

Rajnigandha: Cultivation and Uses

Sulekha Pathak

Department of Botany, Govt. M.H. College of Home Science and Science for Women Jabalpur. M. P.

Abstract: Large number of beautiful and sweet pleasant fragrance flowering plants occurs in nature which attracts human being. Rajnigandha (*Polianthes tuberosa*) is one of such plant which is well known for its uses in bouquets, essential oils and pan masala, essential oil is used in wide variety of Ayurvedic medicines, confectionery, drink, dental cream and mouth wash. Thus this plant is very good source of economic and industrial application. This paper is about wide knowledge of different varieties, cultivation practices including pest management, transport, ratooning and applications.

Keywords: Rajnigandha, Cultivation, Essential oil

1. Introduction

The Rajnigandha or tuberose occupies a very selective and special position among the ornamental bulbous plants for its beauty, elegance and sweet pleasant fragrance. It has great economic potential for cut flower trade and essential oil industry. Due to their great demand it is currently cultivated in most of the tropical and sub-tropical countries of the world.

The common name derives from the Latin tuberose. In Hindi it is known as "Rajanigandha". Though it is referred to as "Raat ki Rani" (Queen of Night). The name Rajnigandha means "Night Fragrant". (Rajani-night, Gandha- fragrance). This flower also has mythological importance. It is known by various vernacular names- in Manipuri-Kundalei angouba, in Urdu-Gul shabbo, in Marati-Gulcheri, Kannada-Sukandaraji, Telgu- Nelasampengi, and Tamil-Nilasampangi.

Its botanical name is *Polianthes tuberosa*. It belongs to family-Asparagaceae sub-family- Agavoideae.

Origin and distribution- It is native to Mexico. In India it is found in Bangalore, Mysore and Dehradun.

Botanical characteristics- It is an aromatic cultivated perennial herb. The stem is underground modified bulb, roots are mainly adventitious, leaves are pale green, long, narrow and very dense, arise in rosette, these are 30-40 cm long and 1.2-1.5 cm in width, some time reddish near the base. The flowers have a funnel shaped perianth and are fragrant, waxy, white, single or double, borne in pairs on a long spike, 3-6 cm. in length. Stamens are six in number, anther dorsifixed, the filaments are attached to the upper part of the corolla, ovary trilobular, ovule numerous, fruit capsule. Seeds are flat. At maturity the flower spike attains 40-75 cm height.

Cultivation-

Varieties- Single flowered- With one whorl of corolla and are highly scented (5 petals per flower). Calcutta- single, Coimbatore-Single, Bangalore single, Kalyani Single, Shringar, Prajwal, Rajat Rekha, Hyderabad Single are main varieties.

Semi double- Bearing two to three whorls of petals.

Double- This group comprises of varieties with more than three whorls. The main varieties are Double, Kalyani Double, Swarn Rekha, Hyderabad Double, Calcutta Double, Vaibhav & Suvasini.

Variiegated- The leaves are variegated i.e. yellow on the margin.

Variiegated single- Rajat (white margin).

Variiegated double- Dhawal (golden margin).

Single flower varieties are more fragrant than double and usually preferred for gajara and garlands, while double varieties are preferably used for vase decoration.

Climate- It is warm climate (tropical) plant but can tolerate light frosts. In cooler areas bulbs can be grown in containers that can be given shelter over winter. 20-30°C is optimum temperature for its growth. High temperature 40°C as well as low temperature 10°C or below reduces the length of spikes and weight and quality of flowers.

Soil- It grows in wide range of soils. It prefers loam and sandy soil, the soil should be rich in organic matter with good drainage. The pH required is 6-7. For cultivation in pots a mixture of garden soil, FYM and leaf moulds in the proportion of 2:1:1 should be used.

Land preparation- The land should be initially ploughed in summer season. Fertilizers should be incorporated in to the soil at the time of last ploughing.

