?" "Is that a really living flower?"

The hall was crowded with the endless streams of visitors pouring questions and journalists clicking shutters. They expressed great wonder and admiration when they knew that this flower was named after Kim Jong Il whom the world people respect.

During the exhibition, a large number of flower amateurs, breeders, floriculturists and people from different countries in Europe asked the Korean floriculturists to help them grow Kimjongilia, expressing their attraction for the flower.

The jury comprising 50 members began its work at dawn, but it was in the

Gold medal and its certificate awarded to Kimjongilia at the 12th International Flower Exhibition

afternoon when they reached the display booth of Kimjongilia. Conspicuously large, full-blown flower, fascinating petals evenly dyed in red and emitting liveliness and heart-shaped green leaves giving fresh and stout feelings …. The more they saw the flower, the more deeply they were fascinated.

At the final judgment held that day the jury decided to award the special prize and gold medal to Kimjongilia.

From 8:30 p.m., the TV of that country broadcasted the 12th International Flower Exhibition. From the following day, Kimjongilia came in the limelight of central and local newspapers of then Czechoslovakia. Austria, Germany, Italy and other countries, too, bannered the news.

At the international flower exhibition held in Stockholm, capital of Sweden, in March 1995, the beautiful image of Kimjongilia evoked a great sensation among Europeans once again. On March 23, the Stockholm International Flower Exhibition was held with splendour at the Solentunna exhibition hall of Stockholm. It was attended by over 160 horticultural associations and companies from 17 countries including the DPRK, Sweden, Norway, the Netherlands, Switzerland and Austria.

Displayed in the exhibition consisting of two big halls were over 760 species of flowers, over 800 kinds of flower seeds, plants, garden tools and instruments.

The DPRK displayed full-blown Kimjongilia and its seedlings.

Although no advertisement and gorgeous decorations could be seen in its booth, the beautiful Kimjongilia struck the participants and visitors with wonder. All of the visitors said: “We’ve never seen such a big and beautiful flower before. What’s the name of this flower?” When they were told by the Korean floriculturists that it was Kimjongilia, they turned up their thumbs in praise of the flower and kept standing before it for a long time, fascinated by its beauty. The European florists and horticulturalists, on their visit to the booth of the DPRK, asked for cooperation in cultivating Kimjongilia or proposed joint cultivation and discussed how to multiply its seedlings on a large scale.

In August 1997, a flower Expo was held at the Jiangnan Park in Jilin City under the auspices of Jilin Province, China. On display there were more than 12 000 flowering plants sent from Changchun, Jilin, Yanji, Tonghua and other cities and counties of Jilin Province. It drew a great number of Chinese, Korean residents in China and foreigners.

Kimjongilia, exhibited at the Expo, caused a great sensation among the participants and was awarded the top prize.

After visiting the Expo, the general manager of the China-Korea Friendship Flower Garden Company in Yanji said: It is a great encouragement and pride to all the Koreans in the north and south of Korea and those in northeast China that Kimjongilia was awarded the top prize at the Expo held in the historical place associated with the immortal revolutionary history of President Kim Il Sung.

The 99 Kunming International Horticultural Exposition, China, held in 1999 in Kunming City, provincial capital of Yunnan, China can be said to be the review of all the achievements made in the horticultural world of the 20th century.

The organizing committee of the Expo saw to it that the exhibition ground provided with a large-size greenhouse, indoor and outdoor display districts and modern horticultural structures and equipment was built on an area of 218 hectares in Kunming City. It also ensured that all provinces, special municipalities and autonomous regions of China built their flower gardens in their quarters and that many countries in Asia, Africa and America, to say nothing of the Netherlands, Canada and Japan that boast of floricultural development, set up their indoor and outdoor display booths.

Meanwhile, the organizing committee asked the DPRK government several times to put Kimjongilia on display.

At its invitation, a delegation of floriculturists of the then Korea Kimjongilia Federation arrived at the spot in March 1999 and grew Kimjongilia in the greenhouse offered by the organizing committee and put it on display at the Expo.

The Expo was the biggest one in the history of the world horticulture, as it brought together 69 countries and regions, including the DPRK, China, the Netherlands, Denmark, France, Japan, Germany and Canada, and 26 international organizations. On display there were over 2 400 species of flowers, including Kimjongilia presented by the DPRK, thousands of species of bonsai trees and potted plants and other gardening tools.

Displayed in the exhibition hall of the DPRK in the centre of the second floor of the international exhibition hall were over 200 pots of Kimjongilia and over 30 species of flowers for decoration. From the first day of the Expo, it caused a sensation among visitors.

The Kimjongilia booth of the DPRK was so crowded with visitors every day that the organizing committee had to organize an order maintenance team and take measures to enclose its front with red strings. But as the visitors to the booth thronged the large plaza in front of it, scores of security policemen were mobilized to maintain order there.

The exhibition hall echoed with voices of visitors admiring Kimjongilia.

Norodom Sihanouk, Great King of Cambodia, said in admiration: Kimjongilia is the best. Really beautiful. The flower named after His Excellency leader Kim Jong Il is quite extraordinary.

The governor of Yunnan Province of China said in excitement: The flower named after the respected Comrade Kim Jong Il is very beautiful. The great personalities of

Grand Prize and diploma awarded to Kimjongilia at the 99 Kunming International Horticultural Exposition, China

Comrade Kim Jong Il respected by the world people can be found in this flower, too. Our province wants to grow this flower widely in cooperation with Korean comrades so as to keep it in full bloom throughout the province.

Kimjongilia, admired by all people, was awarded the Grand Prize, the top prize of the Expo.

China, which had secured the right to open the first world horticultural Expo in the

21st century again by the decision of the International Association of Horticultural Producers and the International Exposition Bureau, made heavy investments in the preparations for the 2006 Shenyang International Horticultural Exposition.

On the basis of the experience gained at the 99 Kunming International Horticultural Exposition, China, the Chinese government intensified the relations and cooperation with the IAHP and other international organizations. While laying stress on the quality of preparations for the Expo, it asked the DPRK to participate in this Expo, too, attaching great importance to the presentation of Kimjongilia which had won sweeping popularity at the Kunming Expo.

The organizing committee of the Expo ensured that a Kimilsungia and Kimjongilia exhibition hall and a DPRK Garden were built in the outdoor exhibition district according to the design of the DPRK, and provided all conditions necessary for the continuous display of Kimjongilia in the whole period of the Expo.

In March 2006, the Korean floriculturists arrived in Shenyang and began to grow Kimilsungia and Kimjongilia in the greenhouse for the Expo. In April they completed the construction of the DPRK Garden in Korean architectural style.

Many countries around the world including the Netherlands, Japan, Canada, the UK and Singapore stepped up preparations for participation in the first international horticultural exposition in the new century with great importance attached to it. The IAHP, the International Flower Trading Association and other international organizations, too, took active part in its preparations, paying deep attention to the Expo.

At 11 a.m. on April 30, 2006, the 2006 Shenyang International Horticultural Exposition, the first horticultural “Olympics” in the new century, raised its curtain at the plaza in front of the venue. Exhibited there were more than 7 000 species of plants including 5 000 species of flowering plants sent from 25 countries including the Netherlands, Germany, the US, the UK, Russia and Canada—the most developed countries in horticulture in the world—and over 200 horticultural organizations and 43 provinces and special municipalities of China.

Invited to the opening ceremony were the vice-chairman of the Standing Committee of the National People’s Congress of the People’s Republic of China, the vice-president of the Chinese People’s Political Consultative Conference, senior

officials of the party and government of Liaoning Province, the head of the delegation of the Korea Kimilsungia-Kimjongilia Committee, the president of the IAHP, other foreign honorary guests, and diplomatic envoys and prominent personages of other countries. Flags of participant nations and the flag of the IAHP were hoisted in the venue of the opening ceremony.

The wide area of 250 hectares of the Expo was divided into an international garden district, national garden district and exhibition district by flower groups. A Wing-shaped Tower of Phoenix, Rose Garden, Lily Tower, Flowers' House and other structures were built in harmony with each other, adding unique features to the Expo.

Kimilsungia and Kimjongilia once again went into the limelight of the Expo in a moment, evoking great sensations among Chinese people and foreigners.

In consideration of what had happened during the Kunming Expo, the space in front of the Kimjongilia booth was further widened and enclosed with red strings beforehand, but it was not enough to escape the jam of visitors.

The Liaoning Province and Shenyang TV televised Kimilsungia and Kimjongilia and the DPRK Garden at the prime time and newspapers gave free space to the articles about the DPRK's exhibition hall and the DPRK Garden.

Viewing Kimilsungia and Kimjongilia, senior party and government officials of China, personages of political, social and horticultural circles from foreign countries and many other spectators spoke highly of President Kim Il Sung and leader Kim Jong Il.

Li Changchun, member of the Standing Committee of the Political Bureau of the Central Committee of the Communist Party of China, said: The flowers named after President Kim Il Sung and General Secretary Kim Jong Il are quite distinctive. They really befit the flowers of the great men.

The secretary-general of the IAHP said heartily: As a saying goes "a drop of water mirrors the universe," Kimilsungia and Kimjongilia highlight the whole-hearted reverence of mankind for the leaders of the DPRK.

The head of a flower association of south Korea said: It is a good luck for our Korean nation to have Kimilsungia and Kimjongilia attracting people with their unique charisma.

In reflection of the visitors' admirations and praises, the jury presented the gold award, the top prize of the Expo, to Kimilsungia and Kimjongilia.

DPRK display booth of the 2006 Shenyang International Horticultural Exposition, China

Gold award, top prize, and diploma conferred on Kimjongilia

Festive gate of the DPRK Garden and gold award and diploma conferred on it

Group Sculpture of Children in the DPRK Garden and gold award and diploma conferred on it

Comprehensive category optimal award (trophy), diploma and certificate conferred on the DPRK Garden

First Place Ribbon awarded to Kimjongilia at the Begonia Exhibition held in San Diego, California, the US

Ri Pyong Sang, director of Euclid Nursery and Landscaping in California, and other Koreans in the US presented Kimjongilia they have grown to the Begonia Exhibition held in San Diego of California in August 2004, which caused a great sensation.

The American Begonia Society, the sponsor of the exhibition, and the jury conferred the first prize on Kimjongilia in reflection of the unanimous admiration and desire of the participants.

On the occasion of the 60th founding anniversary of the People's Republic of China, the 7th China Flower Expo was held in Beijing from September 26 to October 5, 2009.

This Expo, which has been held every four years since 1987 for the purpose of showcasing the achievements made in the Chinese flower industry and promoting exchange and cooperation with other countries, is the national flower festival. The Chinese people call it "Flower Olympics".

It was attended by 27 countries including the DPRK, the Netherlands, Denmark and Germany and over 1 300 floricultural organizations from 31 provinces, autonomous regions and cities of China. On display there were various species of 200 000-odd rare flowers bred and cultivated in many countries of the world.

The Korea Kimilsungia-Kimjongilia Committee displayed hundreds of potted Kimilsungia and Kimjongilia which it has grown on the spot.

The Korean show stand was set up at the centre of the international section in the indoor exhibition hall of the Expo covering an area of tens of thousands of square metres, and the DPRK flag and name were hanging over the stand.

It exhibited pots of Kimilsungia and Kimjongilia against the background of a large electric photo of the flowers. From the first day of its opening, it was crowded with visitors. The pots of Kimjongilia exhibited at some points of the central hall added lustre to the Expo hall. Those who visited the Expo to see world-famous flowers on

show were so fascinated by beautiful Kimilsungia and Kimjongilia that they could hardly leave the place and expressed their high reverence for President Kim Il Sung and leader Kim Jong Il.

An official of the Central Committee of the Communist Party of China who watched on TV the display booth of the DPRK crowded with visitors unbosomed himself as follows: I made time to see the flower with my own eyes. Kimjongilia is the best. It is really a rare and wonderful flower. Its big and red flower looks like the rising sun. The DPRK is not large in territory, but it is a great country.

For the peculiarities in its scale and style the display booth of the DPRK became the limelight, drawing more than 1 600 000 visitors.

Kimilsungia and Kimjongilia displayed at the 7th China Flower Expo

The organizing committee of the Chinese Flower Expo awarded the best prize exhibition and diploma to Kimilsungia and Kimjongilia and the excellent organization prize and diploma to the Korea Kimilsungia-Kimjongilia Committee.

At the awarding ceremony, the vice-chairman of the Beijing Floricultural Society said that the organizing committee for the 7th China Flower Expo decided to award the best prize exhibition only to Kimilsungia and Kimjongilia as the flowering plants, adding that these flowers enhanced the character of the current Expo.

证书 Certificate
朝鲜金日成花金正日花委员会:
荣获第七届中国花卉博览会（北京展区）
优秀组织奖。
二〇〇九年十月

Excellent organization prize and its certificate awarded to the
Korea Kimilsungia-Kimjongilia Committee at the 7th China Flower Expo

证书 Certificate
朝鲜金日成花金正日花:
荣获第七届中国花卉博览会（北京展区）
最佳展品奖。
二〇〇九年十月

Best exhibition prize and its certificate awarded to Kimilsungia and Kimjongilia
at the 7th China Flower Expo

On August 24, 2010, the Kimjongilia Show was held in a grand way in Nakhodka, Russia. Present there on invitation were the mayor of Nakhodka, the vice-mayors of Pokino and Partizansk, the representative of the Foreign Ministry in Vladivostok, the director of Nakhodka Greening Co., Ltd. and other public figures, members of the Group for Studying the Juche Idea and Songun Politics in the Far East and the DPRK consul-general in Nakhodka and his members.

Mazur, director of Nakhodka Greening Co., Ltd., said that he was fascinated by Kimjongilia, expressing his determination to widely propagate the flower not only in the Far East but throughout Russia in the future.

In April 2011, the Xi'an International Horticultural Exposition was opened in Xi'an City, Shanxi Province of China. It drew 27 countries including the DPRK, the Netherlands, Japan and Thailand and other Chinese floricultural organizations. The organizing committee of the Expo presented the gold award for exhibition to Kimjongilia.

The DPRK garden covered not a large plottage of 770 m^2, but it attracted many visitors for the display of Kimilsungia and Kimjongilia everyday.

Today Kimjongilia is enjoying greater expectations and support of the IAHP and other major international bodies engaged in horticulture, and its worldwide propagation is the most important matter of concern for the international floricultural circle.

Faber Duke, president of the IAHP, officially suggested that the Korea

Gold award for exhibition (trophy) and diploma conferred on Kimjongilia at the international orchid competition of the 2011 Xi'an International Horticultural Exposition

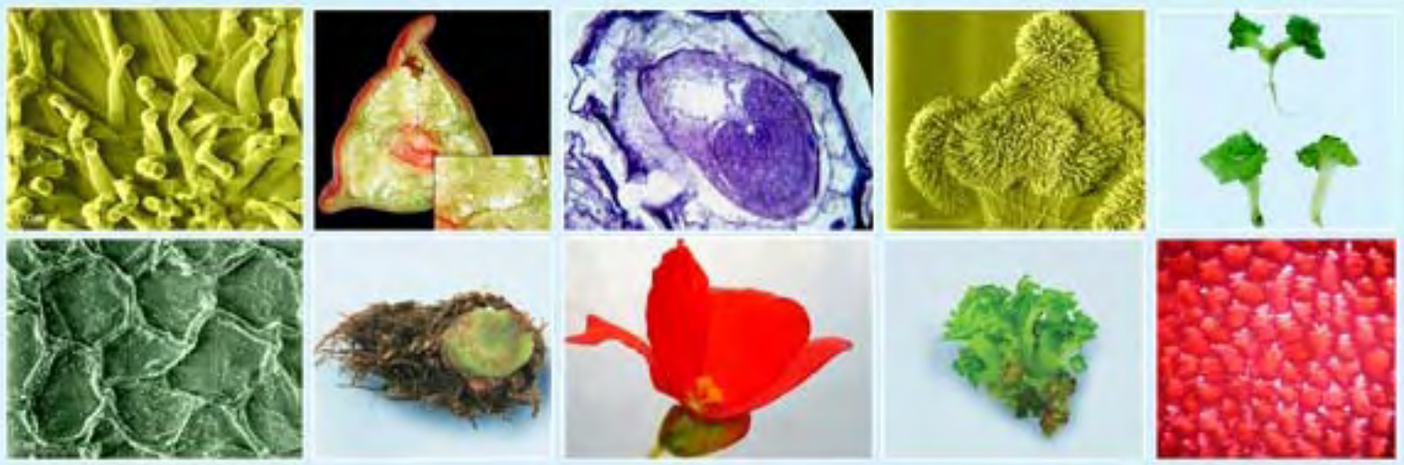
Kimilsungia-Kimjongilia Committee join the IAHP.

On November 3, 2006, the 58th General Meeting of the IAHP proposed as an agenda item the entry of the Korea Kimilsungia-Kimjongilia Committee into the IAHP, which was unanimously approved and decided by its President Faber Duke, the members of the Executive Committee of the IAHP and the representatives of all its member states.

Part II

Biology of Kimjongilia

This part deals with the biology of Kimjongilia and the major characteristics of the Begoniaceae.



Chapter 1
Breeding of Kimjongilia

Kimjongilia is a new species of tuberous begonia (*Begonia* × *tuberhybrida*) belonging to the genus *Begonia* (*Begonia* Linnaeus) of the family Begoniaceae.

This chapter deals with the introduction to the Begoniaceae, characteristics of tuberous begonias which are the wild ancestors of Kimjongilia and its breeding process.

Section 1. Introduction to the Begoniaceae

1. Classification

Begonia was named in the late 17th century after Michael Begon (1638–1710), a French botanical supporter and Intendant of the French Antilles in the Caribbean Sea. Joseph Pitton de Tournefort, a French botanist, used its generic name for the first time in 1700 and Carl Linnaeus, a Swedish botanist, introduced three genera belonging to the family Begoniaceae in his work *Species Plantarum*, Vol. 2 in 1753.

The family Begoniaceae is composed of five genera including *Begonia* Linnaeus, the largest group which has over 2 300 wild species. Over 100 species of this genus are now cultivated as flowering plants and about 10 000 cultivars have been bred so far. These plants, which are called ‘begonia’, are widely cultivated together with orchids, chrysanthemum, dahlia, gladiolus and tulips. Today about 2 500 species and cultivars of the genus *Begonia* are preserved as gene resources and grown.

The genus *Begonia* is divided into three groups according to the form of the underground part: tuberous, rhizomatous and fibrous-rooted.

Tuberous Begonia

The group, to which Kimjongilia belongs, has a tuber, a modification of the stem in the soil, and is subgrouped into two types ¢caulescent (having an obvious stem above the ground) and acaulesent (stemless or seemingly having no stem above the ground).

The caulesent begonias are perennial. In cold or dry season, the part above the ground dies out and the tuber goes into dormancy. In spring or rainy season, the tuber sprouts and the life cycle repeats. Therefore, they are grown like an annual plant.

There are marked differences in life cycle and ecology between Asian- and African-origin tuberous species such as *B. evansiana*, *B. dregei*, *B. socotrana* and their counterparts which originated in the alpine zones of Latin America.

Especially, those from the Andes of the Peru-Bolivian plateau are called Andean begonias or Andean tuberous begonias because of their great ornamental value and strong resistance to cold.

Rhizomatous Begonia

Begonias in this group have rhizomes. Rhizomes are thick stems which usually have short internodes. According to the growth patterns and the plant shape, they can be divided into three main subgroups: creeping rhizome, erect rhizome and rhizome on or below the surface of the soil. *B. rex*, *B. masoniana* and *B. nelumbifolia* are typical species of rhizomatous begonias.

Fibrous-Rooted Begonia

Begonias in this group are characterized by clear internodes, shrub-like shape and fibrous roots. They are evergreen perennials, but are sometimes called “tree” begonias because of their tree-like appearance. In fact, however, the stem is made up of soft cells, not ligniferous, and has no growth rings.

Typical species are *B. maculata*, *B. semperflorens* and *B.* ‘Argentneo-guttata’.

According to the ornamental parts, Begonia is also divided into flower-oriented and foliage-oriented types. Typical foliage-oriented ornamental begonias include *B. rex*, *B. masoniana* and *B. evansiana*.

2. Geographical Distribution

As *Begonia* species are originally tropical and subtropical, they are found mainly in the Tropics of Cancer and Capricorn with the equator in between.

Their phytogeographic distribution zones can be divided mainly into three.

The Southern Hemisphere and the Southeast Asia (including Oceania)

This region, inhabited by over 760 species of the genus *Begonia*, covers the vast area from India south of the Himalaya (over 120 species), Myanmar, Thailand, southern China (over 100 species) to the north, through Vietnam and the Philippines, to the Indonesian islands such as Kalimantan, Sumatra, Java to the south, to New Guinea and the Solomons to the east, and the Isle of Socotra in the Arabian Sea to the west.

Major species which originated in this region include *B. evansiana* (Yunnan of China and various parts of SE Asia), *B. rex* (Assam of India), *B. masoniana* (from southern China to the Himalaya), *B. versicolor* (southern China), *B. hayatae* (Taiwan), *B. decora* (Assam of India and SE Asia), *B. delicosa* (Kalimantan) and *B. serratipetala* (New Guinea).

Africa

Approximately 410 species are distributed in the region of West and Central Africa including the Isle of Socotra in the Arabian Sea and the southern tip of the continent, including Cameroon (over 50 species), Congo (over 20 species), Gabon, Nigeria and Madagascar (over 20 species).

Typical African-origin species are *B. dregei* (tuberous, Capetown of South Africa), *B. socotrana* (tuberous, Socotra), *B. hiemalis* (tuberous, Socotra), *B. macrocarpa* (fibrous-rooted, West Africa) and *B. auriculata*.

Latin America

Over 1 100 wild species grow in region of Latin America covering the southern

part of Mexico (170 species),

Guatemala, Haiti, Costa Rica, Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil and Argentina.

Especially, many begonias currently cultivated originated in Peru, Bolivia, Mexico and Brazil.

B. semperflorens and *B. maculata* including wild tuberous species such as *B. boliviensis*, *B. cinnabarina* and *B. pearcei* originated in the Peru-Bolivian part of the Andes, *B. heracleifolia* in Central America, and *B. coccinea*, *B. haegeana* and *B. aconitifolia* in Brazil.

Begonia species are mostly distributed in alpine forests and grassy land 1 500–4 000 m above the sea level. In the northern and southern regions beyond the Tropics of Cancer and Capricorn, however, some begonias also grow in low-elevated mountainous areas.

In the tropical and subtropical regions where begonias grow the temperature is 10°C lower than in the coastal plains and difference between day and night temperatures is great because they are 2 000 m above sea level. Begonias are well adapted to these climatic conditions. Therefore, they are ecologically different from other herbaceous plants native to the tropical forests.

Vertical distribution limit of begonias varies according to the species and the latitude. It is 1 500–2 000 m above sea level in the island of New Guinea, 1 800 m in Mexico, and even over 3 500 m in the Andean plateaus.

Therefore, wild begonias such as Andean tuberous species, which are wild ancestors of Kimjongilia, and many other cultivars have characteristics of alpine plants as well as of tropical and subtropical ones.

3. Morphology

Root

Begonias in general have short fibrous roots.

Even tuberous begonias have fibrous roots during the first year after propagated by seeds. However, when a low-temperature, short-daytime season comes, tubers develop

and go dormant. In spring new fibrous roots grow from the tubers.

As for rhizomatous begonias, short fibrous roots grow from the nodes of rhizomes.

Stem

In most begonias, except for fibrous-rooted species, the underground part of the stem is modified into the rhizome or its similar form, and doubles as the storage organ and the reproductive organ.

About one third of the *Begonia* species is rhizomatous. Some begonias have erect stems above the ground (caulescent), and others like *B. rex* do not (acaulescent).

Most part of the stem is fleshy with the inner part made up of parenchyma cells, and none of the begonias has a ligniferous stem.

There are two types of the stems—cane-like stem and shrub-like one which produces shoots at the base and branches freely.

Leaf

The shape of the leaf varies according to the species.

The most important feature of the leaf is the asymmetry of its blade. Although most plants have symmetrical leaves, *Begonia* species have asymmetrical leaves with the larger outer part around the midrib and asymmetrical fringe.

Another feature is that every begonia has a stipule on each node. The leaf colour and pattern are really diverse and change according to the surrounding conditions. The green colour of the foliage is different in tint ranging from yellow, orange, silver, blue, violet to black.

The size, shape and colour of the leaf are very diverse, especially in *B. rex* whose cultivars number over 1 100. In some species, even a single leaf may have multiple colours.

Flower

One of the significant characteristics of begonias is that female and male flowers bloom separately on the same peduncle as they are monoecious plants. There are

dioecious types like *B. riscida*. Flowers open in dichasium on peduncles growing from axils in dichasium.

In most begonias, the male flowers are bigger and more beautiful than the female ones. The male flowers of wild begonias are all single, with two petals and two involucres which look much alike and so are often counted four petals in all. The female flower has two involucres and three petals.

In the same plant, the male flowers are above the female ones, and usually bloom and fall off earlier than do the latter ones. Main flower colours of *Begonia* are red, orange, yellow and white, although considerably different in deepness.

Blooming time in nature slightly varies according to the species and cultivars, but tuberous group are mostly summer-bloomers.

Fruit and Seed

Most begonias produce dehiscent fruits and some baccate fruits.

Endosperm is very small and embryo occupies the greater part of the seed.

Also, the seed is distinctively tiny and generally measures 0.2 × 0.4 mm. One gram of seeds of tuberous begonias comes up to 60 000–80 000 grains and *B. semperflorens* to about 15 000 and in case of certain species the maximum number reaches to over 120 000.

4. Environmental Conditions

As *Begonia* species are typically tropical and subtropical but grow in alpine areas, they need environmental conditions different from other tropical and subtropical counterparts growing in plains.

The temperature limit for the existence of begonias is 5–35°C and the daily average temperature appropriate for their growth is 20±2.5°C. *B. rex* and *B. semperflorens* can grow unhurt at temperatures from −5 to −7°C. Most begonias are known to flourish with large flowers of deep colours when DIFs are 10°C or above.

Begonias are commonly known as shade plants. Because most of them grow in

deep valleys or under the shade of rocks and trees, they require filtered light and get hurt under the direct sunlight of 70 000–100 000 lx. There is slight difference in light preferences according to the species, but most begonias grow in the wild exposed to 20 –30% of full sunlight.

Since they live in alpine regions between the two tropics (23° 27′), begonias can grow and bloom normally in conditions of 13–14 hours' daytime.

In the condition of less than 12 hours' daytime, tuberous species form tubers and enter pre-dormancy.

Requirements for humidity and soil conditions are not pressing. In general begonias will thrive at humidity of 70–80%. Begonias of tuberous and rhizomatous group require higher humidity than those of fibrous-rooted group.

Begonias have aerotropic roots. Therefore, root substrates should allow good water -storage, drainage and aeration. They will thrive in soil conditions of neutral or subacidic pH values. Many wild begonias strike root into the layer of incompletely decomposed leaf mould.

Section 2. Andean Tuberous Begonias— Ancestors of Kimjongilia

1. Ecological Environment of the Andean Plateau

The different hybrids involved in the breeding of Kimjongilia originated from wild tuberous species which grow in the Andean plateau.

Thus the biological characteristics of Kimjongilia are closely related with the ecological environment of the Andean plateau.

The Andean plateau, located at 14° 30′–28° S lat. around the southern part of Peru and Bolivia, which occupy the central part of the Andes, is 650–750 km wide from east to west and 3 000–4 000 m above sea level. It comprises scores of high mountains which are more than 4 000–6 000 m above sea level, and mountains exceeding 5 000–

5 500 m are capped with snow all year round.

The eastern part of the plateau is frequently shrouded in thick fog and clouds because the wet SE wind from the Atlantic Ocean meets the high mountains, and is cold and humid due to snowmelt running down from the high mountains.

The annual mean precipitation is nearly 1 000 mm. The flora includes tropical evergreen broad-leafed trees, deciduous broad-leafed trees, coniferous trees and those growing in alpine grasslands and tundra.

Its middle part consists of many highland basins and hilly areas most of which are alpine grasslands. The annual mean precipitation here is around 500 mm, less than that of the eastern part. It consists of alpine grasslands with few trees.

In La Paz, at an altitude of 3 600 m, monthly mean temperature is about 12°C in January and 8.6°C in July. *B. pearcei* and *B.veitchii* were first found near La Paz.

As the western part of the Andean plateau belongs to the subtropical high atmospheric pressure belt, although it is adjacent to the Pacific Ocean, it has little wind and annual precipitation of 150–200 mm. Therefore, the western part including northern Chile is desert-like with cacti and other xerophytes growing there.

As above mentioned, the Andean plateau inhabited by wild tuberous species enjoys longer duration of sunlight than plains at the same latitude (13–14 hours around Dec. 22, the summer solstice in the Southern Hemisphere), and is strongly influenced by the radiation ultraviolet and cosmic rays.

Also, although situated near 20° S lat., temperatures at an elevation of 4 000 m are 16–20°C lower than those in coastal plains at the same latitude, and DIFs are dramatically great. Therefore, the climate of this region, though situated in tropical and subtropical zone, is characterized by coolness.

The eastern and central parts of the Andean plateau are the home of tuberous species.

Andean tuberous begonias grow rooted in the layer of leaf mould on the surface of fertile land in forests or under big rocks of valleys or at the foot of mountains where it is cool, frequently foggy and humid. Tuberous species are distributed at elevations of 2 500–4 500 m.

2. Wild Ancestors of Tuberhybrida Group

Most of the Andean tuberous begonia species are less than 50 cm in height. Some have only roots and leaves but no conspicuous stems.

Leaves are heart-shaped or lanceolate (narrow and long), characterized by asymmetry. They have male and female flowers in the same plant and petals are narrow, long or rounded at the tip and some flowers are pendulous.

The male flower has four petals and the female five. Flowers are showy and the colour varies from species to species and tends to change according to environmental conditions. Dominant flower colours are red, orange and yellow. There are no species of violet and green flowers. Only *B. rosaeflora* produces white flowers.

The following are the wild begonia species which have been most used in hybridizing tuberous begonia cultivars.

B. boliviensis

This begonia grows wild in various alpine parts of Bolivia. First known to the botanical circles in 1857, it was introduced and started to be cultivated in England in the 1860s. (Photo 1)

Photo 1. *B. boliviensis*

The height is usually 50–60 cm and occasionally over 1 m. Side-shoots grow at the base. The stem grows erect at first and later the upper part gets tilted sideways.

Leaves are lanceolate and clearly subentire, measuring 7–10 cm in length and 2–2.5 cm in width at the base. Pendulous peduncles grow at axils.

Male and female flowers are bell-like and pendulously half-open. The male flower is about 5 cm long with four petals which are tapering to the apex. It has numerous stamens and is cylindrical or racemous. The female flower is smaller than the male one and has five petals. Bright red flowers bloom during summer and autumn.

B. boliviensis has been used to breed pendulous, tall-growing and red-flowered types.

B. pearcei

This species is distributed in the alpine areas of Bolivia and Peru 3 000–4 000 m above sea level and was introduced in England in the 1860s.

The stem grows upright as high as 30–50 cm. The leaf is peltate and has irregular incisions at the margins. The maximum length of the leaf is 15 cm. The leaf is characterized by dark yellow spots between veins. The male flower has four petals, two of which are bigger than the other two. Its diameter is about 3 cm. The female flower has five petals.

Photo 2. *B. pearcei*

This begonia is the only species with yellow flowers in the Andean tuberous group. (Photo 2) In its home, it blooms in spring.

B. pearcei, as a species used at the early days of breeding double begonias, passed down to its hybrids its characters such as of the leaf, stem, flower colour, etc.

B. cinnabarina

Distributed in the Andean plateau in Bolivia and its neighbours, this species was collected in 1847 in Bolivia and first cultivated in England in the 1860s.

The stem stands upright, as high as 20–30 cm and is more than 1 cm in thickness. The stem is regularly flexuous at each node. The leaf is asymmetrically broad and long and has fine incisions at the margins. The length of the leaf is about 15 cm and the width about 9 cm. Peduncles come out from the axils. The male flower has four rounded petals, two of which are smaller than the other two. The female flower has five petals and is smaller than the male one. The flower colour is usually orange-red, measuring 3–5 cm in diameter. Autumn-blooming flowers are scarlet (bright red). It is pollinated well.

B. cinnabarina has been used to breed new tuberous hybrids because of its large

flowers, thick and strong stem, beautiful flower colours of orange-red and scarlet.

B. veitchii

This species is distributed in the alpine areas of Bolivia and Peru 3 000–4 000 m above sea level. It was introduced in England in the 1860s

This begonia is acaulescent. The leaf is small, rounded and entire. Peduncles grow upright and higher than do leaves, which makes flowers pendulous, but once fully blown, flowers face upwards. The corolla is spherical and petals are oval. The flower colour is orange-red and the flower size is 2.5–5 cm. There is relatively profuse blooming.

Photo 3. *B. veitchii*

B. veitchii has been widely used to breed double-flowered types. (Photo 3)

B. davissii

This begonia was first collected in 1876 in Peruvian mountains 3 000 m above sea level and started to be cultivated in England later.

It is acaulescent and is very short in height.

The plant body has many hairs.

Leaves are small and petioles are short. The leaf colour is shiny bluish green. It has several erect peduncles. There is profuse blooming. The flower colour is orange and bright red. Because of its profuse blooming and double male flowers, it has been widely used in breeding new hybrids. (Photo 4)

Photo 4. *B. davissii*

In addition, there are *B. rosaeflora* with white flowers, *B. clarcei* with rose-like flowers, etc., among Andes-origin tuberous begonias to be used for breeding tuberous hybrids.

Section 3. Process of Breeding Kimjongilia and Preservation of Its Original Cultivar

1. History of Tuberhybrida Group

In the mid-19th century, cross-breeding started between several tuberous species of Andes- and Africa-origin as they began to be introduced and cultivated in England and other western European countries.

The first hybrid of the Andean tuberous begonias is *B.* 'Sedenii' which emerged in 1869. (Figure 1)

The seed parent is *B. boliviensis* (2n = 28) and the pollen parent *B. cinnabarina* (2n = 26). From its seed parent, *B.* 'Sedenii' inherited the cup-shaped flower which blooms facing downward and, from its pollen parent, the thick stem which is flexuous regularly at each node. Resembling its pollen parent, the shape and size of the leaf are also a little larger than those of the seed parent. The flower colour is red.

Figure 1. *B.* 'Sedenii', the first hybrid of tuberous begonias

After the emergence of *B.* 'Sedenii', the breeding of tuberous hybrids started, and in the 1870s many were developed in several countries, with large, round-shaped flowers and leaves of improved shape and size.

The first double-flowered tuberous hybrid is *B.* 'Monstruosa' bred in 1874 by Victor Lemouine, a French horticulturist. (Figure 2)

It was a complete double-flowered type whose stamens were all transformed into petals. Its parents are *B. pearcei* and *B.veitchii*.

Several double types which were all tall and good-looking were produced from hybrids resultant from the crossing between *B.* 'Monstruosa' and tall-growing *B. boliviensis*.

These cultivars are now considered to be ancestors of modern double-flowered begonias of red and pink flowers. After the first double-flowered cultivar was

produced, cultivars of wide flower colour range with shades of red, orange, orange-red and yellow were developed.

Before the year 1880, the shapes of flowers were already diversified and the round-edged petal shape was completed, with the result that hybrids of hollyhock-, camellia- and crowfoot-like flowers emerged. After the year 1880, many camellia-like cultivars were bred and as a result, rose-like double-flowered cultivars were also produced.

Although one-flowered species outnumbered double-flowered cultivars until 1884, the latter increased 3–4 times as many as the former in the 1890s.

Figure 2. *B.* 'Monstruosa', the first double-flowered cultivar of tuberous begonias

The begonia-breeding in the 1880s focused on camellia-like double flowers while giving priority to breeding double-flowered begonias. Camellia-like flowers, which resemble otome of *Camellia japonica*, have middle stamens transformed into petals. As the breeding gradually switched to producing rose-like cultivars, a number of cultivars with large petals appeared. Modern camellia-like flowers have flat petals and modern rose-like flowers wavy ones. The difference between the petals of camellia-like flowers and rose-like ones is that the former is flat and the latter is slightly curved. The latter is more beautiful than the former, so it has become the prototype of the modern tuberous hybrids. Therefore cultivars of various flower colours have been bred.

As the flower shape and colour improved further in the period of 1891–1900, cultivars of great ornamental value were bred in several countries. *B. cheimanthea*, which is wide in cultivation today, was also developed in 1891. As for main double-flower colours, red and pink types originated from *B. davissii*, *B. veitchii* and *B. boliviensis*, yellow type from *B. pearcei*, and white type from *B. rosaeflora*. Thus, the flower colouring of double-flowered cultivars was diversified into white, yellow, orange, red, pink and their intermediate shades.

Flower size depends on polyploidization, heterosis, nutrition and environmental conditions. Among them, what counts most is polyploidization. The chromosome

number of the wild tuberous ancestors is 2n = 26 or 2n = 28 regardless of species. Later, in western European countries including England, hybrids of tetraploid (2n = 52, 56), triploid (2n = 39, 40, 41, 42), pentaploid (2n = 65, 66), etc., were produced during the process of polyploidizing and crossing of these wild species.

The first tetraploid hybrid was *B.* 'Viscountess Doneraile' developed in 1876 by crossing *B.* 'Monarch' and *B.* 'Sedenii'. In 1883 the first triploid *B.* 'John Heal' was bred by crossing tetraploid *B.* 'Viscountess Doneraile' and diploid *B. socotrana*. Most of the modern tuberous erect-stemmed types are tetraploid (2n = 56). Heteroploid hybrids such as yellow-flowered *B.* 'Corona' (2n = 55) and *B.* 'Sam Philips' (2n = 54), white-flowered *B.* 'Marjorie Portor' (2n = 54), light pink-flowered *B.* 'Rhapsody' (2n = 55), pink-flowered *B.* 'Rose Princess' (2n = 53) and *B.* 'Sugar candy' (2n = 54) were also bred. The flowers of the wild Andean tuberous begonias are 2–6 cm in diameter. However, they were 10 cm at the early period of breeding and are now more than 25 cm.

Through this process of breeding, Western Europe became a second place of origin to tuberous group, from which a lot of cultivars were propagated to the Asian and American continents.

2. Process of Breeding Kimjongilia

Kamo Mototeru, the breeder of Kimjongilia, started cultivating tuberous begonias in the early 1960s, having collected them on a world scale. He built a cultivation greenhouse with the area of 400 m^2 in Kakegawa, Shizuoka Prefecture, and energetically conducted crossings for breeding new cultivars, growing over 500 species and cultivars. In the 1980s, his collection expanded into 890 species and cultivars.

Around that time, he conducted intensive breeding with an intention to breed the most beautiful red tuberous cultivar in the world and name it in honour of Kim Jong Il, leader of the Democratic People's Republic of Korea.

Kamo Mototeru set himself goals as follows.

Flower colour: enthusiasm-inspiring and shiny red

Flower form: "lion mane-like*", a further improvement from the rose-like type,

which gives off the sense of orderliness and toughness

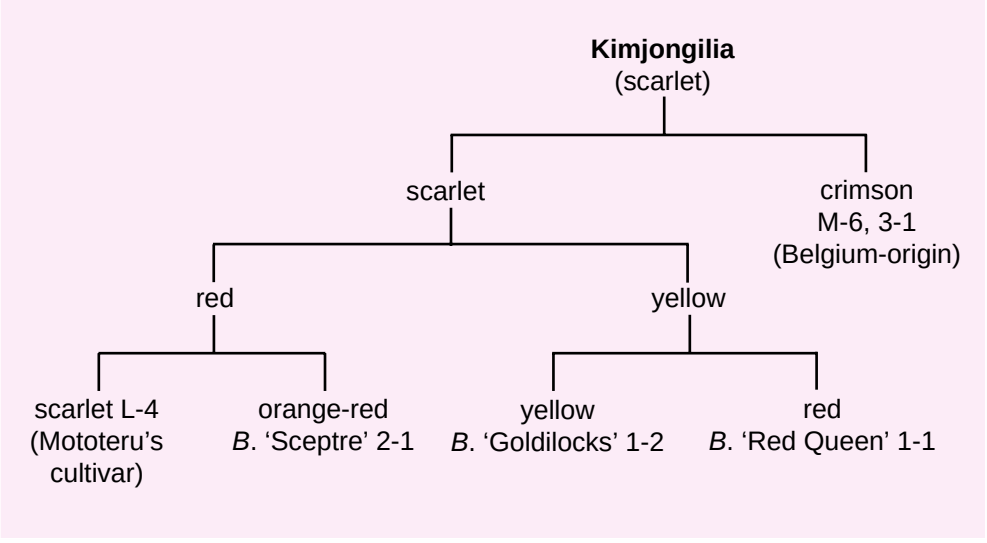
Leaf colour: dark green, which indicates magnificence and strength

Stem: thick and stout, and of proper height

Period of Bloom: as long as possible

* The “lionmane-like” form, which is considered to be the perfection of double-flowered plants, refers to the vivid form in which petals are arranged thickly in spiraling circles around the rosebud-like centre.

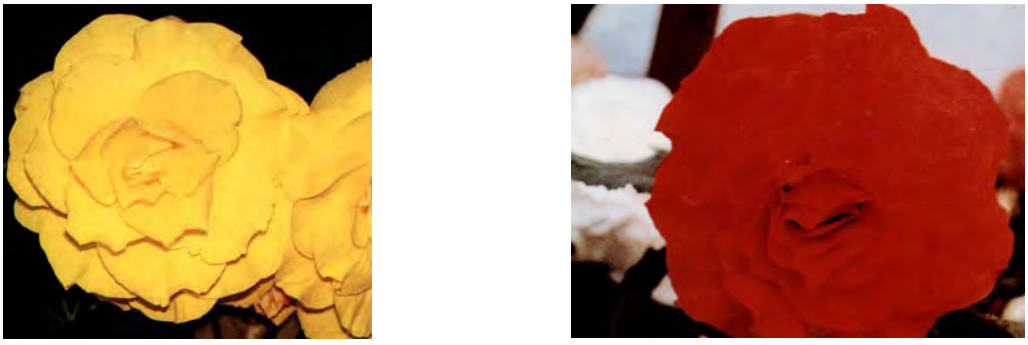
The following is the breeding diagram of Kimjongilia.



Kamo Mototeru bred a rose-like red-flowered cultivar by crossing his first hybrid, Scarlet L-4, and a tissue-cultured plant, Orange-red 2-1, from *B.* ‘Sceptre’ which had been purchased from England.

Then he produced a beautiful yellow-flowered cultivar by crossing Yellow 1-2 and Red 1-1 which were all tissue-cultured plants respectively from *B.* ‘Goldilocks’ and *B.* ‘Red Queen’ purchased from England. (Photo 5)

Kamo Mototeru bred a hybrid of uniquely scarlet flowers by crossing the above-mentioned red- and yellow-flowered cultivars and made it a seed parent of Kimjongilia. Among the hybrid plants of filial generation bred by crossing it with Belgium-origin crimson cultivar *B.* ‘Crimson’ (crimson, Moerman-6, 3-1) as a pollen parent, he chose a plant with large, double flowers of scarlet petals, heart-shaped leaves, and the stout stem, and suggested naming it Kimjongilia.



(A) *B.* 'Goldilocks' (B) *B.* 'Red Queen'

Photo 5. Flowers of *B.* 'Goldilocks' and *B.* 'Red Queen'

Kimjongilia, of which the chromosome number is 2n = 4 × 14 = 56, is tetraploid. (Figure 3)

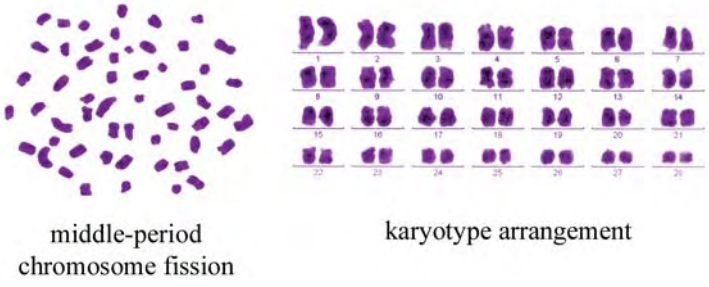


Figure 3. Middle-period chromosome fission and karyotype arrangement of Kimjongilia

3. Botanical Name and Registration of Kimjongilia

The botanical name of Kimjongilia is *Begonia* × *tuberhybrida* Voss 'Kimjongilhwa'. It was suggested by its breeder in February 1988 and first made public in the DPRK.

