

# **Agronomical Study on *Gladiolus gandavensis* Van Houtte. and *Globba bulbifera* Roxb.**

Ngu Wah Win <sup>1</sup>

## **Abstract**

Commercially cultivated flowering plants of *Gladiolus gandavensis* Van Houtte. and *Globba bulbifera* Roxb. were collected from Pyin Oo Lwin Township, Mandalay Region. Morphological characters, preparation of soil, the methods of propagation and pests and diseases were presented. The soil texture was recorded. *Gladiolus gandavensis* Van Houtte. was derived from family Iridaceae. This plant is perennial herb with corm. *Gladiolus* can be grown by seeds or corms. *Globba bulbifera* Roxb. belongs to the family Zingiberaceae. This is rhizomatous herb. *Globba* can be grown from rhizomes. All these plants are cultivated for commercial flowers and also profit among the flowers cultivated in Pyin Oo Lwin Township. *Gladiolus gandavensis* Van Houtte. is more grown than *Globba bulbifera* Roxb. in Pyin Oo Lwin Township.

Keywords: *Gladiolus gandavensis*, *Globba bulbifera* Roxb

## **Introduction**

Pyin Oo Lwin Township is one of the agricultural townships in Myanmar. In this township, the vegetables and the flowers are mostly cultivated in almost area of Pyin Oo Lwin Township and transported commercially to other area of upper and lower Myanmar, especially to Mandalay and Yangon.

Pyin Oo Lwin Township, situated in Central Myanmar and lies on the eastern part of Mandalay Region. Its average elevation is 3539 feet above sea level. The area of Pyin Oo Lwin Township is 488,794 acres or 763.74 square miles. It is situated between the latitudes of 21° 24' and 22° 46' North and the longitudes of 95° 54' and 96° 46' East.

The natural vegetation of Pyin Oo Lwin Township is depending upon the temperature, rainfall, altitudes and soil. The natural vegetation ranges from the tropical types of forests to the sub-tropical types. In 1993, the area of forest land in this township is 417,628 acres covering with 86 %, waste land 34,504 acres with 6.5 %, and agricultural land 36,662 acres with 7.5 %. Among actual flowering cultivated land is 25,006 acres with 5.1 %. In these flowering cultivated acres are only 977 acres (Khin Myo Myo Chun, 1995).

According to the record in 2018, actual cultivated land area of Pyin Oo Lwin Township are 48,762 acres including the flowering cultivated acres of 7,338 acres (Recorded from Department of Land Record).

In this township, many people cultivated on Le, Ya, Kaing-Kyun, Garden and other land. Mostly vegetables, crops and flowers can be grown on Ya lands. Some gardeners cultivated flowering plants and potted plants in the garden lands commercially because the physical conditions of the township are favourable for growing garden and horticultural crop.

Although commercial flowers are involving in men's daily life, there was no systematic survey on taxonomy and agronomy of commercial flowers grown in Pyin Oo Lwin Township. Therefore, present study emphasizes on *Gladiolus gandavensis* Van Houtte. and *Globba bulbifera* Roxb. of commercial flowering plants by describing its morphology, preparation of soil, the methods of propagation, pests and diseases.

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The flowers of *Gladiolus gandavensis* Van Houtte. and *Globba bulbifera* Roxb. are used for various purposes such as for donating to the Buddha Images of both houses and pagodas, for donating to the guardian spirits in order to eliminate mistortunes or prevent from mistortunes; for decorative purposes in ceremonies and meeting and for making flower baskets in funerals. Flower baskets are given to each other as a gift to show the familiarity and love.

The rhizome and sometimes the leaves of several *Globba* sp. are used in traditional medicine in South-East Asia often as a protective medicine after childbirth and extremely to treat sores and rheumatism. In the Nicobar and Andaman Islands, *Globba* sp. is used to treat asthma. Several *Globba* sp. have ornamental value, having inflorescences with dark red bract contrasting with yellow-orange flowers (Valkenburg and Bunyaphatsara, 2002).

The present research intended to give taxonomic information on *Gladiolus gandavensis* Van Houtte. and *Globba bulbifera* Roxb., to give the knowledge of cultivated procedure of traditional ways and to know the infected pests and diseases from study area to other interested peoples and researchers. This township is one of the interested places for researchers of botanists and agriculturalists because of the possessing of natural vegetation and commercially cultivated plants.

