

Medicinal & Aromatic Plants

Gloriosa superba



1. Introduction

Gloriosa superba L. is commonly known as glory lily.

The regional names of the plant are as follows:

English: Malabar glory lily

Hindi : Kalihari, Languli

Tamil : Kalappaikkilangu, Nabhikokodi

Kannada: Agnishike, Nangulika

1.1 Botany

It is a herbaceous, climbing perennial, growing between 3.5 to 6 m in length, usually trained at 1.5 m above the ground level. The vines are tall, semi hard stemmed with tuberous roots that support themselves by means of cirrhosted tips. Leaves are sessile, alternate; flowers bright, solitary, at first greenish later becoming yellow and finally scarlet; fruit capsules containing many seeds.

1.2 Medicinal properties

The plant has been used in the Indian system of medicine since time immemorial. Its rhizomes are reported to have been used as a tonic, anti-periodic, anti-helminthic and also against snake bites and scorpion stings. It is used in local applications against parasitic skin diseases and as a cataplasm in urological pains. The drug is sometimes used for promoting labour pains and conversely also as an abortifacient. It is considered useful in colic, chronic ulcers, piles and gonorrhoea. The leaves when applied in the form of a paste to the forehead and neck, are reported to cure asthma in children. The leaf juice is used against head lice.

The medicinal properties of the plant are due to presence of alkaloids chiefly colchicine and gloriosine. It is used in the treatment of gout, a common disorder in the temperate parts of the world. The colchicine content varies from 0.15 to 0.3% in the rhizomes and 0.7 % to 0.9% in the seeds. The discovery of high colchicine content in seeds led to surge in demand in domestic and international markets.

1.3 Chemical constituents:

Rhizomes and seeds contain colchicine, isoperlolyrine and related tropane alkaloids. Air dried rhizomes contain β - sitosterol and its glucoside, 2-hydroxy 6-methoxy benzoic acid.

2. Package of Practices

2.1 Climate

It is a tropical plant and comes up well in warm, humid regions. An annual rainfall of 350 - 400 cm, well distributed throughout the year, is ideally suited to the crop. It does not withstand continuous moisture stress and requires frequent irrigation up to flowering in dry periods. Rains during December damage the crop and affects yield. Continuous cloudy weather is congenial for multiplication of *Curvularia lunata*, which causes leaf blight and leads to heavy mortality of the vines.

2.2 Soil

The plant grows well in sandy loam soil, having pH 5.5 to 7.0. Good drainage is essential for its successful growth and water logged soils should be avoided at any cost.

2.3 Land Preparation

The field should be ploughed and harrowed several times to bring the soil to a fine tilth. The field must be leveled properly for making adequate drainage arrangements. After the removal of grass stubbles and roots, the field is divided into convenient plots. About 10 t of FYM should be applied at the time of land preparation. Beds are prepared into ridges and furrows. Furrows with 15 cm depth are made with a spacing of 120 cm -150 cm between them.

2.4 Propagation

Gloriosa is commercially propagated from its underground, V-shaped rhizomes. Gloriosa produces bi-forked tuber during the growing season and each of these forks has only one growing bud.



Rhizomes should be handled carefully, as they are brittle and are liable to break easily. If the growing bud is subjected to any kind of damage, the tuber will fail to sprout. The vigour of the vine and flowering and fruiting ability depends on the size of the rhizomes. The optimum weight of the rhizomes should be about 50-60 g. The plants from small rhizomes do not flower during the first year. In order to avoid rotting of rhizomes, it is advisable to treat the rhizomes with fungicides, preferably Carbendazim (0.1%).

2.5 Planting

Treated rhizomes are planted during rainy season, in furrows at a depth of 6-8 cm with a plant to plant spacing of 20-30 cm. It is reported that closer spacing would favour cross pollination and improves the fruit set. In one acre, on an average basis, about 600 kg of rhizomes are required to maintain the plant population of 12000 - 13000 plants per acre.