In 2004 the American Begonia Society, an international authority responsible for the registration of *Begonia*, registered it as a new tuberhybrid which had been named after Kim Jong Il (Begonia "Kimjongilhwa" No. 991) and publicized it through its monthly magazine *The Begonian* (November-December of 2004).

Unlike nomenclature of wild plants, botanical names of *Begonia* are made

according to the "International Code of Nomenclature for Cultivated Plants" (1969) and the rules of nomenclature for tuberhybrids formulated by the International Botanical Society (IBS). In January 1935, IBS decided to add *Begonia* × *tuberhybrida* Voss to names of cultivars of tuberhybrida group. Therefore, this is the general botanical name of tuberous hybrids, followed by a cultivar name written in roman typeface.

Hence the name of Kimjongilia, *Begonia* × *tuberhybrida* Voss 'Kimjongilhwa'.

Botanical names of tuberhybrida group can be shortened to the names of the genus and cultivars. Therefore, *Begonia* 'Kimjongilhwa' is also used very often.

4. Preservation of the Original Cultivar

The original cultivar of Kimjongilia which Kamo Mototeru presented to Kim Jong Il in February 1988 is now preserved in the Central Botanical Garden in Pyongyang, the DPRK.

Over the past two decades, over 20 000 plants annually and 500 000 plants in total so far have been propagated from that single plant of Kimjongilia by tissue culture, tuber-planting, leaf cuttings, stem cuttings, and other vegetative propagation.

The tuber of the original cultivar of Kimjongilia preserved in the Central Botanical Garden was 2.2–3.1 cm in diameter and 2 cm in thickness in 1988, and grew up to 8.4 –10.6 cm in diameter and 7.3 cm in thickness by 2006. (Table 1)

Table 1. Annual Change of the Tuber Size of the Original Cultivar of Kimjongilia

Tuber size (cm)	Year							
	1988	1989	1992	1995	1998	2001	2004	2006
Long diameter	3.1	3.8	5.4	6.3	7.2	8.6	9.8	10.6
Short diameter	2.2	2.9	3.9	5.0	5.9	6.9	7.6	8.4
Thickness	2.0	2.4	3.0	3.8	4.7	5.8	6.8	7.3

The original cultivar grows healthy and its tuber gets bigger year after year, but it is difficult to determine its life expectancy.

Chapter 2
Morphology and Anatomy of Kimjongilia

As a new tuberous cultivar, Kimjongilia is different in shape and structure from others to a certain degree.

Section 1. Stem

1. Shape and Anatomical Structure of the Stem

Shape

The stem of Kimjongilia is upright and normally 30–70 cm high. Its maximum length can be 1 m. The stem has several nodes, and from each node, leaves come out alternately. It is sparsely covered with hairs, 3–5 mm long. From axils peduncles or side-stalks come out. (Figure 4)

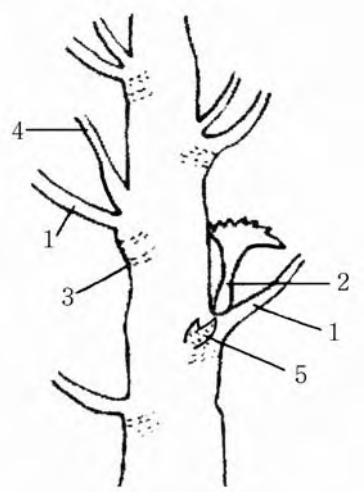


Figure 4. Structure of the stem
1. petiole; 2. side-stalk; 3. node; 4. peduncle; 5. stipule

Generally peduncles grow from the third, fourth or fifth axil. The first flower comes out on the fourth or fifth node in a tissue-cultured plant, and on the third or fourth node in a plant propagated by tuber-planting.

The stem is 1–3 cm in diameter and fleshy. Nodes are a little thicker than internodes. Nodes are normally 2–3 cm apart; in abnormal cases the length of internodes is either less than 1 cm or more than 3 cm. The stem is regularly flexuous at each node in a gentle zigzag

form. If flower buds are continuously removed, the length between nodes may get shorter than 1 cm and the leaves almost overlap.

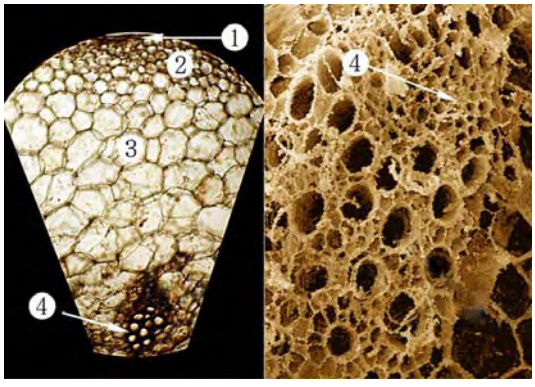
The underground nodes form the tuber which functions both as storage and reproductive organs.

The life span of the stem is less than one year because the plant goes into dormancy and the stem comes off the tuber after flowers fall off.

Anatomical structure

The transection of the stem is similar to that of an annual herbaceous dicotyledon, i.e. it is composed of the epidermis, cortex and stele. (Photo 6)

Epidermis: On the outer surface of the stem, polygonal epidermal cells are arranged closely in one layer, serving as a protective cover. The outer walls of the epidermal cells are cutinized and thickened side walls are joined to each other tightly. The epidermis restricts transpiration and aeration, and prevents bacterial penetration.



A B

Photo 6. Transection of the stem and vascular system
(A) Transection of the stem
(B) Transection of a vascular bundle
1. epidermis; 2. collenchyma; 3. parenchyma cell; 4. vascular bundle

Cortex: Next to the epidermis is the cortex which contains several layers of parenchyma cells. The five or six layers near the epidermis are collenchyma. A kind of mechanical tissues, collenchyma, is arranged in a ring inside the epidermis. Kimjongilia has more advanced mechanical tissues than other begonias so that it can support relatively heavy flowers and leaves safely. The inner layers of collenchyma, which are ground tissues, function as a storage tissue. In Kimjongilia, the endodermis is hard to recognize, which is next to the cortex.

Stele: Next to the cortex are ten or fifteen collateral vascular bundles arranged in a ring, next to which is the pith. It is composed of relatively large parenchyma cells. The

vascular bundles are elongated, and large and small ones occur alternately. The phloem is in the outer part and the xylem in the inner part of the vascular system.

The procambium between the phloem and xylem does not differentiate. The pith, as a ground tissue, functions as a storage tissue.

2. Shape and Anatomical Structure of the Tuber

Shape

The tuber is a greatly thickened portion of the stem below the soil level. It is flatly spherical. (Photo 7)

On the upper surface of the tuber is a hollow scar from which the stem fell off, and around it buds are located. Adventitious rootlets come out on the surface of the tuber.

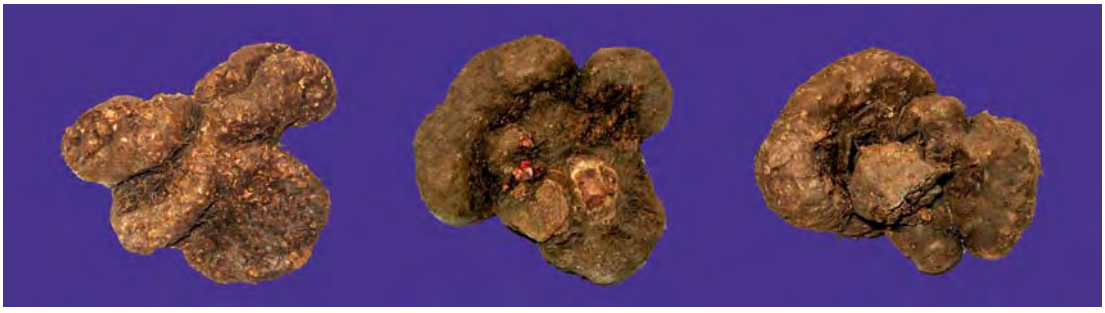


Photo 7. Tuber of Kimjongilia

As the tuber matures, the colour of the surface deepens.

The tuber formation of Kimjongilia is different from that of other tuberous plants.

First, Kimjongilia does not develop little tubers, but only one tuber grows each year.

Second, there are no nodes or traces of nodes except for a scar left by the previous year's stem.

Third, when unfavorable conditions (short daytime, low temperatures, etc.) are created, tuber-formation and its thickening start regardless of the growth phase. If the stem is buried deep in the soil, tubers form at every underground node.

The tuber forms many buds every year. The bud at the bottommost node of the

stem is the terminal bud of the tuber, around which lateral buds come out. The later a bud develops, the farther it is from the terminal bud.

During the dormancy period, buds are covered with very tiny, soft scaly leaves which are dark brown in colour. The part where a bud is located is pink. Tubers develop adventitious fibrous roots each year. However, four- or five-year-old tubers do not develop so many of them as the epidermis thickens.

In the first year of formation, the tuber is 3–6 cm in diameter and 15–40 g in weight, and the following year 5–8 cm and 30–50 g.

Anatomical structure

The transection of the tuber shows the periderm, cortex, cambium and pith. The periderm comprises cork tissue (or phellem), cork cambium (or phellogen) and phelloderm. (Photo 8)

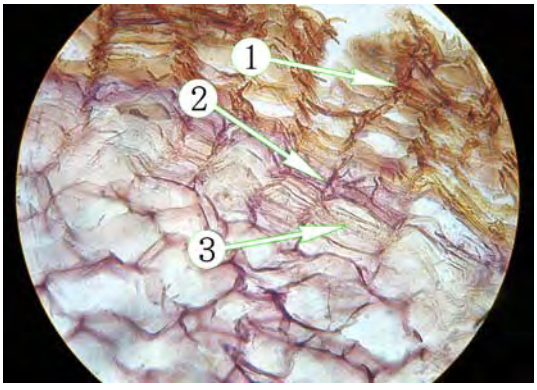


Photo 8. Transection of the tuber
1. phellem; 2. phellogen; 3. phelloderm

The cork cells are often brown or yellow in colour because of the absence of the protoplasm and the presence of coloured organic matter in their lumina. The wall of cork tissue contains suberin and waxes.

The presence of these waxes does not allow transpiration. The phellogen cells are short radially and long tangentially. The cells of the cortex are also long tangentially. They contain elongated nuclei and a small portion of starch grains which are storage substances.

The cell layer beneath the phelloderm is the cortex containing parenchyma cells which function as a storage organ.

Beneath the cortex, the cambium is arranged in a ring. The xylem is inside and the phloem outside the cambium. Beneath the cambium is the pith, which occupies the majority of the volumn of the tuber. Pith cells are egg-shaped and measure 138 μm × 86 μm. Their lumina are full of starch grains.

3. Separation Layer

Kimjongilia and other tuberous begonias have highly-advanced abscission zones at stem nodes, petioles, pedicels, etc.

The formation of the separation layer is adjusted by the ratio of auxin to ethylene around the abscission zone. As the amount of ethylene increases, cellulase and pectinase are activated, and, in turn, the walls of parenchyma cells of the abscission zone are softened. Then the elongated cells change into rounded cells, gaps between the cells widen, and, as a result, the separation layer develops. (Photo 9)

The formation of the separation layer starts at the cells in the middle of the pith, goes on through the neighbouring cells, and is finally completed in the epidermal cells. Even slight external stimuli will cause flowers and leaves with separation layers to fall

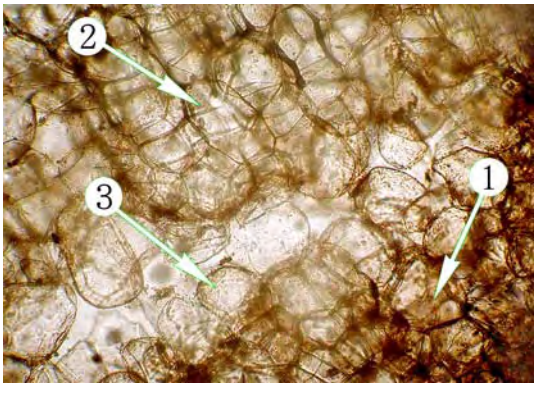


Photo 9. Structure of a node at the beginning of the formation of the separation layer
1. nodular cells; 2. internodular cells; 3. parenchyma cells with thinned walls in the abscission zone

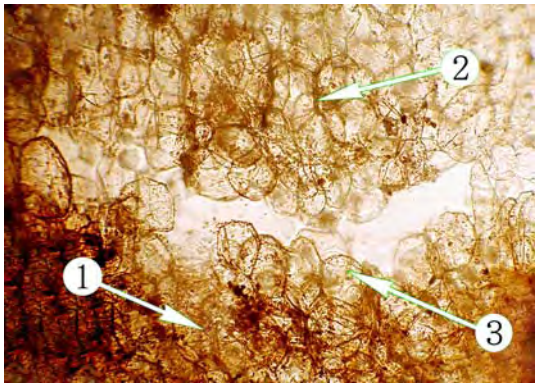


Photo 10. Structure of a node at the end of the formation of the separation layer
1. nodular cells; 2. internodular cells; 3. parenchyma cells with thinned walls in the abscission zone

off easily. (Photo 10)

The phenomenon in which the stem falls off the tuber at the end of its growth is also due to the formation of the separation layer between the stem and the tuber.

To suppress the formation of the separation layer, ethylene inhibitors or auxin should be applied to abscission zones concerned.

Section 2. Leaf

1. Shape

Kimjongilia is unifoliate (simple-leafed) and leaves come out on each node alternately.

In greenhouse conditions, leaves face in one direction due to phototropism. This distinguishes the front of the plant from the back. (Figure 5)

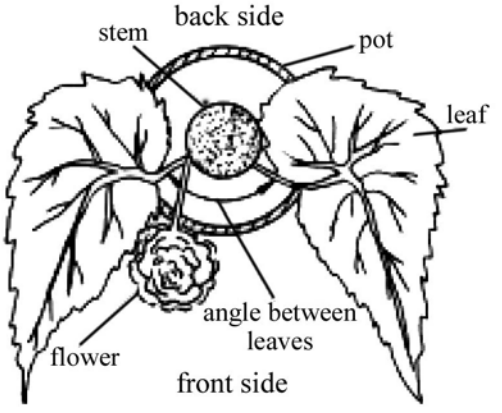


Figure 5. Arrangement of leaves in Kimjongilia

The angle between leaves before flowering increases from 60° to 70–80°. As flowers start to bloom, the angle increases up to 110–120°.

If you remove other flower buds too early or continuously for one flower, internodes will become shorter and upper and lower leaves will overlap too closely. In addition, angle between leaves decreases, which in turn will cause a plant to look deformed and produce an oval deformed flower. (Photo 11)

The leaf shape and size vary depending on the node on which a leaf comes out. (Photo 12)

The first and second leaves are 1.5–3.5 cm in diameter and are orbicular and small. The following leaves are all asymmetrically peltate, which are narrow from the middle vein to the front margins and wide from the middle vein to the back margins. The average length of a mature leaf is 10–30 cm and the width 5–15 cm with the surface area of 30–250 cm^2.

Leaf size varies in accordance with the positions of nodes. The largest leaves are the fourth to seventh leaves from the base, and after them the leaf size gradually

Photo 11. Deformed plant

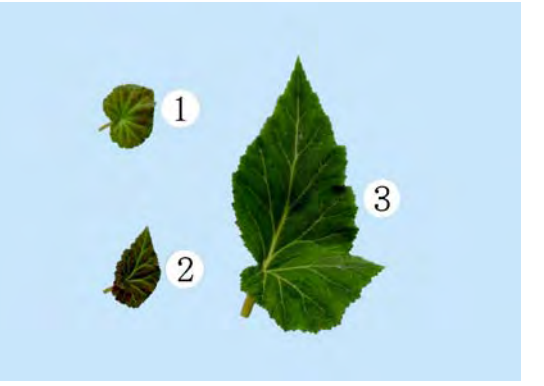


Photo 12. Various leaf shapes
1. orbicular leaflet; 2. peltate leaflet;
3. peltate leaf

decreases. When good nutrition is provided, the leaf size increases regardless of the location of the leaf. When the ratio of the length to width of leaf is 1.8–2, its ornamental value is the greatest.

Humidity has a great effect on leaf shape. If humidity is 30–40% in the greenhouse, leaves will become elongated and margins turn dark red due to the formation of anthocyan and roll up towards the downside.

Each leaf has stipules which measure 1.2–1.4 cm × 1.0–1.2 cm.

2. Anatomical Structure

The upper epidermis is composed of one or more layers according to part. Greater part of the upper epidermis covering the mesophyll is uniseriate, but the part covering the mesophyll of the main vein which contains vascular bundles is composed of two or four layers according to its thickness. The cells of multiple epidermis except for the surface cells are often large and function as water storage cells. The lower epidermis is uniseriate.

The surface cells are polygonal, protruding outward slightly, and their outer walls slightly cutinized. (Photo 13)

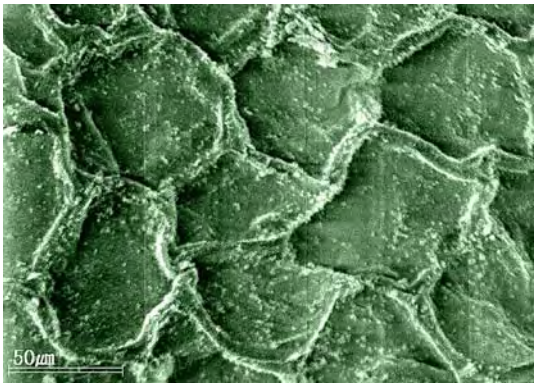
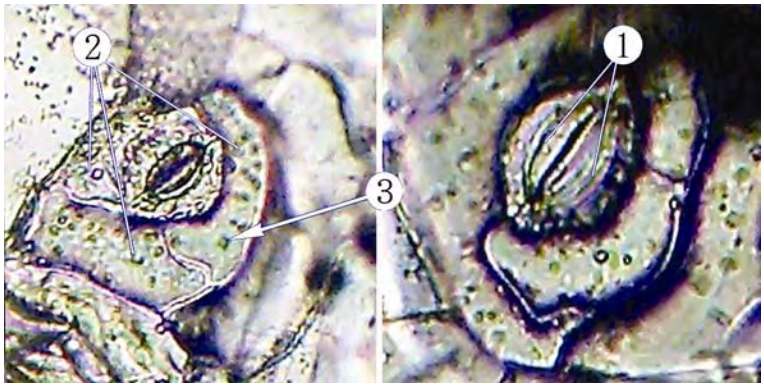


Photo 13. Upper epidermis of the leaf
(the inner part can be seen)

Stomata are evenly distributed only on the downside surface at a density of 30–40 pcs/mm^2.

They are at the same level as the epidermal cells with the plane.

Each guard cell of the stomata is accompanied by three subsidiary cells. The size of a stoma is about 29 μm × 83 μm when it is open. (Photo 14)



A B

Photo 14. Stoma of the leaf
(A) when open (B) when closed
1. guard cell; 2. subsidiary cell; 3. chloroplast

The transection of the leaf below shows the characteristics of a shade plant. (Photo 15)

Next to the upper epidermis of the leaf is one layer of palisade parenchyma and after that, spongy parenchyma. The spongy parenchyma is twice thicker than the palisade parenchyma. The spongy parenchyma appears less regular, and has conspicuous intercellular space which contains air. The palisade parenchyma, which is less lacunose than the spongy parenchyma, contains much more chloroplasts. The structure of the leaf of Kimjongilia, which has advanced spongy parenchyma, reflects its characteristics as a shade plant. Therefore, Kimjongilia grows satisfactorily in a shady, humid place, and has little resistance to direct sunlight.

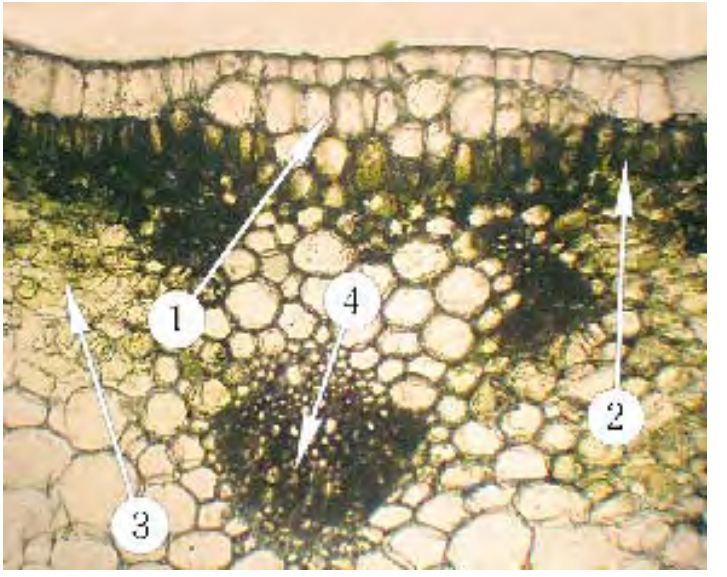


Photo 15. Transection of the leaf

1. three-layer epidermis; 2. palisade parenchyma; 3. spongy parenchyma; 4. vascular bundles

Colour of Flower

The colour of flower is given to corolla or sepal by plant pigment.

It depends on the kind, quantity and chemical reaction of anthocyan dissolved in the cell sap.

It is also manifested by chromosome in cytoplasm.

For example, blue, red and dark purple colour of cornflower is made by cyanin, red colour of fish geranium by pelargonin, and red colour of rose by cyanin and pelargonin.

The red colour caused by anthocyan is turned into blue or bluish purple by alkali, and the yellow colour becomes deep maroon or purplish red by it.

The yellow colour given by chromosome does not change by alkali. Production of anthocyan depends on temperature, light, nitrogen, phosphor and others, and its kind and quantity vary even in the same plant. It is also related to pH of the cell sap.

Section 3. Root

1. Shape

The root of Kimjongilia is fibrous, which measures 0.8–1.5 mm in diameter and 5–15 cm in length. The root is a typical dichotomy which is distributed mainly in the depth of 3–7 cm and aerotropic. The ratio of the horizontal growth to vertical growth remains almost unchanged during the whole period of the growth. (Figure 6) The tuber produces new fibrous roots every year.

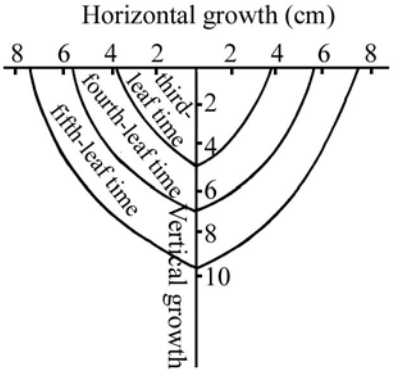


Figure 6. Diagram of vertical and horizontal growth of the root

2. Anatomical Structure

The transection of the root is similar to that of other annual dicotyledons. (Photo 16)

The root epidermis consists of the cork tissue containing several layers of elongated cells. The cortex next to the cork tissue is composed of parenchyma cells containing starch grains. Next to the cortex, vascular bundles are arranged actinomorphically.

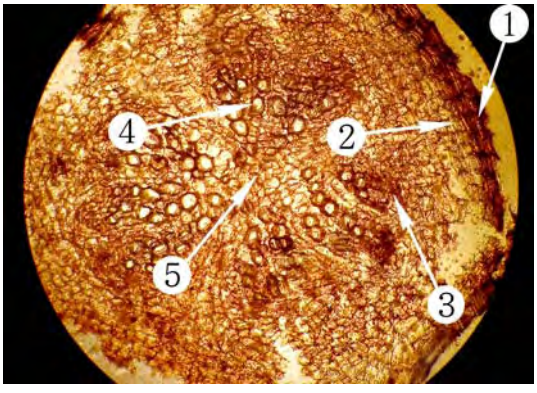


Photo 16. Transection of the root
1. cork tissue; 2. cortex; 3. phloem; 4. xylem; 5. pith

Aeration and water-storage tissues are not advanced.

The longitudinal section of the root cap is also similar to that of other plants.

The root development of Kimjongilia is relatively slow compared to the growth of the stem and leaves.

Section 4. Flower

1. Shape and Colour

Kimjongilia is a monoecious plant with double staminate (male) flowers and single pistillate (female) flowers of scarlet colour. Each peduncle has one staminate flower with a pistillate flower on either side. (Photo 17)

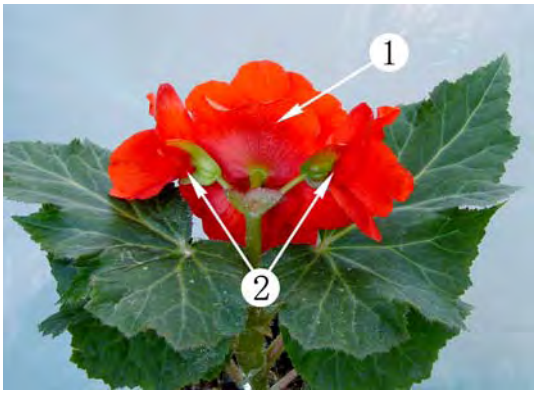


Photo 17. Inflorescence of Kimjongilia
1. Staminate flower; 2. Pistillate flower

In most cases, ten to fifteen flowers open one after another in the same plant, but there are some plants in which up to 25 flowers bloom.

The peduncle is 8–15 cm in length and 0.9–1.2 cm in thickness. On the tip of it are a pair of bracts in which pedicels of staminate and pistillate flowers grow separately.

The major ornamental part in Kimjongilia is the staminate flower. (Photo 18)

Photo 18. Staminate flower of Kimjongilia

The diameter of the staminate flower is usually 10–25 cm, but it can reach more than 30 cm according to cultural conditions. The depth is 5–12 cm, and the weight

Photo 19. Pistillate flower of Kimjongilia
1. sepal; 2. petal; 3. stigma; 4. ovary

10–12 cm in diameter, and usually have two sepals and two or three petals. The shape is oval or rounded, and there are several veins fanning out from petals. (Photo 19)

The pistil has three styles, 0.8–1 cm long, each of which has two branches of slightly different heights. (Photo 20)

The stigma is covered with numerous ridges, which are not the same in height. (Photo 21)

Photo 21. Ridges of the stigma

is 50–100 g, even 150 g at the most. The size of the staminate flower depends on conditions of light, temperature, humidity, nutrition and the sequence of blooming.

The fourth or fifth flower is often largest in the same plant.

The pistillate flower, which is single and smaller than the staminate flower, is

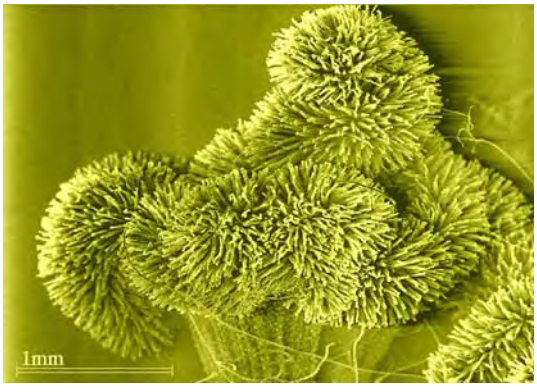


Photo 20. Style and stigma

The winged ovary consists of three locules, which are fused together at the bottom of the pistil, and the placenta is axial.

There are a great number of ovules joined to the placenta in the locule. (Photo 22)

Before the birth of Kimjongilia, rose -like or carnation-like type, which was an improvement from the former, were considered to be perfect of modern

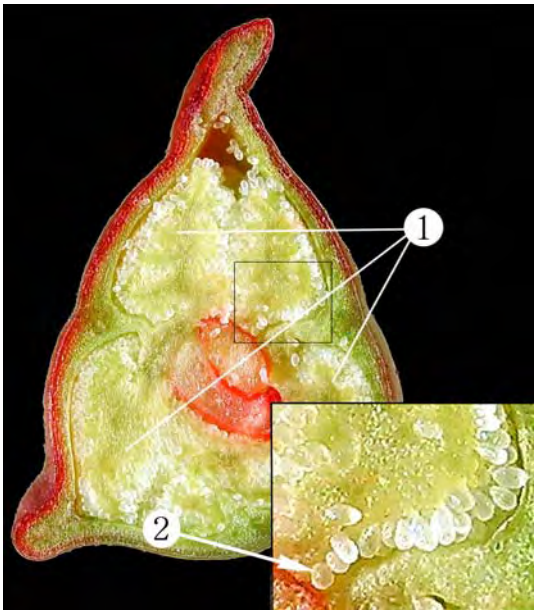


Photo 22. Transection of the ovary
1. locule; 2. ovule

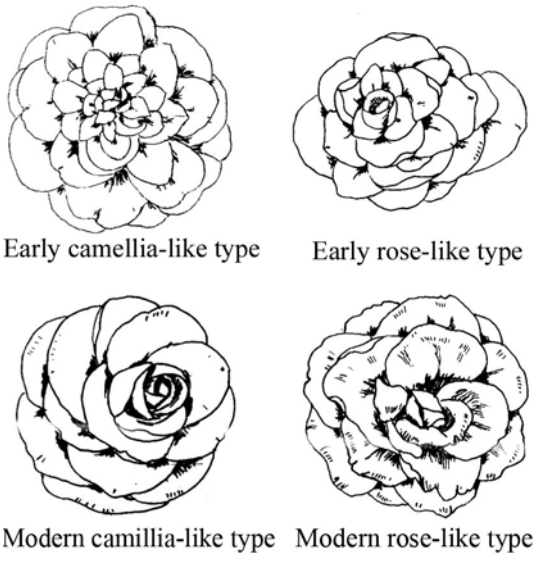


Figure 7. Flower forms of double-flowered tuberous begonias

tuberous cultivars. (Figure 7)

Kamo Mototeru, planning to breed a new cultivar of “lion mane-like” double-flowered tuberous begonia, strived to make it.

After succeeding in breeding a unique and wonderful cultivar, he named it Kimjongilia.

The following are the flower shapes of double-flowered begonias.

Camellia-like → Rose-like → Carnation-like
↓
Kimjongilia

The corolla of Kimjongilia is rounded like rose-like type.

The oval, wavy petals are arranged in regular whirls, which makes Kimjongilia look fresh and graceful.

The staminate flower has 30–50 opened petals in the corolla and 10–20 small unopened petals in the flower centre. The greater size and weight of flowers, the larger

number of petals of Kimjongilia. (Table 2)

Table 2. Number of petals and its relation to flower size, weight and height

Flower diameter (cm)	Average height (cm)	Average weight (g)	Mean number of petals			
			Opened petals	Unopened, coloured petals	Unopened, uncoloured petals	Total
10.1–12.0	6.5	14.6	24.0	5.4	5.4	34.8
14.1–16.0	7.5	23.2	31.6	8.3	6.0	45.9
18.1–20.0	10.5	47.4	39.4	10.4	7.0	56.8
20.1–22.0	12.0	48.7	40.5	13.0	8.5	62.0
22.1–24.0	14.1	52.8	42.7	12.7	8.4	63.8

The fiery red colour is one of the most important characteristics of Kimjongilia, which is shinier, brighter than red flowers of the well-known double-flowered tuberous types such as *B.* 'Zulu', *B.* 'Red Queen', *B.* 'Sceptre', *B.* 'Seacoral', *B.* 'Guardsman', *B.* 'Red Admiral', *B.* 'Allan Langdon', *B.* 'Rosalind', *B.* 'Phapsody' and *B.* 'Royalty'.

The flower colour of Kimjongilia slightly changes according to seasons and cultural conditions and methods, subject especially to ultraviolet rays, temperature, macronutrients, micronutrients and pH values of substrates.

2. Anatomical Structure of the Petal

The front and back sides of a petal is different in structure. The epidermal cells of the front side are elongated and polygonal, measuring 62–117 μm. As the outer surface of these cells expands, ridges occur, 69 μm high and 74 μm wide. Each cell has one ridge, leaning to one side. (Photo 23)

The greater part of a cell of the petal is occupied by the vacuole and the cytoplasm is pushed towards the wall as a thin layer. The vacuole is full of red anthocyanin. The nucleus is located in one side of a cell.

The brightness of the flower colour of Kimjongilia is provided by ridges on the

surface of a petal and extinction and reflection of anthocyanin, the pigment in the vacuole. The ratio of the height to width of a ridge is 1.03, which gives feelings of stability to a certain degree. In yellow-flowered begonias which were used in breeding Kimjongilia, the ratio is 1:0.56, resembling a low hill, and in red-flowered tuberous cultivars like *B.* 'Royalty' and *B.* 'Zulu', ridges are too high, resembling a high hill. Since the ridges of Kimjongilia are different from others, its flowers have unique colour.

The petal turns dark if touched, for the ridges in the epidermal cells on the front side are damaged and the vacuoles burst open, which causes pigments to oxidize.

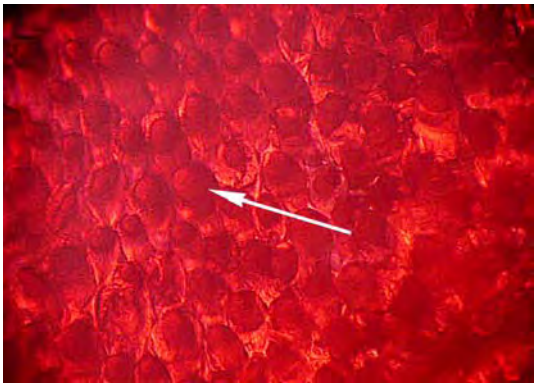


Photo 23. Ridges on the front side of a petal

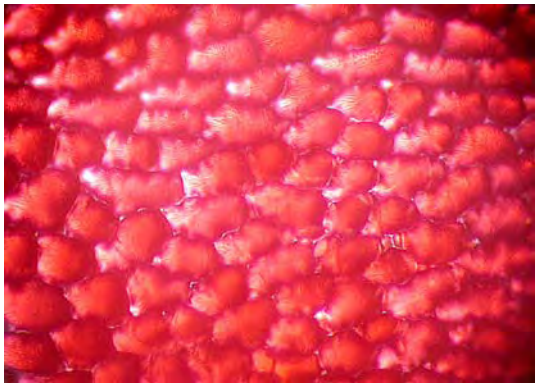


Photo 24. Backside epidermis of a petal

Weak resistance of Kimjongilia to direct sunlight and drought is also attributable to its structural characteristic that epidermal cells of the petal are full of the soft ridges.

The epidermal cells on the backside of a petal are elongated and tetragonal, measuring 76 μm × 139 μm, and are joined to one another like cogwheels. (Photo 24)

In the transection of a petal, the epidermal cells with soft ridges on the front side are arranged in one layer. Under it is a close-packed layer of cells of the palisade parenchyma. After that, cells of the spongy parenchyma are loosely arranged. Intercellular spaces contain air. Under the spongy parenchyma, there is a layer of the epidermal cells of the backside, on which degenerative stomata are sparsely distributed. The vascular bundles are leaned to the backside, measuring about 240 μm in diameter. In a vascular bundle, tracheas are located on the front side and sieve tubes on the backside.

3. Deformation of the Flower

In the process of cultivation of Kimjongilia, deformation occurs occasionally in flower shape, flower colour, double-floweredness, etc.

Deformed flowers are found in following generations of plants propagated by tuber -planting or stem-cutting as well as in those of tissue-cultured plants.

Especially various different types of deformed flowers occur in 5–10% of tissue-cultured plants: camellia-like, rose-like, shallow-centred, multi-centred and wild-flowered. (Photos 25–29)

Flowers of rose-like type resemble roses and those of camellia-like type camellias. Multi-centred type has two or three centres of several petals in one flower.

Shallow-centred type has flat flowers resembling a plate.

And oval-shaped flowers may occur in which bracts are too widely open to either

Photo 25. Rose-like type

Photo 26. Camellia-like type

Photo 27. Shallow-centred type

Photo 28. Multi-centred type

Photo 29. Wild-flowered type

side of the flower and small petals are packed in the centre.

Also, deformation occurs in flower colour: dark red, light pink, yellow and ring-spotted.

In some flowers, deformed things which are neither petals nor stamens may develop in the centre or between petals. In other cases, one pistillate flower and two staminate flowers may come out.

Section 5. Fruit and Seed

In Kimjongilia, fruits and seeds do not develop in normal cultivation conditions, but are produced when artificially inducing stamens and pollinating pistills.

The fruit is capsulate and reversely trigonal, pyramid-shaped one which is tapering to the base and flat and broad at the top.

Either corner of the fruit has a wing. One of the wings is relatively longer than the others.

The fruit has three compartments containing seed grains. One fruit has 100–500 seed grains in it.

The seed is light brown, measuring 0.33 mm × 0.18 mm. (Photo 30)

Seed grains are so tiny and light that one gram of seeds is made up with 60 000–80 000 grains.

The seed is composed of embryo, endosperm and seed coat.

The seed coat is a layer of cutinized cells.

The endosperm, which is the storage tissue of the seed, is beneath the seed coat in a thin, underdeveloped layer. Nutriments are stored in cotyledons of the embryo.

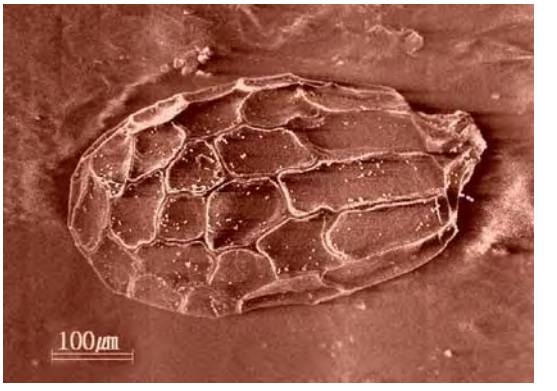


Photo 30. Outer structure of the seed

Chapter 3
Growth of Kimjongilia

Kimjongilia is a perennial plant. Therefore, if you start to grow a young plant at the beginning of the year, it will bloom continuously after four or five leaves have come out and form a tuber (one-year-old) in autumn. The following year this tuber produces new shoots and life cycle repeats.

This chapter describes the phases of the growth of Kimjongilia, from a young plant, blooming, formation of a tuber to dormancy.

Section 1. Phases of the Growth

The growth of Kimjongilia varies slightly depending on the methods of producing plantlets. Plantlets can be produced by tissue culture, tuber-planting, stem-cuttings, growing side-shoot, etc., of which tissue culture is the commonest method of propagation.

Tissue-cultured plants undergo the following growth phases—tissue culture, acclimatization and post-acclimatization (young plant, differentiation of the first flower bud, development of flower buds and blooming, formation and maturization of a tuber and dormancy).

Plantlets produced by other methods do not go through the phases of tissue culture and acclimatization.

Tissue culture

In this phase, a plantlet with the system of root, stem and leaves is produced. In most cases tissue culture is done with a leaf, and it takes 40–50 days for shoots to differentiate after inoculation (primary culture). These shoots are multiplicated

through up to five subcultures at a monthly cycle (shoot-multiplication culture). Each shoot is inoculated onto the regeneration medium and cultured for a month (shoot-regeneration culture). Then a plantlet, about 3 cm in height and with two or three leaves, is produced.

Acclimatization

In this phase, a plantlet which has grown in a culture container is transplanted in the substrate to get acclimatized in greenhouse conditions. The stomata, which have always been open in a highly humid condition in a culture container, become capable of adjusting transpiration by controlling humidity. A plantlet which has undergone this phase is called acclimatized plantlet. The first two leaves of an acclimatized plantlet are orbicular and almost the same in length and breadth. (Photo 31) An acclimatized plantlet is 3–4 cm high and its root system measures 0.5–1 cm. Acclimatization takes 15–30 days.

Photo 31. Acclimatized plantlet

Post-acclimatization

Acclimatized plantlets grow, flower and form tubers as they are transplanted into bigger pots than the previous ones. The whole growth from the first potting of an acclimatized plantlet to tuber formation can be divided as follows:

Young-plant phase: This is the first phase after the acclimatization. In this phase, the potted plantlet develops root system and two peltate (heart-shaped) leaves. The first leaf measures 8–11 cm × 7–8 cm, the second 11–14 cm × 8–9 cm. The stem is 2–3 cm in height and 0.7–1.0 cm in thickness. The height of the stem above the soil level is 5–7 cm. (Photo 32) The period of a young plant is 30–40 days.

Differentiation of the first flower bud: This phase covers the period from when the first flower bud starts to differentiate to when a flower bud starts to form.

In this phase, the second leaf opens and then the next three leaves come out. From this point of growth, the terminal bud of the stem functions as a mixed bud which

develops leaves and flowers simultaneously. Therefore, exactly speaking, this phase is the period from the differentiation of the first mixed bud to the starting of flower bud formation. The longitudinal section of the apex of the stem shows that when the second leaf opens and the third leaf starts to come out, the growing point develops the fourth (or fifth) foliar primordium and after that, foliar and floral primordia simultaneously. The foliar and floral primordia are wrapped in a pair of primitive leaves (stipules) together with the growing tip.

Photo 32. Young plant of Kimjongilia (when the first peltate leaf has come out)

When the fourth leaf continues to grow and the fifth leaf starts to come out around the growing point, differentiation of the first flower bud (mixed bud) is completed. (Photo 33)

When the fourth or fifth leaf begins to grow, the first green bract can be seen with unaided eyes. (Photo 34)

At this time, the second floral primordium appears at the axil of the following leaf, and the third floral primordium differentiates at the axil of the leaf after the former. In this fashion, foliar primordia differentiate on either side of the growing tip, and at each axil of them, one floral primordium develops. At this time, the plant measures 10–12 cm, the stem is 5–7 cm high and 1–1.2 cm thick.

Formation of flower buds and blooming time: This phase covers the period during which the first bud forms and flowers bloom in succession. When the fourth or fifth leaf comes out, a floral primordium grows inside the first bracts to form a bud. When the red bud grows to be more than 1–2 cm in size, it comes out of the bracts. From this time on, the peduncle grows longer and the bud also grows. The length of the peduncle at the time of the sixth leaf is 7–8 cm. It takes 25–30 days for a bud to grow 6–7 cm high. The first bud blooms fully at the time of the sixth or seventh leaf. (Photo 35)

When the first flower is fully blown, the second flower is half-blown and the third

Photo 33. Completed first flower bud when the fourth leaf comes out (bracts are opened)

Photo 34. First bract when the fourth or fifth leaf comes out

flower starts to open. Therefore, there are three flowers in one plant at all times during the blooming season. The first flower is 10–20 cm in diameter, and the size increases from the third flower. The flower size can be increased up to 30 cm by providing proper environmental conditions, nutrition and care.

One plant normally produces almost 15 flowers over four months, but if a plant is grown in long-day conditions, it can produce up to 30 flowers.

Formation and maturization of a tuber: After blooming is over, a tuber is formed in low-temperature and short-day conditions. When the tuber matures up, a

A B

Photo 35. Kimjongilia at its blooming time

(A) when flower buds are being formed; (B) when flowers are blooming

separation layer develops between the tuber and the stem above the ground which then falls off. Formation and maturation of a tuber takes 40–60 days.

Dormancy of a tuber: In this phase, the tuber goes into dormancy for the healthy growth of the plant next year.

Mature tubers are stored at temperatures of 2–5°C. The effective dormancy period is two months. After dormancy is over, the tuber starts into growth for the next generation.

Kimjongilia can also be propagated by tuber-planting. In this case, the phase of growth starts when shoots develop from the tuber. (Photo 36)

Photo 36. Tuber when shoots develop

In young plantlets produced by tuber-planting, the first flower bud differentiates and blooms earlier than in those by tissue culture. (Photos 37 and 38) The growth of leaves and flowers is vigorous and the period of tuber formation and maturation is shorter.