### Materials and Methods

The specimens of commercially cultivated flowering plants were collected from Pyin Oo Lwin Township, Mandalay Region from 2017 to 2018. Field notes were recorded. Inflorescences and field cultivation were marked by photographs. The specimens were collected immediately into the plastic bags to identify, classify and describe systematically. Identification was done by using references, Flora of British India (Hooker 1897), Flora of Java (Backer 1968) and Flowering plants of the world (Heywood 1978) for deciding family, genus, species and local names. Agronomic data were recorded by interviewing to commercially cultivated farmers and professional gardeners. The method of cultivation or propagation, preparation of soil, fertilizers application are recorded. The pests and diseases are also presented. This soil texture is tested from Forest Research Institute, Ye Zin. The required data for cultivated acres are obtained from Land Records Department of Pyin Oo Lwin.

### Results

- |    |                  |   |  |
|----|------------------|---|--|
| 1. | Source plant     | - | <i>Gladiolus gandavensis</i> Van Houtte.<br>(Figure 1) |
|    | Family           | - | Iridaceae  |
|    | Local name       | - | Thit sa pan  |
|    | English name     | - | Gladiolus  |
|    | Flowering period | - | Throughout the year                                    |

#### 1.1. Taxonomic Description

Perennial herbs with corm, erect. Stems and branches terete. Leaves simple, equitant, exstipulate, petiolate, the petiole sheathing; blades linear-lanceolate, sheathing at the base, entire along the margin, acute at the apex. Inflorescences simple spikes, 8- to 13-flowered, variable in coloured. Flowers bisexual, zygomorphic, irregular, epigynous, various in coloured, large and showy; 4.5-10.0 cm across at anthesis, sessile; bracts 2, superposed unequal, upper bract entirely enclosed by the lower one, green. Perianth 6-segments, 2 whorls; tube shorter than the lobe, curved; lobes unequal, recurved, anterior segment often blotched. Stamens 3, free, inserted; filaments long; anther dithecous, dorsifixed, longitudinal dehiscence, attached to the basal cleft, variable in coloured. Ovary ellipsoid or oblongoid, trilocular, with many ovules in each locule on the axile placentae; style long, filiform; stigma 3-fid.

Specimen examined: Mandalay Region, Nyain nyin tha Village, Kan gyi kon Village Tract; September 3, 2017; Ngu Wah Win, Collection No. 4.

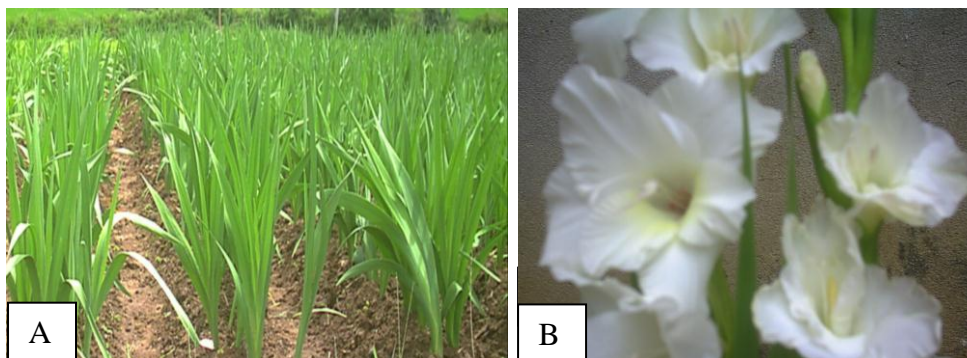


Figure 1 A Cultivation of *Gladiolus gandavensis* Van Houtte.  
B Inflorescences of *Gladiolus gandavensis* Van Houtte.

## 1.2. Agronomy

### 1.2.1. Kind of soil

Although alluvial loam and silt having good drainage soil are the best for the growth of *Gladiolus*, its cultivars are the best grown in Loamy sand of Pyin Oo Lwin Township.

### 1.2.2. Climate

*Gladiolus* can grow well in cool climate. It can be grown on hilly regions all the year round and on the low flats lands only in winter.

### 1.2.3. Preparation of soil

After ploughing the land about two times, cow dung manure is added into the plot of land. After that, the mixture of land must be watered for about two or three days. In this way the soil becomes fine. *Gladiolus* is also grown by making ridges.

