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# Advances in Production Techniques of Tuberose

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## Abstract

Tuberose is a monocot herbaceous perennial plant. It is mainly used as cut flower and loose flower. It is extensively cultivated in many sub-tropical and tropical parts of the world including India. It is native of Mexico and popularly known as Rajanigandha, derives its generic name from the greek word *Polios*, which means white or shining and *anthos* meaning a semi perennial bulbous plant. It is a half hardy plant with tuberous roots producing long spikes, bearing waxy white fragrant flowers which impregnate the atmosphere with their sweet fragrance. It is a crop which flowers profusely throughout the year. Due to the longer keeping quality of flower spikes, they are in great demand for making floral arrangement and bouquets in major cities of India. The cultivation practice of tuberose is more important and discussed in this paper.

## Introduction

Tuberose is an important half hardy bulbous perennial plant known for its colour, purity, elegance and fragrance of flowers. The cultivation of crop is increasing due to its utility as cut flower, loose flowers and in the perfume industry. The flower remains fresh for long time and is suitable for long distance transport.

**Botanical Name:** *Polyanthes tuberosa*

**Family:** Amaryllidaceae

### Cultivated species in tuberose

1. *Polyanthes tuberosa*
2. *Polyanthes nelsonii*
3. *Polyanthes blissi*
4. *Polyanthes sessiliflora*

**Climate:** Tropical conditions with a temperature range of 28 to 30°C.

**Soil:** Well drained loamy soil having a pH of 6.5-7.5 is ideal for cultivation.

## Commercial Cultivars

Tuberose cultivars are classified into three types based on the number of rows of petals.

### 1. Single Flowered Tuberose

- Flowers with one row of corolla segments
- Flowers are extensively used for essential oil extraction
- Loose flowers are used for making floral ornaments
- Single types are more fragrant than double
- Seed setting is also high in single type

- Floral buds are greenish white
- Flowers are pure white
- Concrete content has been observed to be 0.08 to 0.11 percent

- Varieties: Rajat Rekha, Calcutta Single, Shringar, Single Mexican, Prajwal, Arka Nirantara

### 2. Semi-Double Flowered Tuberoses

- White flowers with 2-3 rows of corolla segments on straight spikes.
- Used as cut flowers also
- Varieties: Vaibhav

### 3. Double Flowered Tuberoses

- Flowers with more than three rows of corolla segments on long and sturdy spikes.
- Used as cut flower as well as loose flower
- Used for extraction of essential oil.
- Concrete recovery has been found to be 0.06%.
- Flower colour is white and/or also tinged with pinkish red.
- It does not open well and is not commercially viable as the single cultivar.
- Varieties: Suvasini, Pearl Double

## Description of Major Varieties / Hybrids

### Single Flowered Type

#### 1. Rajat Rekha

- It is released by NBRI, Lucknow
- Silvery white streak all along the middle of the leaf blade
- It is a mutant evolved by irradiating bulbs of single type cultivar
- Concrete content has been found to be 0.089%

#### 2. Shringar

- It is released by IIHR, Bangalore
- Developed from a cross between Single x Double
- It bears single type of flowers on sturdy spikes
- The flower bud is slightly pinkish tinged
- Florets are bigger than Calcutta Single
- It is resistant to *Meloidogyne incognita* nematode
- Loose flowers are ideal for making garland
- Spikes can be used as cut flower
- Yield of loose flowers is about 1500 kg/ha per year (40% higher than Calcutta and Mexican Single)
- Concrete content of this hybrid is at par with Mexican Single

- It is preferred by farmers and perfumery industries

### 3. Prajwal

- It is a hybrid developed from Shringar x Mexican Single
- It bears flowers on tall stiff spikes
- It is released by IIHR, Bangalore
- The flower buds are slightly pinkish in colour
- Flowers are white
- The individual flowers are large in size, compared to Local Single
- It yields twenty percent more loose flowers than Shringar
- It is recommended for both loose flower and cut flower purpose

### 4. Arka Nirantara

- It is released by IIHR, Bangalore
- White, single flowers with prolonged blooming

### 5. Arka Suganthi

- It is released by IIHR, Bangalore
- White, single flowers with prolonged blooming
- Plants are dwarf in nature

### Semi-Double Flowered Type

#### 1. Vaibhav

- The hybrid is derived from the cross Mexican Single x IIHR 2
- It is released by IIHR, Bangalore
- It bears semi double flowers on medium spikes
- The flower buds are greenish in colour
- Flowers are white
- Spike yield is 50 percent higher compared to Suvasini
- It is suitable for cut flower

### Double Flowered Type

#### 1. Swarna Rekha

- Double type with golden yellow streaks along the margins of leaf.
- It is released by NBRI, Lucknow
- It is a gamma ray induced mutant, in which mutation occurred in chlorophyll synthesis resulting in change in leaf colour
- Concrete content has been found to be 0.062 percent.