When propagation is done by stem cuttings, leaf cuttings and side-shoot planting, adventitious roots and buds come out and plants will grow well. Side-shoots grow from the adventitious buds on a tuber or root neck or the lateral buds on third or fourth node from the base of the stem above the soil level. One plant usually develops three or four side-shoots, but

Photo 37. Two-leafed young plant growing from a tuber (at the time of differentiation of the first flower bud)

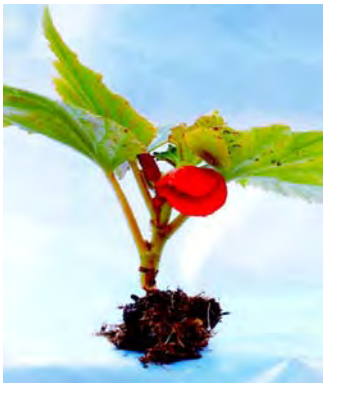


Photo 38. Four-leafed young plant growing from a tuber (at the time of formation of the first flower bud)

can sometimes develop dozens of them according to the physiological state and environmental conditions. These side-shoots can be cut and used for stem-cuttings. (Photo 39)

In this case, the period in which callus forms and root system develops is considered young-plant phase. It takes 15–20 days for callus to form. (Photo 40)

Root system develops 20–30 days after callus forms. (Photo 41)

The time of differentiation of floral buds in plants produced by stem cuttings varies depending upon the part where cutting is done. In case of using side-shoots developing on the bottom of the stem, first flowers come out on the third or fourth node. The growth since then is the same as that of tissue-cultured plants.

The propagation of Kimjongilia is also done by growing side-shoots which develop from the buds on the underground nodes. If the stem is removed when a flowering plant develops a side-shoot, it will grow quickly and develop a flower bud on the second or third node. (Photos 42 and 43)

In case that there are no side-shoots, the stem may be cut for side-shoots to develop. However, side-shoots grow better if the stem is cut after they have developed.

Propagations by side-shoots and stem-cuttings are different although both of them use lateral shoots. In stem-cutting propagation, the

Photo 39. Cutting side-shoots off a parent plant

Photo 40. Callus formed at the part where cutting has been done

Photo 41. Root system of a plant produced by stem cuttings

Photo 42. Plant with side-shoots left and the stem removed

Photo 43. Flower bud having developed on the third node of a plant grown from a side-shoot

parent plant is not removed, but in side-shoot propagation, it is removed.

Differentiation of floral buds starts when side-shoots develop from the parent plant. The growth since then is the same as that of tissue-cultured plants.

The growth period of Kimjongilia after acclimatization varies depending on the propagation methods. (Table 3)

Table 3. Period of growth phases according to the propagation methods (day)

Propagation Method	Young plant	Differentiation of the first floral buds	Formation of floral buds & blooming	Tuber formation & maturation	Dormancy	Total
Tissue culture	60–70*	40–50	140–150	40–60	30–60	310–390
Tuber planting	10–20	40–50	140–150	30–40	30–60	250–320
Stem-cutting	35–50	40–50	140–150	40–60	30–60	285–370
Side-shoot Growing	None or short	40–50	140–150	30–40	30–60	240–300

* Period of acclimatizing a plantlet included

As shown in Table 3, depending on the propagation methods, the growth period of Kimjongilia is different in terms of periods of the young-plant phase, and tuber formation and maturation.

The period of flower bud formation and blooming is 140–150 days in proper day length and temperatures in any propagation method. The total period of growth is the longest in tissue-cultured plants (310–390 days).

Section 2. Formation and Growth of Vegetative Organs

1. Root

The root system of tissue-cultured plantlets develops when multiplicated shoots are cultured in the root-differentiation medium.

The root-differentiation medium should contain 0.05 mg/l of 6-BA and 0.25 mg/l of α-NAA. Then the differentiation of shoots stops while the stem grows together with the root development. However, as this root is underdeveloped, a new root system should be developed during the process of acclimatization. 15–30 days after transplanting a plantlet in the substrate through humidity adjustment, acclimatization is completed with the development of new root.

As for a tissue-cultured plantlet, when it is acclimatized after removing the roots and callus, new roots develop more quickly. This is because mechanical change stimulates the synthesis of ethylene which helps the root development. The root system develops from the callus of the part where the cutting was done. If one node is planted in the substrate, even a shoot at the axil develops roots. (Photo 44)

Photo 44. Root system having developed at the time of acclimatization

To promote root development in a tissue-cultured plantlet, the substrate should have good porosity, because at this place respiration quickens and the plantlet needs more oxygen.

The tuber sends up shoots and then develops the root system. Most fibrous roots of the tuber die away, but some thick roots remain alive until the next spring and develop new roots if proper humidity is provided. Tubers which have been dried and stored also send up shoots and develop new root system if proper

humidity conditions are provided. In case of small tubers, the root system is underdeveloped. Therefore, the root primordia are produced from the pericycle and then roots are developed.

Side-shoots at the axil or leaves also develop root system very well when they are transplanted. In case of a leaf, it takes long for a shoot primordium to form. Therefore, the petiole with the foliar bud at the axil should be cut and planted. The underground part grows slower than does the part above ground. (Figure 8)

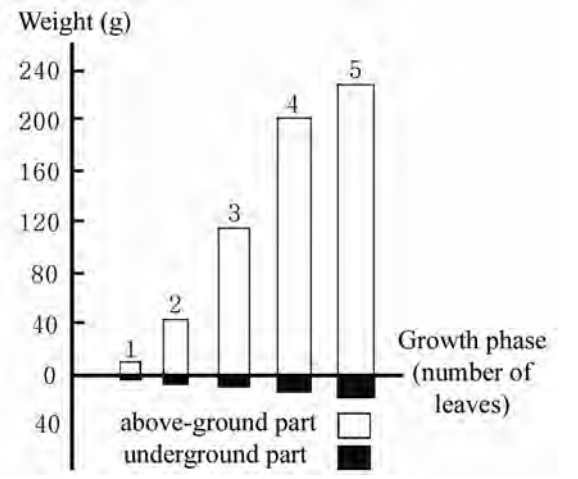


Figure 8. Fresh weights of above- and below-ground parts at every growth phase

1. plantlet; 2. when the 3rd and 4th leaves come out; 3. when the 5th and 6th leaves come out; 4. when the 7th and 8th leaves come out; 5. last phase of growth

From the phase of a plantlet, there is considerable difference in weight between the underground part and above-ground part. After the first flower blooms when the seventh and eighth leaves come out, the weight of the root accounts for 4–8% of the total weight of the plant. The reason is that less amount of nutriments moves to the root system. The average rate of root growth is 2 mm a day. As the root of Kimjongilia needs much oxygen, it spreads more horizontally than vertically.

2. Stem and Leaf

A new node develops whenever a foliar primordium grows into a complete leaf out of the stipules. Internodes are elongated by the activity of meristem at the bottom of a node. Therefore, a pair of stipules are joined to the bottom of their nodes. (Photo 45)

Early stipules are left as scars, but later stipules are freshly left. Internodes grow 2.3–4.5 cm over a period of 75–90 days and then stop growing. Nodes develop in succession and internodes grow, as a result of which the stem is formed.

The growth rate of the stem varies according to the growth phases and

environmental conditions. When you make all flowers including the first flower bloom, the curve graph of the plant height goes in S's pattern till the period when the tenth leaf develops, but when you remove the first three flower buds, it goes in a nearly straight line. In other words, if the plant is grown to produce flowers in its early days, the stem growth slows down when there are three or six leaves in the plant. The stem normally grows 0.1–0.3 cm longer and 0.1–0.3 mm thicker a day.

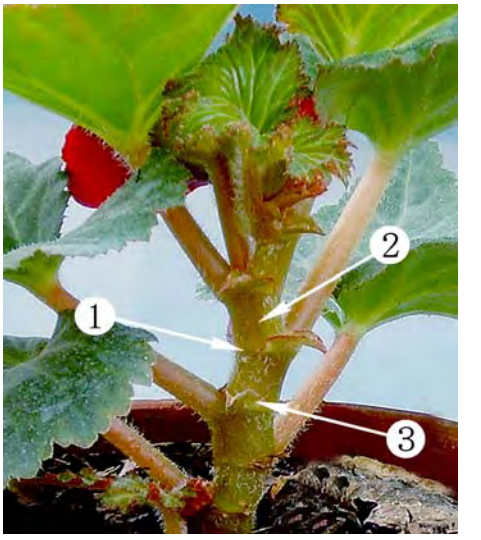


Photo 45. Node, internode and stipule
1. node; 2. internode; 3. stipule

The stem which is 2–3 cm thick or above has great ornamental value and lasts about five months. The stem of a young plant thickens quickly. When the first floral bud differentiates and a flower bud forms, the thickening slows down, but when blooming starts it quickens again.

As foliar primordia at the growing tip grow into leaves, leaves come out at each node one after another in alternate phyllotaxis. Flowers usually come out at the fourth axil and above. Foliar primordia at the growing tip are wrapped in bracts. As the bottommost part of the foliar primordium turns into a petiole and the upper part into a blade, a complete leaf grows out of the bracts.

At this time, a foliar primordium and a floral primordium develop at the growing tip on the opposite side of the previous foliar primordium. These mixed buds develop into leaves and flowers at each node of the stem.

When the pedicel grows, the growing tip is pushed to one side a little. This causes the stem to grow in a slightly zigzag pattern.

The rate of foliar development depends on the growth phases and environmental conditions, but leaves come out every 10–20 days.

It usually takes 30 days or more for a leaf to grow to be more than 20 cm long. The leaf growth varies depending on the order of leaf development as well as the propagation methods. (Table 4)

Table 4. Growth period of leaves of a plant grown by tissue culture according to the order of leaf development and their surface area

Order of leaf development	1	2	3	4	5	6
Growth period (day)	21	38	59	63	58	56
Leaf surface area (cm^2)	63.7	85.3	117.8	189.4	185.2	170.5

3. Tuber

The tuber, which is a nutritive storage organ, is formed by accumulation of reserve materials (mostly starch) at underground nodes or when buds do not send up shoots but store reserve materials instead.

The process of tuber formation in which underground nodes undergo structural changes and starch is accumulated is as follows.

Before tuber formation underground nodes of the stem are the same in structure as those above ground. In other words, there is no difference in the primary structure. As it becomes cooler and daylight time shortens, the underground stem starts to thicken and changes greatly in shape and structure. First of all, there occurs cell division of the procambium between the xylem and phloem in the vascular bundles at the bottommost node and vascular cambium starts to develop. Thus the gap between the xylem and phloem gradually widens. At this time, the vascular bundle is about 205 μm in diameter. (Photo 46) Meanwhile, the parenchyma cells between the vascular bundles regain the ability of division and form intervascular cambium. The intervascular cambium and vascular cambium are connected to form a cambial ring. (Photo 47)

At the final phase of the formation of the cambial ring, most cells not only in the pith but in the xylem are turned into storage cells. Starch begins to be stored in the cells which have developed as a result from continuous cell division of the cambial ring. The pith cells which are filled with starch become much larger, their cell walls getting smooth and nuclei mostly destroyed. (Photo 48) Oval nuclei can be found only in newly born cells. In the end, every cell turns into a storage cell and starch grains become much larger.

The cortex cells of 9–10 layers formed by cell division of the cork cambium under

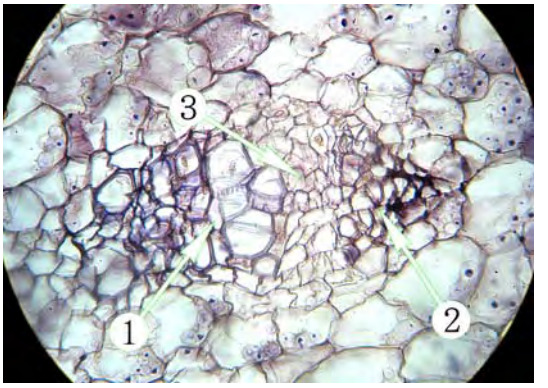


Photo 46. Vascular cambium at an underground node 1. xylem; 2. phloem; 3. cambium

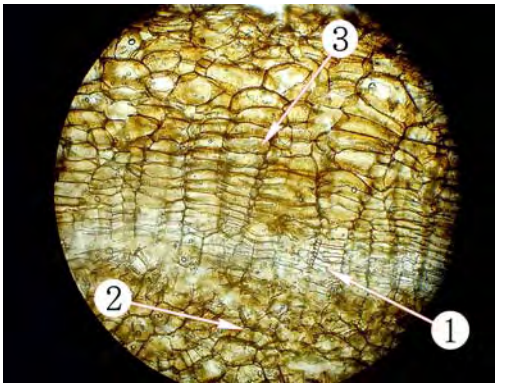


Photo 47. Completed cambial ring
1. cambial ring; 2. pith; 3. cortex

the epidermis are elongated tetragonals (measuring about 76 μm × 24 μm), whose nuclei are destroyed and cell walls turn dark brown as time goes by.

Lighting and temperature are critical factors decisive of tuber formation. In Korea's climate, Kimjongilia begins to form a tuber from early or mid-September when the daytime is less than 12 hours. As the temperature gets lower and the daytime shorter, the tuber quickly becomes heavier and thicker. If temperature is low (14.5°C at day and 7°C at night) and the daytime is 8 hours long, the tuber will start to develop in about 20 days. However, when it is shorter (less than 20 days), it will not. If the daylight time is 10–12 hours, it takes more than 20 days for the tuber to begin to form.

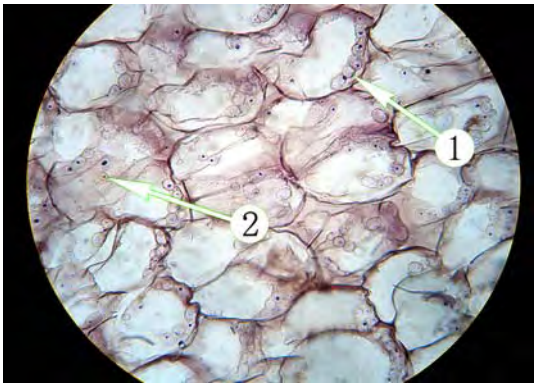


Photo 48. Pith cells of a tuber at the time of starch accumulation
1. starch grain; 2. nucleus

In winter conditions of a greenhouse supplemental lighting should be provided. Otherwise even young plants stop growth and develop tubers in a month. Such plants do not grow but only tubers become larger even if long-day conditions are provided again. (Photo 49)

The formation of a tuber in a young plant preconditions short daytime, but a tuber

grows larger in long-day conditions. Therefore, the tuber is bigger when the plant is cultivated for 20 days in 8-hour-daytime conditions and for 60 days in 12- to 13-hour-daytime conditions than when it is done for 90 consecutive days in 8-hour-daytime conditions.

If the temperature is high, tuber formation slows down although short-day conditions are provided. The temperature at night is particularly important. The reason is that if the temperature is high at night, the tuber consumes much nutriments through respiration. The tuber grows and matures very well in conditions in which day temperature is 18–20° C and night temperature is 6–10°C. At the final phase of its maturation, cooler temperature of 0–2°C should be provided so that the stem can fall off from the tuber quickly as formation of the separation layer is promoted.

A B

Photo 49. Tuber of a young plant in conditions of short daytime
(A) before growth has stopped;
(B) after growth has stopped

Watering has a great effect on the formation and maturation of the tuber. During the formation of the tuber, a certain amount of water is needed. However, during the maturation, less water should be provided in order to facilitate the accumulation of organic substances. Therefore, soil moisture should be 50–60% of the maximum amount of water used when the tuber is at the stage of formation, and watering should be stopped when the tuber starts to mature so that it can go into physiological dormancy.

The number of leaves is also closely related with tuber formation. In general, Kimjongilia develops a tuber regardless of the number of leaves in short-day conditions (even when the third or fifth leaf comes out). However, a mature plant with many leaves can develop a tuber even in long-day conditions in which a tuber starts to form when the seventh or eighth leaf comes out, and gradually becomes larger.

When a plant is in good nutritional state, starch is easily accumulated in the tuber. However, a tuber continues to develop shoots in conditions of high temperature and long daytime, and in turn does not mature completely due to the consumption of stored

carbohydrate. Such tubers tend to rot easily during the storage. Immature tubers, too, can be used as propagation materials after being stored for about two months in conditions in which the temperature is somewhere between 2 and 4°C and humidity 80%.

Like that of other organs, the formation of tuber is controlled by hormones. If the growth of the above-ground part of the plant is retarded in unfavourable conditions, hormones which quicken the formation of a tuber are produced and transferred to the rhizome. Then the rhizome grows sideways, not lengthways and starts to form a tuber.

If a plant which has been grown in long-day conditions is moved to a location in short-day conditions, the leaves make hormones to facilitate tuber formation by sensing short daytime. If leaves at the lower nodes are cut away at this time, the tuber grows larger. If you are to develop a tuber in long-day conditions, do the pinching. Then the growth of the above-ground part slows down and a greater amount of assimilation products is transferred to the tuber, which will quicken the formation of the tuber.

Tuber formation is influenced by the amount of inorganic nutrients supplied to the plant such as nitrogen, phosphorus, kalium, etc. Like other flowering plants, Kimjongilia needs a large amount of nitrogen during the vegetative growth and phosphorus and kalium during the blooming period. Especially kalium has a great effect on tuber formation. If potassium chloride is applied to the plant during the formation of a tuber, it will help develop a large, mature tuber.

In addition, unfavourable external stimuli promote tuber formation as well. For

A B C

Photo 50. Various forms of tubers developed when the stem is buried deep in the soil
(A) tubers developed from the contracted nodes;
(B) and (C) small tubers developed from the nodes in the soil

example, a plant whose growth has been stopped temporarily by the infestation of dustmites can develop a tuber even if it is young. Also, if the bottommost node of the stem is deeply buried in the soil or is given a mechanical stimulus, every bud of the node in the soil will develop a tuber. (Photo 50)

Section 3. Blooming

Flowers, as a reproductive organ of the angiosperm, usually produce fruits and seeds after fertilization. However, Kimjongilia produces fruits and seeds only when artificial fertilization has been conducted.

1. Differentiation and Growth of the Floral Bud

Differentiation and growth of a floral bud in Kimjongilia cover the period from differentiation of a mixed bud to blooming.

Differentiation and growth of the floral primordium can be divided into seven phases.

In the first phase, the terminal bud of the main shoot which has produced four or five foliar primordia is turned into a mixed bud. The floral primordium is differentiated as a ridge together with the foliar primordium.

In the second phase, the primordia of staminate and pistillate flowers are differentiated as a ridge inside the space wrapped by a pair of bracts. The largest primordium which is located in the middle is a staminate primordium which will grow into a male flower. On either side of it there is a pistillate primordium which will grow into a female flower. (Photo 51)

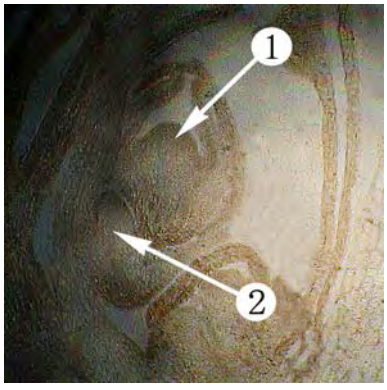


Photo 51. Longitudinal section of the floral bud at the second phase of differentiation
1. staminate primordium;
2. pistillate primordium

In the third phase, sepals are formed. At first, sepals are differentiated near the staminate primordium to encircle it. Immediately after that, sepals of the pistillate primordium are differentiated.

In the fourth phase, petals are formed. Numerous petal ridges on the staminate primordium are differentiated and start to grow. The staminate primordium measures 800 μm × 600 μm at this time. In the pistillate primordium, petal ridges are also differentiated. The pistillate primordium measures 300 μm × 600 μm at this time. (Photo 52)

The better the conditions are for petal formation, the more the petal ridges are

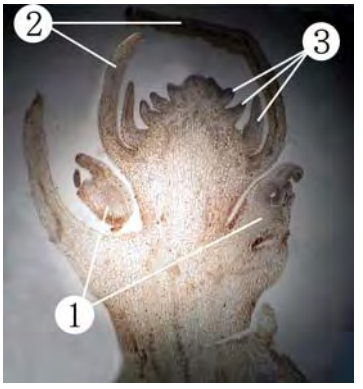


Photo 52. Longitudinal section of the floral bud in the fourth phase of differentiation
1. pistillate petal ridges; 2. sepals of the staminate flower; 3. staminate petal ridges

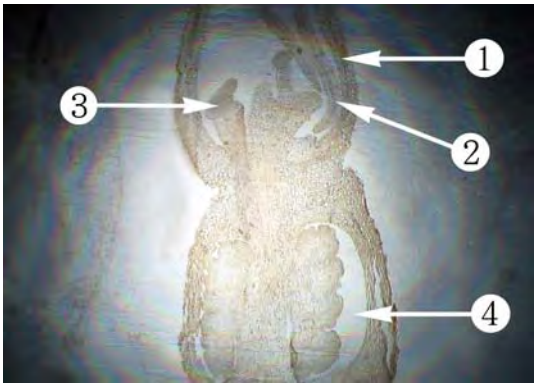


Photo 53. Pistillate primordium in the fifth phase of differentiation
1. sepals of the pistillate flower; 2. petal ridges of the pistillate flower; 3. stigma ridges of the pistils; 4. loculi of the ovary

differentiated to develop a double, large flower with many petals.

In the fifth phase, ovary is formed in pistillate primordium. As sepals open little by little, petals begin to grow larger. Loculi of the ovary are fully developed and stigmas of the pistils begin to differentiate. (Photo 53)

In the sixth phase, the peduncle develops and flowers begin to bloom. Bracts are

A

B

Photo 54. Flower bud formation
(A) process of flower bud formation out of the floral primordium
(B) full-fledged flower bud

completely open and the lower parts of the staminate and pistillate primordia grow longer to form peduncles. Petals grow to form a bud, which comes out of the encircling bracts. The bud of the staminate flower measures 4–7 cm. (Photo 54) In the pistillate flower, the ovary is fully developed and the ovule begins to form.

In the seventh phase, flowers bloom as sepals and petals open. The peduncle grows to measure 7–10 cm long at this time. The pedicel grows to be 1–3.5 cm long. The staminate flower begins to bloom first and then pistillate flower follows. The former is 10–25 cm in diameter and 5–10 cm in depth; the latter is 10–12 cm in diameter and single. If stamens are induced, the staminate flower produces pollen sac and pollen. The pistillate flower completes the ovule.

In Kimjongilia, differentiation of the first floral bud begins at the time of two leaves. As the plant continues growth, following floral buds are also differentiated. For example, the eleventh or twelfth floral bud differentiates at the time of the sixth or seventh flower which is considered the peak of blooming. As the period of floral bud differentiation is long as above mentioned, blooming goes on acropetally rather than collectively and lasts for a long period of time.

2. Characteristics of Blooming

Blooming of Kimjongilia starts earlier and lasts longer than do the West European double-flowered begonia cultivars.

The blooming starts at the fourth or fifth axil and lasts for about four months in a plant. It takes 40–50 days from the start of floral primordial differentiation to the formation of a flower bud which can be recognized with unaided eyes. Then, 40–50 days after, the flower blooms fully.

The time a flower bud takes to fully bloom can be predicted, seeing its size. (Table 5)

Table 5. Relations between bud size and the period until buds bloom fully

Bud size (cm)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Period until buds bloom fully (day)	39.0	35.4	33.3	30.1	26.7	24.9	22.2	20.1	17.9

Fully blown flowers last more than 20 days. About three weeks after full bloom, flowers begin to fall off as the edges of the outermost petals start to dry. From the above-mentioned characteristics of blooming, Kimjongilia can be enjoyed for a long time.

The blooming of Kimjongilia is greatly affected by external and internal factors.

The number of a node where a floral bud forms varies depending upon the propagation methods. In a tissue-cultured plants, the first floral bud is differentiated at the fourth or fifth node of the stem, but a plant propagated by tuber-planting develops the first floral bud at the third or fourth node. This phenomenon can be explained by the fact that plants propagated by tuber-planting are generally in better nutritional conditions than are their tissue-cultured counterparts. Like tuber-planted plants, plants propagated by stem cuttings produce the first flower at the third or fourth node but not one in good nutritional conditions. In plants propagated by side-shoots, the first flower comes out from the second or third node. The flower at a node with a large leaf is usually larger than that of a node with a small leaf. However, a flower at the fourth or fifth node is relatively small although there is a larger leaf than those of the lower nodes. The reason is that it is the first flower to bloom. Therefore, it is advisable to remove the first one or two flower buds as early as possible in order to help following floral buds grow into large flowers. Kimjongilia is the most beautiful when the fourth or fifth flower is in bloom, for the plant is of appropriate height and the flower is large. As the plant gets older, the rate of floral-bud differentiation changes. Floral buds differentiate quickly during the period from the third flower to the fifth flower, but slows down sharply after the seventh flower. Therefore, the period from floral-bud differentiation to full blooming is quite long.

Floral buds usually start to open into bloom after they have grown for 20–25 days to be 6–7 cm in size. The time a flower bud takes to bloom fully and the blooming rate depend upon the degree of the development of floral parts, environmental conditions and nutrition. Flowers of Kimjongilia become larger as they bloom and continue to grow larger even after they are open to a certain degree. Because leaves come out and floral buds differentiate in succession at the nodes after the bloom of the first flower, one plant can produce up to 15 flowers. As Kimjongilia is a long-day plant, the ideal daytime for wonderful flowers is 14 hours or above. The conditions in which the daylight time is between 13 and 14 hours will slow the rate of blooming down and reduce flower size.

Chapter 4
Physiology and Ecology of Kimjongilia

A new cultivar usually exhibits adaptive characteristics to the ecology of its wild ancestors. Therefore, Kimjongilia has much of the physiological and ecological characteristics of its wild ancestors on the Andean plateau.

Section 1. Light Requirements

1. Light Intensity

A shade plant, Kimjongilia does not require strong light. This is related to the fact that its wild ancestors have ecological characteristics as shade plants.

The compensation point of the photosynthesis is between 200 and 500 lx. If light intensity drops below the compensation point, the speed of photosynthesis becomes lower than that of respiration with the result that organic substances are not accumulated. Consequently, leaves at the lower part of the stem start to turn yellow and drop.

The saturation point slightly varies in accordance with the growth phases: about 13 000 lx at the time of one to five leaves and about 9 000 lx during the blooming season. If Kimjongilia gets light of intensity above the saturation point, photosynthesis is more severely restricted than in other plants. For example, if it is exposed to direct sunlight outdoors in summer for only five minutes leaves will be damaged, which, in turn, photosynthesis will be restricted seriously. Therefore, light intensities should be adjusted according to light-intensity requirements of Kimjongilia at each growth phase.

The ideal light intensity for a young plant is somewhere between 10 000 and 15 000 lx. In case of 8 000–10 000 lx, leaf size reduces and in case of 30 000–35 000 lx,

foliar edges dry and the plant does not grow well.

Kimjongilia needs light of 10 000–15 000 lx when the first floral bud differentiates. If light intensity drops below 10 000 lx, the plant will become leggy and limp.

When flower buds are formed and blooming starts, Kimjongilia requires a little lower light intensities than in the previous phase. If Kimjongilia is provided with light of 8 000–10 000 lx, the stem thickens, leaves grow very well and flowers be in vivid colour and last long. However, if it is provided with light of 10 000 lx or above continuously, the amount of chlorophyll and flower size will be reduced, and petals thickened and the duration of blooming shortened.

2. Daylight Time

Kimjongilia is a long-day plant and thus very sensitive to the length of daylight. The daylight time has a great effect upon blooming, tuber formation and dormancy. (Table 6)

Table 6. Effect of the daylight time upon the growth of Kimjongilia

Daylight time (h)	Average number of leaves	Number of existent peduncles	Fresh weight of the above-ground part (g)	Fresh weight of underground part (g)	Fresh weight of tuber (g)	Diameter of tuber (cm)
10	3.1	0	45.8	34.4	25.6	4.1
11	4.6	0	44.5	30.6	22.0	3.8
12	8.2	0.3	59.3	26.2	12.4	2.9
13	8.3	3.3	70.7	23.8	7.6	2.3
14	11.5	6.0	71.5	21.6	5.8	2.3

In long-day conditions, Kimjongilia grows normally and produces flowers successfully. However, if the daylight time is reduced below 14 hours, the growth of the above-ground part becomes slow while the tuber becomes fleshier. In the condition of 10- to 11-hour daytime, the growing tip stops growth and bare-centred flowers open with margins of petals rolled inwards and the tuber becomes largest. Therefore, in order to get flowers to bloom in winter or spring, 14-hour daylight should be provided.

If short-day conditions last for 3–5 days in winter, the growth and blooming of Kimjongilia are not interrupted. However, if they last for a week, the plant goes into

dormancy for the time being. If long-day conditions are restored the plant will grow again, although blooming is delayed for about 9 days. If the plant which has been placed in short-day conditions for over 10 days returns to long-day conditions, it will grow irregularly and blooming be delayed for more than 25 days, and as a result, its ornamental value as a whole will be greatly reduced. On the other hand, placing it temporarily in conditions of short daytime facilitates the growth of its tuber. However, such tuber does not grow satisfactorily because it has not undergone complete dormancy.

Section 2. Temperature Requirements

It is important to avoid heat in summer and cold in winter in growing in the temperate zones Kimjongilia which originated from wild tuberous begonia species in the subtropical highlands at elevations of 3 000–4 000 m. The limit temperature range for growth is between 28–30°C and 5°C. The optimum temperature range slightly varies according to the growth phase. 22–24°C at day and 16–18°C at night are optimum temperatures during the period from the transplantation of an acclimatized young plant in the pot to the time of the development of three leaves. Temperatures, either below 10°C or above 30°C, slows down growth.

Optimum temperatures are 22–24°C at day and 14–16°C at night during the period from the development of three leaves to that of the first bract. If the DIF is more than 10°C, the plant grows too tall. So at this time it is good to maintain DIFs at about 8°C for proper height of the plant.

Table 7. Relations of temperature to flower size

Temperature (°C)		DIF (°C)	Flower size (cm)
Day	Night		
20.0	10.0	10.0	21.0
20.0	11.5	8.5	20.4
19.0	11.5	7.5	18.7
20.5	13.0	7.5	17.8
18.0	12.0	6.0	16.3
18.0	12.5	5.5	16.0

Temperatures during the period from the development of the first bract to blooming of the first flower effect the quality of flowers. The blooming period of a flower varies depending upon temperature. The ideal temperature range is between 18–20°C at day

and 8–10°C at night with DIF of 10°C. (Table 7)

In the above-mentioned temperature conditions, blooming goes slow and lasts long, and flower size increases (more than 20 cm).

Section 3. Water Requirements

The above-ground part of Kimjongilia is composed of 91–95% water. (Table 8)

Because leaves of a young plant have underdeveloped stomata, up to 50% of transpiration takes place through the foliar epidermis. In mature leaves, however, transpiration is mainly done through stomata. Although the area covered by the stomata on the lower epidermis of the leaf accounts for only 1.15% of the whole surface area of the leaf, there is much transpiration through the leaf.

Table 8. Water content of each organ of Kimjongilia

Organ	Plantlet with three leaves			Blooming plant					Tuber
	Root	Stem	Leaf	Total	Root	Stem	Leaf	Flower	
Water content (%)	46.3	91.7	94.3	94.3	29.2	95.4	94.2	91.6	84.5

Transpiration of Kimjongilia in conditions of a greenhouse changes regularly according to the light intensity and temperature which change periodically each day. When the sun rises in the morning, the stomata open, and as the temperature goes up and the difference in vapour pressures inside and outside the stoma increases, transpiration reaches its peak between 12 o'clock and 14 o'clock. The amount of transpiration during the day is 1.9 times larger than that during the night. The reason is that at night the stomata are closed and transpiration is done only through the foliar epidermis.

As its above-ground part has the characteristics of a hygrophyte, Kimjongilia requires much water during the whole period of growth. The amount of daily transpiration and evaporation in a young plant transplanted in a 9-cm pot is 35 g, and increases up to 100 g until the first flower blooms, and is about 130 g at the time when the third flower opens into full bloom. A plant requires 13 kg of water during the period

of 152 days from acclimatization to the time when the third flower is in full bloom.

Because of its genetical characteristics, Kimjongilia requires high humidity. The ideal humidity is 70–80% during the period from acclimatization to the time when three leaves develop and 60–70% not only when the above-ground part grows vigorously and flowers start to bloom, but also when flowers fall off and tuber forms itself.

Photo 55. Guttation in Kimjongilia

Kimjongilia is very sensitive to humidity. If the amount of transpiration is greater than that of water absorbed, it will wilt. Therefore, care should be taken to provide proper humidities in the greenhouse.

Even if transpiration does not take place, water is moved owing to the root pressure. If humidity in a greenhouse is saturated during the night, you can see water droplets gather on the margins of the leaves (guttation in the morning). (Photo 55)

This phenomenon occurs because the water absorbed through the root during the night comes out through the water pores, though the stomata are closed.

Flower Vegetables

Pedicels, flowers, peduncles and flower buds serve as edible vegetables. Flower vegetables include cauliflower, rape, *Zingiber mioga*, *Cirsium maackii*, *Ochna hamandii*, *Allium odorum*, edible lily and others.

As for cauliflower, its constricted, light milkish white pedicels with plenty of nutrients are edible. As for *Cirsium maackii, Zingiber mioga* and edible lily, their well developed flower buds are edible. As for rape and *Allium odorum*, the soft tip of their floral axes and flowers are edible.

Since olden times the Korean people have been accustomed to pancakes made of flowers of azalea. Unlike usual vegetables, flower vegetables are serviceable as vegetables only when they are picked in the right season. Method of their cultivation differs according to their use.

Section 4. CO_2 Requirements

CO_2 level in a greenhouse can be up to 500–600 ppm at night due to the catabolism of microorganisms and respiration of plants. Two or three hours after the sunrise, CO_2 level in a greenhouse becomes equal to that outdoors as photosynthesis progresses. Much of CO_2 in a greenhouse is absorbed through photosynthesis during the daytime, and thus, CO_2 level is reduced (below 100–200 ppm).

If CO_2 level is raised up to 380 ppm, the accumulation of dry matter quickens in Kimjongilia. As a result, there is a considerable increase in plant height, number of leaves, foliar surface area and plant weight. Excessive CO_2 level of more than 380 ppm slows the accumulation of dry matter in a plant body.

Section 5. Soil Preferences

The wild ancestors of Kimjongilia grow in the soil composed of fallen leaves of evergreen broadleafed trees and deciduous trees. Therefore, this kind of soil is very coarse and capable of good aeration and water storage, which Kimjongilia prefers.

Fallen leaves which have lain for 2–3 years in broadleafed woods should be used as culture soil. In other words, half-decomposed leaves are best, which easily break to the touch.

The most appropriate pH of culture soil is 6.5. The optimum temperature of culture soil should be 2–3°C lower than the air temperature. In case of a potted plant, the temperature of the soil can be adjusted by watering.

The root system develops well when the culture soil has much air within it. The growth and flower size depend on the ratio between solid, liquid and gas of the soil. The ideal ratio is approximately 1:1:1 (measured by volume).

The requirements for this composition of culture soil do not change greatly through the whole period of growth.

Section 6. Nutrition Needs

Around the blooming time, the above-ground part of Kimjongilia is composed of 95% water and 5% dry matter which consists of over 60 chemical elements including carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium and sulfur. Elements including nitrogen, phosphorus, potassium and others, except for carbon, hydrogen and oxygen which take up the largest proportions, are mainly absorbed through the root.

Like in other plants, the most important elements in inorganic nutrition of Kimjongilia are nitrogen, phosphorus, potassium, calcium and magnesium.

1. Nutrient Content in the Plant Body

The content of inorganic nutrients in the plant body of Kimjongilia varies depending upon the growth phase. The following table shows the average contents of inorganic nutrients of the above-ground and underground parts. (Table 9)

Table 9. Contents of inorganic nutrients at each growth phase (proportion to dry matter)

Growth phase	N		P_2O_5		K_2O		CaO		MgO	
	above-ground	below-ground	above-ground	below-ground	above-ground	below-ground	above-ground	below-ground	above-ground	below-ground
1–2 leaves existent	3.95		1.02		6.3		1.24		0.76	
3–4 leaves existent	3.66	2.57	0.87	0.77	5.9	4.6	1.21	1.22	0.77	0.58
5 leaves existent	3.52	2.24	0.80	0.72	5.9	3.8	1.10	1.09	0.85	0.73
Flower bud formation	3.20	1.78	1.04	0.62	5.4	3.8	1.06	1.06	0.57	0.82
Blooming	2.80	1.73	1.08	0.70	5.3	2.8	0.87	1.08	0.54	0.75
End of blooming	2.57	1.45	1.25	0.77	5.4	2.4	0.86	0.96	0.81	0.72
End of growth	2.43	1.26	1.59	1.00	7.0	2.4	1.08	0.95	0.85	0.72

The contents of nitrogen both in the above-ground and underground parts decrease as the plant nears the end of growth. However, the content of phosphorus usually increases.

The content of potassium in the above-ground part decreases until the blooming time and then increases again. However, the content of potassium in the underground part continues to decrease throughout the growth. As for the contents of calcium and magnesium in the above-ground and underground parts, there are no considerable changes throughout the growth. The ratio between the contents of N, P_2O_5 and K_2O is 4:1:6 until the time when five leaves are existent; 2.5:1:4.5 around the formation of flower bud and the blooming time and 1.4:1:3.6 towards the final phase of growth.

Kimjongilia requires much potassium throughout the growth. The content of K_2O in the plant body is 1.7 times as much as nitrogen until the time when five leaves are existent, 1.8 times at the time of blooming and 2.6 times at the final phase of growth. Flowers contain more potassium than leaves or the stem.

2. Effects of Nutrients on the Growth

If you apply fertilizer solutions without nitrogen, phosphorus and potassium respectively

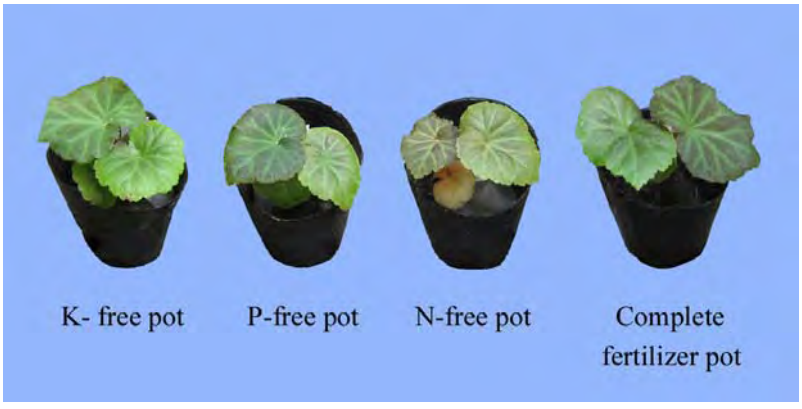


Photo 56. Effects of N-, P- and K-free fertilizer solutions upon the growth of a young plant (when 3–4 leaves are existent)

to Kimjongilia plantlets cultivated in potting soil, there are considerable differences between them and those to which complete fertilizer solutions have been applied. (Photo 56)

If nitrogen is deficient, leaves turn yellow going up along the main stem because assimilated nitrogen in the lower leaves is transferred to the upper leaves. In case of phosphorus deficiency, the above-ground part of the plant does not grow vigorously and much anthocyan is produced, as a result of which the central parts of the lower

leaves become red and the blades of the upper leaves become blackish green. Potassium deficiency causes the leaf to decrease in size and leaf colour to fade. Deficiencies of calcium and magnesium also disturb growth. If calcium is deficient, growth disturbances are observed in the root system, growing tip of the stem and leaflets. If magnesium is deficient, leaf blades turn yellow though the leaf veins are green, and blooming is delayed. Microelements such as iron, boron, molybdenum, copper, manganese and zinc are also indispensable for the growth of Kimjongilia.

The amount of necessary inorganic nutrients in the culture soil is not sufficient for the growth. Therefore, they should be added in the form of fertilizer. When fertilizers are applied until the time when the plant goes into blooming, the ideal ratio between N, P_2O_5 and K_2O is 2:1:4. What most affects the vegetative growth is nitrogen, and next phosphorus and potassium. Phosphorus is highly effective at the phase of the growth of the reproductive system. If sufficient amount of phosphorus is applied, blooming lasts 2–3 days longer. It is advisable to apply the mixture of NH_4^+–N with NO_3^-–N at percentages of 20–40% considering the growth phase for begonias like Kimjongilia. In cultivating Kimjongilia, it is important to ensure that many rootlets occur instead of long extension of the root and strengthen the activities of the root. For this, the ratio between solid, liquid and gas should be 1:1:1 and microelement fertilizers be applied properly.

Kimjongilia absorbs a certain amount of nutrients through the leaf surface when fertilizer solutions are sprayed. The leaves and stem of Kimjongilia consist of epidermal cells with less waxy walls and are covered with many hairs. Therefore, spraying fertilizer solutions to the foliage is also a highly effective method of fertilizing. The optimum concentration of fertilizer solutions is 0.1–0.2% and the appropriate pH value 5–6.

3. Amounts of Nutrients Absorbed at Each Growth Phase

The total amount of individual nutrients absorbed dramatically increases during the period from the early stage of flower bud formation to the final phase of growth. The amount of nitrogen absorbed until blooming accounts for 40% of the total amount of nitrogen absorbed throughout the growth. 70% of the total amount of phosphorus is

absorbed until the final stage of blooming. Like the uptake of nitrogen and phosphorus, the amount of potassium absorbed starts to increase at the time of flower bud formation and tends to increase sharply at the final phase of growth.

Unlike other plants, Kimjongilia continues to absorb nutrients until the final phase of growth. This is due to tuber formation. Therefore, it is necessary to provide enough nutrients throughout the growth until the plant goes into dormancy.

Section 7. Distribution and Day-Night Mobility of Photosynthetic Assimilation Products

1. Characteristics of Distribution of Photosynthetic Assimilation Products

In general, photosynthetic assimilation products are distributed according to the position of leaves in keeping with a law. Photosynthetic assimilation products produced by lower leaves are used for root development and those produced by upper leaves for the development of new branches and leaves. Likewise, flowers and fruits use the products mainly from leaves near them.

In Kimjongilia, these characteristics are particularly evident. According to a study of the characteristics of the distribution of the photosynthetic assimilation products in a plant with 8–9 leaves and a fully-blown flower at the sixth axil where $^{14}CO_2$ was put into the six leaves from the base, the higher the position of the leaf, the more the amount of $^{14}CO_2$ left in the leaf and the less the amount of $^{14}CO_2$ moving to other organs. In four leaves from the base, the lower the position of the leaf, the more $^{14}CO_2$ it sent to the root. However, the fifth and sixth leaves did not send any $^{14}CO_2$ to the root. The larger amount of $^{14}CO_2$ sent to the stem was from the third leaf, and the farther leaf from it, the less amount of $^{14}CO_2$ was sent to the stem.

All the leaves sent a small amount of $^{14}CO_2$ to fully blown flowers, but plenty of $^{14}CO_2$ to flowers which were in the middle of blooming. The bigger the flower bud, the more $^{14}CO_2$ was sent to it. Even the sixth leaf sent more $^{14}CO_2$ to the flower which was

not fully blown than to the flower at its axil. Therefore, if flowers are brought into bloom in succession, the flowers which have already bloomed do not grow but wilt soon.

2. Day-Night Mobility of Photosynthetic Assimilation Products

In general, assimilation products of the leaf are moved to other organs in different amounts during the day and night respectively.

According to an investigation after $^{14}CO_2$ was put into the fourth leaf of the plant with an open flower, plenty of assimilation products was moved to the flower regardless of the day and night. However, more assimilation products were moved to the leaves during the night and to the root during the day. (Figure 9)

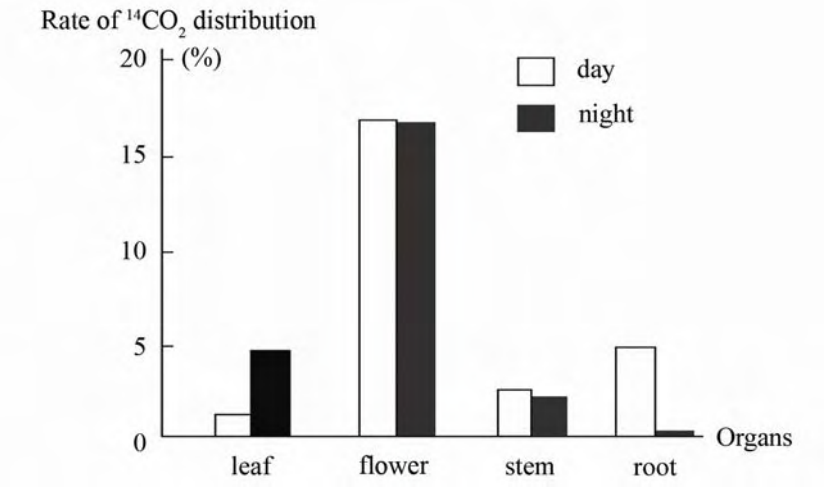


Figure 9. Distribution rate of assimilation products to organs during the day and night (at the time of five leaves)

As for the amount of assimilation products moved during the day and night according to the position of the leaf, nothing was moved to the leaves under the fourth leaf, a small amount of $^{14}CO_2$ was moved to the fifth leaf, and the large amount was moved to the sixth leaf which was in the middle of growing.