### 1.2.4. Cultivation

*Gladiolus* can be cultivated either from seeds or from corms.

#### By growing from seeds

If growing from the seeds, it takes two years to flower. In order to get the seeds, the biggest and best flowers should be selected and kept aside till the flowers bear many fruits. Then these fruits become to mature. From these matured fruits good seeds are obtained. In putting the seeds in the nursery, the seeds are to be nursed as other flower seeds to become seedlings. Fertilizers or manures containing thoroughly pounded and mixed humus and cowdung must be put in a wooden box with a height of one foot. After that, the plot of flower bed are prepared with the ridges of 1½ feet breadth, then the seeds must be sown to a depth of one inch and they are to be sown in zig-zag position. A moderate amount of water must be poured on the prepared flower bed. The best time for growing the seeds is during March to April. After sowing the seeds for a week, the small seedlings or plants begin to appear. The young plants must be watered moderately. After appearing three leaves, urea is added in the flower bed. If the plants are overcrowded, weak plants must be pulled out. When appearing 6-8 leaves, the buds begin to appear. Corms obtained by growing from the seeds must be dug out. The corms of *Gladiolus* should be dug out during winter and they should be planted during the early rain period. By growing the plants from the seeds sometimes good species of flowers can be developed. Such type of flowers can be grown as cross-breed or hybridized plants.

#### By growing from corm

If cultivated from corms it flowers within a year. Strong and healthy corms are chosen for cultivation. Then the outer skin should be peeled off before planting. The corms are

covered with a mixture of carbon powder and ash to grow. After that, the plot of flower bed are prepared with the ridges of 2 feet breadth and a height of six inches, then the seeds must be sown to a depth of one inch and they are to be sown in zig-zag position. The young plants must be watered moderately. After appearing three leaves, urea is added in the flower bed. If the plants are overcrowded, weak plants must be pulled out. When appearing 6-8 leaves, N, P, K fertilizers (10:10:5) must be added in the plot of field. Then, the buds begin to appear.

After harvesting the flowers for 4 months, the corms must be dugged up. Then, the corms with many nodules must be seen, but the corms are smaller size because the corms had been used to flowers blooming. The small nodules getting from these corms must be dried in room temperature and stored in the bags. One corm must be used to grow 3-4 times, but the production of flowers is different.

#### 1.2.5. Fertilizers

Cowdung manure, urea and T-super are used as fertilizers for cultivation of *Gladiolus* plants.

#### 1.2.6. Harvesting

When the plants become five months age, *Gladiolus* plants start to bloom, and then the inflorescences are cut with scissor.

#### 1.2.7. Pests and Diseases

**Aphids** : These are small insects, soft-bodied, green, deep purple or black. They usually occur in clusters. These move around freely and rest on their heads while sucking plant juice. They multiply very fast, infecting the whole plant in a short time.

**Leaf spot** : The affected leaves develop brown or yellow blotches. Sometimes a portion of leaf is affected and if remedial measures are not taken the leaf may die.

**Fusarium crown (corm) rot** : Small yellow spots appear on the upper surface of the leaves. Brick-red pustules or blisters form on the lower leaf surface.

**Wilt** : This symptom is characterized that leaves turn yellow and die from the bottom of plant toward top. Infected plants are stunted or killed.

2.	Source plant	-	<i>Globba bulbifera</i> Roxb.	(Figure 2)
	Family	-	Zingiberaceae	
	Local name	-	Padein ngo, War so pan	
	English name	-	Unknown	
	Flowering period	-	May to October	

#### 2.1. Taxonomic Description

Rhizomatous herbs; stem erect. Leaves alternate; blades ovate to lanceolate, with ligules, glabrous on both surfaces, cuneate at the base, entire or slightly undulate along the margin, acuminate at the apex. Inflorescences terminal, paniculate spikes, 15- to 25-flowered. Flowers yellow, creamy white, violet, bisexual, zygomorphic, sessile; bracts ovate, persistent. Calyx infundibuliform. Corolla-tube longer than calyx; lobe ovate, subequal. Stamen fertile but sometimes sterile; filament long, incurved; anther oblong; connective simple, winged. Ovary globoid, inferior, unilocular, with one ovule on the parietal placentra; style filiform; stigma turbinate.

Specimen examined: Mandalay Region, Ye nge Village Tract; August 4, 2018; Ngu Wah Win, Collection No. 8.