2.6 Manures and fertilizers:

Though *Gloriosa* makes satisfactory progress with little manuring and fertilization, the addition of well decomposed manure, bone meal and fertilizers to the soil ensures a vigorous plant, strong rhizomes and better flowering. Ten tonnes of compost is required for one acre. A fertilizer dose of 60 kg N, 25 kg P₂O₅ and 40 kg K₂O/ha is recommended. Of the nutrients, the whole P₂O₅ and K₂O and one-third of Nitrogen is applied as a basal dose and the remaining two-third of Nitrogen is given in the first six to eight weeks after planting.

2.7 Intercultural Operations:

During the initial stages of crop establishment, frequent weeding is required to avoid competition of weeds with the main crop. While weeding, utmost care is to be taken to avoid any damage to the growing tip of the rhizomes as once the growing tip is damaged it does not sprout again during the season. Chemical weeding is not possible in this crop.

2.8 Hand pollination

Hand pollination is required due to peculiar position of stigma and anthers. Muslin cloth or cotton tied sticks can be used for pollination. Morning time (between 7-10 a.m.) is preferred for hand pollination.

2.9 Irrigation

Frequent irrigation is required during the sprouting time to keep the soil surface soft, so that there is no hard pan formation, which inhibits sprouting and emergence of growing tip outside the soil. Excess watering is harmful to the plant. An irrigation interval of 4-7 days during initial period and later on at an interval of 15 days is recommended. On an average basis, a plant requires 5 litres of water per day. No irrigation is required after flowering. Flood irrigation is in vogue in cultivated areas and off late drip irrigation is receiving popularity among growers.

2.10 Crop Support:

The plant requires some kind of support, since the stem is tender. When the plants are about 30-40 cm tall, they should be staked or tied to wires or allowed to climb on some sort of frame. There are two types of structures adopted by farmers. One method is planting of four feet wooden sticks along side of the furrows with the spacing of about 15 feet between sticks. 3-4 steel wires are tied parallel to the tip of wooden sticks. Sorghum straw is inserted in between steel wires. This facilitates the plant to climb. In the other method, the farmers use iron rods (3'*3'*3'), as shown in the picture below, instead of wooden sticks and rest of the support system is same as in the case of wooden support system. The main disadvantage of wooden system is that wooden sticks are to be replaced frequently due to termite attack.



2.11 Pests and Diseases

Gloriosa has few pests and diseases. Major pests of Gloriosa are Lily Caterpillar and Green Caterpillar and spraying of Metacid at a concentration of 0.2% at fortnightly intervals controls these pests. Major diseases are leaf blight and tuber or basal stem rotting and wilting. The leaf blight incidence is higher during cloudy weather coupled with high humidity. This disease can be controlled by spraying Dithane M-45. Another disease is tuber rot which is a soil borne disease affecting the underground rhizomes causing the death of the plant. Drenching the soil with Bavistin@ 0.2% is recommended to control the disease. Some progressive farmers apply bio-pesticides and bio-control agents for controlling pests and diseases.

2.12 Harvesting

Gloriosa is a perennial plant. The crop flowers during September – October and matures in 170 - 180 days after planting. A single plant produces 75 -100 flowers and a single fruit contains 70 - 100 seeds. The right stage of harvest is when the capsule starts turning light green from dark green and skin of the fruit shows shrunken appearance and becomes light in weight. At this stage, when pressed the pod gives a cracking sound. The harvesting time is February (for crops planted in July). The fruits are harvested after 170 -180 days of planting and dried in the shade for 10 -15 days. The rhizomes, which are, buried beneath the soil again sprouts and the plant cycle continues with the advent of monsoon. The rhizomes are finally harvested after 5-6 years of plantation, cut into small pieces and dried in shade.

2.13 Yield

The yield of seed differs greatly depending on the vigour and age of the plant, which in turn depends on the size of the tuber. The yield in the initial years will be low, but gradually increases in the subsequent years. After three years from a well managed field under irrigated conditions, about 300 kg/acre of dried seeds may be harvested. About one tonne of tuberous roots is harvested after five years of the plantation (i.e. at the end of economic life of the plantation).