There is some difference in day-night mobility of assimilation products according to the position of the flower. According to the investigation into the mobility of assimilation products after $^{14}CO_2$ was put into the fourth leaf, the most amount was moved to the second flower bud on the fourth leaf node. Next to it was the first flower

at the node below the fourth leaf, and then the third and fourth flower buds. (Figure 10) More assimilation products were moved to the second flower bud during the day than at night. This indicates that nocturnal conditions of low temperature help flowers grow bigger.

When the vegetative growth is nearly over, assimilation products are concentrated in flowers and after that sent to the tuber which is a storage organ.

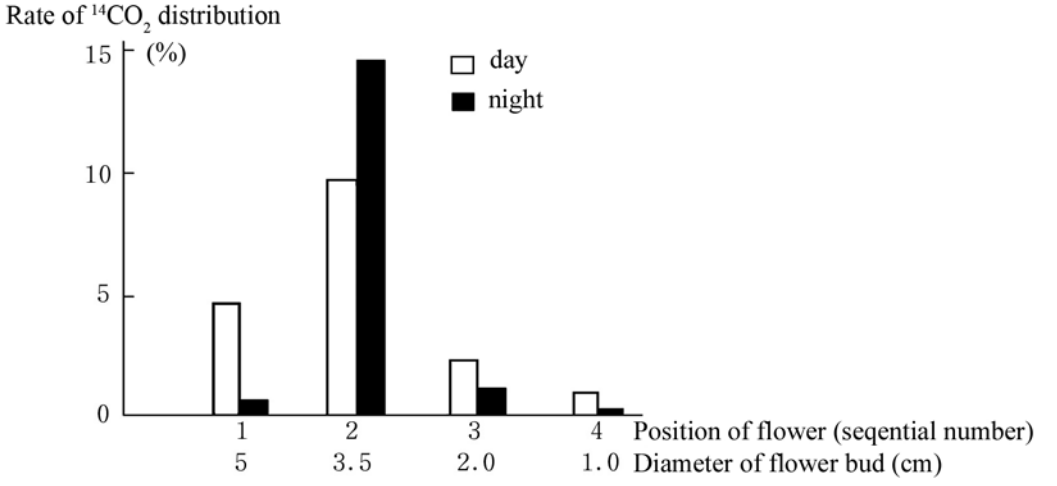


Figure 10. Distribution rate of assimilation products during the day and night according to the position of flowers

Flowering Plants—a Good "Medicine" for Health

Various species of flowering plants not only give beautiful feelings to people but stimulate or calm down their nerves. They also adjust blood pressure and enhance the immunity of the human body. So people enjoy their benefits unawares. The natural flowers evoke people's emotion and present an aesthetic fragrance to them, relieving their fatigue and exciting their mind.

Red flowers improve their appetite, and blue flowers act as an antipyretic and sedative.

The scent of lilac is germicidal, while that of chrysanthemum stops headache and enhances eyesight. Lilies stimulate people's mind and add much to the beauty of surrounding environment. Azalea blossoms reduce bronchitis, and purple flowers give pleasant feelings to pregnant women. And those of datura are effective as a sedative and soporific.

Besides, the pollen contains 14 kinds of vitamins, 11 kinds of microelements, 21 kinds of amino acids and over 50 kinds of natural enzymes. In particular, some active substances such as an antibiotic contained in pollen are essential for preventing ageing.

Part III

Culture of Kimjongilia

This part describes various methods for growing Kimjongilia on the basis of the experiences acquired by Korean botanists in cultivating the flower for a long time.

Chapter 1
Producing Plantlets of Kimjongilia

In growing Kimjongilia, it is most important to produce good plantlets. Plantlets of Kimjongilia can be produced by utilizing vegetative reproduction methods such as stem-cuttings, leaf-cuttings, tuber-planting and tissue culture.

Section 1. Stem Cuttings

This method is widely used for producing plantlets because it is one of the easiest ways of propagating a plant.

Materials

Cuttings should be obtained from a healthy standard plant in flower shape, size and colour or shoots of a tuber. Kimjongilia normally grows spreading out several lateral shoots, for example, 5–7 shoots from a tissue-cultured plant grown in a pot.

To obtain plenty of cuttings, leave 1–3 nodes on the lower part of the main stem so that more shoots can come out from them. In this way you will be able to get more than 20 cuttings from a single plant.

Cuttings can be collected from a tuber. Normally 1–7 shoots come out from a single tuber. Once they have reached the size for cutting, leave one shoot as it is and the remainder can be cut for transplanting.

You should sterilize the instruments to be used for cutting so that the mother plant and cuttings from the plant can avoid bacterial infection. The rooting rate of cuttings varies according to the size, planting time and the parts from which they are obtained.

In general, stem cuttings should be planted in spring or autumn. The length of a

cutting should be 3–4 cm. It is advisable to obtain cuttings from the three nodes at the base of the plant. If you either cut the stem diagonally at the end to widen the section or peel the skin of the section about 1–2 mm wide, it will also facilitate the rooting.

Rooting Medium

The rooting rate of stem cuttings depends on the kind of rooting media.

Leaf mould, sphagnum moss and coarse sand can be used as rooting media. These media are put into propagation containers such as pots, flats and beds. In case of a pot, first place a layer of small pieces of broken pot or big gravel on the bottom, then fine gravel and finally leaf mould or sphagnum moss to a thickness of 2–3 cm. In case of a flat or bed, first place a layer of small pieces of broken pot or fine gravel and then coarse sand or sphagnum moss to a thickness of 3–4 cm.

Planting and Tending of Cuttings

When the rooting medium is ready, insert cuttings in it at the depth of 1–1.5 cm. Make certain that the section be adhered closely to the medium. If you either apply wood ash to the section or dip the lower part of a cutting in α-NAA solution (100–120 mg/l) for 4 hours, it will help enhance the rooting rate.

After planting cuttings in the rooting media, proper temperatures, air humidities and light conditions should be provided. The ideal temperature range is somewhere between 15 and 20°C. The air humidity should be 70% or above and there should be good ventilation in the period of rooting. The appropriate light intensity should be 500–1 000 lx in the first few days, 2 000–3 000 lx in the next 5–10 days and after that about 5 000 lx. The required daylight time is approximately 14 hours. If the conditions in which the daylight time is less than 10 hours and the temperature is lower than 10°C last for over 25 days, the stem cuttings stop growing and form tubers. If those conditions last for 45–60 days, the overground part dies out as the abscission layer forms and the tuber goes into dormancy. Watering should be done when the surface of the medium is dry.

After the cutting takes root, transplant it in a pot 15 cm in diameter.

Here are the figures which show the main stages of producing plantlets from stem cuttings. (Photos 57–64)

Photo 57. Lateral shoots

Photo 58. Cutting a lateral shoot

Photo 59. Part of the mother plant from which a cutting has been taken

Photo 60. Dusting wood ashes on the section of a cutting

Photo 61. Inserting a cutting in the sand medium

Photo 62. Removing a plantlet from the medium

Photo 63. Plantlet removed from the medium

Photo 64. Plantlet transplanted in a pot

Section 2. Leaf Cuttings

Leaf cuttings are a wonderful method of vegetative propagation by which many plantlets can be produced from a single plant. In order to produce good, healthy plantlets from leaf cuttings, you should determine the right time for planting leaf cuttings in the rooting medium. High temperatures and strong light stunt rooting, so, if you have no special conditioning equipment, winter will be your best choice, for the rooting rate in winter is 70% or above. The rate is lower in the other seasons.

The appropriate temperature for rooting is 13°C at night and 18°C in the daytime.

The length of leaf cuttings should be 7–9 cm. If they are shorter, it reduces the rooting rate and slows the rooting. The petiole should be about 2 cm long, and wood ash should be applied to the section. Sphagnum moss is used more often than sand as the rooting medium because the rooting rate of leaf cuttings planted in sphagnum moss is four times higher than in sand. Insert the petiole in the rooting medium to the depth of 0.5–1 cm. Watering is done with a sprayer once a day. Maintain the air humidity at 75–85% and light intensity at 300–500 lx. In about 40 days, the inserted leaf cuttings will develop a good root system providing that they are placed in short-day conditions. Transplant the plantlets in 15-cm pots and provide night temperature of 14°C and day temperature of 24°C, the light of 5 000–8 000 lx and long-day conditions. Three or five

shoots will come out at the base of the inserted leaf cutting in about 20 days. When the second true leaf comes out, separate the shoots and transplant them in other pots. When three to four leaves come out from them, replant them in 18- to 21-cm pots. The figures below show the main stages of producing plantlets from leaf cuttings. (Photos 65–72)

Photo 65. Leaf cutting ready to plant in the rooting medium

Photo 66. Rooted leaf cutting

Photo 67. Plantlet with the first shoot coming out

Photo 68. Plantlet with several shoots coming out

Photo 69. Separating shoots

Photo 70. Shoot separated

Photo 71. Dusting wood ashes

Photo 72. Plantlet transplanted in a pot

Section 3. Tuber-Planting

In Korea, Kimjongilia forms tubers in conditions of short daytime and low temperatures in autumn in a greenhouse, and remains dormant in the state of a tuber in winter. The following spring new sprouts come out from the tuber to continue to grow.

Although the tuber grows larger year after year like *Cyclamen persicum* of the Primulaceae, living for several years, Kimjongilia does not develop even a new tuber by itself.

The propagation of Kimjongilia by tuber takes the following steps: digging up the tuber, sending it into dormancy, planting it temporarily, separating shoots from the tuber and replanting them individually.

1. Storing a Tuber and Sending It into Dormancy

Dig up tubers about a week after the stems fall off and brush soil off them. Clean injured parts, if any, and apply sulfur or wood ash to them. Spread the tubers in a place at the temperature of 20–30°C and cover them with paper. Spray water over them once

a day and turn them over two or three times a week. Then all the rootlets dry out with the formation of a cork layer over their surfaces, which will prevent the tubers from wilting or rotting.

If there are any thicker rootlets which do not fall off naturally, cut them 1 cm above the surface of a tuber and treat the section with 0.1% polyvinyl alcohol solution or bactericides.

Like other tuberous begonias, the tubers of Kimjongilia can go into normal growth only after a certain period of dormancy.

Therefore, they should be kept dormant for about two months. Even if the dormancy period is 5–6 months, it will not disturb their sprouting. Tubers should be stored in a dark place at the temperature of 2–4°C and in humidity of 70–75%. In winter, they can be stored in large quantities in a pit outdoors.

A refrigerator (at the interior temperature adjusted to 2–4°C) would provide wonderful storage for a small quantity of tubers.

2. Sprouting a Tuber

Prepare dormant tubers after determining the time when flowers are desired. Sterilize them by dipping them in a 0.05% solution of $KMnO_4$ for approximately one hour or do them in 500- to 1 000-fold diluted solutions of topsin or orthocide. Then put them in fresh water at the temperature of 20–30°C for 2–3 hours before sprouting. In case of tubers stored at relatively high temperatures, it is advisable to put them in a place at the low temperature of 1–2°C for 10–15 days before sprouting.

It is convenient to sprout tubers in flats that are 60 × 40 × 10 cm in dimensions. To allow good drainage, place gravel or small pieces of broken pot 2–3 cm deep at the bottom and leaf mould or peat 2 cm deep over them.

After that, place tubers about 5 cm apart with the scar left by a fallen stem facing upwards. Cover them with coarse leaf mould to the depth of 1–1.5 cm. Then water them thoroughly. Cover the flat with paper and put it in a semi-shady place. The ideal temperature is 19–21°C, air humidity 70–80%, and the medium should be kept moderately moist.

In about a week the tubers begin to sprout and root. A week after the bud begins to show, the shoots grow 3–4 cm tall. Then remove the paper cover and keep the temperature at 14–24°C and air humidity 60–70%. The light intensity should be 5 000 lx in the early stage.

After that you should gradually increase it to about 10 000 lx while providing over 14-hour-long-day condition. Watering should be done when the surface of the leaf mould is dry.

3. Transplanting a Plantlet and Its Growing

When a tuber develops three leaves and the length of root reaches 2–3 cm, transplant it in a pot as it is.

In case of cutting and planting the tuber, it is good to cut it before the true leaf comes out. A tuber 7–8 cm in diameter is cut into 3–4 pieces and that 5 cm in diameter into 2–3. If the tuber piece is too small, it is likely to rot and unable to grow well. The smaller the section is, the better the shoots grow.

The tuber cutting with shoots attached can be transplanted directly in a pot or temporarily in a flat to root enough to be potted or bedded. At this time the tuber should be planted to be hardly seen. If they are planted too deep, they will gradually become fleshier. If they are shallowly planted, they will dry. And the tubers should be planted at intervals of 10–12 cm.

Watering should be done one or two hours later.

The pots should be placed in a semi-shady place in the first 3–4 days before gradually relocating. Additional fertilization should be done about 10 days after transplanting. Since the nutrition requirement of a tuber plantlet is not so high, frequent application of highly concentrated fertilizers will only result in thick foliage. Therefore, in the early stage of fertilization, weak solutions of nitrogenous, phosphatic, potassic, organic and micronutrient fertilizers should be applied before increasing the concentration of the solutions gradually.

The following figures show the main stages of producing plantlets from tubers. (Photos 73–76)

Photo 73. Sprouted tuber

Photo 74. Tuber which has developed shoots and roots

Photo 75. Tuber cutting with shoots attached

Photo 76. Tuber plantlet transplanted in a pot

Section 4. Tissue Culture

Tissue culture is the major method for producing a plantlet of Kimjongilia. Kimjongilia can be propagated by tissue culture based on its leaf or peduncle. Producing a plantlet by tissue culture is done in the order of primary culture, shoot-multiplication culture, shoot-regeneration culture and acclimatization of a plantlet.

1. Culture Media and Environment

1) Culture Media

The media used for tissue culture of Kimjongilia are made by varying the contents of some components of an MS medium and adding various plant growth regulators and sugar to suit each culture stage. The tables below show the components of media and of mother solutions used at each culture stage. (Tables 10 and 11)

Table 10. Components of the media used at each culture stage (mg/l)

No.	Chemical reagent	Chemical formula	Primary culture	Multiplication culture	Regeneration culture
1	Ammonium nitrate	NH_4NO_3	320	320	320
2	Potassium nitrate	KNO_3	1 200	1 200	1 200
3	Potassium dihydrogen phosphate	KH_2PO_4	204	204	204
4	Calcium nitrate	$Ca(NO_3)_2•4H_2O$		236	236
5	Magnesium sulphate	$MgSO_4•7H_2O$	247	247	247
6	Ferrous sulphate	$FeSO_4•7H_2O$	27.8	27.8	27.8
7	EDTA	$C_{10}H_{14}N_2O_8Na_2•2H_2O$	37.2	37.2	37.2
8	Manganese sulphate	$MnSO_4•4H_2O$	22.3	22.3	22.3
9	Zinc sulphate	$ZnSO_4•7H_2O$	8.6	8.6	8.6
10	Boracic acid	H_3BO_3	6.2	6.2	6.2
11	Potassium iodide	KI	0.83	0.83	0.83
12	Sodium molybdate	$Na_2MoO_4•2H_2O$	0.25	0.25	0.25
13	Copper sulphate	$CuSO_4•5H_2O$	0.025	0.025	0.025
14	Cobalt chloride	$CoCl_2•6H_2O$	0.025	0.025	0.025
15	Glycine	$C_2H_5NO_2$	2	2	2
16	Vitamin B1 (Thiamine hydrochloride)	$C_{12}H_{17}N_4OSCl·HCl$	0.1	0.1	0.1
17	Vitamin B6 (Pyridoxin hydrochloride)	$C_8H_{11}NO_3·HCl$	0.5	0.5	0.5
18	Nicotinic acid	$C_6H_5NO_2$	0.5	0.5	0.5
19	6-benzyl adenine (6-BA)	$C_{12}H_{11}N_5$	1	0.5	0.05
20	α-NAA	$C_{12}H_{10}O_2$	0.5	0.25	0.25
21	Sugar	$C_{12}H_{22}O_{11}$	20 000	10 000	10 000
22	Agar		7 500	7 500*	7 500
23	pH		5.5±0.1	5.5±0.1	5.5±0.1

*Not put into the liquid medium

Table 11. Components of the mother solutions

No.	Chemical reagent	Chemical formula	Concentration (mg/l)	Content (g)	
				500(ml)	250(ml)
1	Ammonium nitrate	NH_4NO_3	320	16	8
	Potassium nitrate	KNO_3	1 200	60	30
	Potassium dihydrogen phosphate	KH_2PO_4	204	10.2	5.1
2	Calcium nitrate	$Ca(NO_3)_2 \cdot 4H_2O$	236	11.8	5.9
3	Magnesium sulphate	$MgSO_4 \cdot 7H_2O$	247	12.35	6.175
4	Ferrous sulphate	$FeSO_4 \cdot 7H_2O$	27.8	1.39	0.695
	EDTA	$C_{10}H_{14}N_2O_8Na_2 \cdot 2H_2O$	37.2	1.86	0.93
5	Manganese sulphate	$MnSO_4 \cdot 4H_2O$	22.3	1.115	0.5575
	Zinc sulphate	$ZnSO_4 \cdot 7H_2O$	8.6	0.43	0.215
	Boracic acid	H_2BO_3	6.2	0.31	0.155
	Potassium iodide	KI	0.83	0.0415	0.02075
	Sodium molybdate	$NaMoO_4 \cdot 2H_2O$	0.25	0.0125	0.00625
6	Copper sulphate	$CuSO_4 \cdot 5H_2O$	0.025		0.005
	Cobalt chloride	$CoCl_2 \cdot 6H_2O$	0.025		0.005
7	Glycine	$C_2H_5NO_2$	2	0.1	0.05*
	Vitamin B1(Thiamine hydrochloride)	$C_{12}H_{17}N_4OSClHCl$	0.1	0.005	0.0025*
	Vitamin B6 (Pyridoxine hydrochloride)	$C_8H_{11}NO_3HCl$	0.5	0.025	0.0125
	Nicotinic acid	$C_6H_5NO_2$	0.5	0.025	0.0125

* The amount of the mother solution: 2 000 ml

To make one litre of medium for each culture stage, add 10 g of sugar (20 g in case of primary culture) and the due amount of the mother solutions to 100 ml of water, and stir it. Then increase the amount to one litre by adding water and adjust pH to 5.5. (Table 12)

Table 12. Amount of the mother solutions added to the medium at each culture stage (mg/l)

Mother solution	Primary culture	Multiplication culture	Regeneration culture
1	10	10	10
2		10	10
3	10	10	10
4	10	10	10
5	10	10	10
6	10	10	10
6	10	10	10
6-BA	10	5	0.5
α-NAA	5	2.5	2.5

After the adjustment of pH level, put 7.5 g of agar in the solution. In case of a tube, 16 mm in diameter, put 5 ml of primary culture medium, and in case of a tube 20 mm in diameter, 7 ml.

When you use a 500 ml culture container, put 50 ml of solid shoot multiplication-culture medium or 10–15 ml of liquid shoot multiplication-culture medium. At the stage of shoot-regeneration culture, put 50 ml of solid or liquid medium into a 500 ml container. Plug the containers and sterilize them in a high-pressure steam pasteurizer (at 0.11 Mpa and 121°C) for 15–30 minutes.

2) Culture Environment

The shoots should be put under the light of 1 500–2 000 lx for 12–16 hours a day. Less light intensities would cause the weak growth of shoots. The ideal temperature is 23–25°C in lighting conditions and 18–19°C in dark conditions.

2. Primary Culture

Primary culture is the first stage of tissue culture, in which shoot-masses are formed.

1) Selection and Tending of a Mother Plant

What is most important in massive propagation of Kimjongilia by tissue culture is to select a good mother plant as a starting material and take good care of it. A mother plant should be a healthy plant which possesses every standard character of Kimjongilia, especially of flower. The selected plant should be cultivated for another

2–3 years to see whether it can exactly show the same characters as Kimjongilia's. It also should be taken good care of to avoid diseases. Only then is it possible to reduce the rate of infection and increase that of shooting at the first stage – primary culture.

2) Inoculating and Culturing

It is leaves that are often used for inoculation. To select appropriate leaves, cut off the leaf tip as long as 1–2 cm and dip it in 70% alcohol. If the alcohol penetrates into the section as long as 2–3 mm, not through the leaf surface, it will make a good inoculum. Pick the leaves from the bottom which measure 10 cm in length and 5 cm in width. Then dip them in 70% alcohol for a few seconds and in hypochlorite solution with 0.5% active chlorine for about 30–40 minutes. To increase the effect of the sterilizing solution, you may add a few drops of Tween surfactant. The sterilized leaves should be washed at least three times with sterile water. Cut them into 1 cm^2 pieces with veins included, and inoculate the pieces with the top surface devoid of stomata sticking to the medium. In case of a young leaf, you can cut it into up to 0.5 cm^2 pieces.

In 7–11 days, the inoculums become thicker by cell division, and calluses are formed on the section. In 20–25 days, shoot primordia form, and in 30–40 days, shoot masses in several places of the leaves.

3. Shoot-Multiplication Culture

This stage is intended to increase the number of shoot-mass to produce the desired number of plantlets. In this stage, several subcultures are conducted.

1) First Subculture

Separate well-grown shoot masses so that they can each measure less than 5 mm in diameter and inoculate them. The shoot masses that are grown unsatisfactorily are separated into 4–6 sub-masses before inoculating. The shoot masses inoculated grow more actively than they did at the stage of primary culture. In about a month's time, they grow 10–20 mm in diameter and 30–50 mm in length.

Those shoot masses include less normal shoots than abnormal ones.

2) Second to Fifth Subcultures

Separate the first subcultured shoot masses to the size of 4 × 5 mm and remove abnormal shoots and the dark brown tissues at the bottom before inoculating. Unlike the first subculture, there are more normal shoots than abnormal ones in this subculture. The leaves of normal shoots more than 10 mm in length can be cut and used as those for multiplication. The number of shoots to be inoculated in the second to fifth subcultures is 10–20 per 500 ml container. The time the second subculture takes is roughly the same as the first subculture. After the third subculture, fewer abnormal shoots develop, so you can separate more than 3–4 normal shoots from a single shoot mass and inoculate them in the media for next subcultures. Separating and inoculating are done in the same fashion as the second subculture. At this stage, you can also cut leaves of normal shoots grown more than 10 mm in length and use them as shoot-multiplication materials. The number of shoot masses increases twice at each stage of subculture.

3) Sixth or More Subcultures

In the sixth subculture or upward, shoot masses develop many shoots more than 5 mm in length. If you plant and grow these shoots in shoot-regeneration culture media, you can get plantlets with leaves more than 30 mm in length in one or two months' time. Smaller shoots can be cultured again to grow bigger to form lots of shoot masses. From this time shoot-multiplication culture and regeneration culture should be conducted simultaneously. The number of big shoots for regeneration culture is twice or more than that for multiplication culture. It is important to quickly grow the small shoots less than 5 mm in length as well as to develop new shoots in the shoot masses. Therefore, you should combine solid-medium culture with liquid-medium culture in which the growing rate of shoots is relatively high.

4) Factors Influencing Tissue Culture

Growth Regulators

In general, in primary and shoot-multiplication cultures, the concentrations of growth regulators are adjusted according to the species of plants and the tissue culture formula.

Kimjongilia can grow and send up shoots well at the stage of shoot-multiplication culture only when the concentrations of growth regulators are lower than those at the stage of primary culture. If the concentration of 6-BA is reduced by half (0.5 mg/l), the shoots more than 2 mm in length per shoot mass increase 1.5–1.8 times and the shoots more than 5 mm in length 1.5 times, for tissues in which new shoot primordia form and grow to a certain degree are used in shoot-multiplication culture. Effects of growth regulators also vary depending on which subcultures of shoot-multiplication culture they are used in. In the first subculture, the number of shoots per shoot mass does not differ greatly from that of primary culture even if you reduce the concentrations of 6-BA and α-NAA by half of those of primary culture media. However, in the sixth subculture, it rises almost more than 1.5 times, for as the number of a subculture increases, the shoot masses become accustomed to the culture media and environment more quickly.

Culture Formula

If you continue to use liquid media, the formation of new shoot primordia slows or almost stops. Therefore, it is advisable to use liquid media for quickly growing shoot primordia and small shoots rather than for shoot-multiplication. The shoot masses placed in a liquid medium grow twice faster than in a solid medium. If shoot masses with two or three shoots more than 2 mm in length are cultured in solid and liquid media for 30 and 20 days respectively, the number of shoots 5 mm in length in the liquid medium is twice greater, and the number of those more than 10 mm in length three times greater than those in the solid medium. The number of shoots more than 2 mm in length is roughly the same.

Culture Temperature

The most appropriate temperature for shoot-multiplication is between 18–19°C (at night) and 23–25°C (in the daytime). If the night temperature happens to be somewhere between 21 and 22°C for 15–20 days, the number of shoots more than 5 mm in length per shoot mass will drop by 30–70%, as compared to the optimum temperature conditions. If the night temperature of over 20°C lasts for over 20 days, the shoot masses

turn paler and become smaller as they dry out. On the contrary, if the night temperature is 18°C or below, the growth of shoots will slow, resulting in the increase of small shoots.

Nutrients in the Media and Light

The rate of shoot-multiplication varies according to the concentration of sugar in the media and lighting time. The ideal conditions for shoot-multiplication are those in which the concentration of sugar in the media is 1% and the lighting time is 16 hours. You can add about 50 mg/l of rare-earth reagents in the form of nitrate to the shoot-multiplication culture medium in order to help the shoot masses grow vigorously at the early stage of culture.

In liquid-medium culture, it takes two or three weeks to consume most of the nutrients of the medium. However, in case of a solid medium, inorganic ions and sugar are absorbed in various amounts. After ten days of culture, the percentages of absorbed N, P, K, Ca, Mg and Fe are 46–60%, 38%, 30%, 30%, 10% and about 20% respectively, and after a month, N and K 95%, Mg 90%, Fe 84%, P 70% and Ca about 50%. K is absorbed most quickly, which is absorbed by about 94% in three weeks. As for sugar, about 80% remains in the medium after the culture is over.

4. Shoot-Regeneration Culture

Shoot-regeneration culture is the process of growing a shoot more than 5 mm in length into a little plant which is more than 30 mm long.

Size of Shoot in the Early Period

The bigger shoot you inoculate to the shoot-growing medium, the faster it grows and the stronger plantlet you can acquire.

Growth Regulators

When preparing the medium for shoot-regeneration culture, the proportion of auxin/cytokinin should be increased by decreasing the concentration of 6-BA by a tenth, as compared to that of shoot-multiplication culture media. In other words, the ratio of α-NAA to 6-BA in the shoot-multiplication culture medium is 0.5, but in the shoot-

regeneration culture medium, it should be five. If the concentration of α-NAA is more than 0.25 mg/l, shoot growth overground is disturbed and the root system develops excessively, as a result of which it is difficult to take out the mature plantlet from the culture container or to remove the medium residue from the roots. If the concentration of 6-BA is maintained at 0.05 mg/l, it will encourage the early shoot growth and the formation of calluses. In addition, it will help a plantlet grow healthily by facilitating the absorption of nutrients in the medium. In lower concentrations of 6-BA, shoot growth slows and in turn, a small plantlet will be acquired. In higher concentrations of 6-BA, shoots do not grow quickly due to the active formation of calluses and new shoots.

Other Culture Conditions

Sugar in the medium serves as the source of carbon. Meanwhile, shoots also use sugar they photosynthesize. In the closed culture container where there is very little air circulation, however, the main source of carbon for photosynthesis is the carbon dioxide produced in the process of absorption of sugar in the medium and respiration. Therefore, the concentration of sugar in the medium should be maintained at more than 0.25% at least. For satisfactory shoot growth, the concentration of sugar in the medium should be more than 0.5% (the optimum concentration is 1%) and the lighting time should be as long as possible. When the night temperature is 18–19°C and the day temperature 26–28°C, a plantlet can reach the maximum fresh weight.

5. Acclimatization of a Plantlet

The process of acclimatization is essential for adapting the plantlet cultured in a container to the external environment. First, take the plantlet carefully out of the container and remove the medium residue by washing it with water. Remove moisture so that the roots of plantlets are moist moderately, classify them according to their size and transplant them into flats. Since one-leaf plantlets are hard to acclimatize, it is good to use two- or three-leaf plantlets for acclimatization.

As a substrate, sand, sphagnum, peat and other materials can be used. The best one is sand. The sand should be washed with water before using it.

Water the substrate thoroughly and make holes, 1.5–2.5 cm apart. Insert the

plantlets into the holes and fill the space around the plantlets by spraying water. Cover the flats with glass or film plastic to provide the same conditions as in the culture container. A few days after transplanting, remove the cover gradually so that the plantlets can be accustomed to the greenhouse environment.

For high rates of acclimatization, it is important to have the exterior and interior structures of an underdeveloped leaf completely developed. The most significant factors in this task are temperature, humidity and light. When the day temperature is between 22 and 24°C and the night temperature between 16 and 18°C, the rate of acclimatization is more than 90% and the fresh weight of a plantlet is about 1.2 g. In conditions of lower temperatures, the time it takes to acclimatize plantlets is prolonged, and at higher temperatures, plantlets rot. If the conditions in which the night temperature is 20°C or above last, the mortality of plantlets will be very high, and the plantlets which have already rooted will not grow well.

The stomata of a plantlet in the culture container are always open because the humidity inside the container is over 90%. In the greenhouse conditions in which usual humidities are between 60 and 70%, water would evaporate through the open stomata and in turn, the plantlet would wilt. Therefore, after transplanting for acclimatization, provide the plantlets with humidity 90–100% for the first week and gradually reduce it to 70–80%.

The appropriate light intensity for satisfactory acclimatization is approximately 3 000 lx in the first week after transplanting, and after that provide 8 000 lx. If the light intensity is 3 000 lx during the whole period of acclimatization, the rate of acclimatization is not low, but due to the lack of photosynthesis, the fresh weight will be reduced by 50%, leaves turn pale and the petioles grow thinner and leggy. If the plantlets are placed in conditions of high light intensities from the beginning of acclimatization, for example, at 13 000 lx, most of them will not survive the strong light, for they have grown in the culture container at the light of about 2 000 lx.

Given such appropriate conditions, they will develop roots 1.5–2 cm in length and send up new shoots during the acclimatization. The time it takes to acclimatize plantlets may vary more or less according to the state of a plantlet and the environmental conditions for acclimatization, but is usually 20 days or so.

The acclimatized plantlets are transplanted in 9-cm pots.

Chapter 2
Greenhouse Growing of Kimjongilia

Greenhouse growing is the main method for growing Kimjongilia, which was bred for its matchless beauty. Therefore, you can obtain the most spectacular Kimjongilia only when the optimum environmental conditions are provided.

Section 1. Culture Substrate and Pots

1. Culture Substrate

Culture substrates for growing Kimjongilia in a greenhouse must be coarse, light and porous in order to allow good drainage. They must also serve as a good reservoir for various nutrients.

Leaf mould, peat and sand are widely used as culture substrates.

Leaf mould: It can be collected from fallen leaves in forests of oak trees (*Quercus acutissima* Carr.) and other broadleaved trees. The fallen leaves to use must be 2–3 years old and not completely decomposed so that they can crumble to the touch and some portion of the vein may be seen.

Leaf mould serves as a source of organic and inorganic nutrients, provides good drainage and aeration and increases the culture substrate's capacity of holding water and fertilizers.

Peat: This is from decayed hygrophytes such as sphagnum. Therefore, it is similar to leaf mould in physical and chemical properties, but its pH value is 3.5–4.5. In Korea, there are two kinds of peat; highland peat and lowland peat. The main origin of highland peat is sphagnum L. and lowland peat is from Phragmites Adans., Zizania L.,

Typha L., Acorus L., Iris L., etc. The most appropriate culture substrate is peat from sphagnum in the highland, which must be incompletely decayed and light brown with fibers noticeable.

Sand: As a substrate, you can use river sand or coarse sand of granite origin from mountainside. In case of sea sand, it should be thoroughly washed with fresh water before using, because it contains much salt. Sand particles should be between 1 and 3 mm.

The above-mentioned materials can be used individually or mixed at various rates.

Screen leaf mould and peat through a sieve whose eyes are 5 mm in size and then through a sieve whose eyes are 2 mm in size. Using incompletely decomposed leaf mould and peat is aimed at ensuring proper aeration and organic nutrition of culture substrates.

Cow manure may be added to a substrate. In this case, choose cow discharges which are decomposed for one or two years and dry them in the sun. After that, pulverize them until the particles become 2–5 mm in size.

In addition, you can use substrates mixed with pumice, Kumgang medical stone, slag, charcoal, sawdust, sphagnum or ash of rice chaff.

The rational ratio of leaf mould to peat (humus) to sand is 5:3:2 or 1:1:1. In some cases only sand is added to leaf mould, or leaf mould or sphagnum is individually used. You must not add quick-acting fertilizers, decayed grass, incompletely decomposed cattle manure, bean cake, etc.

When preparing culture substrates for potting, it is important to ensure that the ratio of components (solid:liquid:gas) is 1:1:1, for the roots of Kimjongilia require much oxygen. If the culture substrate is too compact and moist and as a result the concentration of O_2 reduces to 5%, it will suppress respiration and metabolic processes. Since microorganisms as well as roots consume oxygen and produce carbon dioxide, there must be good aeration in the substrate.

Next, the culture substrates must be thoroughly sterilized in order to exterminate bacteria, insect eggs, pupae, larvae and weed seeds inside them. Sterilization can be done by chemicals, steam and hot air.

Sterile substrates should be kept clean and used as soon as possible before their physical and chemical characteristics change.

2. Pots and Staking

Types of Pots

Pots of various materials can be used for growing Kimjongilia in a greenhouse.

Clay pots: Clay pots are good at holding water and aeration and low in thermal conductivity. Clay pots baked at 800–850°C are most suitable because of their proper porosity.

Ceramic pots: Ceramic pots have very little porosity and lack water-holding capability, and the thermal conductivity is higher than that of clay pots. However, they are widely used for display because of their nice appearance.

Plastic pots: These pots are light and easy to handle and have good thermal insulation. However, they are not porous and do not hold water. Therefore, they are used for growing a plantlet or display.

Wooden pots: The advantages of these pots are good porosity and water-holding capability.

In addition, there are specially made stone pots, metal pots and pots made of Kumgang medical stone which are intended for supplying microelements.

Staking

The overground part of Kimjongilia, as it grows, becomes much heavier than the underground part. The average length of big leaves is about 30 cm, in rare cases, 45 cm. The diameter of flowers is 20–25 cm, and the weight reaches up to 50–150 g. On the other hand, the root neck part is relatively thin, which can hardly support the weight of flowers and leaves, and, in turn, may snap. Also, since the substrate is loose and light, the potted plant may fall over. Therefore, staking is necessary for Kimjongilia. An excellent stake is the universal one which also comes in handy for repotting. (Photo 77)

Photo 77. Universal stake

The universal stake consists of a round base, an insect net made of metal or plastic

and a support. The metal part should be covered with a vinyl pipe or coated with paint in order to prevent rusting.

You can also make another type of stake with aluminium wires, which can be fixed to the rim of a pot. (Photos 78–80)

This stake can be used when carrying the potted flowering plants over a long distance, but should be pulled out when placing the plant on display.

In general, three stakes of this kind are set up in a single pot.

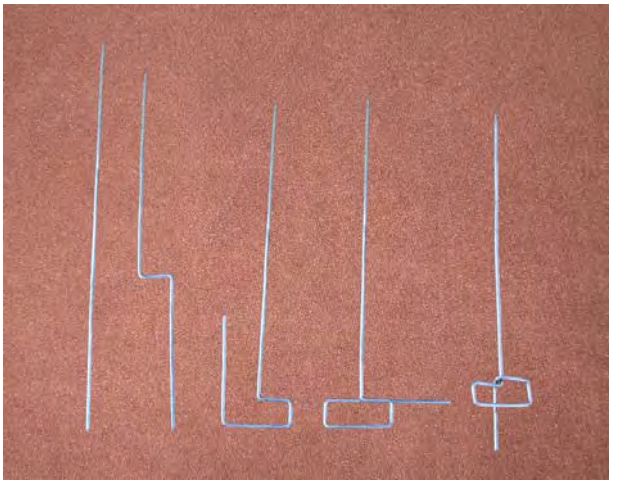


Photo 78. Making a stake with aluminium wires

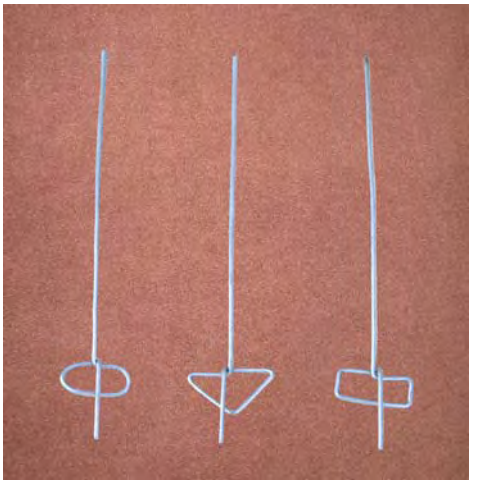


Photo 79. Various forms of stakes

Photo 80. Fixing a stake to the rim of a pot

Section 2. Transplanting a Plantlet and Repotting

1. Transplanting a Plantlet

Fill the pot with the culture substrate to the level 2 cm from the rim of the pot, and make a hole which measures 2 cm in diameter and depth. The plantlet to transplant should be thoroughly watered half an hour or an hour ago. Remove the plantlet by using a bamboo knife or things like that.

Plant the plantlet in the hole and move the pot up and down softly so that the culture substrate can pack. Then, water it thoroughly. Place the potted plantlet in a shady location at the light of 3 000–5 000 lx for about a week and gradually increase the light intensity for good root development.

A rooted leaf-cutting should be transplanted into a 15-cm pot. First, put an insect net or a small piece of broken pot over the drainage hole and place a 2-cm-deep layer of fine gravel or coarse leaf mould. Then, fill the pot with culture substrates to the half height of the pot and place a plantlet. Finally fill with culture substrate to the level 2 cm from the rim of the pot.

The same method can be employed for transplanting a plantlet produced from a stem-cutting.

In case of a plantlet produced from a tuber, leave one strong shoot by cutting the others and transplant the tuber in a 15- to 18-cm pot.

2. Repotting

Since Kimjongilia is a fast-growing plant, repotting when necessary is very important. It is advisable to do repotting twice or thrice at intervals of 20–25 days throughout the life of Kimjongilia.

Repotting starts with 15- to 18-cm pots. First, put a universal stake into a new pot and place a layer of coarse leaf mould or fine gravel to the depth of 2–3 cm (You may

Photo 81. Holding the pot

Photo 82. Removing the plant from the pot

Photo 83. Plant removed

not use a universal stake if unnecessary). Then, place a two-centimetre-deep layer of the culture substrate. Remove the plant from the old pot with the substrate attached to the roots. (Photos 81–83)

Remove pieces of broken pot from the soil ball and center the plant in the new pot carefully. (Photo 84) Add the substrate in around the sides, gently pack it down, and water the plant. (Photos 85 and 86)

The same can be done for plants grown from stem-cuttings or leaf-cuttings. The only difference is to use pots 18–21 cm in diameter.

For second repotting, pots 18–21 cm in diameter are used. As for the pot with a universal stake, gently pull the stake upward to take out the plant together with the soil ball. Remove fine gravel or coarse leaf mould from the soil ball. Then repot the plant

Photo 84. A new pot ready for repotting (without a universal stake)

Photo 85. Placing the plant in the new pot

Photo 86. Plant repotted

together with a new universal stake into a new pot.

Repotting of a staked plant is shown in the following figures. (Photos 87–90)

Repotting of a non-staked plant is done in the same fashion as the first repotting.

The root system of the plant repotted with the soil ball in time is not much damaged, so it can continue to grow normally.

However, if the plant is repotted too late, much harm will be done to the root system. In this case, put it under the light of about 5 000 lx for 9–10 hours a day, and such condition should be provided for 7–10 days until the root system recovers. At this time, the temperature should be maintained at somewhere between 5 and 8°C for 4–6 days and gradually increased to 8–10°C.

After that, fertilizing should be done regularly.

Photo 87. Plant removed from the pot

Photo 88. New pot ready for repotting

Photo 89. Transplanting

Photo 90. Plant repotted

Section 3. Locating Pots and Grooming

1. Locating Pots

The location of pot shelves and the number of pots placed per square metre should be determined carefully according to the type and size of a plantlet, the object of its production and the stage of growth. (Photo 91)

Since leaves of Kimjongilia form a space to a certain degree between one another where flowers open, the front side must be placed so that it can always face the direction in which sunlight comes in.

Photo 91. Locating pots in a greenhouse

The plants placed in the back of a shelf should be relocated regularly in order to prevent the effect of phototropism. Additional lighting lamps should be properly located in winter, especially in December and January when the length of daytime is the shortest in the year.

Pots should be arranged according to their sizes and those of potted plants. In general, when acclimatizing tissue-cultured plantlets, it is appropriate to place 700–800 plantlets per square metre. After acclimatizing is finished and transplanting is done, place 90–100 pots per square metre and then reduce the number of pots per square metre as they grow.

2. Grooming

Kimjongilia usually develops lateral shoots from the first to fourth axils. Lateral shoots can also come out at the base of a plantlet which has grown for about a month after transplanted. For a strong, thick stem, remove these shoots. In this case, removal

should be done when they are so young that there will be little scars.

The growing tips of Kimjongilia may be injured by various external factors. In this case, cut horizontally the middle part of the internode at the upper part of the stem and apply wood ash to the section thickly so that new shoots can come out. About two weeks later, the abscission layer will develop from the node, when the upper part of the stem should be removed.

For one flower from a single plant, you can remove the growing tip of the stem. At this time, you should make certain that the scar is not large.

Since Kimjongilia is grown for its graceful foliage as well, you should pay attention to grooming of the foliage. The foliage must be regularly checked for diseases or pests, and once those are detected, immediate measures should be taken so that they can leave no scars or discoloured spots. Leaves wet with solutions of fertilizers should be washed with fresh water immediately and those which touch the soil surface should be held up in order to prevent rotting. Newly coming leaves, 7–15 cm long, may get jammed between older ones, so they should be cared for so that they can grow properly. Removing a leaf is done when it looks unattractive because of diseases or pests, or when leaf cuttings are needed. In this case, the leaf should be cut so that the remainder of its petiole attached to the stem is 1.5–2 cm long to allow an abscission layer to form. If the remainder of the petiole does not fall off naturally after the formation of the abscission layer, force it to fall off by pushing it downward in order to prevent the stem from rotting.

The angle between leaves varies greatly with the removing of flower buds. Before the formation of a flower bud, the angle between leaves is 80–90^{o} in a plant produced by tissue culture and 50–70^{o} in a plant from a stem cutting. As a flower bud grows bigger, the angle increases accordingly. When a flower blooms, the angle is somewhere between 110 and 120^{o}. Should you continue to remove flower buds for a large flower, the angle between leaves will be only 90^{o} or so. Then the flower will get jammed between the leaves around and in turn, look unattractive as well as small. For this reason, it is advisable to remove the peduncle below the desired flower bud when the angle between leaves reaches the maximum.

There is normally one female flower on either side of the male flower on a single

peduncle, but in some cases, vice versa. If you want one large male flower only, remove the other male flower or female flowers in their early days.

Be careful not to damage the petals while grooming a flowered plant.

Section 4. Fertilizing and Watering

1. Fertilizing

Fertilizing should be done on a regular basis to suit the nutritional and physiological characteristics of Kimjongilia so that the best results can be acquired. What is important in fertilizing potted plants is to apply fertilizers frequently in low concentrations.

Nitrogen, Phosphorus and Potassium

The fertilizers used for growing Kimjongilia include those for vegetative growth (2:1:4), for reproductive growth (2:4:4) and for the formation of tuber (2:4:8). These fertilizers contain Mg, Zn, Fe, Mn, B, Mo, Cu, and Co as well as N, P and K. They are used in concentrations of 0.1–0.3% according to the growth stage. In some cases the complete fertilizers of N, P and K can be mixed with special fertilizers.