Figure 2 Inflorescence of *Globba bulbifera* Roxb.

## 2.2. Agronomy

### 2.2.1. Kind of soil

*Globba bulbifera* Roxb. can grow well in sandy loam and loam. But it also grows in loamy sand. It cannot tolerate water logging.

### 2.2.2. Climate

*Globba bulbifera* Roxb. likes a cool climate.

### 2.2.3. Preparation of soil

After the field is ploughed at least two times, the plots of the soil are mixed with cowdung manure. The mixture of the soil must be watered for two days. In this way fine soils are obtained. After that, this mixture of soil must be prepared into ridges.

### 2.2.4. Cultivation

It can be cultivated from rhizomes. If cultivated from young plant into mother plant, it takes two years to bloom the flower.

If the plants are cultivated directly from rhizomes, flowers are seen within one year. Strong and healthy rhizomes must be chosen for cultivation.

*Globba bulbifera* Roxb. is grown chiefly the early rainfalls. From the beginning of cultivated year, the inflorescences and the flowers are short and they cannot be grown. After cultivation of plants for about 2.5 to 3 months, the plants begin to bloom. The last time of blooming flowers are small and do not get a good selling prices. If cultivated on time, flowers can be sold three years commercially. Quality of flowers is the best in second years.

In growing *Globba bulbifera* Roxb., it should be grown on flower beds of 2 feet wide and it should be raised to a height of six inches.

After harvesting the flowers for 4 months, the rhizomes can be dug up. One rhizome can be used to grow for 3 to 4 times, but the production of flowers is different. If the corms are not dug, *Globba* returned to grow and the flowers will be bloomed at the rainy season.

### 2.2.5. Fertilizer

Cowdung manure, urea and T-super are used as fertilizers for cultivation of *Globba* plants.

### 2.2.6. Harvesting

After the cultivation of plants for six months, flowers bloom well; the inflorescences can be imported to market.

### 2.2.7. Pests and Diseases

**Aphids :** These are small, soft-bodied, green, deep purple or black insects. They usually occur in clusters. These move around freely and rest on their heads while sucking plant juice. They multiply very fast, infecting the whole plant in a short time.

**Smut :** Fungus is affected on *Globba* plants and the rhizomes also become completely destroyed.

### Discussion and Conclusion

The present research was studied on *Gladiolus gandavensis* Van Houtte. and *Globba bulbifera* Roxb. which were collected from Pyin Oo Lwin Township.

*Gladiolus* is one of the commercial flowering plants grown in Pyin Oo Lwin Township. *Gladiolus* flowers were economically important in Pyin Oo Lwin Township. Various kinds of *Gladiolus* cultivars were collected from Pyin Oo Lwin Township. *Gladiolus* is also known as "Holland flowers". This plant is perennial erect herbs with corm. The flowers are simple spike, large and showy.

*Gladiolus* can be grown by seeds or corms. If growing by seeds, it takes two years for flower blooming. If growing by corm, it flowers within one year. But the seeds can be cultivated to get corm. There are three kinds of corm, such as the big corm, the medium corm and the small corm. The big corm has the broad and wide hilum and its life span is assumed mature. If the plants are grown from its corm, the vegetative part is stronger and the flowers appeared within one growing season. If the medium corm with rounded shape is grown, the plants get not only growing vegetative part and flowers but also growing corm lets together with corms. If the small corm is grown in next year, the plants develop the vegetative part only. So, the horticulturists choose to buy the corms with rounded shape. The corm of *Gladiolus* must be dug out during the rainy season. And then the corm should be dried in sunlight and kept up. After drying for about 4 months, the roots appear and these corms can be reported to cultivated area. In this way, the corm can be repeated to cultivate many times. Eventually, the production of flowers becomes declined. Although the corms are continuously used for cultivation, these small nodules can also be used for it. But the blooming time of flowers are late.

Fertilizers used for *Gladiolus* are mainly cowdung manure and N, P, K fertilizers. The main infected diseases are aphids, leaf spot and semi-looper. The fungicides are needed to use for flowering plants only in rainy season. Many kinds of cultivars was most widely cultivated in this township.

*Globba bulbifera* Roxb. is one of the commercial flowers in Pyin Oo Lwin Township. This cultivar is shade loving plant. This is suitable for growing at 75% of shade and 25% of sunlight. This can be cultivated beneath the perennial trees.