Cropping method- The Rajnigandha (tuberose) is propagated by bulbs. Care should be taken in selecting healthy and good sized bulbs. The bulbs are planted in the month of April to June. The bulbs of 2 cm or above in size, weighing 30 gm are most suitable for better flower yield. Bulb weight is important factor which influences the flowering. When the bulb having weight more than 30 gm are used than flowering started within 40 days after planting, while bulbs having 15 gm weight required 50 days for flowering, bulbs with 10 gm weight do not produce flowers even in 200-250 days. Before planting the bulbs should be treated with- 0.1% Bavistin for 30 minutes. Dipping the bulbs in 4% solution of thiourea can break the resting period. Pre-plant storage of bulbs at 10°C for a period of 30

days improves the plant growth, increased spike and flower yield.

Pre-planting treatment of bulbs with GA₃, ethe-rel or thiourea promoted early appearance of flower and produced highest number of longer spikes with maximum number of florets. They are planted at the depth of 4- 8 cm at a distance of 10 to 20 cm.

Nutrition requirement- Before planting the field should be supplied with organic manure FYM 25 t/ha. A fertilizer dose of 100:50:50 kg NPK is best for its good growth. Half dose of nitrogen and full dose of P, and K should be given at the time of planting and rest dose of Nitrogen should be given in 3 doses i.e. at the final preparation of plat, 60 and 90 days after planting of bulbs.

Micro-nurients-Foliar spray of ZnSO₄ 0.5% + FeSO₄ 0.2% + Boric acid 0.1% is good for yield.

Growth regulators- Foliar application of GA₃ at 50 to 100 ppm thrice at 40, 55 and 60 days after planting is good for yield.

Irrigation management- It requires regular water during growing season and at the time of blooming. When tuberose goes in dormant stage after the end of flowering no irrigation is needed. Over water condition should be avoided. The field is irrigated before planting of bulbs and there after further irrigation is avoided until the bulbs have been sprouted because too much water at the time of sprouting will result in rotting of bulbs. During summer, irrigation should be given at weekly interval or even earlier in case soil dries out and during winter at 10 days interval.

Weed control management- weeding should be done regularly. For chemical weed control, Atrazine @1.0-1.5 kg /ha in 1000 litres of water is sprayed immediately after planting of bulbs.

Once the bloom stalk forms, some sort of support is needed as they can be quite heavy when studded with their thickly petalled flowers.

Harvesting - Flowers bloom in summer after 3 – 3.5 months. Flowers are harvested for two purposes-
1. as a cut flower for vase decoration.
2. as a loose flower for veni or garlands.

When the flowers are harvested for vase decoration spikes are to be cut when lower most 1 or 2 florets have been opened. After cutting the spike the base of the spikes immediately placed in a bucket full of water. When the loose flowers are to be harvested, then fully developed but unopened flowers are plucked. Each spike produces 16-20 florets out of this terminal 3-4 pairs of florets are very small and of no use. Full bloomed flower spikes should be cut from the upper side of the surface. It should be cut in early morning or evening.

Yield- 3-4 months after planting Rajnigandha (tuberose) start flowering. Summer and rainy season are the peak period. Bulbs once planted give the commercial yield up to 3

years. 6000 to 8000 kg flowers are obtained by 1 ha. The yield of loose flowers/spike depends on variety, planting distance and climate condition prevailing in the area. One hectare of tuberose plantation yield 4-5 lakhs of spikes per year from single varieties, 10.5 tonnes/ha of loose flowers may be harvested. In addition, 20 tones/ha of bulbs may be harvested after 2-3 years.

Storage- Rajnigandha should be stored in dry atmosphere with limited air circulation.

Pests and Diseases- Following chemicals are used for control of loss due to diseases-

- 1) Thrips and mites- Nuvacron spray 2 ml/liter.
- 2) Thrips and Aphids- Spray Dimethoate 1.5 ml/liter. Or Fipronil 5% Sc 1.5 ml/ liter.
- 3) Root knot nematode-Application of Furadon @ 2 g/plant or carbofuran @ 2-5 kg/ha, neem @ 1 tonne/ha controls nematode infestation. Carbofuran 3G 1gm/plant near the root zone and irrigate immediately to control nematode infestation.
- 4) Fungal diseases-Soil drenching with Brassicol 2gm /liter.