For quicker action of fertilizers, you can spray fertilizer solutions directly on the foliage of the plant. In this case it is appropriate to use urea $CO(NH_2)_2$, KH_2PO_4 and KNO_3. Spray them on the foliage in 0.1% concentration every other day at the stage of a young plant and after that, in 0.2–0.3% concentrations on a 5- to 7-day basis. Since the uptake of nutrients through the leaf is encouraged in conditions in which the temperature is 15–20°C and the humidity is over 70%, it is advisable to apply fertilizers in the early morning when there is no direct strong sunlight and the temperature is not so high. At this time you can use a mixture of various fertilizers or apply ammonium sulphate or urea alone. If you spray a 0.1% solution of ammonium sulfate on the leaves of a plantlet three times on a weekly basis, the growing rate of the leaves can increase 1.5 times and the roots grow better. Furthermore, new leaves come out about two weeks earlier. Applying urea to the substrate comes in effect three days later, but in case of spraying it on the foliage the result can be brought within 12–24

hours and 50–70% of applied fertilizers are absorbed.

Calcium, Magnesium and Micronutrients

Macronutrients and micronutrients supplied from the substrate and water can hardly satisfy the nutritional needs of Kimjongilia. Kimjongilia requires plenty of potassium, so calcium and magnesium fertilizers should be applied so that the plant can maintain the suitable ratio of (Ca + Mg) /K in its body. Calcium can be supplied by using calcium superphosphate or calcium hydroxide, and magnesium by using $MgSO_4 \cdot 7H_2O$. Magnesium accounts for 12–13% of $MgSO_4 \cdot 7H_2O$ in the form of MgO. Magnesium can also be supplied by adding light-burned magnesia when preparing the substrate. The water which flows through areas rich in limestone contains MgO in concentrations of 15.8–16.0 mg/l and CaO in concentrations of 37.8–40.5 mg/l. Therefore, you can satisfy the majority of the required amounts of calcium and magnesium by giving this sort of water to the plant.

Rare-Earth Element and Kumgang Medical Stone

The rare-earth elements, which are very active physiologically, are widely used for floriculture as well as agriculture. The rare-earth element fertilizers in recent use in the Democratic People's Republic of Korea are nitrate rare-earth element fertilizers containing seven light rare-earth elements such as lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm) and europium (Eu), which contain 18.8–34% rare-earth elements with 15% lanthanum and 75.8% cerium.

Spraying 0.03% solutions of the rare-earth element fertilizers on the foliage promotes the growth as a whole. As for flowers, they bloom 5–7 days earlier, the size increases and the colour becomes livelier. It also enhances the resistance to adverse environment. If you use a mixture of the rare-earth element fertilizers and 6-BA, it will increase the amount of chlorophyll in the leaf and in turn, the rate of photosynthesis will increase.

Kumgang medical stone contains over sixty kinds of elements ranging from macronutrients to rare-earth elements, most of which are essential for the plant. The amount of harmful elements in Kumgang medical stone is below the allowable level,

which means this stone makes an excellent microelement fertilizer. If you use the particles (1–3 mm) of Kumgang medical stone as a substrate when acclimatizing a tissue-cultured plantlet, the rate of acclimatization will be 97.3%, far higher than when using a sand substrate composed of particles 1–3 mm thick. In addition, the length of a leaf and the number and size of flowers will increase and the first flower will bloom about a week earlier.

Also Kumgang medical stone facilitates the general growth of the plant and improves the adaptability to unfavourable environmental conditions.

Organic Fertilizers

In case of chicken manure, it should be mixed at 1–3% of the substrate or dissolved in water. You can also use plant exudate made of useful components such as humic acid, fulvic acid, amino acids, nucleic acids, organic acids, sugar, fat acids, vitamins, pigments and other physiological activators.

2. Watering

Proper watering should be done since Kimjongilia can grow satisfactorily when the humidity of the substrate is somewhere between 70 and 80%. Make sure that the temperature of water to use should be roughly the same as of the greenhouse air.

It is advisable to water only when the surface of the substrate or soil is dry to the depth of about 1 cm.

In a small-size greenhouse water is given to the plant from overhead with a sprayer or watering can. In case of a plantlet, dripping water is a good way of watering.

Watering should be done thoroughly until excess water pours through the drainage hole at the bottom of the pot. When watering the plant, be careful not to pack or wash away the substrate or soil. Water so slowly that the entire root ball is thoroughly wet. You can cover the surface of the substrate with sphagnum moss or other materials like that in order to prevent it from drying too quickly after watering.

Thorough watering should be done on a 10- to 15-day basis to remove redundant inorganic salts and harmful gases.

The best time of day to water in a greenhouse is 9–10 o'clock in the morning when there is active transpiration in the plant, so that the soil will not remain wet for a long period of time. If you water in the evening, the roots remain excessively wet until the following morning, for evaporation is hardly done during the night.

Section 5. Control of Light, Temperature and Air

1. Light

Kimjongilia should be provided with proper light: 5 000–8 000 lx during the period of a plantlet; 8 000–13 000 lx during the differentiation of a first flower bud; 5 000–8 000 lx during the flowering; 5 000 lx during the formation of a tuber.

In Pyongyang, light intensities of a greenhouse during the summer is 80 000 lx or so on sunny days. Therefore, on sunny days protection from strong sunlight is necessary. Film plastic transmits 50–70% of light, reed-screen 10–15%, waterproof cloth 8–10% and clean glass 80%. In consideration of these figures, shading should be done properly, depending on weather conditions, seasons and time.

Since Kimjongilia is a long-day plant, it can grow well and bloom in conditions in which the length of day is more than 14 hours. Therefore, supplemental lighting should be provided according to the seasonal daily length of sunlight in the particular geographical location. The ideal light intensity of supplemental lighting is somewhere between 40 and 60 lx. One or two hours' lighting during the night can be as effective as the additional daytime light.

If you are to produce tubers in summer, reduce the length of day to less than 12 hours.

2. Temperature

The ideal temperature range suitable for the growth and development of Kimjongilia is between 8 and 25°C. Therefore, while maintaining optimum temperatures according to the development stage, do the best to prevent damage by

higher or lower temperatures.

When the temperature drops below 5°C, Kimjongilia stops growth. Even if it returns to normal temperature conditions, it will resume growth no fewer than three or four days later. If the temperature remains below 7–8°C for quite a long time, growth almost stops and tubers start to form.

The day-to-night temperature differential (DIF) has a significant effect on growth of the plant. Ideally the DIF value should be +10 after the stage of a plantlet.

3. Air

In a greenhouse, it is equally important to maintain proper humidity and concentration of CO_2 and prevent damage by harmful gases.

For a plantlet, the humidity should be maintained at 70–80% and, after that, reduced to 60–70% until the flowering.

You can adjust the humidity by ventilating the greenhouse, watering the plants or misting the floors. In the rainy season, the humidity level can reach saturation point. If this condition lasts for over 10 days, flowers will fall off and growing tips will be damaged. Therefore, it is essential to take proper measures to reduce the humidity in the rainy season.

In general, the level of CO_2 in the greenhouse rises steadily until sunrise and reaches roughly the same point as outdoors two hours after sunrise. After that, it gradually drops to 50–150 ppm. Since the saturation point of CO_2 is 1 500–2 000 ppm, it is essential to increase CO_2 concentrations in one way or another.

Harmful gases often found in the greenhouse include H_2S, SO_2, CO, etc. The damage point is 0.01–0.02 ppm for H_2S, 0.2–0.3 ppm for SO_2 and 5–10 ppm for CO. The damage by these gases can be worse when the atmospheric pressures are relatively low. If a plant is damaged by harmful gases, the leaves and petals will turn dark brown and dry from the margins. Then growth is disturbed and leaves and petals drop. If the growing tips are damaged, growth will stop and the plant may even die in a worse situation. Therefore, any sources of harmful gases must be eliminated and the interior should be observed on a regular basis.

Chapter 3
Control of Flowering

Kimjongilia can be made to bloom at a desired particular time by utilizing various culture techniques to suit its characteristics concerning flowering and by adjusting its ecological environment properly. This chapter is aimed at introducing various methods of getting large, beautiful flowers, in any season.

Section 1. Methods of Controlling Flowering Time

To make Kimjongilia bloom in any season, you should adjust ecological environment in a greenhouse to a desired level and organize stage-by-stage cultivation according to the type of plantlets while combining various methods such as removing flower buds, pinching and treating plants with growth regulators in a rational manner.

1. Types of Plantlets and Stage-by-Stage Cultivation

The time it takes for a first flower to bloom after transplanting varies depending upon the types of plantlets: 73 days for a plantlet grown from a lateral shoot; 125 days for a plantlet produced by tuber-planting; 130 days for a plantlet produced by stem-cutting; 170 days for a plantlet produced by tissue culture. Therefore, if you grow plantlets of Kimjongilia stage by stage in consideration of the types of plantlets and the time it takes for the fourth or fifth flower which has the highest aesthetic value to open, you can get flowers at the desired time.

2. Removing Flower Buds

Flowering time can be controlled by removing early flower buds and growing the following ones.

No two plants starting at the same time in the same way can flower exactly at the same time. Therefore, it is advisable to transplant plantlets a few days earlier than the planned date and remove flower buds until a flower bud suitable for your desired time comes out.

In general, the time it takes for a flower bud to open fully is between 55 and 60 days.

The more flower buds you remove, the sooner and the larger the remaining flower is. For example, if you remove two and three buds, the remaining flower opens 8.5 days and 12.4 days earlier respectively, and the size increases by 1.7–4.2 cm. If you remove flower buds in consideration of this fact you can get plants which are more or less different in growth to flower almost at the same time.

The growing rate of a flower bud is highly dependent upon temperature. A flower bud grows by 2–3.5 mm a day at night temperatures of 14–16°C, but no more than 1.5–2 mm at 8–10°C. If the latter temperatures last for a few days, the daily growing rate will be reduced to 1 mm or below. Furthermore, if the night temperature is 5°C for a few days, the growth of a flower bud stops. Therefore, you should control flowering time far more exactly by putting these characteristics to good use. At this time, be sure to always maintain the DIF value at +10.

3. Pinching

If the growing tip is cut, the plant develops lateral stems at the axils of the four nodes from the base. In 40–45 days, budding starts and a first flower blooms 45–55 days from then. In order to grow the fourth or fifth bud for a large, beautiful flower, pinching should be done 100–150 days before. This means that it is appropriate to pinch the plant in mid-October or early November for flowers to open in February of the following year and in mid-August or early September for flowers to bloom in December

Pinching is also done to have one large flower for a long time. When a flower bud is 0.5–1 cm in length, remove the growing tip immediately above the bud. Then, the peduncle becomes thicker, and the flower grows 2–3 cm larger in diameter than others and remains in bloom for a long time.

It is also possible to open flowers by inducing new lateral stems from the old stem. Make a cutting immediately above the two leaves from the base. Then, lateral shoots come out at the root neck of the plant in two or three weeks. Cut away the original stem and the leaves from the base after two or three true leaves come out from the lateral shoot. In addition, there are other methods such as control by DIF or chemical growth regulation.

Section 2. Control of Flowering Time According to the Months

1. February and March

The figure below shows the technical stages of cultivation to make flowers open in February and March. (Figure 11) A tissue-cultured plantlet is acclimatized from late

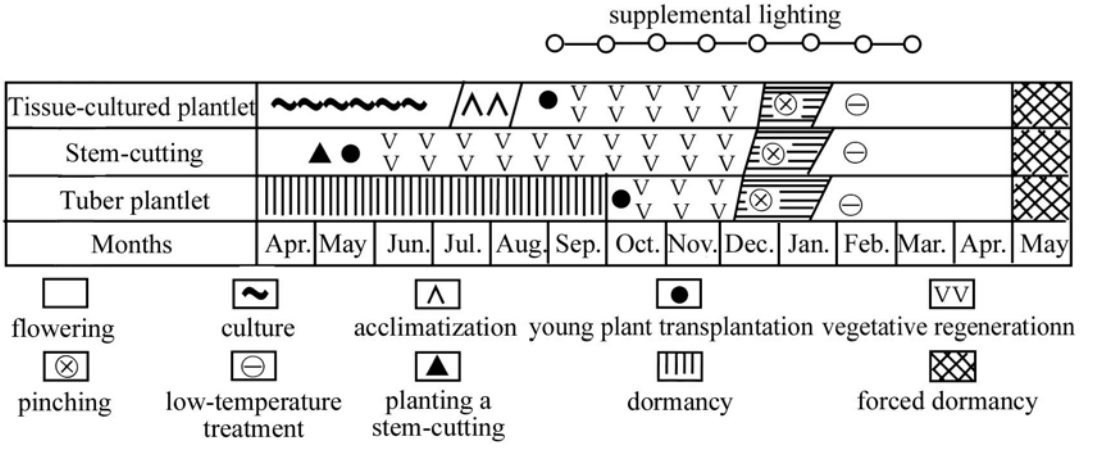


Figure 11. Technical stages of cultivation to make flowers open in February and March

June–early July to mid-July–mid-August. After that transplant the plantlets in 9-cm pots. Supplemental lighting should be provided from mid-August in which the daylight time begins to get shorter (below 14 hours). The light intensity should be 3 000 lx and gradually increased to 5 000–8 000 lx. From September, shading should be gradually removed according to weather conditions, and completely off in mid-November, when the light intensity is lower. The DIF value should be +10 with

daytime temperatures 24–25°C and nighttime temperatures 14–15°C.

Five to seven days after transplanting, apply exclusive fertilizers for tuberous begonias in concentrations of 0.1–0.2% or a mixture of 0.1% complete fertilizer and 100–200-fold diluted solution of organic fertilizers on a 5- to 7-day basis.

About a month after transplanting, repot the plant in pots 12–15 cm in diameter. At this time, add slow-release complete fertilizers to the potting soil as base manure. Second repotting is done 30–40 days after first repotting by using 18- to 21-cm pots. Like the first repotting, add slow-release fertilizers to the potting soil or place a mixture of well-decomposed organic fertilizers and slow-release complete fertilizers at the bottom of the pot. After the second repotting, the plant grows vigorously. Therefore, apply inorganic fertilizers with a higher proportion of nitrogen and 180- to 200-fold diluted solution of organic fertilizers. When foliage growth is dull, spray 0.1% solution of urea directly on the foliage. From mid-October, application of additional fertilizers should be started with a higher proportion of phosphorus and potassium. If you apply the nitrogenous fertilizers excessively, the foliage will be bushy and unshapely and the flowers will be relatively small.

Another way to make flowers open in February and March is to treat the plant at lower temperatures or cut the roots at some time between mid-December and late January. If you want one large flower in February, leave one flower bud and remove the growing tip of the stem within the period between the 15th and 25th of December. Keep the temperature in the greenhouse at 18–20° C during the day and at 8–10° C at night. Ventilate the greenhouse at midday in order to avoid too high humidities.

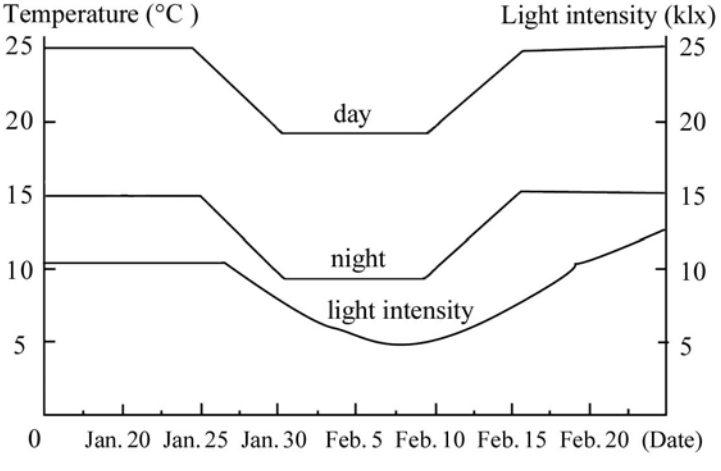


Figure 12. Light and temperature control for flowers in February and March

Once the flower bud reaches the size of 7.5–

8.5 cm in length, it starts to open. When the first petal opens at an angle of 160–180°, lower the temperature to 18–15°C during the day and 8–5°C at night. (Figure 12)

The duration of low-temperature treatment must not exceed 10 days.

Here is another mode of low-temperature treatment. Around the 20th of December, remove every flower or bud excepting the fourth or fifth bud, about 1 cm long. Keep the nighttime temperature at 10°C and daytime temperature at 20°C until late January of the following year. After that, ensure temperatures of 5–8°C at night (duration–8 hours) and 15–18°C during the day until early February, and raise the temperature up to 14°C (night) and 24°C (day). Then about three days later, the flower bud starts to open and bloom fully in the middle of February. If the temperature in the greenhouse drops below 8°C in winter, the humidity level nearly reaches saturation point. If this condition lasts for over 10 days, the petals will fall off. Therefore, it is advisable to ventilate the greenhouse at midday.

The light intensity should be 13 000 lx or so when flower buds are in the middle of growing. Supplemental lighting should be provided at night so that the whole time of sunlight and light comes to 14–16 hours. During the low-temperature treatment, reduce the light intensity to 5 000–8 000 lx.

If you want flowers in early spring from a plant produced by tuber-planting, you should transplant it in a 15- to 18-cm pot at the end of August or at the beginning of September. The longer the dormant period of a tuber is, the earlier the flower opens. Therefore, you should give it a careful consideration before planting.

Transplant a plantlet produced by stem-cuttings in a 15-cm pot in May because it is rooted in mid-March or April.

Leaf-cutting should be done in January or February, and after the development of root system, transplant a plantlet in a 15-cm pot. If shoots come out in April or May, separate them and transplant them in pots 15–18 cm in diameter.

Plants grown from stem-cutting or leaf-cutting should be treated at high temperatures (daytime temperature 25–28°C and night temperature 20°C) in the period from June to October in order to stunt growth and after that, provide normal temperatures.

Repotting is unnecessary for a plantlet produced by tuber-planting, but should be done once for a plantlet from a stem-cutting or leaf-cutting.

2. April and May

A tissue-cultured plantlet should be acclimatized in mid- or late September. Tuber -planting should be done in late November or early December and stem-cutting in late September or early October. The figure below shows the technical stages of cultivation for flowers in April and May. (Figure 13)

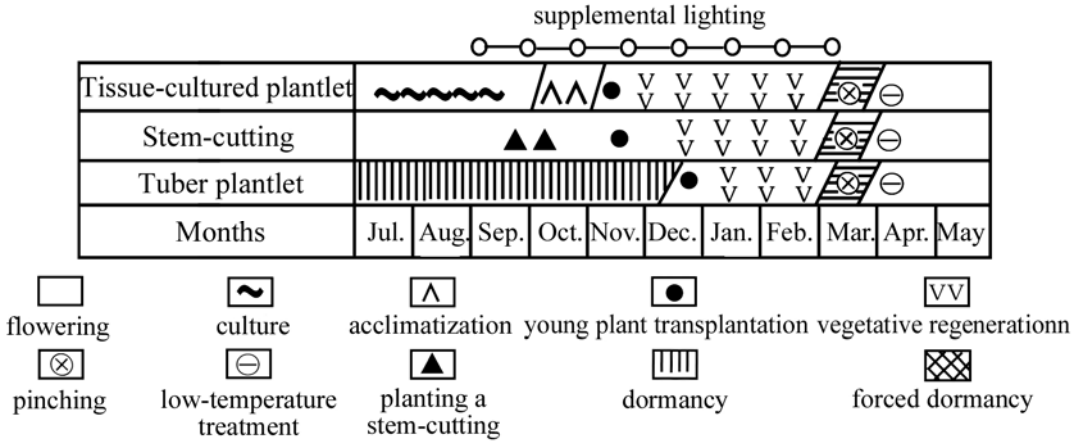


Figure 13. Technical stages of cultivation for flowers in April and May

Tissue-cultured plantlets, after acclimatization, are transplanted in pots 9 cm in diameter, in mid- or late October.

At first, provide light intensity of about 3 000 lx, then gradually increase it to 5 000 –8 000 lx and finally 10 000 lx in the middle of November.

About a month after transplanting, first repotting is done, which is followed by second repotting 30–40 days after the first repotting. Light intensities should be kept at 8 000–13 000 lx during this period and reduced to 5 000–8 000 lx from March.

Supplemental lighting should be provided throughout the whole period of cultivation until April.

3. June, July and August

June, July and August in Korea are very unfavourable months for growing

Kimjongilia.

You can get flowers in summer by continuing to grow the plant which has opened flowers in spring for the first time.

However, this kind of flowers are smaller in diameter and thickness and less beautiful than those which open in winter. Therefore, for wonderful flowers in summer, it is advisable to plant and grow plantlets.

The technical stages of cultivation for flowers in June, July and August are shown in the following figure. (Figure 14)

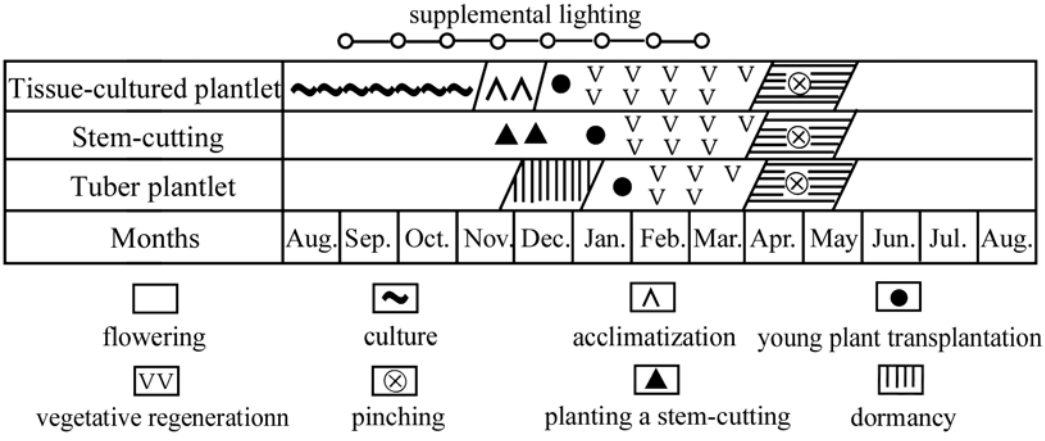


Figure 14. Technical stages of cultivation for flowers in June, July and August

Tissue-cultured plantlets are transplanted in late December or early January after acclimatization, sprouted tubers in late November and plantlets from stem-cuttings in mid-December.

The temperature in the greenhouse should be 22–24°C (day) and 12–14°C (night) with the DIF value of +10.

As the temperature gradually rises since June, ventilation must be conducted frequently. At this time, the humidity of a greenhouse tends to fall and the substrate can dry quickly. Therefore, watering should be done every one or two days. In the wet season, water should be given at intervals of 4–5 days.

Avoid using organic fertilizers in summer.

Since the hot, wet season is favoured by powdery mildew and dustmites, thorough measures must be taken to prevent them.

4. September and October

Tissue-cultured plantlets are transplanted in pots in mid-March after acclimatization.

Stem-cutting should be done in February so that you can transplant a plantlet in a pot in March. Sprouted tubers must be transplanted in late April.

The technical stages of cultivation for flowers in September and October are as follows. (Figure 15)

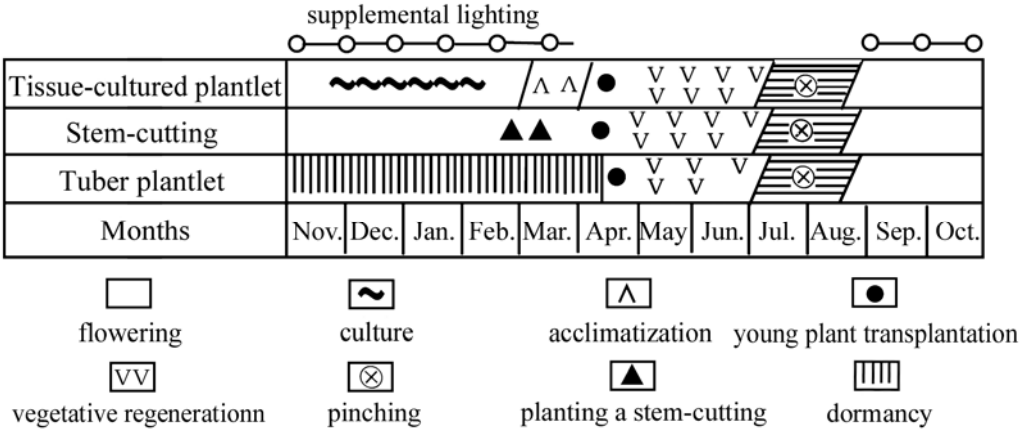


Figure 15. Technical stages of cultivation for flowers in September and October

Since the temperature starts to rise from May, the plantlets transplanted in pots can be cared for in the same fashion as the method of making flowers open in summer. From mid-August the gap between daytime temperatures and nighttime temperatures starts to widen sharply, so care should be taken to maintain the DIF value constantly at +10 in order to ensure good growth of the plant.

Kimjongilia cannot grow well or develop floral buds in conditions in which the temperature is high.

Even if floral buds come out, flowering will be delayed. Therefore, it is important to maintain the temperature below 27°C all the time.

The light intensity should be kept at 13 000 lx in the daytime while providing supplemental lighting at night.

5. December and January

Tissue-cultured plantlets are acclimatized in late June or early July and transplanted in pots in mid-July. (Figure 16)

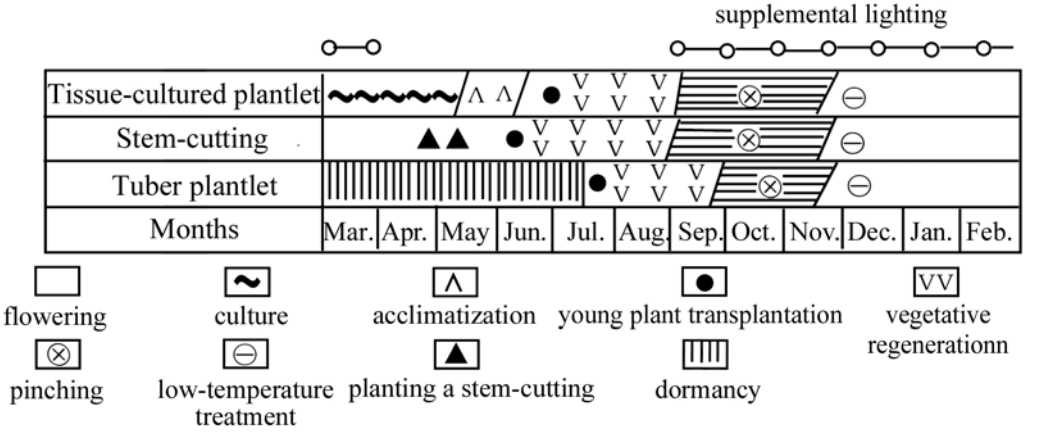


Figure 16. Technical stages of cultivation for flowers in December and January

Stem-cutting should be done in April or May so that the plantlets can be transplanted in pots at least by late May. Dormant tubers are transplanted in late July. Since the daily length of sunlight starts shortening in July, supplemental lighting should be started in late August or early September at the latest. If you conduct low-temperature treatment when the first petal opens at an angle of 160–180^{o}, the flower will become livelier in colour and larger in size. After transplanting, create wind of 3–5 m/s blowing towards the plants so that they can grow sturdy and compact.

Section 3. Increasing Flower Size

Flower size is highly dependent upon cultural environment. Therefore, it is essential to use various cultivation techniques skillfully.

Flower size can be increased by controlling nutrition and environmental conditions during the whole period of growth and by regulating growth in various ways.

1. Removal of Flower Bud

Even the first flower can be grown more than 20 cm in diameter by removing the following flower buds. When the differentiated floral bud is visible to the naked eye, open the bracteoles and remove the bud with tweezers, leaving the growing tip intact. Be careful not to disturb the growing tip. In this fashion, remove two or three flower buds following the first one. Then, the first flower can grow more than 20 cm in diameter, without removing any other buds.

Removing the female flowers on both sides of the male flower should be done when they are young.

Remove the first and second buds, and let the third bud bloom in the early January. After that, if the three following buds are removed, you can get two large flowers in February. Continue to remove the four following buds. Then, you will be able to get in April flowers as large as those in February.

2. Removal of Growing Tip

The plant which has already opened one large flower by removing the growing tip can be re-grown for flowers or tubers. In other words, considering the desired blooming time, you can remove the growing tip above the desired flower bud for one large flower.

You can get one large flower by growing a tissue-cultured plantlet after acclimatization in the following way.

Ninety-five or a hundred days after transplanting in the pot, the plant develops flower buds. Wait for the first bud to grow to a certain degree for wide space between leaves before removing. Continue to remove the following buds once they have reached the size of about 5 mm. Remove the growing tip of the stem 60 days in advance of flowering, leaving one bud 5–10 mm in length. The peduncle devoid of the growing tip grows erect and thick like the stem, and a large flower will result from it. In addition to the good size, this flower can stay open for quite a long time.

3. Low-Temperature Treatment

Flower size can be increased by conducting low-temperature treatment immediately before flowering. This is because most of the photosynthates produced in the leaves go to the flower and, in turn, less amount of them is consumed through the process of respiration during the night.

When the bud reaches the size of 7.5–8 cm and starts to open, provide a day temperature of 18°C and a night temperature of 8°C for 5–7 days.

4. Chemical Growth Regulation

In general, chemicals such as α-NAA, 2,4-D, KT and 6-BA have a great effect on flower size as well as plant growth. If 0.2 mg/l solution of 6-BA is sprayed on the plant, you will see considerable increases in both flower and leaf sizes.

Structure of Flower

Morphologically, flower is formed by transformation of bud at the point of the internode which is not branched, and is very much contracted. It consists of receptacle, calyx, petals, stamens and pistil. The receptacle is the enlarged tip of the peduncle to which other elements of flower adhere.

Calyx is arranged at the outside of flower and usually consists of several sepals which protect its inner part.

Corolla is formed by petals.

Calyx and corolla are termed a perianth all together. Inside corolla are stamens, and in its centre pistil.

The stamen consists of pollen-sac and filament. The pistil is composed of stigma, style and ovary. The ovary contains ovules which grow into seeds after fertilization. The flower which has both androecium and gynoecium is called the monoclinous flower, and that which has either stamen or pistil the diclinous flower. The flower which has only a pistil is called the female flower, and the flower which has only stamens the male flower. The plant with both the female and male flowers is termed monoecious one, and that with only the male or female flower dioecious one.

Section 4. Inducing Simultaneous Flowering

1. Creating Unfavourable Conditions

Simultaneous flowering can be induced by cutting away some roots of flowering plants and providing them with short-day, low-temperature conditions over a certain period of time.

Photo 92. Kimjongilia with flowers on the main stem

When one or two petals at the far end of the flower open at an angle of nearly 180°, take the plant out of the pot, cut away some roots and plant it back. Place it in conditions in which the daily length of lighting is 10–11 hours (short-day condition) with day temperatures of 15–18°C and night temperatures of 5–8°C.

After about two weeks, return the plant to normal conditions. Then, a few flowers open almost at the same time with no decreases in flower size. (Photo 92)

If the flowers are about to bloom earlier than the desired time, provide them with temperatures of 5–7°C for 3–4 days, so that flowering can be delayed for about 4–5 days.

Generally, in short-day, low-temperature conditions, most of the nutritional substances accumulated in the leaves and stems are used for forming tubers and, in turn, flowers are forced to consume them in small quantities.

Cutting some roots can delay the formation of a tuber by developing calluses at the cut edges.

Then, providing short-day, low-temperature conditions can delay flowering. If you return the plants to favourable conditions after some time, several flowers can bloom nearly simultaneously.

2. Inducing Side-Branching

Photo 93. Kimjongilia with several flowers on the lateral stems as well as the main stem

Kimjongilia also develops flowers on lateral stems. Therefore, if you grow one or two lateral stems as thick as the main stem, you can get flowers to bloom on them. (Photo 93)

The tissue-cultured plantlet, if it is well-nourished, develops lateral stems at the three nodes from the base when 5–6 leaves come out. For only one lateral stems together with the main stem, remove others except for the first one. For two lateral stems, leave the first and second ones from the base. Removing flower buds should be done properly according to the state of budding at the main stem and the lateral stems, so that several flowers can bloom at the same time.

Section 5. Preventing Flower Drop

The main cause of flower drop of Kimjongilia is the formation of abscission layers at the bottom of the pedicel. If unfavourable conditions start to exist, the ratio of ethylene and auxin rises due to active synthesis of ethylene, as a result of which formation of abscission layers is greatly accelerated. Therefore, it is essential to provide adequate nutrition and adjust environmental conditions properly in order to prevent flower drop.

Firstly, provide sufficient light for growing and flowering. If light intensities are below the optimum intensity for several days, flowers fall off. Secondly, provide suitable temperatures for flowering. Flowers are liable to drop at high temperatures above 25°C. Thirdly, good care should be taken to maintain proper humidity levels in the greenhouse and prevent the damage from such harmful gases as sulfur dioxide or carbon monoxide. Lastly, it is highly effective in preventing flower drop to use tomatotone (4-CPA, $C_8H_7O_3Cl$), borax ($Na_2B_4O_7 \cdot 10H_2O$), silver nitrate ($AgNO_3$), etc. which can retard the synthesis of ethylene.

Chapter 4
Outdoor and Indoor Growing

Kimjongilia can grow and flower successfully in any places which suit its physiological and ecological characteristics, providing that proper care is taken.

Section 1. Outdoor Growing

Kimjongilia can be grown outdoors after the late frost in spring. It is advisable to create beds in places near a fountain or a pond surrounded by trees.

Plantlets are directly transplanted into the potting mixes or garden soil. The garden soil must drain well and be rich in humus. The best example is clay sand. Before transplanting, add enough amount of leaf mould and peat to enrich and make the soil crumbly.

A tissue-cultured plantlet takes about 40 days longer to grow and open the first flower than its counterpart produced by tuber-planting. Therefore, the latter is better for outdoor growing.

Since the plantlets to transplant outdoors are from a greenhouse, they must be hardened off before transplanting them by providing them with environmental conditions (light intensity, temperature, humidity and ventilation) similar to outdoors.

When the daily lowest temperature is above 8–10°C, transplant the plantlets with 3–4 leaves into the outdoor garden, about 25 cm apart.

Care should be taken to avoid dissatisfactory environmental conditions of light, temperature and humidity.

The damage due to the strong sunlight can be doubled by heat. Therefore, lower the temperature of the bedded plants and soil by spraying cold water (about 15°C) as well

as providing proper shading.

Watering should be done only when the soil at the surface and the ground slightly below is dry. In case of potted plants, water them each day. On cloudy days, watering every other day is good.

Fertilizing should be done as in a greenhouse with mixture of organic, inorganic and micronutrient fertilizers. Since outdoor growing is done mainly in summer, organic fertilizers should be completely decomposed. Spray over the foliage 0.1–0.2% solution of complete fertilizers every three or five days and 0.025% solution of micronutrient fertilizers every two weeks. When floral buds begin to differentiate, spray 0.025% solution of borax and rare-earth fertilizers in order to open flowers earlier and larger.

After flowers fall off and 5–7 days after you get the first frost, dig up the tubers. In spite of the formation of abscission layers, the stem is still joined to the tuber. In a week, however, the stem will fall off naturally. Then brush the soil off the tubers and store them.

Section 2. Indoor Growing

Indoor environment varies according to the properties of building materials, the location and size of windows and seasonal weather conditions. In general, it is most important to provide proper light intensities. Since Kimjongilia does not require strong light, however, it can be grown satisfactorily in any homes or offices except for ones with windows facing north.

It is good to use tubers for indoor growing of Kimjongilia. If you sprout a tuber in late August and transplant it in a pot, it will grow actively through autumn and flower in early winter. In case of transplanting sprouted tubers in early March, flowering will start in July. For flowers in the period between February and April, transplant a sprouted tuber in late August or early September.

Good care should be taken according to the season when growing Kimjongilia indoors.

In spring, too little light and low humidities may cause flowers to fall. Therefore, 100-fold diluted solution of 4-CPA should be sprayed on the plants while providing good nutrition.

In summer, the plants are susceptible to the damage caused by high temperatures. The effective way to prevent it is to spray 0.03% solution of rare-earth micronutrient fertilizers. Good nutrition is also essential in summer. Exclusive compound fertilizers should be applied once a week and 0.05% micronutrient fertilizers be sprayed on the foliage. Since the summer is favourable to powdery mildew and dustmites, you should spray bactericides and pesticides every two weeks.

In autumn, you should provide supplemental lighting to prevent the formation of tubers.

In winter, it is of utmost importance to provide proper temperature. On the other hand, the heating system may cause decreases in humidity. Therefore, watering should be done regularly.

Edible Flowers

The flowers that people can use for food in daily life include 50-odd species, including those of chrysanthemum, rose, lily, sweet brier, yulan, peppermint, lotus, laurel tree, peach, *Styphnolobium japonicum*, pear, apricot and balsam.

For their peculiar nutritive value and various efficacies, like preventing and curing diseases, they are widely used in the daily life by the people.

With the living standard of the people improving continuously, edible flowers which are of high nutritive value and used as medicinal materials can be seen on family tables.

When liquors or biscuits are made from edible flowers, their taste and nutritive value would be several times higher than others.

When efficacious ingredients contained in flowers are refined using cutting-edge technology and then spices, essential oils and medicines are made with them, their economic effectiveness will be further enhanced. For example, in case of the essential oil of rose, its supply is not equal to the demand and its price is very expensive. Therefore, extraction and refining of effective ingredients contained in edible flowers by means of sophisticated technology are one of important ways of boosting the value of edible flowers.

Chapter 5
Diseases and Pests Harmful to Kimjongilia

Section 1. Diseases

1. Powdery Mildew

Pathogen: *Oidium begoinae* var. *macrosporum*

Characteristics: The mildew conidiospore is single-celled, colourless and often oval-shaped. Small ones measure 22–36 × 13–17 μm and big ones 34–67 × 17–31 μm. (Photo 94) They each occur at the end of a cylindrical side branch of the mycelium.

Photo 94. Spores of powdery mildew

Photo 95. Germination of the spore of powdery mildew

This fungus is parasitic on living things and sucks in nutrition by sticking the haustorium into epidermal cells. Since the conidiospores contain much moisture, they are highly resistant to dry conditions and develop easily at lower humidities toward the sunset or when the plant is deficient in nitrogen. They do not germinate in water drops. Powdery mildew rests in the form of mycelium on affected plants (Photo 95) and develops conidiospores, which are spread by air currents or by various contacts to surrounding

plants. Development in the greenhouse is more severe during the spring or autumn.

You may see frequent development of the powdery mildew especially when the mean temperature is between 15 and 20°C and humidity 75–85% with bad air circulation, watering in excess or insufficient sunlight.

Symptoms: This disease develops on the surfaces of leaves, stems and petals. (Photos 96 and 97) At first, whitish powdery spots, about 5 mm in diameter, appear on the leaf surfaces and gradually expand to the whole leaf surfaces, to stems, peduncles and petals. Affected plants slow down in growth owing to the failure to

Photo 96. Plant infected by powdery mildew

Photo 97. Powdery mildew on the flower

photosynthesize, the foliage turns dull yellow and the flowers are of little ornamental value because they are covered by the whitish mildew growth.

Control: The first preventive measure is the use of strong, healthy tissue-cultured plantlets originally from high-immunity mother plants. Apply nitrogen fertilizers properly so that the plant does not grow adversely. Place the plants apart to allow sufficient sunlight and good air circulation. Maintain proper temperatures in the greenhouse since greater DIF values favour the development of the powdery mildew. When this disease develops, spray thiophanate methyl, safrole, lime sulfur, Karathan, ferbam, polyoxin, fenarimol, etc., over the diseased plants two or three times at weekly intervals. It is also effective to spray 20-fold diluted solutions of extractives of thuja leaves, leeks, garlic, *Aconitum kusnezovii*, etc., 3–4 times at 5-day intervals. If there is persistent development all year round, evacuate and close up the greenhouse, then sterilize it by generating sulfur smoke or steam.

2. Gray Mould Rot

Pathogen: *Botrytis cinerea*

Characteristics: The conidiospore is colourless and elliptical, which measures 8–12 × 11–15 μm. Spores are produced on the dendroid conidiophore, like a bunch of grapes. They are colourless at first, but later turn grayish. Growth of mycelia and formation of conidiospores can be possible at 3–31°C, although the most favourable temperature is about 23°C and high humidity is required. They germinate readily in water drops.

Gray mould rot rests on infected parts in the form of mycelia, conidiospores or sclerotia and starts to spread from the winter through the following spring by flying spores.

Symptoms: This disease commonly attacks the stems, leaves and petals. (Photos 98 and 99) Infected parts of the stem rot, turning dark brown, as a result of which the whole plant topples. Lower leaves touching the pot or substrate are easily attacked by gray mould rot. Spotted areas expand from leaf margins to the rest of the leaf.

In most cases of infection, as the petioles rot, leaves drop although they are

Photo 98. Plant infected by stem rot

Photo 99. Leaf infected by leaf rot

unaffected by the disease. Petals are occasionally attacked by gray mould rot. In this case, infected flowers rot, turning dark brown, and in turn, their ornamental value decreases. Every infected part of the plant is identified by the development of grayish fungus masses, which remind you of tobacco ashes.

Control: Do not place the plants too close. Provide them with good nutrition so that they are healthy and strong. Close attention should be paid to maintaining proper

environmental conditions in the rainy season which favours the development of gray mould rot. Once this disease develops, remove spots immediately and apply sulfur dust. Badly diseased parts of the plant should be cut away. The effective preventive measure is to treat the plants with zineb, chlorothalonil, mancozeb, etc., on a regular basis.

3. Bacterial Leaf Spot

Pathogen: *Xanthomonas begoniae*

Characteristics: This bacterium is Gram-negative and produces yellow, circular colonies in the agar medium. It resembles a rod with both of the tips rounded, measuring 1–2 × 0.5–0.6 μm and moves with the flagellum attached to one tip. The temperature range for survival is between 1 and 37°C, although the best temperature is 27°C. It dies at 50°C in 10 minutes, but can live for about two years in the exuding leaf sap.

This pathogen passes the winter on the soil surface, resting on the spot of an infected leaf and is carried by rainy wind, invading through stomata, hydathodes or injured leaf tissues. The latent period is usually 7–10 days from invasion, but 2–3 days in case of inoculation by injection. It is favoured by the rainy season characterized by high temperature and humidity.

Symptoms: At first, tiny dark green spots appear on the leaf surface and grow into 5- to 10-mm round spots and, finally, assume amorphous appearance. (Photos 100 and 101) The center of the infected area is dark brown or black in colour and the periphery

Photo 100. Early synptoms of bacterial leaf spot

Photo 101. Late symptoms of bacterial leaf spot

pale yellow. As infection spreads from upper leaves to lower ones, from the leaf surfaces to the petioles via leaf veins and become merged, the plant dries out. This disease causes decreases in ornamental value of the plant and severe stunting in growth.

Control: Watering should be done properly in the wet season. When watering the plants, do not splash water onto the leaf surfaces. Infected leaves or plants must be eliminated quickly. When the disease is detected in the greenhouse, spray antibiotic bactericides such as streptomycin, polyoxin, etc., 3–4 times at weekly intervals. It is equally effective to spray 20-fold diluted solutions of extractives of wild bergamots, garlic, leeks, etc., at 5-day intervals.

4. Ring Spot

Pathogen: *Cercospora begoniae*

Characteristics: The conidiospore, measuring 1.5 × 4.5 μm, is colourless, needle-shaped and its base is slightly thick and crooked. It has 3–15 septums. The conidiophore, which are dark brown in colour, are produced en masse in number of 5–15. Each has 1–3 septums and a zigzagged tip. The best temperature for spore production is about 28°C. The pathogen passes the winter in the form of mycelia (or spores in rare cases) and are spread by rainy wind the following year. Ring spot readily develops especially in hot geographical locations. Also, application of too much K fertilizers may cause the development of this disease.