*Globba* can be grown from rhizomes. If cultivated from young plant in mother plant, it takes two years to bloom the flowers. If cultivated directly from rhizomes, it flowers within one year. After harvesting, the rhizomes must be dug up. And then these rhizomes must be repeated to grow. If the rhizomes are not dug, *Globba* is returned to grow and the flowers will be bloomed at rainy season. One rhizome can be used in growing for 3-4 times. This plant is grown by clearing of weeds and feeding the N, P, K fertilizers.

In preparation of soil, the ridges must be prepared as concave shape to get the water from plants for many hours in summer and winter and it must be prepared as convex shape to get a better drainage in soil in the rainy season. When the sun is shiny in the afternoon, watering is needed to be done. When the weather is cold, watering is not needed.

The main infected diseases are contagious disease, aphids, rust and wilt. According to the farmers' prevention, the flowering plants are not destroyed by diseases in this township. The N, P, K fertilizers mixed with insecticides and spraying in the field in seasonally. In the

rainy season, the spraying must be done by not only complete fertilizers but also fungicides and insecticides must be used.

The soil texture such as loam, sandy clay loam, sandy loam, clay loam and loamy sand are observed in Pyin Oo Lwin Township. *Gladiolus* can be grown in loamy sand. Nyain nyin tha Village of Pyin Oo Lwin Township is the best of soil texture as shown in table.

The flowers can be easily transported by car to other township. In packaging of these cultivars, the wooden box, newspaper, the leaves of Inn and banana are used. After harvesting, the branches or roots are sprinkled with water until it reaches to marketing. If the flowers touched with water, these become rotten while carrying. The branches or roots must be soaked in water before the flowers are sold in market.

In Pyin Oo Lwin Township, there are about 9133 agriculturalists. Among them 8203 persons were engaged in cultivation of the Garden lands. Although local peoples are regularly in touch with cultivation they are still needed to get a scientific knowledge to be successful in their work. They should not always be depended on the hybrid cultivars introduced from foreign countries; it is also needed to try a local hybrid that is more showy and stronger than the introduced one. The local farmers, horticulturists, and researchers should be tried in the future.

Therefore, if Pyin Oo Lwin Township is called '**Flower Capital**', it is not thought that will be mistaken. Then, some plant growers from Pyin Oo Lwin Township can stay economically by cultivating of flowering plants. By the studying of this research from Pyin Oo Lwin Township, the valuable information of the local peoples for their economy and plants researches for their cultivated plant taxonomy and horticultural knowledge can also be partially accomplished.

**Table 1 Soil Texture in Pyin Oo Lwin Township**

Particular	pH	Organic Matter %	Sand %	Silt %	Clay %	Texture
1	7.7	9.88	40	34	26	Loam
2	6.4	7.78	61	19	20	Sandy Clay Loam
3	6.8	2.05	59	25	16	Sandy Loam
4	8.2	4.65	50	36	14	Loam
5	7.4	9.3	39	28	33	Clay Loam
6	8	6.85	84	7	9	Loam Sand
7	7.8	6.12	84	10	6	Loam Sand
8	5.1	4.62	85	11	4	Loam Sand

Particular 1 Pyin Oo Lwin Town

Particular 2 A ni sакhan, Pyin Oo Lwin Town

Particular 3 Moe koe pik Village

Particular 4 Ye nge Village

Particular 5 Kan gyi kone Village

Particular 6 Si tha Village

Particular 7 Kyauk phar-do Village

Particular 8 Nyain nyin tha

**Source : Forest Research Institute (FRI)**

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### Appendix

Name	Date	Occupation	Location
U Kyint Wai	8.1.17	Gardener	Pyin Oo Lwin Town
U Kyin Maung	11.2.17	Gardener	Sintha Village
U Aung San	19.3.17	Gardener	Kyin ga naing Village
Ko Maung Lat	3.9.17	Gardener	Nyain Nyin Tha Village
U Aye Maung	5.11.17	Gardener	Kangyikon
Ko Lwin Zaw Oo	18.2.18	Gardener	Sintha Village
U Kyi Maung	4.8.18	Gardener	Ye Nge Village
Ma Thin Thin Yu	9.9.18	Gardener	Zay Kone Village
Daw San San Yi	17.11.18	Gardener	Pyin Oo Lwin Garden