3. Forward and backward linkages

3.1 Planting material

Gloriosa is propagated from its underground, V-shaped rhizomes. In the absence of government nurseries, supply of planting material is in the hands of private sector. At present, rhizomes are procured by farmers from three sources viz., from agents, progressive farmers who have large acreage under this crop and cultivating for long time and seed procurement companies. Rhizomes are procured from wild and cultivated sources. Forest areas of Kovilpatti, Pudukottai, Tenkasi in Tamil Nadu and Chitoor, Nellore, Tirupathi, Visakhapatnam in Andhra Pradesh are the important places where rhizomes are procured by the collectors, which is in turn sold to agents. Seed procurement companies also supply planting material as an advance to farmers and price of planting material is adjusted towards final seed price.

3.2 Marketing of seeds:

The medicinal properties of the plant are due to the presence of alkaloids, chiefly colchicine, in seeds and rhizomes. There are certain companies (extractors of colchicine) procuring seed material from farmers by executing MOU with farmers assuring buy back of seeds at a fixed price.

4. Financial aspects

4.1 Unit Cost

The cost of cultivation of Gloriosa has been estimated at Rs.164000 per acre and its detailed break-up is given in Annexure I. Planting material (rhizomes) accounts for almost 65% of the cost of cultivation. The price of planting material (rhizomes) shows yearly fluctuation and it is mainly dependent on seed price (end product). If the seed price is high, tuber cost goes up, and vice versa. In recent past, the planting material price has increased from Rs. 75 - 80 kg in 2005 to Rs.300 per kg in 2009. It is expected that planting material cost is expected to stabilize at Rs 150 per kg, owing to comfortable demand and supply position.

4.2 Sale Price and Gross Income:

Sale price of seeds is dependent on the supply and demand position of the procurement agencies. The sale price of seeds during last few years is showing an ascending scale and it is as given below:

Year	Sale Price (Rs/kg)	Year	Sale Price (Rs/kg)
2004	425	2007	1100
2005	425	2008	1250
2006	525	2009	1600

However, while working out the economics of the crop, a conservative price of Rs.600 per kg has been assumed.

4.3 Margin Money

The margin money / down payment prescribed is 5 %, 10 % and 15% for small, medium and other farmers respectively. The rest of the cost of development will be provided as bank loan. However, in the present model, 10 % of the unit cost i.e. Rs.16400/acre has been considered as margin money

4.4 Bank Loan

Bank loan of 85 - 95 % of the total cost of development shall be available from the financing institution. Bank loan considered in the model is 90%. It works out to Rs.147600/acre in the model.

4.5 Rate of interest

Banks are free to decide the rate of interest within the overall RBI guidelines issued from time to time. However, the ultimate lending rate has been considered as 12 % for working out the bankability of the model project.

4.6 Security

Banks are guided by RBI guidelines issued from time to time in this regard.

4.7 Financial Analysis

Financial analysis has been carried out by taking into account the techno economic parameters indicated in Annexure II. The details of the financial analysis are given in Annexure III, the results of which are summarized below:

NPW at 15% DF : Rs. 187250

BCR : 1.92 :1

IRR : >50%

The crop is financially viable with out taking into account the income from selling of rhizomes.

4.8 Repayment schedule

The bank loan along with interest can be repaid within five years including one year grace period. The details are furnished in Annexure IV.

5. Other Important terms and conditions

1. The crop should not be cultivated in waterlogged soils and adequate drainage is must.
2. Soil and water testing is essential for selecting the area for planting of Gloriosa
3. Planting material cost varies from year to year and there is no source of supply from government nurseries. Hence, banks may watch price situation of planting material as well as seeds on year to year basis.
4. The cost of cultivation suggested in the model is indicative only. Banks may revise the cost of cultivation based on local conditions.
5. As the crop entails high cost of cultivation, financing banks may select the borrowers who have got other source of income/large acreage for financing.
6. As market for this crop is very specific, it is suggested that banks may insist MoU between the procurement agency and farmer. As far as possible contract farming may be insisted upon by financing banks.
7. Financing banks may contact Department of Horticulture for getting subsidy

assistance in respect of their borrowers.

6. Conclusion

The area under Gloriosa has been increasing steadily during the last five years. Sale price of planting material and seed are on an ascending scale. The economics of the crop is favourable, even with conservative pricing.

[Cultivation of Gloriosa superba – Annexure I](#)

[Cultivation of Gloriosa superba – Annexure II](#)

[Cultivation of Gloriosa superba – Annexure III](#)

[Cultivation of Gloriosa superba – Annexure IV](#)