Photo 102. Leaf infected by ring spot

Photo 103. Mould mass produced on the spot

Symptoms: This disease develops on leaves and stems. At first a tiny, dark green spot appears, and gradually grows dark brown in the rounded shape, which finally assumes amorphous appearance, with the white or gray centre and dark brown margins. (Photos 102 and 103) It measures about 1.5 cm during the spring or autumn, although it can grow as long as 5–6 cm in the rainy season. In serious symptoms of this disease, dark gray mould develops over the surface of rotted tissues. The number of the spot per leaf is usually one.

Control: Make sure that there should be good air circulation and proper amount of sunlight. Once this disease has developed, stop foliar watering. Be careful not to splash water onto the leaf surfaces when watering the potted plant. Spray first appearance of ring spot with 0.6% Bordeaux mixture. In addition, spray fungicides such as zineb, chlorothalonil, benomyl, mancozeb, etc., three times at weekly intervals. It is also effective to use 10- to 20-fold diluted solutions of extractives of sweet flags, horsetails, castor-oil plants, leeks, garlic, etc., 3–4 times at 5-day intervals.

5. Seedling Damping-Off

Pathogen: *Pythium* spp. and *Fusarium* spp.

Characteristics: *Pythium* spp. produces genes in the conidiospore which travels by water to the root neck and infects it. *Fusarium* spp. forms hook-shaped multicellular conidia and causes infection by seed or soil. Pythium mainly attacks the capillary tube tissue of sapling and withers it up.

Photo 104. Seedlings infected by damping-off disease

Symptoms: This disease commonly occurs in plantlets which are in the middle of acclimatization or young plants. At first, a tiny, light brown ring appears on the roots and at the soil line, and gradually spreads. (Photo 104) Diseased tissues turn dark brown and become thinner. Severe infection causes leaf drop and the plantlet eventually withers away. This disease is characterized by the yellowing of the whole overground part of plant which makes you spot its emergence easily.

Control: Sand should be washed with flowing water several times before using as

the substrate for acclimatization. Potting substrate should be sterilized by using formalin, chloropicrin, steam or sunlight. Diseased plants must be burned together with root substrates. Watering should be done properly during the wet season. Also, it is advisable to treat the plants with fungicides such as zineb, mancozeb, chlrorothalonil, etc., on a regular basis.

Section 2. Pests

Pests which cause frequent damage to Kimjongilia include dust mites, nematodes and thrips.

1. Dust Mites

Pest: *Hemitarsonemus latus* and *Tarsonemus pallidum*

Characteristics:

***Hemitarsonemus latus*:**

The adult female is oval-shaped, 0.13–0.22 mm in length and 0.09–0.12 mm in width. (Photo 105) The adult male is long hexagon-shaped and a bit smaller than the female. (Photo 106) The eggs resemble chicken eggs, measuring 0.09–0.1 × 0.06 mm, on the surface of which dozens of tiny hemispherical projections are arranged orderly. The adult has four pairs of legs, although the nymphs are six-legged. Their

Photo 105. Adult female of *Hemitarsonemus latus*

Photo 106. Adult male of *Hemitarsonemus latus*

development is favoured by high humidity (90% or above) and high temperature (28–30°C or above). The rate of development and hatching is considerably low at

humidities of 70% or below and temperatures of 20°C or below.

***Tarsonemus pallidum*:**

The adult female is spindle-shaped and about 0.27 mm long. The male is a bit smaller than the female. The egg is about 0.1 mm long, oval-shaped with the smooth surface. The development of this mite is similar to that of *Hemitarsonemus latus*.

Symptoms: Dust mites affect growing points, young leaves and flower buds. Damaged growing points nearly stops growing, and infested young leaves are distorted and do not grow well. Even somewhat old leaves, once infested, become rigid all over

Photo 107. Plant infested by dust mites

Photo 108. Lower part of a leaf infested by dust mites

with the lower part of a leaf turning dark, which makes them brittle to the touch. (Photos 107 and 108) Infested flower buds become whitish in places and fail to open altogether.

Control: Good care should be taken to maintain appropriate temperature and humidity in the greenhouse. The highly effective pesticides to control mites are dimethoate, chlorobenzilate, abamectin, etc. Spray them on a regular basis. If dust mites develop explosively, more frequent application is needed.

2. Nematodes

Pest: *Meloidogyne hapla, Pratylenchus penetrans* and *Aphelechoides ritzemobos*

Root-Knot Nematodes (*Meloidogyne hapla*)

Characteristics: The adult female is bottle-shaped, with one end pointed and measures 0.5–0.8 × 0.5–0.7 mm. The adult male looks like a long earthworm, with both ends pointed, 1.2–1.5 mm long and 0.26–0.34 mm wide. The larvae are all thread-shaped regardless of sex. The adult female lays 300–600 eggs into a gelatinous sac produced on the tip of the tail and then dies. The time it takes for females to develop from larva to adult is 17 days at 25–30°C, 31 days at 20°C and 57 days at 15°C. They can develop at any time of the year without hibernation in the greenhouse.

Symptoms: Root-knot nematodes produce many galls on the root system. (Photo 109) Galled plants do not perform as well as healthy ones as the function of the roots weakens. The main symptoms are small leaf size, pale foliar colour and daytime wilting.

Photo 109. Symptoms of root-knot nematode on the tuber

Control: The root substrate must be thoroughly sterilized. If the substrate is pasteurized with steam or fumigants (80–100°C) for about 30 minutes, all nematodes in various stages of the development can be killed. In addition, the root substrate may be sterilized by using sunlight or chemicals. Be careful not to splash water onto the plants. If nematodes develop during the cultural period, add nematode-killers to the root substrate or drench the pot into warm water.

Root-Rot Nematodes (*Pratylenchus penetrans*)

Characteristics: The female and male adults are all thread-shaped. The body length is 0.3–0.9 mm and width about 0.02 mm. The female has a genital pore at the posterior end, in the front of which there is an egg-sac. The male has one testis. The adults and larvae enter the epidermis or tissues of the roots and are soil-borne. The life cycle from egg to adult is 30–50 days. In the greenhouse, root-rot nematodes propagate for several generations in the year. The presence of root-rot nematodes decreases the resistance of the plants to bacterial and fungal diseases.

Symptoms: Root-rot nematodes enter the roots and feed on the nourishment of root cells. As a result, root tissues rot and rootlets fall off. Severe symptoms include complete rotting of the root system and wilting of aboveground parts of the plant. (Photo 110)

Control: Prevention and control of root-rot nematodes are the same as those of root-knot nematodes.

Photo 110. Rotted tuber by root-rot nematodes

Foliar Nematodes (*Aphelechoides ritzemobos*)

Characteristics: The female and male adults are all thread-shaped and bigger than other nematodes. The female is 0.8–1.2 mm long and the male 0.7–0.8 mm. Then invade leaves through injured areas or stomata, carried by water spurts. The life cycle from egg to adult is 10–13 days. The female lays 25–35 eggs during her life.

Symptoms: The presence of foliar nematodes cause partial withering of upper leaves and brownish or darkish mottles on the surfaces of lower ones. Severely infested leaves curl from the outside inward, and eventually the whole plant dries out.

Control: Spray fenthion, chlorophos, vamidothion, salithion, etc. at weekly intervals during the wet season. Do not splash water onto the foliage when watering the plants. Root substrates must be thoroughly sterilized before placed in use.

3. Thrips

Pest: *Heliothrips haemorrhoidalis*

Characteristics: The adult is about 1.5 mm long and about 1.8 mm wide when it spreads the wings. Its back is black. The antennae on the head consist of seven segments, of which the sixth one is the longest. Thrips have one pair of black compound eyes and three red ocellar ones. The abdomen consists of nine segments and there are short black hairs on both sides of the body.

The adult female has a long, sawlike ovipositor on its abdomen. The life span of the

adult female is 30 days and lays about 170 eggs over 20 days. Eggs are oval-shaped and milk-white, measuring 0.25 mm. They hatch into nymphs in three to six days and begin attacking the plant. The development of thrips is favoured by the conditions in which the day temperature is about 25°C, night temperature 15° C or above, and humidity 85% or more.

Photo 111. Thrips attacking the leaf

Symptoms: Thrips cause damage to leaf shoots, leaves, petioles and flower buds. (Photo 111) They scrape the tender petal surface and suck the exuding sap, which causes a white discolouration and the affected flowers are of little value as ornamental ones. Infested flower buds fail to open altogether. They can transmit virus diseases while sucking the plant sap.

Control: During the period from April to October, set up insect screens on all the windows of the greenhouse in order to prevent invasion of thrips. Make sure that the greenhouse humidity should not be below 60%. Once thrips are present in the greenhouse, spray sumithion, nicotine sulfate, acephate, etc.

Flowers and Mankind

If the history of the earth is supposed to cover a day, that is, 24 hours, the time of the birth of mankind is 23 hours and 59 minutes, that is, just one minute to 24 hours.

Since then more than two million years equal to one minute have passed, and the flowers had already existed on the earth in those days.

Along with the birth of ancient culture, several thousand years have elapsed again.

In this period humankind made efforts to obtain more beautiful flowers, with the result that the breeding technique such as the cross grafting has been invented and widely used.

With the rapid progress of some realms of life sciences including genetics and cytology, modern breeding and culture techniques have been invented and introduced.

Consequently, many species of beautiful flowers have been bred and disseminated, providing mankind with more beautiful and emotional life.

Part IV
Kimjongilia Festival and Functions to Mark the Anniversary of the Naming of Kimjongilia

Today Kimjongilia is in full bloom all over the world, backed up by the reverence and best wishes of the world people for leader Kim Jong Il.

Every year in Pyongyang, the capital of the DPRK, the Kimjongilia festival and exhibition take place in a grand way on the occasion of February 16, his birthday, amidst great interest and expectation of the Korean people and the world progressive people, and a variety of functions are held on the occasion of the anniversary of the naming of Kimjongilia.

Chapter 1
Kimjongilia Festival

There are a variety of horticultural expositions and flower shows in the world, but never has there been elsewhere such a grand festival that is held in winter with one kind of flower. The Kimjongilia festival takes place on the occasion of February 16 each year across the country including Pyongyang, unfolding a sea of flowers in praise of the great man. It has developed into an international festival of great ideological and artistic value, drawing diplomatic missions and offices of international organizations in Pyongyang, friendship and solidarity organizations, foreign organizations and figures and overseas Koreans.

The Kimjongilia exhibition was held in February 1997 for the first time. As it grew in scale year by year, it developed into a flower festival in 2004. During the festival, a

Emblem of Kimjongilia Festival

Flag of Kimilsungia and Kimjongilia Festival

Flag of Kimjongilia Festival

variety of events are held including scientific and technological presentation and art performance. The festival will be held every year in reflection of the desire of the Korean and progressive peoples over the world.

This chapter introduces the Kimjongilia exhibitions and festivals held so far in the DPRK and some impressions of them.

First Kimjongilia Exhibition

The First Kimjongilia Exhibition opened on February 11, 1997, at the Pyongyang International House of Culture amid the great interest of people at home and abroad.

On display were over 800 pots of Kimjongilia presented by different establishments in the country and people from all walks of life. The exhibits also included the flowers sent by Kamo Mototeru, Japanese horticulturalist who bred the flower, Ri Thae Ryong, a Korean living in Shizuoka Prefecture, Japan and the Yanji China-Korea Friendship Flower Garden Company in China.

Present at the opening ceremony were senior officials of the Party and government, officials from ministries and national agencies, soldiers of the Korean People's Army (KPA), working people in Pyongyang and from provinces, overseas Koreans and foreigners.

The participants looked round the venue decorated with full-blown Kimjongilia and other beautiful flowers. The visitors made up their mind to grow Kimjongilia more beautifully, keeping the impressive story about the immortal flower in mind.

On February 14, there was the first presentation of experiences in the Kimjongilia cultivation at the Pyongyang International House of Culture.

The exhibition closed on February 17.

Impressions

Jo Yun Hae, secretary-general of the International United Confederation of Koreans

"I was struck with admiration as I looked round the exhibition hall. The moment I stepped into the hall, I felt the sincere devotion of the people to leader Kim Jong Il.

This exhibition is a showcase of the loyal passion of the people who have got Kimjongilia to bloom in winter. Everything here is breathtaking.

I pay respect to the people for their devotion to the leader. Kim Jong Il is indeed the lodestar and hope to our nation. I am sure that the people led by a leader as great as him are invincible and Juche socialism will emerge victorious on this planet."

Takashima Norio, Itaka Kikaku Corporation in Sendai, Japan

"Kimjongilia blooming in my heart is my feeling toward the DPRK, the home dear to my heart."

Hong Renquan, general manager of the Dandong Promotion Trading Company, China

"Through the visit to the hall I have realized that Kimjongilia is the best flower in the world and I have been convinced that its gloss and fragrance bring hope and light to the five continents of the world."

Orcas Quinder Fernandez, counsellor of the Embassy of the Republic of Cuba in Pyongyang

"Each flower on display reflects the determination of the Korean people to follow their leader, bring about well-being and prosperity of the country, achieve final victory in socialist construction and realize the country's reunification under his wise leadership. Leader Kim Jong Il is the sun of guidance all the Korean and world peoples revere."

Yurikov, member of the fisheries delegation of the Russian Federation to the DPRK

"Flower is one of wonderful creations of nature. It makes man good and kind-hearted. The First Kimjongilia Exhibition is a big hit and a product of the Koreans' love for their leader. I have been struck by the exhibits."

Kang Sang Ho, chairman of the International United Confederation of Koreans (Kothongryon) in Kazakhstan

"As chairman of Kothongryon in Kazakhstan, I have visited the venue of the exhibition which left me an unforgettable impression. I am eager to grow such flowers by myself."

First Kimjongilia Exhibition

(February 11–17, 1997)

Poster

Display booth of Kimjongilia Greenhouse of the Yanji China-Korea Friendship Flower Garden Company, China

Pots of Kimjongilia exhibited by Kamo Mototeru, director of the Fuji International Flower Garden, Japan

"The beauty of Kimjongilia is beyond description. The flower is beautiful and the hearts of the Korean people, who hold in high esteem and trust their leader, are more beautiful. The exhibition is as wonderful as a piece of art."

Ahmad Salah Endin Musiri, member of the Embassy of the Arab Republic of Egypt in Pyongyang

Second Kimjongilia Exhibition

The Second Kimjongilia Exhibition raised its curtain in Pyongyang on February 13, 1998.

A large poster for the exhibition was set up in front of the Pyongyang International House of Culture, the venue of the exhibition, and inside the exhibition hall decorated in festive attire was a signboard reading "The 2nd Kimjongilia Exhibition".

On display were over 2 000 pots of Kimjongilia reflecting the deep reverence of humankind for Kim Jong Il who had performed the immortal exploits for the country, people, times and revolution.

Also on show were the flowers sent by Kamo Mototeru, the Mongolian Kimjongilia Society, the general manager of Yanji China-Korea Friendship Flower Garden Company in China , overseas Koreans and many foreign delegations.

The exhibition hall was visited by the senior officials of the Party and government, anti-Japanese war veterans, KPA soldiers and working people—more than 230 000 people in all.

Visitors also included those from Pyongyang-based diplomatic missions, economic and trade counsellors corps and military attachés corps, officials related to culture and friendship at embassies and foreigners and overseas Koreans on a visit to the DPRK.

The successful exhibition dropped its curtain on February 17.

Impressions

Jagjit Singh Sapra, ambassador of the Republic of India to the DPRK

"Outstanding exhibition of Kimjongilia flower.

It is an example of the many wonders that nature has in store for us. The Kimjongilia flower's radiance will surely purify the environment besides beautifying

the country.”

E. G. Ryoushikin, counsellor of the Embassy of the Russian Federation in Pyongyang

“It is a great joy for me to be here at the Kimjongilia exhibition.

We, Russians, say that the people with a heart as beautiful as the flower live in the DPRK. I am sure such people only can get the wonderful flower into bloom. I wish the Korean people a happy life filled with hope like the beautiful flower in the future.”

Ahmad L. C., chargé d'affaires of the Embassy of the Arab Republic of Egypt in Pyongyang

“I am very pleased to visit the Kimjongilia exhibition hall in the tenth year of the birth of Kimjongilia.

The hall showing the wonderful flowers presented by different national agencies of the DPRK and many countries of the world reflects the immense respect of the Korean and world peoples for leader Kim Jong Il.”

Yan Jianfeng, military attaché of the Embassy of the People’s Republic of China in Pyongyang

“Kimjongilia, how can you be so beautiful
Kimjongilia, how can you be so red
That’s because the great sun shines over you,
That’s because the masses of people love you.
You illuminate the way ahead of people like a torch
You lead the general march like a banner.
O, beautiful flower, come into full bloom
Bloom red as an immortal flower.”

Second Kimjongilia Exhibition

(February 13–17, 1998)

Poster

황해북도

Third Kimjongilia Exhibition

The Third Kimjongilia Exhibition was held at the Pyongyang International House of Culture from February 13, 1999. On display were over 2 500 pots of Kimjongilia sent by many establishments and people, foreigners and overseas Koreans.

Present at the opening ceremony were senior Party and government officials, officials from ministries and national agencies, related officials and working people of the country. It was also attended by delegations of the General Association of Korean Residents in Japan (Chongryon), the Organizing Committee of the 99 Kunming International Horticultural Exposition, China, the Dandong Kimjongilia Greenhouse of China and other delegations. After the ceremony, the participants looked round the flowers on display. During the exhibition the venue was visited by senior officials of the Party and government, anti-Japanese war veterans, officials from ministries and national agencies, KPA soldiers, working people and students and schoolchildren.

Other visitors were the delegation of the Party for Peace and Unity of Russia, other delegations and delegates of foreign political parties, Pyongyang-based diplomatic corps, military attachés corps and officials related to culture and friendship, other foreign people and overseas Koreans' delegations and delegates including the congratulatory group of Koreans in Japan.

On February 15, a presentation of experiences in the Kimjongilia cultivation was held at the Pyongyang International House of Culture. The exhibition ended on February 18.

Impressions

Delegation of the Organizing Committee of the 99 Kunming International Horticultural Exposition, China

"Kimjongilia, symbolic of the prosperity of the DPRK, is permeated with the feelings of respect of the Korean people for leader Kim Jong Il. If Kimjongilia is exhibited at the 99 Kunming International Horticultural Exposition, China, it will be a better global flower expo. Congratulations to the successful Kimjongilia Exhibition!"

Alfonso Rodriguez Perez, military attaché of the Embassy of the Republic of Cuba in Pyongyang

"I have had the privilege of visiting for the second time the hall where the most beautiful flowers I have ever seen are on show. I was deeply impressed by the loyalty of the Koreans who grew and put on display many beautiful flowers named after their leader."

Vu Dinh Thang, military attaché of the Embassy of the Socialist Republic of Vietnam in Pyongyang

"Looking round all the flowers on display, I have realized that those grown by KPA service personnel are the biggest and most beautiful. This is indicative of their intense loyalty to their Supreme Commander."

Ri Pyong Sang, president of the then Kimjongilia Propagation Society in America

"I was deeply impressed at the sight of the venue of the 3rd Kimjongilia Exhibition. The show makes remarkable development year after year. In scale, form and content, it is by far larger, fresher and richer than flower shows of developed countries. I will work harder to propagate more Kimjongilias in America."

Wan Yongxiang, ambassador of the People's Republic of China to the DPRK

"Congratulations to the successful holding of the 3rd Kimjongilia Exhibition. The exhibits are so beautiful that I can hardly discern which one is best at one look. I hope the wonderful exhibition will get better. The friendship between China and the DPRK will continue to bloom like Kimjongilia."

Inoue Shuhachi, then director general of the International Institute of the Juche Idea

"I visited the Kimjongilia exhibition hall on the occasion of the birthday of General Secretary Kim Jong Il and felt again how immense the reverence of the world people for him is. Kimjongilia is very marvellous and beautiful."

Nata Takashi, delegate of the Ehime Modern Korean Question Institute in Japan

"I am very glad to visit the Kimjongilia exhibition hall. The red, large and beautiful Kimjongilia is the symbol of General Secretary Kim Jong Il who will lead the 21st century. I have been fascinated by the beauty and magnificence of the flower."

Third Kimjongilia Exhibition

(February 13–18, 1999)

Display booth of Dandong Kimjongilia Greenhouse, China

“Kimjongilia was born of the passionate sincerity of humanity toward General Secretary Kim Jong Il. It is red in colour, symbolic of sunlight illuminating the way ahead of people. Awakened people create the most beautiful and excellent things in transforming nature.”

Eduard Fernandez, international secretary
of the October 8 Revolutionary Movement of Brazil

Fourth Kimjongilia Exhibition

The Fourth Kimjongilia Exhibition opened on February 14, 2000, in Pyongyang amid great interest and expectation of the Korean people and the world progressive people.

On display were over 4 500 pots of Kimjongilia cultivated by the Korean people and foreigners with great care.

The opening ceremony was attended by the delegations of Chongryon, Japanese Kimjongilia Amateurs Association, the Hubei Provincial Forestry Research Institute of China and Dandong Kimjongilia Greenhouse in China, delegates from the Museé National d'Histoire Naturelle of France and American California Euclid Nursery and Landscaping and other foreigners and overseas Koreans as well as the senior officials of the Party and government of the DPRK, officials from the units attending the exhibition and working people in Pyongyang.

The participants made the rounds of the hall filled with full-blown Kimjongilias and other nice flowers.

Although mountains and fields were covered with snow, the exhibition hall was literally a sea of the flowers of loyalty to their leader.

KPA soldiers, working people and students and children crowded into the venue every day.

Among the visitors were Pyongyang-based diplomats, military attachés, economic and trade counsellors, the delegation of the Party of Communists of Moldova, other foreign guests and overseas Koreans' delegations including that of the Federation of Korean Nationals in China.

During the flower show the number of visitors amounted to over 300 000 and on February 15 a presentation of experiences in the Kimjongilia cultivation was held at the Pyongyang International House of Culture.

The flower exhibition came to a close on February 21.

Impressions

Paulo Eduardo, secretary of the Brazil October 8 Revolutionary Movement

"This is a very important exhibition showing the deep respect and admiration of the Korean people for their leader. Red Kimjongilia is very beautiful and meaningful flower. We have been touched by the exhibits as they reflect the intense loyalty of the people to their leader."

Eduardo Sanchez Pena, military attaché of the Embassy of the Republic of Cuba in Pyongyang

"Today we have seen Kimjongilia, a product of the greatness of leader Kim Jong Il. Its grace and nobility are really beyond description."

Renzo Reias Olivares, military attaché of the Embassy of the Republic of Peru in Pyongyang

"This wonderful flower named after Chairman of the National Defence Commission Kim Jong Il will always bloom in the hearts of all the Korean people."

Nirsia Castro Guevara, counsellor of the Cuban Embassy in Pyongyang

"I have greatly been moved to see the Kimjongilia exhibition hall, because the flowers on display reflect the devotion of their growers. It is a token of the immense reverence of the Korean people for their leader."

Andy Brooks, general secretary of the Central Committee of the New Communist Party of Great Britain

"This is a wonderful tribute to Kim Jong Il on his birthday.

This beautiful display of flowers seems to symbolize the beauty of Korea and the unity of its people. Flowers give a pleasure to millions and this exhibition has been a wonderful experience for me."

Fourth Kimjongilia Exhibition

(February 14–21, 2000)

Poster

김정일에게

… 김정일화는 참으로 좋은 꽃입니다.
김일성

Fifth Kimjongilia Exhibition

On the occasion of leader Kim Jong Il's first birthday in the new century, the Fifth Kimjongilia Exhibition opened at the Grand People's Study House on February 14, 2001, amidst great interest of people at home and abroad.

On display were over 7 000 pots of Kimjongilia grown by Koreans and foreigners.

Present at the opening ceremony were the senior officials of the Party and government of the DPRK, relevant officials, KPA soldiers and working people in Pyongyang. In addition, the ceremony was attended by the delegations of Chongryon and the Afforestation Bureau of Beijing Municipality, China, the Moscow horticultural delegation of Russia and the delegations of the Museé National d'Histoire Naturelle of France and the American California Euclid Nursery and Landscaping.

During the exhibition the venue was visited by senior officials of the Party and government, KPA service personnel, working people and youth and students—300 000 in all. The flower viewers also included foreign diplomats, military attachés and economic and trade counsellors in Pyongyang, foreign delegations and guests and overseas Koreans' delegations including the congratulatory group of Koreans in Japan and overseas Koreans.

On February 18, there took place a presentation of experiences in the Kimjongilia cultivation at the Grand People's Study House.

The exhibition was closed on February 20.

Impressions

So Man Sul, then first vice-chairman of the Central Standing Committee of Chongryon

"At the sight of the exhibition hall, I have keenly felt the reverence of the Korean people for leader Kim Jong Il pervading the venue."

Yang Yong Dong, chairman of the Federation of Korean Nationals in China

"All the Koreans and peace-loving people of the world fighting for the victory of the cause of independence for mankind have held this flower show out of their will to

uphold leader Kim Jong Il as the sun of the 21st century. Kimjongilia will be in full bloom all over the country from Mt. Paektu to Mt. Halla."

Mohamed Saad Zaghloul Anter, military attaché of the Embassy of the Arab Republic of Egypt in Pyongyang

"I was told that a foreigner, not a Korean, bred this wonderful flower and named it after leader Kim Jong Il. This is a show of the respect and admiration of the world people for him. I hope your country will be prosperous and powerful under his wise leadership."

Nguyen Thac Du, counsellor of the Embassy of the Socialist Republic of Vietnam in Pyongyang

"I am very pleased to visit the Fifth Kimjongilia Exhibition on the occasion of February 16, the national holiday of the Korean people. Kimjongilia is a unique flower in the world."

Dominik Bar, Cooperation Office of the European Union

"Nice flowers. Very good presentation. Kimjongilia variety is unique in the world."

Wang Dongping, Dandong Dongwen Trade Company in China

"I'm deeply moved to see Kimjongilias grown with great care. I will grow Kimjongilia in China with devotion and widely propagate it among the people."

Yu Thae Yong, Federation of Korean Nationals in America

"Kimjongilia filled with the spirit of Mt. Paektu
Emits radiance and fragrance to the century.
I wish General Kim Jong Il good health,
Lodestar and leader of national reunification movement."

Alain Inanmary Michel, chief of the Cultivation Bureau of Museé National d' Histoire Naturelle of France

"It is a great pleasure to visit the flower show once again. I think the display is wonderful and the techniques of gardeners are at a very high level. This is a source of visitors' pleasure. I hope this exhibition will help promote relations among peoples of different countries of the world and accelerate Korea's reunification."

Fifth Kimjongilia Exhibition

(February 14–20, 2001)

Poster

"On February 14, 2001, the first year of the new century which will shine as the century of Kim Jong Il, the great leader of the Korean Party and people, we have had an opportunity to visit the Kimjongilia exhibition, a product of the heroic Korean people. I wish Comrade Kim Jong Il, supreme commander of the Korean People's Army, good health in the name of the Communist Party of Cuba, all the soldiers of the Cuban Revolutionary Armed Forces and the Cuban people."

Eduardo Sanchez Pena, military attaché of the Embassy of
the Republic of Cuba in Pyongyang

Visitors making an entry in the visitor's book

Sixth Kimjongilia Exhibition

On February 13, 2002 the Sixth Kimjongilia Exhibition opened at the Grand People's Study House. In the venue, over 14 300 pots of Kimjongilia were on display, which had been grown by Korean working people, students and children and foreigners.

What drew the attention of visitors was the flowers displayed by Pyongyang-based diplomatic missions of different countries including Indonesia, Syria, India, Nigeria and Sweden, offices of international organizations in Pyongyang including the World Food Program and UN Development Program and the Swiss Committee for Supporting Korea's Reunification and other friendship and solidarity organizations in Russia, Spain, Romania and Brazil. The number of visitors amounted to over 600 000 during the exhibition. The visitors included diplomats from foreign embassies in Pyongyang, delegates of international organizations who attended the Meeting to Greet the Sun of the 21st Century, delegations of different countries and foreign guests, delegations of overseas Koreans including the congratulatory groups of Koreans in Japan and the Federation of Korean Nationals in China.

On February 15, there was a presentation of experiences in the Kimjongilia cultivation at the Grand People's Study House. The exhibition was closed on February 20.

Impressions

Mohammed Camalcady, vice-chairman of the Egypt-Korea Friendship Society

"I have been struck by full-blown Kimjongilias on show. I take my hat off to the Korean people who have displayed such wonderful flowers as a show of their pride in and respect for their leader."

Piras Hamed Alpandy, head of the military delegation of the Arab Republic of Syria

"It is a great joy for me to see the display hall full of full-blown Kimjongilias. Today the flower attracts global attention. So, many countries grow the flowers and send them here. This is because the flower bears the name of Kim Jong Il."

D. Mizki and S. Salinchakeg, Mongolian delegates to the Meeting to Greet the Sun of the 21st Century

"We are glad to visit the show of the flower named after leader Kim Jong Il. We are growing the flower in Mongolia, too.

We wish him in the bloom of youth as energetic as Kimjongilia."

Pak Sang Gwon, president of Peace Motors Company

"I have enjoyed all rounds of the Kimjongilia exhibition so far. Through the show I felt that the reverence of the people for the leader has intensified year after year. At the sight of the words describing Kimjongilia as the flower of the Sun, I marvelled at the nobility of the people's mind. Thank you for showing me such a wonderful display."

Jitendra Sharma, president of the International Association of Democratic Lawyers

"It is wonderful to see this exhibition of Kimjongilia.

The flowers received from different parts of the world establish its high appreciation. The flower is beautiful, has lovely red colour and yet is so strong and lasting. Like the dear leader, it spreads friendship, strength and determination. I am sure the flower will soon be the most popular and likeable flower throughout the world. It is so good to have come here and seen the exhibition."

Tran Van Hieu, counsellor of the Embassy of the Socialist Republic of Vietnam in Pyongyang

"We have seen the Kimjongilia exhibition with a feeling of respect for Kim Jong Il, the great leader of the fraternal Korean people and the Korean People's Army. It is a great honour to us.On this occasion, we have been able to have a good knowledge of how they revere their leader."

Jo Ryong Hyon, vice-chairman of the Central Standing Committee of Chongryon

"I was fascinated by a sea of beautiful Kimjongilias. The exhibition shows us the warm, fresh and noble personality of leader Kim Jong Il, the image of the great man, warmly embracing all the people. The Korean residents in Japan will grow the 'flower of loyalty', sharing the idea and destiny with the leader like the people in the homeland."

Sixth Kimjongilia Exhibition

(February 13–20, 2002)

Opening ceremony

“We have deeply been impressed by the Kimjongilia Exhibition arranged on the occasion of the birthday of Marshal Kim Jong Il, the great leader of the Korean people.

We have come to know well how loyal to leader Kim Jong Il the Korean people are and how sincerely they wish him good health and happiness. His good health is their happiness. We share the same wish with them. On behalf of the counsellor and secretaries in charge of culture and friendship of the Embassy of Poland in the DPRK.”

Stanislaw Skowron, counsellor of the Embassy of the Republic of Poland in Pyongyang

Poster

Presentation of experiences in the cultivation of Kimjongilia

Seventh Kimjongilia Exhibition

On February 12, 2003, the Seventh Kimjongilia Exhibition was held in a grand way at the Kimilsungia and Kimjongilia Exhibition Hall which was newly built on the banks of the Taedong River.

The exhibition hall was decorated with lots of Kimjongilia and other flowers grown with immense reverence for the peerless great man. Seen in the venue were the baskets of flowers in the name of embassies in Pyongyang, the member nations of the ASEAN and delegates of international organizations, each of which was wearing a ribbon with the inscription of the best wishes for leader Kim Jong Il's good health and national flag. Tens of thousands of people thronged the venue to see the show every day, and the number of visitors rose to over 100 000, respectively on February 16 and 17.

During the exhibition, over 800 000 people visited the hall, including KPA soldiers, working people, students and schoolchildren. An endless stream of people in holiday attire flowed into the venue with great longing for the leader. A presentation of experiences in the Kimjongilia cultivation was held at the hall during the exhibition.

The show came to a close on February 21. At the closing ceremony, souvenirs were given to diplomatic missions and offices of international organizations in Pyongyang which attended the exhibition with a feeling of friendship toward the Korean people.

Impressions

Ogami Kenichi, secretary-general of the International Institute of the Juche Idea

"With the progress of the era of independence Kimjongilia will shine more brightly over the world and will be treasured by people."

Khar Amerokhanov, vice-director of the Ministry of Agriculture of the Russian Federation

"Very beautiful, indeed. A miraculous sea of beautiful flowers.

I wish your great country will be filled with such beauty. I wish the Korean people led by Kim Jong Il happy life and well-being."

Bounneuang Khoukham, attaché in charge of culture of the Embassy of the People's Democratic Republic of Laos in Pyongyang

"Through the visit to the Seventh Kimjongilia Exhibition I keenly felt again the boundless reverence and best wishes of Koreans for leader Kim Jong Il. Availing myself of this opportunity, we reaffirm our commitment to bolstering up the ties of Laos-DPRK friendship."

Yasek Woilinski, president of the Polish side of the Poland-Korea Shipping Co., Ltd.

"I have deeply been impressed by today's visit to the Kimjongilia exhibition.

I have been visiting the show for five years and every year I can see the exhibition get more wonderful. I have been touched by the extraordinary efforts made by people to get graceful and beautiful flowers into bloom in their homes for the leader. Congratulations to this successful exhibition. I hope that all the staff of the Poland-Korea company will come here to see next year's exhibition."

Yang Mei, general manager of Shenyang Shengge Trade Company, China

"It is a great honour for us to attend the exhibition of Kimjongilia.

It makes us feel immense respect of the Korean people for leader Kim Jong Il.

On behalf of the foreign trade section of the Shenyang company, China, we hope the Korean people will develop their country into a world power of the 21st century under the leadership of Kim Jong Il. Also, we wish leader Kim Jong Il good health.

We hope that Kimjongilia will be in full bloom all over the world."

Hwang Jin Song, member of the congratulatory group of Koreans in Japan

"We have come here with a longing to see our leader Kim Jong Il.

Our pride and honour of having him as our great father know no bounds. Through the visit to the venue of the exhibition of the flower of the sun held to mark the February holiday I have keenly felt the pure reverence, worship and spirit of devotedly defending the leader of the people at home who are making strenuous endeavours to build a thriving nation under the wise Songun leadership of Kim Jong Il. We will do our best to improve national education initiated by President Kim Il Sung and led by leader Kim Jong Il. I wish the leader good health."

Seventh Kimjongilia Exhibition

(February 12–21, 2003)

Opening ceremony

Poster

"I am pleased to visit the exhibition hall to mark the birthday of Kim Jong Il, leader of the DPRK. Through the show I have had a good understanding of how loyal to their leader the Korean government and people are.

I wish the leadership, government, army and people of the DPRK health, happiness, development and prosperity."

Jalaleddin Namii Mianji, ambassador of the Islamic Republic of Iran to the DPRK

21세기의 태양 김정일장군

경애하는 어버이 김정일장군 만세!

Presentation of experiences in the cultivation of Kimjongilia

Eighth Kimjongilia Festival

With a surge of interest in and enlarged scale of the Kimjongilia exhibition, the exhibition developed into a festival in the eighth round. On February 14, 2004, the Eighth Kimjongilia Festival opened in a grand way at the Kimilsungia and Kimjongilia Exhibition Hall.

Congratulatory messages were sent to the organizing committee of the festival by 15 political parties and organizations of different countries including the Executive Council of the Central Committee of the Bulgarian Communist Party (Marxist) and the Bangladesh People's League.

On display were over 16 000 pots of Kimjongilia presented by the Korean people and Pyongyang-based diplomatic missions and offices of international organizations.

During the festival the visitors numbered over 1 000 000.

Visitors included DPRK-resident diplomats, military attachés, economic and trade counsellors, officials related to culture and friendship of embassies in Pyongyang, other foreigners and overseas Koreans including the congratulatory groups of Koreans in Japan and the Federation of Korean Nationals in China.

On February 15, a presentation of experiences in the Kimjongilia cultivation was held at the exhibition hall.

The flower festival was closed on February 25.

Impressions

Wu Donghe, ambassador of the People's Republic of China to the DPRK

"The fragrance of flowers on pearly shelves
In glittering exhibition hall fills the sky
On the February holiday bringing spring earlier
Kimjongilias come into bloom vying with each other
They are so beautiful

That I have forgotten to return home, admiring their beauty."

Elena Shervakova, director of the Russian State Moiseyev Folk Dance Troupe

"I cannot help admiring the beauty of the Kimjongilias flowering to mark the birthday of leader Kim Jong Il.

This flower is symbolic of the reverence of all the Korean people for their leader.

It is a great honour for us to celebrate the auspicious February holiday with the Korean people. Kimjongilia is, indeed, a beautiful flower of mankind."

Nicholas Boner, president of Koryo Tours Compamy, the U.K.

"It is indeed a great honour and privilege to be able to participate in the wonderful Kim Jong Il flower festival that demonstrates the Korean people's love for the General and allows us to show our great respect and admiration.

The dedication of the individuals and groups who have made the displays shows such devotion and is indeed a wonderous sight."

Vladislav Prokopenko, military attaché of the Embassy of the Russian Federation in Pyongyang

"I saw, with deep emotion, the flowers symbolic of the reverence of the Korean people for their leader Kim Jong Il, supreme commander of the KPA. The red colour of the flower shines the country brightly and warms the people with love. Kimjongilia is an immortal flower, a tribute to the great man. Marking this significant day, I wish Kim Jong Il, Chairman of the National Defence Commission of the DPRK, good health and great success in building up the defence capacity of the country."

Stanislav Variboda, ITAR-Tass special correspondent in Pyongyang

"I was really astonished by the beauty of Kimilsungia and Kimjongilia.

I've seen them for the first time in my life. I've never imagined that such beautiful flowers could bloom in the middle of winter.

On the threshold of February 16, I wish leader Kim Jong Il good health and hope that the Korean people will achieve success in building a prosperous and powerful

nation and reunify the country by themselves as early as possible."

Nazir Ahmad Khan, ambassador of the Republic of Pakistan to the DPRK

"The flowers are a symbol of love. These flowers show the love the people have for their great leader. We are impressed to see how well these are arranged and exhibited."

Jon Yong Won, Korean resident in the US

"I've seen Kimjongilia for the first time and it is really lovely and charming.

As an unknown Korean in the US, I pray that our Korean nation will reunify the country at the earliest date by displaying the national spirit as fervently as this flower."

Jacques Santer, head of the European Parliament delegation

"With deep impression, we saw the gorgeous display of Kimilsungia and Kimjongilia, which are really wonderful flowers. We have really made a good visit."

Nicola Pirotsi, member of the delegation of the Italian non-governmental cooperation organization Apmal

"My country is called a land of flowers. However, I've never been in such a beautiful sea of flowers as this in my life. Every flower here is meaningful and has been grown with great care. I extend my sincere congratulations to this wonderful festival and hope that it will make big success."

Esteban Lobaina Romero, ambassador of the Republic of Cuba to the DPRK

"I was deeply impressed by the beautiful festival hall. As a show of our love, admiration and respect for leader Kim Jong Il greeting his birthday, we put on display the flowers we had grown ourselves. I hope wholeheartedly that his great ideology will permanently grip the hearts of the world people aspiring for peace and justice."

Xi Xinlong, Xinhua chief correspondent in Pyongyang

"Naming Kimjongilia after leader Kim Jong Il is a token of the boundless respect and love of the Korean people for him and a symbol of the brilliant future of the

Korean socialism. I wish Kimjongilia will bloom more beautifully and be immortal."

L. Golovanov, People's Artiste of the former USSR and dance director of the Russian State Moiseyev Folk Dance Troupe, and A. Gussy, Russian People's Artiste and chief conductor of the dance troupe

"We are writing this in the name of dancers of the Moiseyev dance troupe.

Wonderful. This can be seen nowhere else in the world.

Such beautiful flowers can be grown only with sincere admiration.

Like so many DPRK citizens and working people, we would like to grow this flower and present it to leader Kim Jong Il. We extend our thanks to the festival organizers and technical personnel for their painstaking efforts."

Ri Chol Jae, head of the congratulatory group of the Federation of Korean Nationals in China in celebration of February 16

"Kimjongilia is in full bloom everywhere in the homeland and spreading to many other countries and regions of the world. Respect and admiration for leader Kim Jong Il are expressed by more and more people around the world.

Kimjongilia! May you be in bloom all over the world forever."

Abdullah Hamidi Benam, military attaché of the Embassy of the Islamic Republic of Iran in Pyongyang

"First of all, I would like to offer my warm congratulations to leader Kim Jong Il and the Korean people on the occasion of his birthday. I am pleased to come here when the whole country is in festive mood.

This festival gives a good picture of the DPRK prospering under the wise leadership of Kim Jong Il with the passage of time. Though they are experiencing hardship under the pressure of the US imperialists, the Korean people are doing their best for world peace and security.

I extend my thanks to the organizing committee of the festival and all the institutions and groups which exhibited their flowers at the festival. I wish leader Kim Jong Il good health and the DPRK prosperity."

Eighth Kimjongilia Festival

(February 14–25, 2004)

Poster

Visitors describe their impression on the exhibition

Poster

Closing ceremony

Kimjongilia Exhibition in Celebration of June 19

On June 17, 2004, the Kimjongilia Exhibition in Celebration of June 19 was opened in Pyongyang to commemorate the 40th anniversary of leader Kim Jong Il's start of work in the Central Committee of the Workers' Party of Korea.

On display were over 15 000 pots of Kimjongilia and other rare flowering plants which were grown by many units of the country.

Tens of thousands of people visited the exhibition hall every day and on June 19 the turnout stood at over 130 000.

Among visitors were overseas Koreans and their delegations including the home-visiting group of students from Korea University of Chongryon and many foreigners including Pyongyang-based diplomats and economic and trade counsellors.

During the exhibition, the State Folk Art Troupe, Pyongyang Circus and Central Youth Art Propaganda Team gave art performances in the square in front of the Kimilsungia and Kimjongilia Exhibition Hall, which enlivened the festival.

The exhibition was closed on June 23.

Impressions

Evelio Duenas Ponce, counsellor of the Embassy of the Republic of Cuba in Pyongyang

"I am very pleased to see the Kimjongilia exhibition hall. Leader Kim Jong Il's wise leadership over Party work has enabled the Korean people to become strong nation who fight courageously against any formidable enemy and display their dignity and might. Seeing the exhibition, I have fully realized how the Korean people trust and look up to leader Kim Jong Il.

The Kimjongilia exhibition hall is a beautiful flower garden. Every exhibit is associated with a great longing for and devotion to their leader. I hope their struggle to build a thriving nation will emerge victorious under his Songun leadership."

Wang Maojie, head of No. 101 delegation of China

"All kinds of beautiful flowers bloom vying with one another in Pyongyang in June
And their fragrance fills the air attracting the people
O, immortal flower that remains in bloom forever!
His forty-year-long energetic leadership has brought happiness to the people
Illumining the road ahead of them with Songun politics
And they build a thriving nation in single-hearted unity."

Choe Il Su, member of the delegation of Koreans in Japan

"Beautiful Kimjongilia
May you bloom forever
And instill into our people
A hope as sweet as you."

Kang Kwi Su, member of Korea University delegation of Chongryon

"I've never seen such a flower as beautiful and red as Kimjongilia. I will keep Kimjongilia in my heart forever."

Phan Trong Thai, ambassador of the Socialist Republic of Vietnam to the DPRK

"It is a great honour for me to see the flower exhibition held in commemoration of the 40th anniversary of leader Kim Jong Il's start of work in the Central Committee of the Workers' Party of Korea. Kim Jong Il is the great leader of the DPRK. He has led the country to make great achievements in national defence and the cause of Korea's peaceful reunification. I wish the Korean people greater success under the leadership of Kim Jong Il."

Kim Po Yong, student of Illinois State University in the US

"It is a wonderful sight to see all these Kimjongilias that were grown with such care and effort. It is obvious how much love the people of this country have for their leader."

Jo Il Min, representative of the Pyongyang Mission of the Anti-imperialist National Democratic Front

"Along with the time Kimjongilia will bloom red and red in the hearts of the seventy million fellow countrymen supporting the Songun ideology of leader Kim Jong Il."

Kimjongilia Exhibition in Celebration of June 19

(June 17–23, 2004)

Poster

Ninth Kimjongilia Festival

On February 12, 2005, the Ninth Kimjongilia Festival opened at the Kimilsungia and Kimjongilia Exhibition Hall in Pyongyang.