#### 2. Suvasini

- A multi whorled variety developed from the cross between Single x Double
- Pure white flowers are bold and big, borne on a long spike
- Spikes are best suited as cut flower
- Suvasini recorded 25% more yield than cv. Double

## Propagation

Tuberose is commercially propagated by **bulbs** and bulblets.

### Bulbs

**P**ropagation by bulbs is the most common method practiced for the commercial multiplication of tuberose. The bulbs remain dormant during the winter months in places where the temperature is low. The dormancy can be successfully broken by dipping the bulbs in 4% Thiourea solution for one hour. Ethylene chlorohydrin can also be used for breaking the dormancy. The bulbs are separated from the clumps by rubbing off the loose scales and the long roots should also be removed. Spindle shaped bulbs with a diameter of 2.6 to 3 cm size and 25- 30 g weight are used for planting.



Figure 1: Optimum size of bulbs

If the bulbs are very large, they may be cut into 2-3 vertical sections, each containing a bud and part of the basal plate. Each of these sections is treated with copper fungicide and planted vertically with their tips just showing above the surface.

Multiplication by bulb-segments and *in vitro* micro propagation from scale stem-sections is also possible.

## Planting

**T**uberose is generally planted in February-March in the plains and April-May in the hills. The bulbs can also be planted during July-August. Tuberose can be planted all year round in Bangalore, but a higher flower yield is obtained from the April-May planting. In order to obtain flowers almost throughout the year, sequential planting can be practiced.

❖ About 1,00,000 to 2,00,000 bulbs (8-9 tonnes) are required for planting one hectare of land.

❖ Spacing of 15 cm x 20 cm (Maharashtra), 25 cm x 25 cm (West Bengal), 30 cm x 30 cm (Lucknow), 30 cm x 22.5 cm (Bangalore) and 45 cm x 20 cm (South India) have been recommended for this crop. Dip the corms in 5000 ppm CCC

(5 g/lit.) before planting to increase the yield.

❖ While planting, the bulbs (25 - 30 g) are planted at the recommended spacing, 2.5 cm deep on the sides of the ridges.



Figure 2: Soaking of bulbs with 0.2% Bavistin

## Manuring and After Cultivation

**M**anuring can be done with FYM 25 t/ha and NPK 200:200:200 Kg/ha (IIHR recommendation). Full P and K can be applied during the final preparation of plots, while N can be applied in 3 equal split doses *i.e.*, at the final preparation of plot, 60 and 90 days after planting of bulbs.

**Micronutrients:** Foliar spray of ZnSO<sub>4</sub> 0.5%+FeSO<sub>4</sub> 0.2% + Boric acid 0.1%.

**Growth regulators:** Foliar application of GA<sub>3</sub> at 50 to 100 ppm thrice at 40, 55 and 60 days after planting.

### Pests

**Thrips:** Spray Dimethoate @ 1.5 ml/lit or Fipronil 5 % SC @ 1.5 ml/l.

**Aphids:** Spray Dimethoate @ 1.5 ml/lit or Imidacloprid @ 1.5ml/l.

### Root Knot Nematode:

Apply Carbofuran 3 G 1g/plant near the root zone and irrigate immediately to control nematode infestation.

### Diseases

**Basal rot (or) stem rot:** Soil drenching with Carbendazim @ 0.1 %

### Crop Duration

It extends up to 2 years. The crop can be maintained for one more year with good management practices.

### Harvest

Sprouted bulbs take 80 to 100 days for flowering. August-September is the peak period of flowering.

**For loose flowers:** Harvesting is done by cutting the fully opened spikes from the base or single flowers are harvested as they open by day. Picking of individual flowers should be completed by 8.00 a.m.

**For cut flower:** Whole spike is cut leaving 4 to 6 cm from the base. Crop extends up to 2 years. The crop can be maintained for one more year with good management practices.



Figure 3: Tuberose seed

**Yield**

Loose flowers: 14-15 t/ha;

Cut flower: 2 - 3 lakhs spikes/ha/year; Bulbs & bulblets: 20 -25 t/ha (at the end of 3<sup>rd</sup> year). Concrete recovery: 0.08 - 0.11 %.

**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 percent of concrete. The concrete contains 3 – 5 percent 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.

**Ratooning**

In November-December, when the temperature drops, the leaves of the plants turn yellow and die and the plants undergo dormancy. 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.



Figure 4: Tinting

**Tinting**

Tinting is the technique which is used for making colouring of flowers or artificial coloring of the flowers with use of food colorants.

**Conclusion**

Tuberose is most important commercial flower crops produce flowers throughout the year. In India different states cultivating this crop as loose flowers and also as cut flower. Since the flowers are producing mild fragrance. Essential oil extracted from flowers, Single varieties are more fragrant than Double type and contain 0.08 to 0.14 percent concrete which is used in high grade perfumes. There is high demand for tuberose concrete and absolute in international markets which fetch a very good price. This cultivation practice of tuberose crop is very useful to the farmers.

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