2. Post Harvest Activities

Grading

The flower spikes are graded according to the stalk length, length of rachis, number of flowers per spike and weight of spikes.

- Straight and strong stem of uniform length and uniform stage of development are preferred.
- Flowers should be free from bruises and diseases and pests.
- Florets are graded according to their size for loose flowers.

Packing and Transport

For room decoration, long spikes are preferred and are sold in bundles. Each bundle contains 100 spikes. To avoid damage of the flowers and buds, the whole bundle should be wrapped in soft, white tissue paper or polythene. These bundles are packed in rectangular bamboo baskets lined with Hessian cloth.

For long distance transport, they are packed in square boxes or airy baskets but packing in cardboard boxes is more suitable which can be easily transported by rail, bus or by truck. Loose flowers are packed in bamboo baskets holding about 10-15 kg flowers and the baskets are covered with muslin cloth and are transported to the nearby wholesale market where they are sold by weight.

Holding solutions

A holding solution consisting of sucrose 2% + Al₂ (SO₄)₃ 300ppm was found best for increasing the post harvest life and quality of cut spikes of tuberose.

Extraction of Oil and Quality Control

The flower oil is extracted by effleurage and solvent extraction with petroleum ether. Freshly picked flowers, before they open are effleuraged. About 150 kg of flowers yield 1 kg of absolute of enfleurage which contains 11-15%

of steam volatile oil. Extraction of tuberose flowers with petroleum ether yield 0.08 – 0.14 per cent of concrete. The concrete contains 3 – 5 per cent of a steam volatile oil. Out of the approximate total yield of 30,000 kg of loose flowers from one hectare, in three years, 27.5 kg of ‘concrete’ could be obtained. This concrete in turn will yield about 5.50 kg of absolute. One hectare of tuberose plantation may yield upto 12 kg of concrete.

3. Ratooning

In November-December, when the temperature drops, the leaves of the plants turn yellow and die and the plants undergo dormancy. Digging of bulbs should be done at this stage. With the increase in temperature the crop regains growth from the previously planted bulbs which is termed as ratooning. The ratoon crop results in more number of spikes but reduces number of florets, length of spikes and weight of flowers. Therefore, ratoon crop should be used only for loose flower or oil extraction purpose.

For ratooning in tuberose, the yellowing plants should be twisted from the ground level which leads to early maturing of bulbs. For the proper growth and development of plants, fertilizer dose as given in the main crop should be applied in two equal split doses in January-February and April. All other cultural practices should be done as in case of main crop. There is early flowering in ratoon crop as compared to main crop.

4. Uses

- 1) Flowers are used for artistic garlands, floral ornaments, bouquets, and buttonholes. The long flower spikes are excellent cut flower for table decoration when arranged in bowls and vases. The variegated type with golden striped leaf margins is very attractive and suitable for beautification of gardens. The spikes of tuberose are used as cut flowers due to its delightful appearance, sweet fragrance and good keeping quality.
- 2) Flowers are source of tuberose oil. The natural flower oil of tuberose remains today one of the most expensive of the perfumer’s raw material.
- 3) It is used in production of cosmetics, perfumes, essential oils and pan masala.
- 4) The essential oil is used in wide variety of Ayurvedic medicines, confectionery, drink, dental cream and mouth wash.
- 5) The flowers are used in religious ceremonies, wedding ceremonies, garlands, decoration and various traditional rituals due to its fresh fragrance. The bulbs are considered diuretic and emetic.
- 6) They are rubbed with turmeric and butter and applied as a paste over pimples of infants.
- 7) Dried tuberose bulbs in the powder form are used as a remedy for gonorrhoea.
- 8) Fragrant flowers are added along with the stimulant or sedative to the favorite beverages prepared from chocolate and served either hot or cold as desired.

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