Kimjongilia exhibitions took place in every province of the country at the same time, so that the whole country was immersed in a festive mood.

The festival hall was adorned with over 19 000 pots of Kimjongilia which the Korean people and foreigners had grown with great care.

The Embassy of the Russian Federation in Pyongyang displayed full-blown Kimjongilias with the picture of leader Kim Jong Il meeting the Russian President Putin and other embassies including the Chinese and Cambodian embassies also exhibited the flowers with all their sincerity. Draws also included the flowers exhibited by the Nepalese National Committee for Remembering President Kim Il Sung**,** friendship and solidarity organizations of different countries and international organizations.

The venue was visited by a great number of people every day with a total turnout amounting to over 800 000. The viewers also included Pyongyang-based diplomats, military attachés, economic and trade counsellors, the delegation of the International Liaison Department of the Central Committee of the Communist Party of China, other foreign delegations and the delegations of overseas Koreans.

On February 14, there was a presentation of experiences in the Kimjongilia cultivation at the Kimilsungia and Kimjongilia Exhibition Hall.

The festival was closed on February 21.

Impressions

Eugen Popa, Rumanian chargé d'affaires to the DPRK

"Congratulations to the wonderful festival. This festival created by the beauty of nature and sincere efforts of the Korean people shows the love and respect of the Korean people for Chairman of the National Defence Commission Kim Jong Il.

I wish once again Chairman Kim Jong Il long life, happiness and prosperity."

Bassam Al Mhames, attaché of the Embassy of the Arab Republic of Syria in Pyongyang

"It is a good fortune for me to visit the venue of the Kimjongilia festival, great festival of all humankind as well as the Korean people, on the occasion of the birthday of leader Kim Jong Il. The friendly Korean people value this flower as it symbolizes his devotion to his people. I deem it a happiness and honour to offer my best regards to leader Kim Jong Il on this auspicious occasion.

I wish him happiness and the Korean people progress and prosperity and success in the struggle for national reunification under his wise leadership."

Andrey Karlov, ambassador of the Russian Federation to the DPRK

"Thank you for ensuring my visit to the Kimjongilia festival hall.

The flowers on display mirror the immense respect and admiration of the Korean people for Kim Jong Il, Chairman of the National Defence Commission of the DPRK."

Bruce Hugh Gollan, general manager of Korea-Maranatha Enterprise Development Ltd.

"Congratulations to the fantastic exhibition. The exhibition gives great credit to the creativity and energy of the Korean people and their honour for Chairman Kim Jong Il.

The Kimjongilia blooms capture that vibrant energy and represent well the heart of the nation and its leader. Long life and even greater success for Chairman Kim Jong Il."

Jakob Poke Rimer, head of delegation of the International Federation of Red Cross and Red Crescent societies

"I have seen Kimjongilia again in wonder.

No other countries but the DPRK can show such a wonderful flower in the world."

Nam Sung U, head of the congratulatory group of Koreans in Japan in celebration of February 16

"In reflection of the best wishes and reverence of all the Chongryon officials and Koreans in Japan, I warmly congratulate leader Kim Jong Il greeting his birthday amidst the blessings of all the people. The warm hearts of our people who venerate him are in bloom in the sea of beautiful Kimjongilias."

Ninth Kimjongilia Festival

(February 12–21, 2005)

Poster

21세기의 태양 김정일장군 만세!

"It is indeed a great joy and honour to once again visit the flower exhibition marking the auspicious occasion of the birthday of leader Kim Jong Il.

The beautiful and grand floral exhibition clearly demonstrates the love and affection of the great people of Korea for President Kim Il Sung and leader Kim Jong Il.

May the close and friendly relations between Malaysia and the Democratic People's Republic of Korea be further strengthened in the years ahead."

Dato Md. Yusoff Bin Md. Zain, Malaysian ambassador to the DPRK

Choe Sang Gyun, musician of an art troupe of Korean nationals in America, makes an entry in the visitor's book

Wang Jiarui, director of Foreign Liason Department of Chinese Communist Party, makes an entry in the visitor's book

Kimilsungia and Kimjongilia Exhibition in Celebration of the 60th Anniversary of the Founding of the Workers' Party of Korea

On October 6, 2005, the Kimilsungia and Kimjongilia Exhibition in Celebration of the 60th Anniversary of the Founding of the Workers' Party of Korea opened in a grand way at the Kimilsungia and Kimjongilia Exhibition Hall.

A signboard reading "The Kimilsungia and Kimjongilia Exhibition in Celebration of the 60th Anniversary of the Founding of the Workers' Party of Korea" and the emblem of the festival were seen at the venue of the exhibition and the flags of the Workers' Party of Korea and the festival were fluttering.

On display were over 20 000 pots of Kimilsungia and Kimjongilia presented by DPRK institutions, foreigners and overseas Koreans.

The exhibition hall showed the 60-year history of the Workers' Party of Korea with flowers. It was crowded with visitors every day.

Among the visitors were the senior officials of the Party and government, officials from ministries, national agencies and working people's organizations, former unconverted long-term prisoners who are patriotic fighters for reunification, delegates to the celebrations of the 60th anniversary of the Workers' Party of Korea, KPA soldiers, working people, students and schoolchildren, overseas Koreans who came to the homeland to participate in the celebrations, Chinese government delegation headed by Wu Yi, then vice-premier of the State Council of the People's Republic of China, Megawati Sukarnoputri, former Indonesian President and general chairwoman of the Indonesian Fighting Democratic Party, and her suite, delegation of the Workers' Party of Congo, delegation of the Workers' Party of Mexico and other foreign delegations and military attachés corps in Pyongyang.

They saw Kimilsungias and Kimjongilias with deep emotion.

The exhibition was closed on October 13.

Impressions

So Man Sul, chairman of the Central Standing Committee of Chongryon

"The exhibition of the full-blown immortal flowers reminds me of the glorious 60-year history of our Party led by the peerless great men.

The theme of the exhibition is clear and it is arranged well in keeping with the style of flower exhibition. Kimilsungia and Kimjongilia are famous as they bear the names of the great leaders. They will be eternal along with their august names."

Yang Yong Dong, then chairman of the Federation of Korean Nationals in China

"The magnificent exhibition hall reflects the desire of the revolutionary people of the world to venerate forever President Kim Il Sung and leader Kim Jong Il who put Korea on the map and illumine the way ahead of the world with the torch of Juche. It also mirrors the respect of the Korean and world peoples for leader Kim Jong Il leading the cause of making the world independent to victory by dint of Songun politics. It is a pride of the Korean people and Kimilsungia and Kimjongilia will always be in full bloom all over the world. I do not want to leave this fascinating exhibition hall."

Wu Yi, then vice-premier of the State Council and head of the delegation of the Chinese government

"Seeing the wonderful sea of beautiful flowers, I have come to have a better understanding of immense reverence of all the people for President Kim Il Sung and Chairman Kim Jong Il. I was touched by the devotion of the KPA units and all the institutions which grew the flowers by themselves. I visited many flower expositions in the world, but I have never seen such a grand show of flowers named after their leaders. I would like to be a member of the Kimilsungia and Kimjongilia Amateurs Association and contribute to propagating the flowers."

Megawati Sukarnoputri, former Indonesian President and general chairwoman of the Indonesian Fighting Democratic Party

"Seeing the charming flower exhibition, I have felt a great pride in being honorary

chairwoman of the Association of Supporters for Propagation of Kimilsungia and Kimjongilia. It is more distinguished and wonderful than that of last April. The sincerity and devotion of the Korean people including the workers here are really amazing."

Wang Zhecai, military attaché of the Embassy of the People's Republic of China in Pyongyang

"Kimilsungia and Kimjongilia are the flowers of hope and victory. I sincerely wish the flowers mirroring the people's loyalty would be in full bloom throughout the world and the banner of victory of the Workers' Party of Korea would be fluttering forever."

Mark Sedon, head of the delegation of the British Labour Party

"Both are all excellent, the exhibition hall and the exhibition. I was greatly encouraged by the flower show pulsing with the strength and spirit of the Korean people. The birth of the flowers named after great men is a pride of mankind. May Kimilsungia and Kimjongilia be eternal as the flower of mankind as well as the Korean people."

Zhang Jinlu, daughter of Zhang Weihua, Chinese anti-Japanese revolutionary martyr

"The beautiful flower, a token of our love for President Kim Il Sung, will always bloom in our hearts."

Mahmoud Mohamed Osman Atik, military attaché of the Embassy of the Arab Republic of Egypt in Pyongyang

"It is an honour to have seen the exhibition of Kimilsungia and Kimjongilia on the occasion of the 60th anniversary of the Workers' Party of Korea. I looked round in a trance Kimilsungias and Kimjongilias presented by ministries and other institutions of the country as well as individuals. Availing myself of this opportunity, I pray for the immortality of Kim Il Sung, the founder of the WPK, and offer my heartfelt thanks to General Kim Jong Il who devotes his all to the cause of independence of the world."

Uma Thapa, deputy country director of the World Food Program

"The visit to Kimilsungia and Kimjongilia exhibition is very impressive. The flowers were decorated very well. They are beautiful."

Kimilsungia and Kimjongilia Exhibition in Celebration of the 60th Anniversary of the Founding of the Workers' Party of Korea

(October 6–13, 2005)

Poster

Megawati Sukarnoputri, ex-President of the Republic of Indonesia, looks round the exhibition hall

Members of Pyongyang-Visiting-Group of south Korea looking round the exhibition hall

Visitors making an entry in the visitor's book

Tenth Kimjongilia Festival

On February 14, 2006, the Tenth Kimjongilia Festival opened in Pyongyang.

A signboard reading "The Tenth Kimjongilia Festival" and the emblem of the festival hung on the façade of the Kimilsungia and Kimjongilia Exhibition Hall and the festival flags were fluttering.

Over 23 000 pots of Kimjongilia were on display in the name of Koreans at home and abroad, the Central Standing Committee of Chongryon, the embassies in Pyongyang, foreign friendship, social organizations, etc.

Korean working people, students and schoolchildren and service personnel came to see the festival. Seeing Kimjongilias, they felt a pride in having the famous flower as a national treasure and admired the devotion of the flower growers.

DPRK-based foreign embassies including those of Russia, China and Cambodia put on display full-blown flowers as a show of their respect for leader Kim Jong Il and friendly feelings toward the Korean people, to the admiration of viewers.

The Central Standing Committee of Chongryon exhibited a hundred and scores of pots of Kimjongilias against the background of the model of the Korean Hall of Culture by placing the picture of leader Kim Jong Il meeting with Chongryon officials at the centre. During the festival, a presentation of experiences in the Kimjongilia cultivation and a TV forum were held at the Kimilsungia and Kimjongilia Exhibition Hall.

The Tenth Kimjongilia Festival was closed on February 21.

Impressions

Eugen Popa, counsellor of the Embassy of Romania in Pyongyang

"The Tenth Kimjongilia Festival was a complete display of the great admiration of the Korean people for leader Kim Jong Il. In Rumania, there is a saying 'A garden of exuberant flowers brings about peace and prosperity.' The DPRK with such a beautiful flower garden will be peaceful and prosperous forever. It is, indeed, a great masterpiece."

Giraldo Abreu Morales, military attaché of the Embassy of the Republic of Cuba in Pyongyang

"We have looked round the venue of the impressive festival held on the occasion of the birthday of Kim Jong Il, the leader of the Korean people and supreme commander of the Korean People's Army. In the name of the Cuban Revolutionary Armed Forces and myself, I wish Kim Jong Il good health and success in his important work.

I wish the Korean people success in the building of a thriving nation and national reunification which President Kim Il Sung had been so desirous of."

Nakagawa Kazunori, representative of the Aichi Mie Liaison Association for Supporting Korea's Reunification, Japan

"Through my first visit to the venue of the Kimjongilia Festival held in celebration of the birthday of leader Kim Jong Il**,** I felt the immense reverence of the Korean people and peoples of many countries of the world for him."

Baudouin Dekers, general secretary of the Workers' Party of Belgium

"This wonderful Kimjongilia Festival fully shows the loyalty of the Korean people to Comrade Kim Jong Il. He has led his people to victory and will continue to lead them to victory in the future, too. These flowers have bloomed with the help of the sincere care of the growers. Great success to you!"

Cha Sang Bo, vice-chairman of the Federation of Korean Nationals in China

"These flowers mirror the reverence of the seventy million fellow countrymen and the world progressives for leader Kim Jong Il who leads the efforts to build a thriving nation and the cause of independence for mankind to victory by dint of ever-victorious Songun politics. They will continue to bloom all over the world as a pride of our nation."

V. Khallilov, general conductor of the Central Military Band of the Ministry of National Defence of the Russian Federation

"We were deeply impressed by the Kimjongilia Festival held to mark the birthday of Kim Jong Il, supreme commander of the Korean People's Army.

The DPRK is an amazingly beautiful country like beautiful Kimjongilia.

We are very pleased to have seen all this beauty with our own eyes."

Tenth Kimjongilia Festival

(February 14–21, 2006)

Poster

Opening ceremony

위대한 수령 김일성 동지는 영원히 우리와 함께 계신다
2.16
김정일 화 축전

TV forum

Pots of Kimjongilia sent by overseas Koreans

Wu Donghe, ambassador of the People's Republic of China to the DPRK, makes an entry in the visitor's book

A visitor describes her impression on the exhibition

Eleventh Kimjongilia Festival

The Eleventh Kimjongilia Festival opened in a grand way on February 14, 2007.

Present at the festival were the DPRK institutions, national agencies, working people and youth and students who grew Kimjongilias. Kimjongilias were on display in the name of the embassies of over 30 countries including Russia and China, international organizations, over 20 friendship and solidarity organizations, the missions of organizations of overseas Koreans and individuals.

A sea of Kimjongilias associated with the feeling of respect for leader Kim Jong Il was unfolded in the venue, giving off sweet smell around.

Chongryon officials and Koreans in Japan adorned their section with models of Jongil Peak and Kim Jong Il's birthplace in the Paektusan secret camp and displayed hundreds of Kimjongilias, drawing the attention of visitors.

The Eleventh Kimjongilia Festival ended on February 21.

Impressions

Martin Lötscher, chairman of the Swiss Committee for Supporting the Independent and Peaceful Reunification of Korea

"I visited the Kimjongilia Festival hall with a great joy. Kimjongilia is the most wonderful and precious flower that reflects the love of the Korean people and the world progressive and peace-loving peoples for leader Kim Jong Il."

Naulak Tuan Khankhup, ambassador of the Republic of India to the DPRK

"It is a great privilege to visit the Kimjongilia festival hall. This is a great show of love, respect and affection of the people of the DPRK to leader Kim Jong Il. The arrangements are perfect, beautifying the honour and great love of the people to their leader. May the love and respect blossom as Kimjongilia blooms!"

Jamal Sharifuddin Johan, charge d'affaires of the Malaysian Embassy in

Pyongyang

"On behalf of the embassy and government of Malaysia, I would like to congratulate the great leader Kim Jong Il and the people of this great nation on his birthday. I have had a pleasant experience visiting the venue of the Eleventh Kimjongilia Festival and the decorations and presentation of Kimjongilia have been wonderful and beautiful. May the great leader Kim Jong Il enjoy many more prosperous, successful and happy years ahead."

Anatoli Tamahkov, journalist of the delegation of Nakhodka City, Russia

"During my visit to the DPRK, I have seen the significantly decorated flower festival held in celebration of the birthday of leader Kim Jong Il. Really wonderful."

Manju Ratna Sakya, chairman of the Nepal Journalist Association

"The six-member high-level journalist delegation led by me is very happy to visit the Kimilsungia and Kimjongilia Exhibition Hall. We are highly impressed.

We wish a long life and good health of the great leader Comrade Kim Jong Il and prosperity of Korea. Long live Nepal-Korea relations!"

Valery Beltsov, member of the delegation of Nakhodka City, Russia

"On this auspicious occasion of the birthday of leader Kim Jong Il, I have seen over 250 000 flowers in the venue of Kimjongilia festival.

What I saw is not simply flowers, but the hearts of the Korean people who love their respected leader. I hope the DPRK will prosper and more people enjoy Kimjongilia and try to grow it. I extend thanks to the Korean people advancing with a great aim. I also offer my thanks to them for their love for leader Kim Jong Il."

Abudullah Jalali Nasab, military attaché of the Embassy of the Islamic Republic of Iran in Pyongyang

"In the name of God, I am very happy that I visit this exhibition for the second time.

At first I congratulate this occasion to H. E. Marshal Kim Jong Il and I wish he has long life and health and the Korean nation visit this occasion for many times.

This exhibition shows the deep relation between leader and nation and shows that

DPRK people like and love their leader."

Ruben Perez Valdes, ambassador of the Republic of Cuba to the DPRK

"We warmly congratulate the organizers of this wonderful festival.

On the occasion of his birthday, we offer heartfelt congratulations again to the respected Supreme Commander Kim Jong Il."

Choe Jang Gil, Korean resident in America

"I've seen the most beautiful flower in the world for the first time in my 70-year life. I hope that this flower will beautify the whole country more and more."

Nikitsin Alexandrovich Sergeyevich, head of the delegation of KAMAZ Co., Ltd. of Russia

"We've got really impressive feelings looking round the Kimjongilia festival hall on the occasion of the birthday of leader Kim Jong Il.

Best regards to him."

Chae Kyong Ae from the Kumgangsan Opera Troupe of Chongryon

"I have been able to feel the absolute loyalty of the home people to leader Kim Jong Il as I look round the Eleventh Kimjongilia Festival hall when the whole country is vibrant with a festive mood on the occasion of his birthday.

Back to Japan, I will keep pace with them and take active part in patriotic work."

Ahmed Medhat Ismail Attia, military attaché of the Embassy of the Arab Republic of Egypt in Pyongyang

"Today, I have had the honour of seeing the Kimjongilia festival.

We have been charmed by the looks of fully-blown Kimjongilias.

Although there are so many flowers in the world, Kimjongilia is the most beautiful and representative of them all. Availing myself of this occasion, I hope that under the leadership of Marshal Kim Jong Il, supreme commander of the Korean People's Army, the Korean people will make progress and prosperity in firm unity.

At the same time I wish leader Kim Jong Il greeting his birthday good health."

Eleventh Kimjongilia Festival

(February 14–21, 2007)

Pots of Kimjongilia sent by overseas Koreans

Pots of Kimjongilia sent by south Korean people

Poster

“ Kimjongilia, the immortal flower of loyalty,
Blooms red
Looking up to the Sun of Songun
You will be in full bloom on this land forever
Along with the bright future
Of Juche Korea, Kim Jong Il’s country.”

Ri Ki Sok, head of the congratulatory group of Koreans in Japan in celebration of February 16

Visitors describe their impression on the exhibition

Alba Chabez with the Institute of Juche Idea of Ecuador makes an entry in the visitor’s book

Kimilsungia and Kimjongilia Exhibition in Celebration of the 75th Anniversary of the Founding of the Korean People's Army

On April 22, 2007, the Kimilsungia and Kimjongilia Exhibition opened in celebration of the 75th anniversary of the KPA, following the Ninth Kimilsungia Festival which started on April 13.

On display were over 23 000 pots of Kimilsungia and Kimjongilia the Korean people had grown with immense reverence for President Kim Il Sung and leader Kim Jong Il who performed immortal feats for the founding and strengthening of the revolutionary armed forces. Draws were the flowers displayed in the name of friendship and solidarity organizations and social figures of different countries, overseas Koreans and their organizations.

During the exhibition the venue was visited by a great many working people, youth and students, overseas Koreans and foreigners. The visitors admired the exhibition of beautiful flowers.

The exhibition ended on April 27.

Impressions

Torbon Byorkman, head of the delegation of Sweden-Korea Friendship Society

"I, on behalf of the delegation of Sweden-Korea Friendship Society, express my thanks to you to invite us to such a wonderful flower exhibition. It is significant to remember the leader by means of flowers. Even the president of a super power will not be in the memory of his people like this."

Yayat Sudrajyat, military attaché of the Embassy of the Republic of Indonesia in China

"A wonderful flower exhibition! I have never seen such a nice flower. It is my great joy to see such a flower. Long live the Democratic People's Republic of Korea."

Kimilsungia and Kimjongilia Exhibition in Celebration of the 75th Anniversary of the Founding of the Korean People's Army

(April 22–27, 2007)

Poster

Twelfth Kimjongilia Festival

The Twelfth Kimjongilia Festival opened in Pyongyang on February 13, 2008.

The festival was of greater significance as it took place on the 20th anniversary of the naming of Kimjongilia.

Signboards reading "The 20th Anniversary of Naming of Kimjongilia", "The Twelfth Kimjongilia Festival" and "Celebration of February 16" and the emblem of the festival hung on the façade of the Kimilsungia and Kimjongilia Exhibition Hall, the venue of the festival, while the flags of the festival were fluttering in the wind.

On display were Kimjongilias presented by the Central Standing Committee of Chongryon, the Federation of Korean Nationals in China, other overseas Korean organizations and individuals, Pyongyang-based diplomatic missions, offices of international organizations, foreign friendship organizations, social organizations, businesses and personages.

During the festival hundreds of thousands of Koreans including working people and youth and students visited the venue of the festival.

Visitors also included the congratulatory groups and delegations of overseas Koreans, resident diplomats, military attachés, economic and trade counsellors, and representatives of international organizations and other foreign figures.

The Twelfth Kimjongilia Festival was closed on February 19.

Impressions

Puntsagdashu, managing director of the Hum Co., Ltd. of Mongolia

"A-class flower festival. It is a spectacle nobody can enjoy in any other country.

I could feel again the immense reverence and trust of the Korean people in leader Kim Jong Il. My excitement is beyond description."

Dau Xuan Long, military attaché of the Embassy of the Socialist Republic of Vietnam in Pyongyang

"The Twelfth Kimjongilia Festival is a significant flower show reflecting the desire of the Korean army and people to accomplish the cause of Korea's reunification without fail by upholding leader Kim Jong Il as the Sun of the 21st century."

Le Van Cu, ambassador of the Socialist Republic of Vietnam to the DPRK

"I am very pleased to see the Kimjongilia festival on the occasion of the anniversary of the birth of Kim Jong Il, the great leader of the fraternal Korean people.

I wish General Secretary Kim Jong Il good health and happiness.

I hope the Korean people will achieve great success in the building of a thriving nation and the cause of the country's independent and peaceful reunification, united firmly around the Workers' Party of Korea led by General Secretary Kim Jong Il and by inheriting the revolutionary cause of President Kim Il Sung."

Miguel Angel Gala Valiente, military attaché of the Embassy of the Republic of Cuba in Pyongyang

"Every year I am here, the exhibition gives me a glimpse of the reverence of the Korean people for their leader and their diligence and resourcefulness.

I congratulate the Korean people on the birthday of the great leader Kim Jong Il, and I hope they will always emerge victorious."

Zile Singh, ambassador of the Republic of India to the DPRK

"Flowers Exhibition! It is great!

Flowers have universal appeal beyond the boundaries of nations, religions and cultures. Flowers are light; whereas the human beings are heavy.

Be as light as a flower!"

Twelfth Kimjongilia Festival

(February 13–19, 2008)

Opening ceremony

Display booth of the Central Standing Committee of Chongryon

Display booth of the Federation of the Korean Nationals in China

Display booth of the Jilin Province Friendship Import and Export Co., Ltd., China

Poster

Visitors describe their impression on the exhibition

Kimilsungia and Kimjongilia Exhibition in Celebration of the 60th Anniversary of the Founding of the Democratic People's Republic of Korea

On September 5, 2008, the Kimilsungia and Kimjongilia Exhibition in Celebration of the 60th Anniversary of the Founding of the DPRK opened in Pyongyang.

On display were Kimilsungias and Kimjongilias cultivated by the Korean soldiers and people, overseas Koreans, foreign diplomatic missions in Pyongyang, representatives of international organizations and friendship and solidarity groups and foreign figures.

The exhibits looked more beautiful as they were expressive of immense reverence for President Kim Il Sung and leader Kim Jong Il who performed immortal exploits for the founding and development of the DPRK, the country's independent and peaceful reunification and the cause of making the world independent.

An eye-catcher was the display stand of the Central Standing Committee of Chongryon which was adorned with hundreds of Kimilsungias and Kimjongilias, centring on the picture of President Kim Il Sung and leader Kim Jong Il indicating the way to develop Chongryon. They reflected the patriotic devotion of Chongryon officials and Koreans in Japan.

Hundreds of pots of Kimilsungia and Kimjongilia were displayed in the name of over 40 organizations from the five continents such as the Nepalese National Committee for Remembering the Great Leader Comrade Kim Il Sung, Sweden-Korea Friendship Society, Latin American and Caribbean Regional Committee for Solidarity with the Korean People and Support for Korean Reunification, Denmark-Korea Friendship Society and Switzerland-Korea Committee. Plastic arts were applied to the decoration of the display section to show that Kimilsungia and Kimjongilia are rooted in the hearts of all the people of the world.

The venue of the exhibition was visited by senior officials of the Party and government, KPA soldiers and working people and youths and students in Pyongyang.

Visitors also included Pyongyang-based diplomats, representatives of international organizations and military attachés, foreigners and overseas Koreans. Zhang Jinquan, the son of Zhang Weihua, Chinese anti-Japanese revolutionary martyr, anti-Japanese revolutionary fighters in China including Ri Jae Dok and families of Chinese anti-Japanese revolutionary martyrs and Chinese people related to the anti-Japanese struggle saw the flowers with deep emotion.

The exhibition was closed on September 12.

Impressions

Pae Ik Ju, head of the delegation of Chongryon officials

"I have keenly felt intense reverence of our people and the world people for the great men.

History will remember and praise Generalissimo Kim Il Sung**,** founding father of socialist Korea, and Marshal Kim Jong Il who is leading the DPRK to a thriving nation by inheriting the President's cause of nation building.

Chongryon and Koreans in Japan will always advance with the homeland.

The motherland and Chongryon led by Marshal Kim Jong Il will always emerge victorious."

Im Jong Hyok, head of the home-visiting group of students of Korea University

"We are here on the meaningful day marking the 60th anniversary of the founding of the glorious Democratic People's Republic of Korea.

We are very happy and impressed to see the beautiful flowers which the people at home have grown with great care. Back to Japan, we will get into bloom the flowers of loyalty to the great leaders Kim Il Sung and Kim Jong Il."

Chalenue Warinthrasak, ambassador of the People's Democratic Republic of Laos

to the DPRK

"The Kimilsungia and Kimjongilia Exhibition Hall gives an overall view of the single-mindedly united Korean people.

Kimilsungia and Kimjongilia are world-famous beautiful flowers."

Benua Penedet, secretary-general of the France-Korea Friendship Society

"We have visited the exhibition hall decorated with various flowers on the occasion of the founding anniversary of the DPRK and admired the love of the Korean people for their leaders.

Flowers are universally considered as one of means of communication between people.

We hope that hundreds of kinds of flowers will bloom on the road ahead of the Korean people advancing towards national reunification."

Vera Konnyukhova, journalist of *Vladivostok* newspaper of Russia

"All the beauties of Korea are on display in this exhibition hall.

Thank you for showing me these. I hope these flowers will bring beautiful peace to the globe."

Rosarida, national secretary of the October 8 Revolutionary Movement of Brazil

"Kimilsungia and Kimjongilia are very beautiful.

As the names of Comrade Kim Il Sung and Comrade Kim Jong Il shine brightly, Kimilsungia and Kimjongilia add more glamour to this exhibition hall.

We warmly congratulate the organizers of this wonderful exhibition on the occasion of the 60th anniversary of the founding of the DPRK."

Kimilsungia and Kimjongilia Exhibition in Celebration of the 60th Anniversary of the Founding of the Democratic People's Republic of Korea

(September 5–12, 2008)

Opening ceremony

A visitor describes her impression on the exhibition

Thirteenth Kimjongilia Festival

On February 14, 2009, the Thirteenth Kimjongilia Festival opened in Pyongyang.

The signboards reading "The Thirteenth Kimjongilia Festival" and "Celebration of February 16" and the emblem of the festival hung on the façade of the Kimilsungia and Kimjongilia Exhibition Hall, while the flags of the DPRK and the festival were hoisted.

In the venue of the festival, tens of thousands of Kimjongilias were put on display by Korean working people, youths and students, the Central Standing Committee of Chongryon and other overseas Koreans, south Koreans, DPRK-based diplomatic missions and offices of international organizations, foreign friendship organizations, social organizations, businesses and personages and Chinese residents in DPRK.

Full-blown Kimjongilias and other rare flowering plants were fascinating.

The display section of the Central Standing Committee of Chongryon was furnished with nearly 300 pots of Kimjongilia and the models of falls, pavilion and the Chollima Statue, drawing the special attention of visitors.

The Embassy of the People's Republic of China in the DPRK displayed several beautiful Kimjongilias against the background of the picture of Chairman Kim Jong Il meeting with Chinese President Hu Jintao in reflection of the confidence of the peoples of the DPRK and China in the bright future of the bilateral friendship.

Seen were also the pots of Kimjongilia sent in the name of embassies in the DPRK including the Islamic Republic of Iran, Republic of Indonesia and the Kingdom of Cambodia and the offices of World Health Organization and World Food Program and other international organizations in Pyongyang. The flowers shone with their reverence for leader Kim Jong Il.

During the festival the exhibition hall was visited by many people every day.

Visitors included the congratulatory groups and delegations of overseas Koreans including a congratulatory group of Koreans in Japan, overseas Koreans, Pyongyang-based diplomats, economic and trade counsellors, military attachés and other foreigners.

Looking round the venue of the festival, they said they were sure Kimjongilia

would bloom more beautifully in the hearts of all the world people.

Meanwhile, Kimjongilia exhibitions were held in all the provinces of the DPRK.

On display were Kimjongilias which were grown by provincial institutions, industrial establishments, working people, youths and students.

The exhibitions served as an important occasion for popularizing the success and experiences obtained in the cultivation and propagation of Kimjongilia as well as for celebrating the February holiday significantly.

Impressions

Chorn Hay, ambassador of the Kingdom of Cambodia to the DPRK

"It is a great honour and pleasure to participate in the Kimjongilia festival and celebrate the birthday of Chairman Kim Jong Il together with the fraternal Korean people."

Jose Manuel Galego Montano, ambassador of the Republic of Cuba to the DPRK

"On the occasion of the birthday of Chairman Kim Jong Il, I wish him greater success in his work and good health.

This flower festival is the acme of art of the heroic Korean people.

Long live Comrade Kim Jong Il!

Long live the friendship between Cuba and the DPRK!"

Morteza Morodian, ambassador of the Islamic Republic of Iran to the DPRK

"Kimjongilia is a symbol of beauty and fighting spirit.

It is really praiseworthy to have named this flower after Chairman Kim Jong Il."

Kim Jong Ok, general director of the Huifa Trade Company in Hunchun, Jilin Province, China

"Marking his birthday, I, on behalf of my family, wish leader Kim Jong Il good health.

Through the Kimjongilia festival, I could see his greatness and the reverence of the

Korean people at home and overseas for him. Kimjongilia is really beautiful."

Ri Hwa Son, head of the delegation of officials of the Women's Union of Chongryon

"I have been here for the first time.

I have deeply been impressed by the Kimilsungias and Kimjongilias presented by peoples at home and abroad. And I have hardened my resolve to conduct patriotic work in Chongryon more vigorously."

Torben Due from World Food Program in the DPRK

"This is a very beautiful and impressive exposition of flowers made with the participation of all institutions and organizations in the DPRK and embassies and the UN."

Miguel Angel Gala Valiente, military attaché of the Embassy of the Republic of Cuba in Pyongyang

"Through today's visit to the festival, I could see the reverence of all the Korean and world peoples for the DPRK leader.

I wholeheartedly congratulate Supreme Commander Kim Jong Il on his birthday."

Nguyen Xuan Anh, first secretary of the Embassy of the Socialist Republic of Vietnam in Pyongyang

"It is my great pleasure to have a chance to enjoy Kim Jong Il Flower Festival.

I am very happy and inspired with the decoration presented by not only the Korean people from all walks of life but also other friends of the Korean people from all over the world."

Madani Hojaien, vice-president of Orascom Telecom company of Egypt

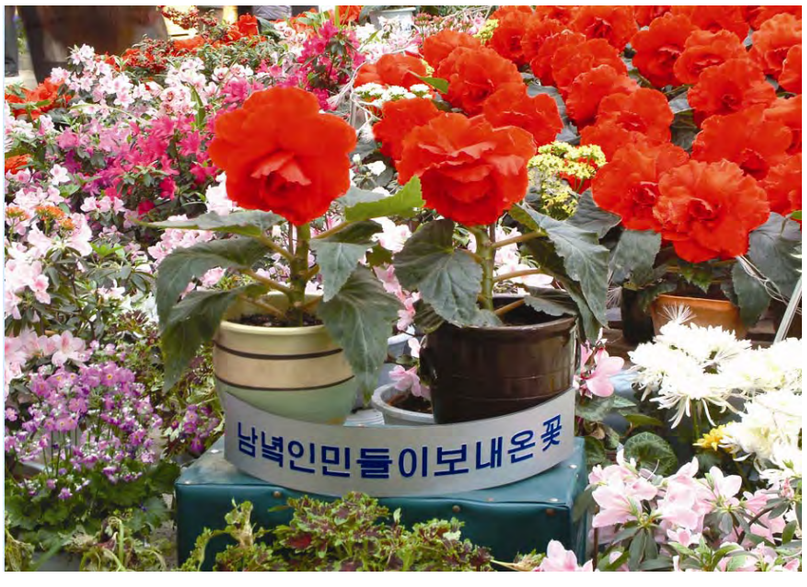
"It is a great pleasure to attend such a great event in the DPRK.

Congratulations to the great leader Kim Jong Il."

Thirteenth Kimjongilia Festival

(February 14–20, 2009)

Opening ceremony



Pots of Kimjongilia sent by south Korean people

Pots of Kimjongilia sent by overseas Koreans

Pots of Kimjongilia sent by foreign embassies and missions of international organizations in the DPRK

Fourteenth Kimjongilia Festival

On February 12, 2010, the Fourteenth Kimjongilia Festival opened in Pyongyang.

On display were the beautiful Kimjongilias grown by working people, youths and students with great care.

Exhibits also included those from south Korean people, overseas Koreans, Pyongyang-based diplomatic missions including the Chinese and Russian embassies, offices of international organizations such as the World Health Organization, World Food Program and UN Development Program, foreign friendship and solidarity organizations, businesses and individual figures.

Tens of thousands of Kimjongilias filled the venue, unfolding a charming scene.

A great number of people visited the festival hall. Among them were the congratulatory group of Koreans in Japan headed by Ri Ki Sok, vice-chairman of the Central Standing Committee of Chongryon, and other overseas Koreans' delegations and individuals and foreigners including Pyongyang-resident diplomats, delegates of international organizations, corps of military attachés and economic and trade counsellors.

The festival showcased the boundless admiration of the Korean soldiers and people and the admiration of world progressive people for leader Kim Jong Il.

The Fourteenth Kimjongilia Festival ended on February 19.

Impressions

Jang Chun Ja, director general of Chongryon-Kyongchun Joint Venture

"Seeing the festival of Kimjongilia, the immortal flower praised by all the people, I harden my resolve to follow the great leader.

I will attend the festival every year."

Choe Un Bok, chairwoman of the Federation of Korean Nationals in China

"Kimjongilia is blooming brilliantly like the sun in the hearts of Koreans in China. It is a proud symbol of our homeland in the year of great events.

The leader is making strenuous efforts to bring about a decisive turn in the people's living this year.

Looking at the red and large Kimjongilias as fervent as his passion, I have been convinced that his intention will come into reality.

Although Shenyang and Yanji are cold and unfavourable in climatic conditions, we will do our best to grow wonderful Kimjongilias."

V. Sukhinin, ambassador of the Russian Federation to the DPRK

"I hope the friendly Korean people will be happy and prosperous under the leadership of Kim Jong Il, chairman of the National Defence Commission of the DPRK, and the friendship between Russian and Korean peoples will bloom forever like the flowers in the exhibition hall."

Yokouchi Yuji, head of the Japanese Juche idea study delegation

"I congratulate General Secretary Kim Jong Il wholeheartedly on his birthday.

Through so many beautiful flowers on display, I could feel the single-hearted unity of the Korean people around him.

I offer my respects to the struggle of the Korean people who are making a big stride to open the gates of a prosperous and powerful country in 2012, the 100th anniversary of the birth of President Kim Il Sung, under the leadership of the General Secretary in the wake of having brought about a turn last year."

We, students of the Juche idea, have made a fresh resolve to work harder for the study and propagation of the Juche idea and the realization of independence of Japan and the world."

Yuri Sidorov, Russian ITAR-Tass special correspondent in Pyongyang

"It is a great pleasure for me to have been able to see the Kimjongilia festival.

I have never seen such a beautiful flower before.

I wish all the people who contributed to growing these flowers good health.

I sincerely congratulate the Korean people on the birthday of leader Kim Jong Il."

Andrei Izdovsky, general director of the ENK Group of Poland

"In Poland there is a city where roses are grown and put on display exclusively.

And we have seen many flower festivals. The venues are decorated with various species of flowers.

It is a unique experience to see the festival of one kind of flower.

Such a festival can be arranged only by the Korean people who have immense respect for their leader.

It is natural that Kimjongilia has been awarded gold medals in different international flower shows."

Mutsuma Sasan, program-coordinator of the Red Cross and Red Crescent

"Today I have deeply been impressed by the Kimjongilia festival that I have seen for the first time.

Finland often sponsors flower shows, but they are no match for this festival in scale and quality.

The festival is a unique flower show featured by the harmonious combination of reverence for the leader and the spectacular beauty of Kimjongilias which have bloomed in the middle of winter, ahead of the season.

I have deeply been moved by the sincerity of the Korean people who have grown flowers in cold winter to celebrate the birthday of leader Kim Jong Il."

Fourteenth Kimjongilia Festival

(February 12–19, 2010)

Opening ceremony

결사옹위
희천속도
김정일강성대국
2.16

외위원

2.16

Visitors describe their impression on the exhibition

Chapter 2
Functions to Mark the Anniversary of the Naming of Kimjongilia

Over 20 years have passed since Kimjongilia came into being as a result of sincere devotion of progressive people.

As time goes by, the Korean and world progressive peoples treasure Kimjongilia more and more.

A variety of functions were held in the DPRK on the occasions of the 10th and 20th anniversaries of the naming of the flower.

1. Functions to Mark the 10th Anniversary of the Naming of Kimjongilia

1) Meeting

On the occasion of the 10th anniversary of the naming of Kimjongilia, a commemorative meeting was held in Pyongyang on February 13, 1998.

It was attended by senior Party and government officials, officials concerned, service personnel, working people and overseas Koreans' delegations, visiting groups and foreign delegations and delegates who had come to the country to participate in the Second Kimjongilia Exhibition.

The speaker said that the 10th anniversary of the birth of Kimjongilia was being commemorated when the whole country was celebrating the birthday of leader Kim Jong Il. He extended thanks to the officials and working people who had grown Kimjongilias with immense reverence for leader Kim Jong Il to add glamour to the

February holiday and warmly welcomed visiting overseas Koreans and foreigners who were commemorating the anniversary with the Korean people. Saying that the world people immensely respect and praise Kim Jong Il for the brilliant exploits he performed for the country, the people, the times and humankind, the speaker noted that Kimjongilia was born thanks to such reverence for the peerless great man. A Japanese botanist who was charmed by his greatness bred the world-famous flower through his painstaking efforts and named it Kimjongilia, he said and continued:

"Kimjongilia, that caused a great sensation as soon as it was born, was propagated rapidly to the DPRK and many other countries over the past decade. With a surge of zeal for growing the flower dozens of Kimjongilia greenhouses have appeared across the country, organizing committees of Kimjongilia associations and Kimjongilia Amateurs Association have been formed and Kimjongilia was awarded special prizes, gold medals and top prizes at the international horticultural expositions and flower shows.

"Kimjongilia was born in reflection of the desire of the world people who value genuine life and dignity of man and love, justice and truth. For its beauty and rareness everybody wants to grow it at workplace and home. To fulfill their desire as soon as possible it is essential to develop the techniques of cultivating and propagating the flower and build more greenhouses. The Korea Kimjongilia Federation (at the time) should have close cooperation with Kimjongilia associations in other countries to exchange experiences in its cultivation and should supply young plants and offer technical aids to all the people who are eager to grow the flower."

In conclusion, the speaker emphasized that Kimjongilia would be in full bloom forever along with the name of leader Kim Jong Il.

2) Presentation of Experiences in the Kimjongilia Cultivation

On the occasion of the 10th anniversary of the naming of Kimjongilia, a presentation of experiences in the Kimjongilia cultivation was held on February 14 at the Pyongyang International House of Culture. Present there were officials concerned, botanists and horticulturalists from Pyongyang and local areas.

At the meeting, the results and experiences obtained in studying the biological

characteristics of Kimjongilia and the methods of its cultivation were presented. The speakers said that the introduction of new methods of propagation and cultivation provided a scientific and technological guarantee for getting the flower into fuller bloom.

Presented there were nine papers including "Research into breeding of Kimjongilia and characteristics of its species", "Study of application of Kumgang medicinal stone to growing Kimjongilia", "Characteristics of floral bud differentiation of Kimjongilia and method of lighting" and "Steps for protecting Kimjongilia from damage from summer heat".

2. Functions to Mark the 20th Anniversary of the Naming of Kimjongilia

1) National Meeting

The national meeting to mark the 20th anniversary of the naming of Kimjongilia was held on February 12, 2008, at the Central Youth Hall in Pyongyang.

It was attended by senior officials of Party and government, officials from ministries and national agencies, those engaged in the Kimjongilia cultivation in Pyongyang and local areas, members of the Association of Supporters for Propagation of Kimilsungia and Kimjongilia and working people in Pyongyang.

The vice-president of the Presidium of the Supreme People's Assembly of the DPRK addressed the meeting.

He said that the birth of Kimjongilia 20 years ago was a great event boosting national pride and an eye-opener for the world botanical circles. He went on to say:

"Kimjongilia achieved worldwide fame while winning top prize, Grand Prix, special prize, gold award, first prize, gold medal, etc. in many horticultural expositions and flower shows such as the 99 Kunming International Horticultural Exposition, China, the 12th International Flower Exhibition and the 2006 Shenyang International Horticultural Exposition, China. Kimjongilia is now in full bloom all over the country amid great interest of the Korean people and the world progressive people. In China,

National meeting to mark the 20th anniversary of the naming of Kimjongilia

Japan and other countries and regions, many Kimjongilia greenhouses have been inaugurated and organizations for the propagation of Kimjongilia and its support have been formed one after another, with the result that the famous flower has been spread to different countries.

"The state administrative guidance organ in charge of the management of Kimjongilia and botanical sector should conduct in a responsible manner research into the characteristics, propagation and cultivation of the flower, technical guidance and training of technical personnel, positively introduce latest scientific and technical achievements and activate the growing and spreading of the flower."

The speaker referred to the need to arrange Kimjongilia festivals in a grand and meaningful way so that they serve as important occasions for cultural and aesthetic education of people.

The meeting was held amidst the high enthusiasm of attendants who were eager to keep Kimjongilia as an eternal national treasure and a flower in praise of the great man.

National scientific symposium on Kimjongilia

2) National Scientific Symposium

On the occasion of the 20th anniversary of the naming of Kimjongilia, the national scientific symposium was held on February 14 at the Grand People's Study House.

Present there were officials from the State Academy of Sciences, officials concerned and scientists, technicians and gardeners in the field of research into and cultivation of Kimjongilia.

Study papers were presented orally or in writing. They included "Research into getting several Kimjongilia flowers into bloom at the same time", "On developing solar heated greenhouse for the cultivation of Kimjongilia and providing growth environment", "Study of some methods of growing Kimjongilia at home" and "Research into application of information technology to Kimjongilia cultivation".

The readers of their papers referred to the fact that during the past two decades Kimjongilia had been spread throughout the world, backed up by the devotion of the Korean and world progressive peoples.

Draws were the study results related to the methods of producing more beautiful

and larger Kimjongilia, properly preserving and managing it and creating a good growth environment for the flower by ensuring proper temperature in greenhouse by means of solar heat.

The symposium that was held when the Twelfth Kimjongilia Festival was running served as an important occasion for cultivating and spreading the flower more widely.

TV forum in commemoration of the 20th anniversary of the naming of Kimjongilia

3) TV Forum

In commemoration of the 20th anniversary of the naming of Kimjongilia, a TV forum was given on February 11 at the Kimilsungia and Kimjongilia Exhibition Hall.

An official from the Central Botanical Garden who took the floor first told an impressive story about how Kimjongilia had come into being.

Next, an official from the Korea Kimilsungia–Kimjongilia Committee introduced a congratulatory letter sent by the Japanese horticulturist Kamo Mototeru in commemoration of the 20th anniversary of the naming of Kimjongilia and referred to the fact that Kimjongilia had been spread all over the country and to many other countries and regions of the world over the past two decades.

Speakers in the forum said they had been growing Kimjongilia with great care both at home and at workplace with the pride in having it as a national treasure and told about commendable deeds.

A diplomat noted that Kimjongilia had been awarded top prizes and gold medals at the world horticultural expositions and international flower shows in succession and admired as a world-famous flower and cited examples of growing worldwide interest in the annual Kimjongilia festival and zeal for participating in it among Pyongyang-based diplomatic missions and different countries.

Officials from Chongryon and other overseas Koreans organizations said that overseas Koreans had been growing Kimjongilia with imminse reverence for leader Kim Jong Il and expressed their will to continue to participate in Kimjongilia festivals.

The TV forum was a key occasion in recollecting the birth of the flower, a landmark event in the history of world floriculture, and for growing it more beautifully as a treasure common to humankind.

Part V
Works of Literature and the Arts on the Theme of Kimjongilia, Gift Plants Presented to Leader Kim Jong Il

The Korean people take great national pride in having a flowering plant named after their leader, and have produced novels, poems, songs, dances, films and fine art works on the theme of Kimjongilia.

In particular, on Kimjongilia festival and many other occasions, those literary and artistic works are created.

Many foreign countries of the world presented leader Kim Jong Il with rare and beautiful plants.

This part introduces some of these works and gift plants.

Chapter 1
Works of Literature and the Arts on the Theme of Kimjongilia

1. Novels

Full length non-fiction ***Desire of the Era***

Written in 1992, this novel is about a famous Japanese horticulturalist Kamo Mototeru, who bred a rare, graceful flowering plant through his 20-year-long assiduous study and named it after Kim Jong Il to reflect the desire of the present era and the wish of mankind.

The story gives a detailed account of the hero who runs an iris garden and his family background, and describes his inner world and painstaking effort to breed a new flowering plant—"Guardian Deity".

The hero becomes fascinated by the great personality of Kim Jong Il while reading a book *Modern Korea and Secretary Kim Jong Il* authored by Inoue Shuhachi, a professor of Rikkyo University.

He decides to breed a flowering plant to be named after the Korean leader who possesses great love for his people. He puts his heart into the research travelling as far as the Andes. He suffers from a high fever up there, but at last finds out Andean wild tuberous begonias.

During his visit to Korea, the horticulturalist climbs Mt. Paektu. Seeing the morning glow over the mountain, he decides to make his flowering plant resemblant of the rising sun.

Back in Japan, he completes his breeding effort. He presents the newly-bred

flowering plant and a letter to Kim Jong Il on the occasion of his birthday.

Later Kimjongilia is awarded special prizes and gold medals in international flower shows and rapidly propagated around the world.

By portraying the historic birth of the beautiful flowering plant the novel spotlights the greatness of Kim Jong Il who builds a paradise for all mankind.

2. Poems

Affectionate Flower

Written in 1988, this poem describes Kimjongilia as an affectionate flower as it was named after Kim Jong Il who bears the responsibility for destinies of all the people and takes good care of them.

At the beginning of the poem, Kimjongilia is described as a flower purifying one's mind at first sight and nourishing one's soul and giving firm faith and youthful vigour at second sight.

It is also portrayed as an immortal flower representing the benevolent care for the Korean people taken by Kim Jong Il who opens a bright future for them and ensures them an honourable life with warm love for them.

At the end of the poem, it writes that whenever they yearn for the benevolent leader, people see Kimjongilia, the flower always giving them hope and vigour in life.

O, the Flower Conveying All People's Best Wishes

Written in 1993, this poem tells that Kimjongilia, unlike other seasonal flowers in mountains and fields, will remain in full bloom in the minds of all mankind conveying their feeling of admiration for the benevolent leader.

Noting that in the world there are a great many beautiful, seasonal flowers of different colours and with different names, the poem stresses that there is no other

flower than Kimjongilia that illuminates the new century with its peculiar fragrance and brilliance.

The poem continues that the flower is remindful of the morning glow over Mt. Paektu, bringing delight and hope and illuminating the way to hew out one's destiny.

The poem finishes by saying that none of the numerous flowers in this vast world of nature can match the beauty and fragrance of Kimjongilia conveying the best wishes from all the people.

What Do Flowers Give Us

Written in 1989, this poem raises a question of what flowers give us and gives a profound philosophical answer to it: Kimjongilia, a rare, splendid flower, gives us something great and valuable, what other flowers can not.

Flowers with vivid colours and delicate fragrance add beauty to the landscape, bringing joy and happiness to people. There are many beautiful flowers in nature, and every person loves them and wants their life to be as beautiful as them.

The poem stresses that Kimjongilia, with its red tints and green leaves, adds splendour and vigour to the present world and gives its people the guiding light for creation and struggle.

Be in Full Bloom, Kimjongilia

Written in 1988, this poem tells that Kimjongilia, conveying the best wishes of all mankind, will be in full bloom in their minds down through generations.

Kim Jong Il enjoys respect from the world people, so the flower named after him, sublime and fascinating, is loved by them all.

Each flower of Kimjongilia evokes energy and enthusiasm like a flaring torchlight.

At the end, it is emphasized that respect for the great leader bred such a splendid flower and Kimjongilia will be in full bloom over the world for all eternity.

Flower Whispers

Written in 1990, this poem expresses the will of the Korean people to faithfully support Kim Jong Il and carry out his cause, looking at Kimjongilia at all times.

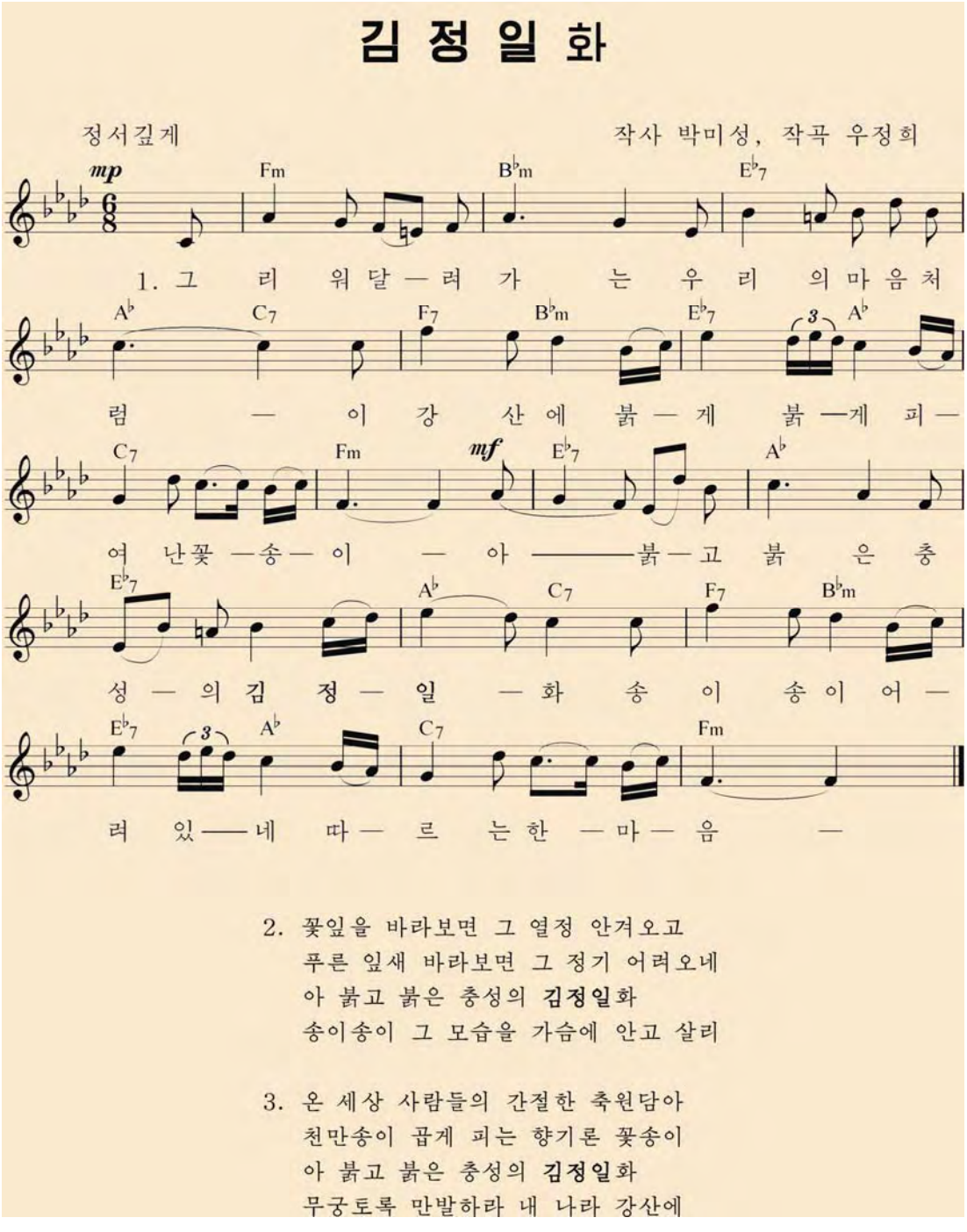
Seeing the red flower by the window on a sunny day, one pledges loyalty to Kim Jong Il.

Stroking it in the morning and at night, one feels as if the flower whispers that one should support the leader with ardent loyalty and pure conscience.

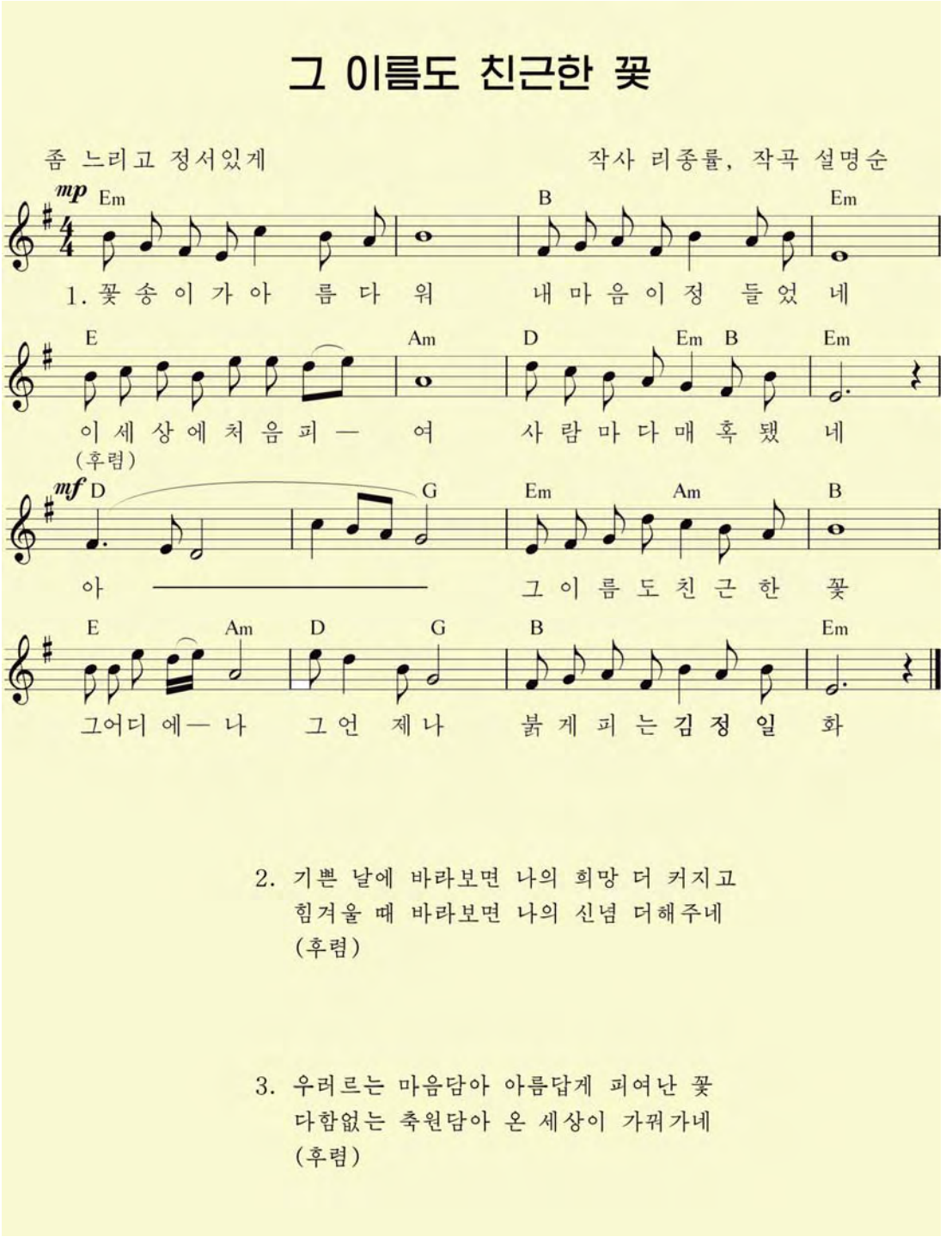
Underlining that Kimjongilia purifies people's mind, encouraging them to live an ennobling life, the poem concludes that if one has a pang of conscience, one should see the red flower and its green leaves to purify one's mind and pledge one's loyalty to the leader.

3. Songs

Kimjongilia



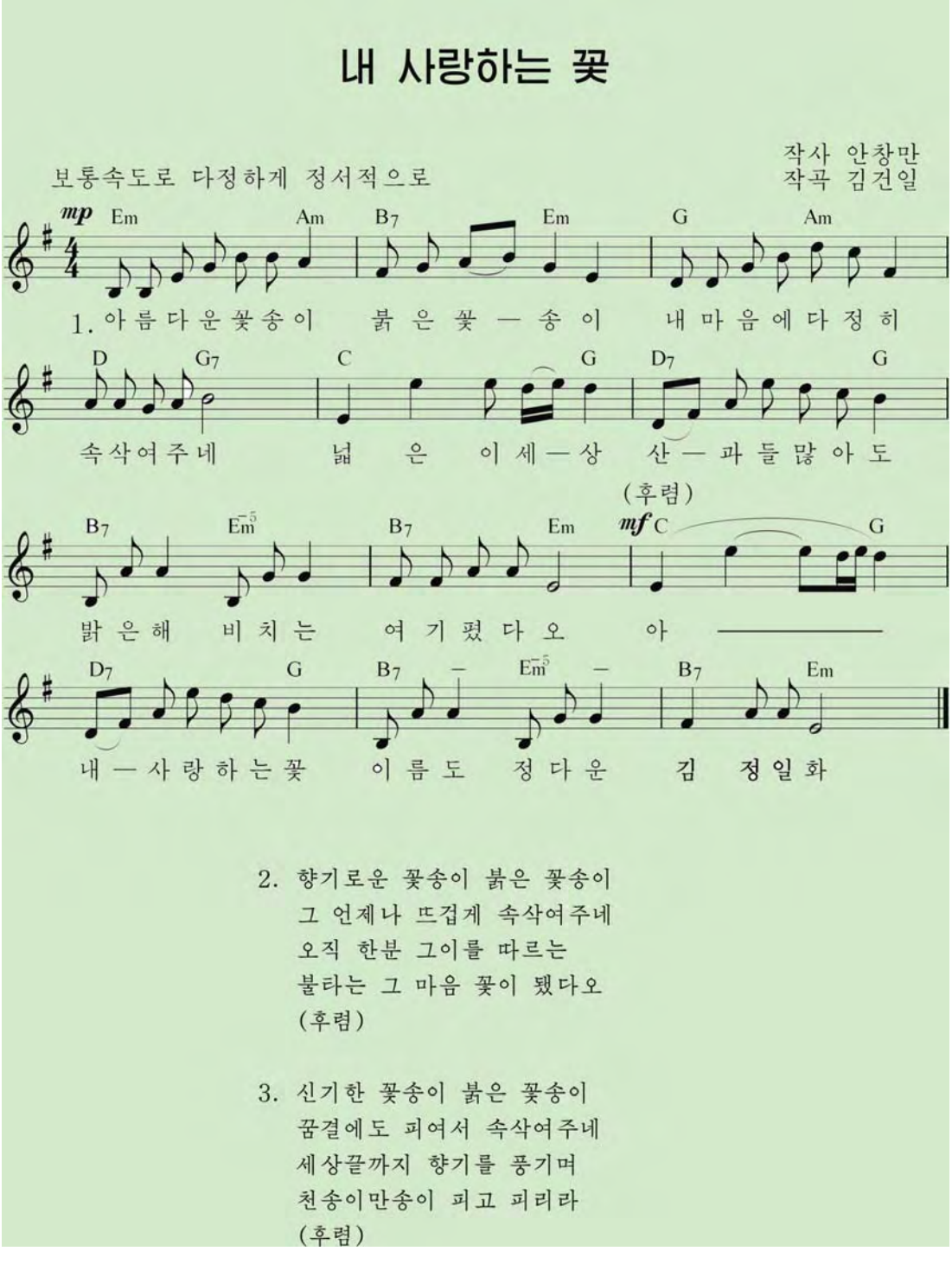
Dear Flower



2. 기쁜 날에 바라보면 나의 희망 더 커지고
힘겨울 때 바라보면 나의 신념 더해주네
(후렴)

3. 우러르는 마음담아 아름답게 피여난 꽃
다함없는 축원담아 온 세상이 가꿔가네
(후렴)

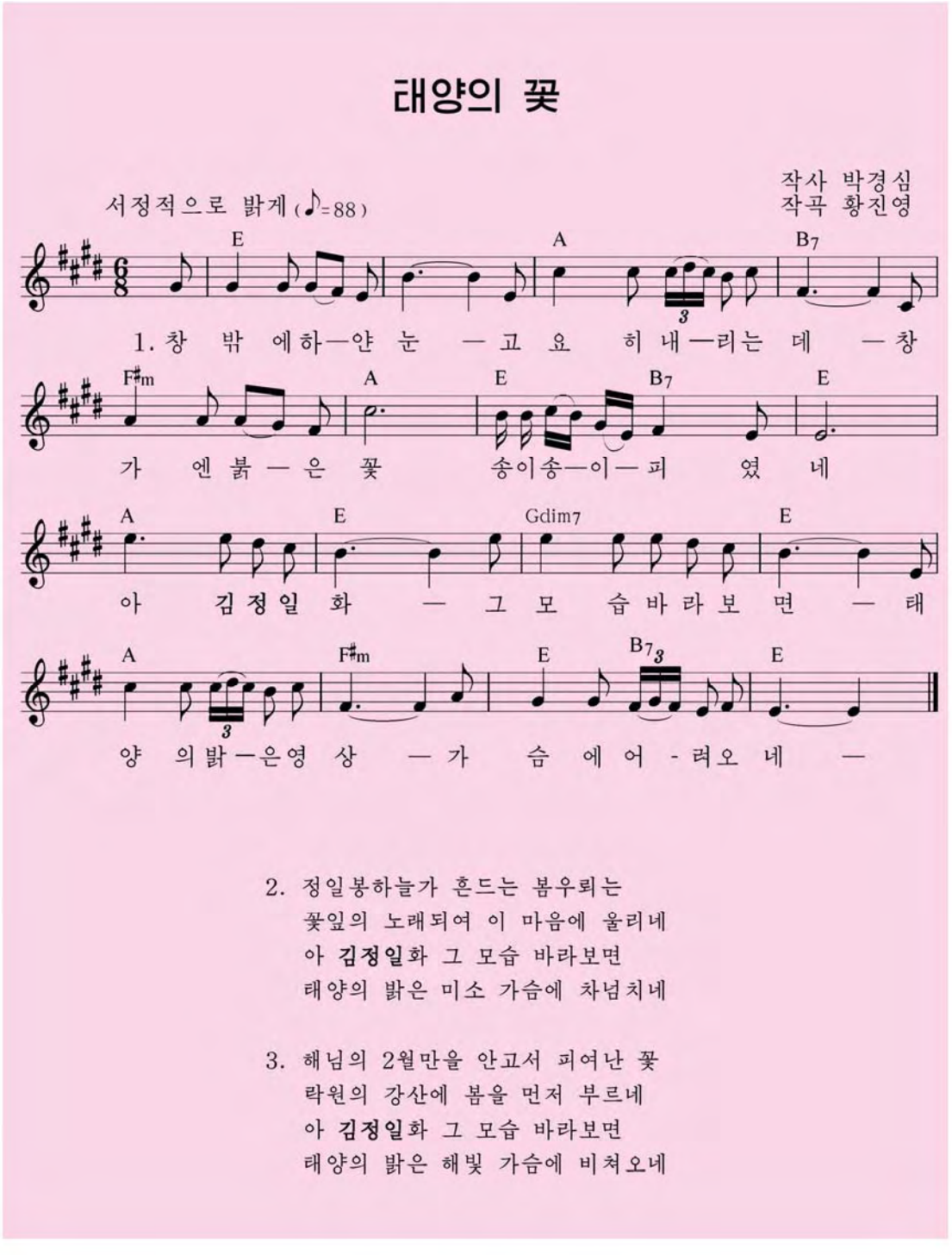
Flower I Love



2. 향기로운 꽃송이 붉은 꽃송이
그 언제나 뜨겁게 속삭여주네
오직 한분 그이를 따르는
불타는 그 마음 꽃이 됐다오
(후렴)

3. 신기한 꽃송이 붉은 꽃송이
꿈결에도 피여서 속삭여주네
세상끝까지 향기를 풍기며
천송이만송이 피고 피리라
(후렴)

Flower of the Sun

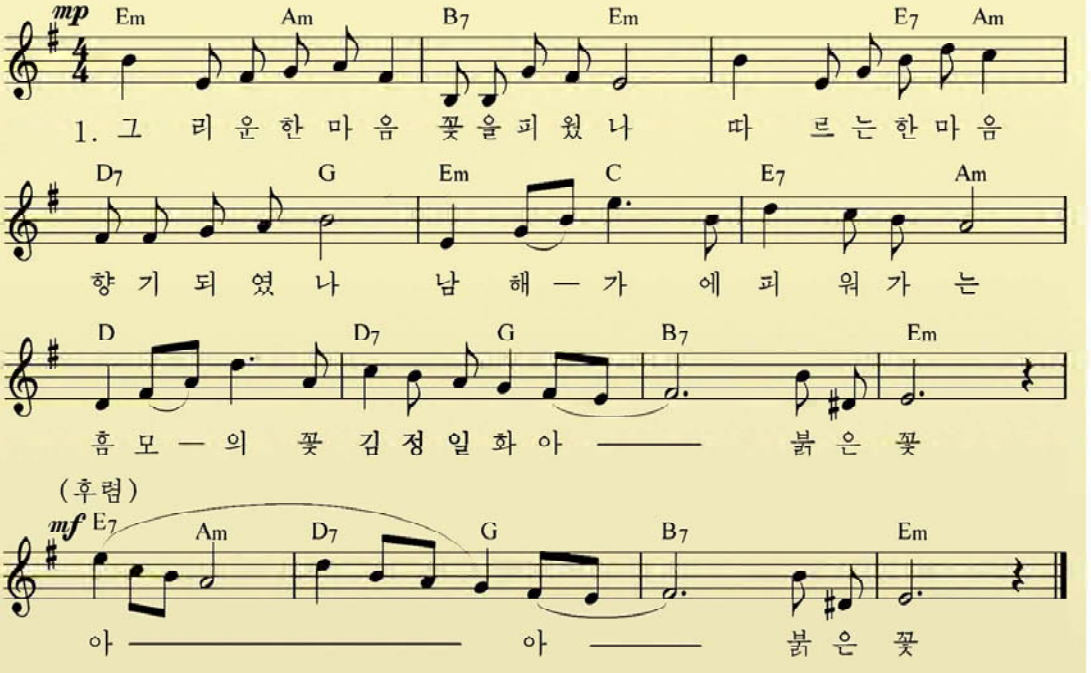


Red Flowers on the Beach of the South Sea

남해가의 붉은 꽃

작사 박미성
작곡 리종오

보통속도로 흠모의 정을 가지고



2. 자애론 그 영상 못내 그리워
꿈에도 그 품에 안기고싶어
남해가에 피워가는
희망의 꽃 **김정일**화 아 붉은 꽃
(후렴)

3. 꽃잎에 불타는 백두의 노을
한나산 끝까지 피워가리라
남해가에 만발하는
불멸의 꽃 **김정일**화 아 붉은 꽃
(후렴)

4. Films

Korea has produced many films on Kimjongilia, including feature films, documentaries and science films.

Typical examples are a feature film *Story of a Blooming Flower*, documentaries *Second Kimjongilia Exhibition*, *Third Kimjongilia Exhibition* and *Hearts of People Growing Kimjongilia* (produced on the occasion of the Fourth Kimjongilia Exhibition), and a science film *Kimjongilia*.

Feature film ***Story of a Blooming Flower***

Produced in 1992, this film is about Kamo Mototeru, a Japanese horticulturalist

who bred Kimjongilia.

As a young child, the hero is influenced by his mother who loved flowers very much, and becomes a horticulturalist.

One day he is informed by Inoue Shuhachi, a professor of Rikkyo University, of the reality of Korea and the great personality of its leader Kim Jong Il. His admiration for Kim Jong Il grows stronger as days go by.

He makes up his mind to breed a flowering plant symbolic of Kim Jong Il and climbs the Andes, where he manages to find begonia tubers.

Despite opposition and threat by the Japanese right-wing politicians, he names the new flower after his most respected leader Kim Jong Il and presents it and a letter to him.

Through portrayal of the horticulturalist, the film tells the truth that a great man breeds a great era and respect for him is part of human nature. The film makes a great contribution to introducing the personality of Kim Jong Il.

Science film ***Kimjongilia***

Produced in 2004, this film introduces Kimjongilia and techniques for its cultivation indoors and outdoors.

The film begins with a detailed analysis of its shape, structure, characteristics and growth, and the methods of applying cell engineering to mass-produce seedlings. It also explains ecological conditions suitable for flowering and other information for cultivating the flower.

At the end it shows the process of a bud coming into full bloom in slow shot. Also, some Korean people and foreigners are seen making bouquets and floral baskets with Kimjongilia at their homes, schools and offices.

Sustaining the features of a science film, it gives ample knowledge for cultivating Kimjongilia and draws the audience into a world of sublimity.

5. Dance

Flower I love

Produced in 1996, this work portrays Kimjongilia through graceful rhythmic movements to express the admiration and praise of Kim Jong Il by the Korean people and other progressive peoples of the world.

Beautiful dance movements are performed to the tune of the Koreans' favourite song *Flower I Love*, leading the audience to the world of longing and reverence for Kim Jong Il.

The dancers depict Kimjongilia wet with morning dew blooming under the brilliant rays of the rising sun, so the audience feel as if they are smelling of the passionate and attractive flower.

In the middle of the dance, the happy life of the Korean people in the embrace of Kim Jong Il is shown amidst a bright melody and rhythms. The dancers finish the work by showing through graceful movements that Kimjongilia is in full bloom throughout the world, as well as in Korea.

6. Fine Art Works

Embroidery ***Kimilsungia and Kimjongilia***

Porcelain work ***Kimjongilia***

Stone work ***Kimjongilia***

White porcelain
Vase inlaid with Kimjongilia

Metal work
Vase decorated with Kimjongilia

Korean painting ***Kimjongilia***

7. Publications on Kimjongilia

There are many publications on Kimjongilia.

Magazine ***The Immortal Flower***

Launched in 2001, this quarterly magazine is released by the Korea Kimilsungia-Kimjongilia Committee.

It carries articles on the thought, leadership and personality of Kim Jong Il, achievements and experiences in cultivating and propagating Kimjongilia, and other related scientific and technological materials. It also covers common knowledge of various flowers, activities of the Association of Supporters' Society for Propagating Kimilsungia and Kimjongilia, Kimjongilia festivals held in Korea and other countries.

Folders and pamphlets introducing Kimilsungia and Kimjongilia

Chapter 2
Gift Plants Presented to Leader Kim Jong Il

The Korean Central Botanical Garden has numerous gift plants Kim Jong Il has received from heads of foreign countries, political and social personages, horticulturalists and the people of the world.

They are rare, beautiful arboreal and flowering plants of good species from tropical, subtropical and temperate zones. The first gift plant was *Osmanthus fragrans Lour* sent to Kim Jong Il from China in 1976, and the number of plants amounts to over 1 300 in kind as of 2011. Some of them were from individual figures, groups and organizations.

Researchers and gardeners of the Central Botanical Garden have taken good care of the gift plants indoors and outdoors and propagated them widely.

Anthurium andreanum

This is a plant which Radovan Blaikovich, chairman of the Presidium of the former Socialist Federal Republic of Yugoslavia, presented with his congratulatory message to Kim Jong Il on January 14, 1986. It is an evergreen perennial plant belonging to the Araceae, and native to Colombia and tropical areas in South America. The leaf is ovate, heart–shaped. Flowers are borne in a spadix 20–50 cm long. The plant is propagated by

seeds and separating root. It is planted in a pot for indoor decoration and used as cut flowers.

Agathis robusta

This is an evergreen conifer which Ding Za Huen, chairman of the People's Committee of Ha Nam Dinh Province and member of the Presidium of the Ha Nam Dinh Provincial Committee of the Vietnamese Communist Party, presented to Kim Jong Il on May 14, 1987.

It belongs to the Araucariaceae and is native to Queensland, Australia.

The tree grows 45 m high. The leaf is oblong, tapering to the apex. The fruit is egg–shaped, measuring about 15 cm in length and about 10 cm in diameter. The plant is propagated by seeds and stem–cuttings. It is often used for indoor decoration.

Cotinus coggygria

It was sent to Kim Jong Il from the botanical garden of Broclaw University of Poland on May 25, 1988.

It is a deciduous tree or shrub of the Anacardiaceae, and native to Europe. It grows 4–5 m high. Its leaves are ovate or obovate. In June and July, it blooms in a panicle, but most of the

flowers are sterile. After they are gone, pedicels continue to grow longer, which are very beautiful. It is propagated by seeds and cuttings. It is often planted in parks and pleasure grounds for its graceful shape. The leaves and barks are used to make tannin.

Juniperus viginiana cv. Skyrocket

It was presented to Kim Jong Il by Anjei and Marianna Prokov, horticulturalists in Katowice of Poland, on May 22, 1988, and by Miroslav Kuchera, a researcher from the Prohonitse Botanical Garden under the Academy of Sciences of former Czechoslovakia, on March 30, 1990 respectively. It is an evergreen conifer belonging to the Juniperaceae. It is native to North America and grows as high as 30–45 m. Leaves are dark blue or green in colour and needlelike that come out densely on twigs and covered with grayish wax. The fruit is either roundish or egg–shaped. It is propagated by cuttings. Its crown is unique in shape, so it is largely used for beautiful scenery in parks, resorts, gardens and around other structures.

Prunus mume cv. Takaraawashe

Shiraishi Itsue, head of the Howaidoline Society for Studying President Kim Il Sung's Works, Japan, and president of Hakuyorain Shipping Co., Ltd., presented Kim Jong Il with the tree on February 8, 1984.

He sent congratulatory letters and gifts to Kim Jong Il on several occasions. In 1984 he sent Kim Jong Il as his birthday gift the 20-year-old bonsai tree in full bloom,

which had been his family heirloom and pride.

It is a deciduous broadleaved short tree belonging to the cherry family. It is native to Japan. The potted tree is about 70 cm high and is about 12 cm round at the bottom of the trunk. Its leaves are egg–shaped and saw-toothed in the margin. The tree bears crimson flowers early in spring before leaves come out. Fruits ripen around July. Propagation is done by seeds and grafting. The tree is often potted for ornament.

Cedrus deodara

Hu Yaobang, former General Secretary of the Central Committee of the Chinese Communist Party, presented this tree to Kim Jong Il on June 12, 1983.

It is an evergreen coniferous tree belonging to the Abietaceae.

It is native to the Himalayas and western Afghanistan. It grows as high as 50–60 m. The leaf is silver-gray, 2.5–5 cm long and pointed at the tip. It is mostly androgynous but rarely heterothallic. It blossoms in spring and the cones ripen in the autumn of the following year. The tree is propagated by seeds and cuttings.

For its graceful foliage, it is planted as street ornamentals or in parks, pleasure grounds and

around buildings. Its timber is used as building materials or for making furniture.

Psidium guajava

Leader Kim Jong Il was presented with this tree by Govind Narain Srivastava, secretary-general of the Asian Regional Institute of the Juche Idea on April 14, 1985.

It is a broadleaved evergreen tree belonging to the Punicaceae. It is native to the tropical America. It grows 5–9 m high. The leaf is oblong or egg-shaped. White blossoms open in spring. Fruits are spherical or oval, and ripen in autumn and eaten raw. The propagation can be done by grafting and seeds. The tree is prized for ornamental value.

Arbutus unedo

This is an evergreen shrub or short tree which Sean Garland, former General Secretary of the Central Executive Committee of the Labour Party of Ireland, presented to Kim Jong Il on September 25, 1994.

It belongs to the Ericaceae and is native to southern Europe. The tree grows up to 3–4 m high. Leaves are oblanceolate which are attached thickly to branches. In May and June, white or light-pink blossoms come out in a raceme. Fruits ripen red between November and December. They are edible. The tree is propagated by seeds and cuttings.

It is often potted for room decoration.

Oxydendrum arboreum

Daniel Develder of Kalumtout Arboretum in Belgium presented the tree to Kim Jong Il on March 19, 1989. He sent over 30 fruit trees of four species and several garden plants on two occasions.

The tree is a deciduous broadleaved tree belonging to the Ericaceae. Native to North America, it grows about 18 m high. The leaf is oblong. In July and August white blossoms open in a panicle 18–30 cm long. Fruits are dehiscent and ripen in October. The propagation is done by seeds. It is largely cultivated in gardens, parks or pleasure grounds for beautiful green leaves and autumn tints.

Plumeria rubra

Maisuk Saisompang, member of the Central Committee of the People's Revolutionary Party of Laos and chairman of Laos-Korea Friendship Society, presented this tree to Kim Jong Il on April 1, 1992.

It is a tall tree or shrub belonging to the Apocynaceae. The tree grows 4.5–9 m high, with oblong and alternate leaves at the end of stems. In summer, yellow flowers come out in a panicle.

It is multiplied by cuttings and layerings. It is potted for indoor decoration.

Coleus blumei

Kim Jong Il received this plant as a gift from David Casery Kiviranggo, special advisor to the President of the Ugandan Republic and chairman of the Korea-Uganda Friendship Society, on September 30, 1994.

It is a perennial plant of the Lamiaceae, and native to Java Island of Indonesia. It is 40–60 cm tall, and the leaves are egg-shaped and red, fox red or green in colour. Small light azure flowers come out in a raceme in June and July. The tree is propagated mainly by cuttings. Since its foliage is unique in colour and shape, it is grown in a pot for enjoyment or in flower beds in summer.

Plumbago capensis

It was presented by Gabriel Bejass, director of Reinsurance Bureau of Nasco Insurance Business Company of France, on September 12, 1994.

It is an evergreen broadleaved tree of the Plumbaginaceae. It is native to South Africa. The tree grows up to 70 cm high and is a little inclined to climbing. It has oval leaves with soft hair on the surface, and bright blue flowers open in a spike in summer. It is propagated by seeds and cuttings. The plant is potted for ornament.

Venidium fastuosum

It was presented by Manfred Kraxvir, mayor of Wolfsberg and chairman of Wolfsberg branch of the Austrian association for promoting relations with Korea, on October 25, 1994.

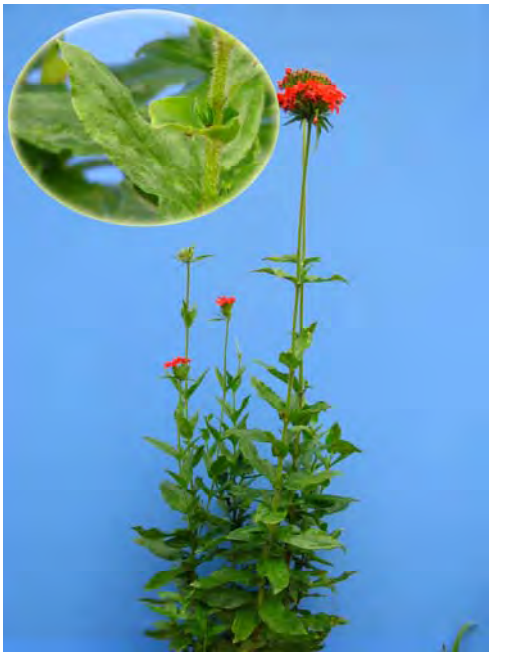
It is an annual plant of the Asteraceae, and native to South Africa. It grows as high as 60–90 cm and produces many lateral branches. The leaf is pinnate, doubled and bristled. In May–June it is in full bloom with bright yellow flowers in a capitulum, and at the base of a petal is a brownish, deep purple pattern. Seeds ripen in July–August. The propagation is done by seeds.

It is planted in flower beds of parks, gardens and resorts.

Lychnis chalcedonica

This is a perennial plant presented by Michael Ranc, a chief editor of a branch office of the Reuters, on November 12, 1994.

It belongs to the Caryophyllaceae. It is native to Siberian and central Asian regions of Russia. It is 80–100 cm high and sparsely hairy. The leaves are egg-shaped at the base of the stem and lanceolate at the upper part. During June–July red flowers come out in a cyme. Seeds ripen during August–September. Since its flowers are beautiful, it is often planted in flower beds of parks, resorts and gardens or used for cut flowers.



Dianthus chinensis

Hafez Al Assad, former President of the Arab Republic of Syria, presented this plant to Kim Jong Il on November 13, 1997.

It is a perennial herb of the Caryophyllaceae, and native to China.

The height of a fully grown plant is 20–40 cm. The leaves are lanceolate. In June–July white, red or pink flowers form cymes. Seeds ripen during August–September.

The plant is propagated by seeds.

It is planted in flower beds or used for cut flowers.

Penstemon barbatus

It was presented by the Central Committee of the Independence-Patriotic Front of the Republic of Zimbabwe on January 16, 1995.

It is a biennial or perennial plant belonging to the Scrophulariaceae.

It is native to Mexico. The leaves are either elongated or egg-shaped at the lower part of the stem, and lanceolate at the upper part. Around June–August violet flowers open in a raceme, and seeds ripen in August–September.

It is propagated by seeds, cuttings and root-separating. It is planted in flower beds of various shapes or potted as room ornamentals.

Hedychium coronarium var. *chrysoleucum*

It was presented by Guillermo Garcia, a Revolutionary Major of the Republic of Cuba, on October 1, 1994.

It is a perennial plant of the Zingiberaceae, and native to India and Malaysia.

It grows to a height of 1–2 m. The leaf is oblong, lanceolate, 20–60 cm in length and 5–12 cm in width. Between autumn and winter spikes of white, aromatic flowers come into bloom at the end of the stems. It can be propagated by root-separating.

It is grown in pots for enjoyment or used as cut flowers.

Chrysanthemum maximum

It was presented by Zens Olewiktopho, managing director of ASG Hamburg Export Co., Ltd. of Germany, on January 12, 1995.

It is a perennial herb of the Asteraceae, and native to Europe. The height of a mature plant is 60–100 cm: the stalk is straight and square. It has ovate or lanceolate leaves, which are irregularly indented in the margin. During June–July white flowers bloom in a capitulum at the end of the stem. Seeds ripen in August–

September. The plant is propagated by seeds, cuttings and root-separating. It is planted in group in flower beds of parks, resorts and gardens or grown for cut flowers.

Convolvulus tricolor

Alehandrocao de Benos, chairman of Friendship Association with Korea, whose head office is in Spain, presented this flowering plant to Kim Jong Il on September 19, 1994.

An annual plant of the Convolvulaceae, it is native to southern Europe and northern Africa. It grows 20–40 cm high, and the stems bear lateral branches, trailing sideways. The leaf is oval or oblong. Flowers of three colours are borne respectively in each axil of leaves from June to September. Seeds are ripe in August–September. It is propagated by seeds.

It is planted in flower beds of various shapes or potted for enjoyment.

Mangifera indica

This is an evergreen tropical fruit tree belonging to the Anacardiaceae, which Alpha Ture, head of the Kim Il Sung Agricultural Science Research Institute and chairman of the Committee of Juche Farming Method, presented to Kim Jong Il on July 25, 1988.

. It is native to eastern India and the Malay Peninsula. It grows as high as 20–30 m. Leaves are lanceolate, leathery and glossy. Reddish white flowers are borne in a compound raceme. Fruits are oval or heart-shaped,

which can be eaten fresh and used as an astringent or remedy for diarrhea. It is multiplied by seeds and grafting. The wood is used as building materials or for making furniture.

Muscari armeniacum

It was presented by a delegation of the American Christian Friends of Korea on November 9, 1998.

It is a perennial bulbiferous plant belonging to the Liliaceae, and native to western Iran and Armenia.

Leaves come out in bundles of six to eight, which are fleshy and string-shaped. Light purple flowers bloom in a raceme during April–May. Seeds ripen in June–July. It is propagated by seeds and bulblets. It is cultivated in flower beds in spring, potted for appreciation, or for cut flowers.

Begonia rex cv.

This plant was presented to leader Kim Jong Il by Mussatiepla Traore, chairman of Mali-Korea Friendship Association, on November 30, 1990.

It is a perennial evergreen belonging to the Begoniaceae. It grows about 20–40 cm high. The leaf surface is greeny-yellow. Dark brown or violet patterns along the vein and tiny, hairy ridges on surface make the leaves look wrinkled.

Petioles are pink in colour and

thickly covered with white fine hairs. Flowers form a panicle at the end of the peduncle 30 cm long. The male flower is four-petaled and the female flower five-petaled. The propagation is done by leaf-cuttings. It is often potted for its graceful foliage.

Lilium tigrinum

This is a perennial bulbiferous plant of the Liliaceae presented by Shadley Canbumus, head of Lausanne Cultural Information Centre between Switzerland and DPRK, and his wife, on March 4, 1991.

It grows 120–140 cm high. Leaves are lanceolate and glossy. From mid-July to early August yellow flowers bloom in a raceme at the end of the stems. Fruits ripen in September-October. It is propagated by seeds and bulbs. It has large, beautiful flowers, so it is grown in parks, resorts and gardens, or for cut flowers.

Nine cultivars of rose (*Rosa hybrida* cv.)

They were presented by the Denmark-DPRK Friendship Association on March 14, 1992.

They are deciduous broadleaved shrubs belonging to the Rosaceae, grow 1–2 m high and have thorns. The leaves are unequally pinnate, five leaflets at the apex and others in pairs. Flowers are borne singly or in small clusters, and in full bloom from spring to autumn. They are various in colour; white, pink, red, etc. Propagation is done by grafting.

Roses are cultivated for their beautiful flowers in parks, gardens and pleasure grounds, or grown for cut flowers.

Pinus bugeana Zucc.

This is a gift presented by the Municipal People's Government of Beijing, China, on March 22, 1984.

During his visit to China in June 1983, Kim Jong Il appreciated the tree in the Beijing Jingshan Park. The Municipal People's Government decided to present him with white pines and in the following year sent five plants whose height and width of the crown were 1.5 m respectively.

It is an evergreen coniferous tree belonging to the Pinaceae. It is native to China. It grows as high as 12–20 m. The bark of an old tree is grayish white. Leaves come out in bundles of three. Fruits are formed in May and ripen in autumn.

The tree is propagated by seeds.

It is usually planted in parks and pleasure grounds because its shape and bark are good-looking.

Callistephus chinesis cv.

This is a flowering plant which Joaquim Alberto Chissano, President of Mozambique, presented on June 17, 1995.

It grows 50–80 cm high.

It is an annual plant belonging to the composite family

Flowers bloom in a capitulum at the end of the stem and branches in July and August.

Their colours vary according to the variety: light pink, dark pink, white and violet. Fruits ripen in September-October.

The plant is propagated by seeds.

It is usually cultivated in parks and resorts for its flowers blooming beautifully and long.

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