



# Khasi Mandarin Orange

Scientific Name - *Citrus reticulata*



## MANDARIN ORANGE

Scientific Name - **Citrus reticulata**

Family - Rutaceae

The mandarin orange is a small citrus tree with fruit resembling other oranges, usually eaten plain or in fruit salads. It can be grown both in tropical and sub-tropical areas. It occupies nearly 50% of the total citrus area in India. The Khasi mandarin is widely cultivated in Meghalaya, Assam and the other North-Eastern states. It has high nutritional value, distinctive quality and taste, vibrant golden fruit colour and sweet tanginess. In Meghalaya, the citrus trees are grown on the steep but not yet mountainous slopes that run along the border between India and Bangladesh. The best fruits come from the south, where the indigenous War and War-Jaiñtia populations live because of the chalky soil and a hot climate. This particular region allows the growth of sweet and juicy mandarins.

**VARIETIES:** - Nagpur Santra, Coorg Santra, Khasi Mandarin, Kinnow mandarin, etc

**SOIL AND CLIMATE:-** Mandarin thrives well in deep loose well aerated soil devoid of any hard pan. Ideal pH range for mandarin is 5.5 to 6.5. Although it can grow under diverse climatic conditions, but thrives well in sub tropical and semi temperate climates having high humidity and requires warm summers and mild winter in the temperature Of 15-30°C.

**PROPAGATION:-** Initial planting is a basic requirement on which the performance of the crop depends. The planting material must be collected from the consistently performing mother plants free from any disease and pests. There are different ways to propagate Khasi Mandarin.

**BY SEEDS:-** The source of planting material for orange in the State of Meghalaya is generally through seedlings raised from seeds procured from healthy, virus free trees which have a pedigree of desirable characters. Mature and healthy fruit should be selected for seed extraction. Fresh seeds are more viable (more likely to grow) than older seeds. Seeds are best planted in spring or early summer. Seed should be sown first in primary

nursery. In beds, the seeds should be sown at a depth of 1-1.5cm giving a spacing of 10\*3cm. Water gently using a rose watering can. Germination starts within 2-3 weeks. Seedlings are transplanted to secondary nursery when they attain 4-6 inches tall having 8-10 leaves.

**BY BUDDING:-** Scion/bud wood should be selected from diseased free healthy plants and defoliate once a week in advance before grafting/budding. The important rootstocks of citrus are Rangpur lime, Rough lemon, Cleopatra mandarin, etc. Budding is done in Feb-March or in July-Aug. 'T'-shaped cut is made through budding knife in the bark at 15-20cm above the ground level. The two flaps of the bark are loosened with the help of bare blade of budding knife. A shield shaped patch of bark is removed measuring 2.5cm length containing a bud from the mother plant. The bud is inserted into the "T" cut on the stock and tied with 400 gauge polythene strip leaving the bud open.

**BY SOFTWOOD GRAFTING:-** Softwood grafting is done in July-Aug. 6 months old shoot is defoliated from the mother plant 7-10 days prior to grafting. Leaves are removed from the rootstock leaving 2-3 leaves before grafting. Defoliated scion is inserted into the prepared rootstock by simple wedge grafting and wrapped with polythene strip.

### PLANTING IN ORCHARDS

**SITE SELECTION:-** the site selected for the establishment of orchard should have sufficient sunlight and protection from strong winds. The soil should be deep, loose and having good drainage.

**LAND PREPARATION: -** Land should be cleared of all trees and shrubs. In the hills lopes, contour system of planting should be adopted. Pits of 60\*60\*60 cm size are dug at 5\*5 m apart. Pits once dug are allowed to remain exposed for a period of 15-10 days for deeper penetration of sunlight to the bottom of the pits. They can also be sterilized by burning firewood inside them. Each pit is filled with topsoil and 15kg well rotten cow dung or compost. The seedling is placed upright in the centre of the pit, keeping the roots fully stretched and the soil pressed firmly around the seedling.

RECOMMENDED SCHEDULE FOR MANURES & FERTILIZERS: - Manures are to be applied in the month of December. It is advisable to apply fertilizers, however, in two to three equal split doses, coinciding with the flush period. The first dose may be given in the months of March- April and subsequently in June- July and finally during September-October. Manures and fertilizers should be applied in circular trench 10 cm deep and 30 cm wide dug all round the periphery of the tree, keeping a minimum distance of 1(one) foot from the trunk. As the tree advances in age, the basin is enlarged and manures and fertilizers are applied in a much wider area. Application of lime @ 3kg/tree, once in three years in the month of January - February, is advocated to improve soil reaction (pH).

Apply the Manures & Fertilizers for pre-bearing and bearing orange as per the Schedule given below-

Age of orchard	DOSE/TREE/YEAR			
	FYM ( kg/tree)	Urea ( g/tree)	SSP ( g/tree)	Mop ( g/tree)
1.	10	200	600	200
2.	15	400	900	400
3.	20	600	1200	500
4.	25	800	1500	600
5.	30	850	1800	600
6.	35	1000	2400	900
7.	35	1200	2700	1100
8.	35	1300	3000	1200

TRAINING/PRUNING: - Pruning is done in early spring, when trees are dormant. This is normally achieved within first three years of planting. During the first year, all the branches growing up to 60cm are removed. Above that, branches growing in all directions are retained. All water sprouts should be removed. In bearing trees, diseased and broken branches are thinned out.

IRRIGATION: Irrigations should be given only during dry periods, the first being at planting time. Subsequently, irrigations can be given at intervals of 15 - 20 days during October to January, and 7 - 10 days during March to June, the quantity of water being just enough to wet the root zones. Extreme care should be taken to keep the base of the trunk dry.

INTER-CROPPING: Growing intercrops in orchard not only generate income but also check erosion through ground coverage and improve soil fertility but this practice in the orchard plantation should be discontinued once the trees have come to bearing. The following points should be kept in mind in selection of the intercrops:

- *It should not be injurious to the main crop.*
- *Creeping types of vegetables should be avoided.*
- *The intercrops should not require too much stirring of the soil.*
- *Should not be too tall.*
- *Avoid growing long duration crops like ginger and turmeric.*

*Leguminous crops like pea, French bean, soya bean etc. are the preferred intercrops as they help in improving the soil fertility.*

WEED CONTROL: It is necessary to keep the basin area free from weeds. Subsequently, dry weeds may be used as mulch, which will help to retain moisture, prevent soil loss and add nutrients to the soil.

HARVESTING AND YIELD: - Seedling trees should bear the first crop by the eighth year and the full crop by the tenth year. Fruits are harvested from November to January when they start to change colour, and as and when they ripen. Fully matured, large fruits are selected and clipped off, taking extreme care not to pull or tear them. During the initial years, 40-50 fruits may be harvested per tree. About 800-1500 fruits per plant per year can be obtained from well maintained 20-30 years old orchard.

DISEASES:-

1. Gummosis or Foot Rot (Phytophthora spp.)

Symptoms-

- large water soaked lesion on the basal portion of the stem
- the lesion turns to brown and crack
- gum oozes out from the affected area
- root rot and leaf fall also occurs in affected tree

Management-

- water stagnation around the plants to be avoided
- provision of double ring for keeping irrigation water away from the trunk

- application of trunk paint with Bordeaux paste before and after monsoon
- bud union should be kept 15-20 cm high from the ground level
- drainage should be improved
- injury to the root should be avoided
- application of FYM and other organic manure
- soil application of *Trichoderma harzianum* @2per cent
- diseased and dead bark of the tree trunk should be scraped with sharp knife and apply Bordeaux paste

## 2. Powdery Mildew

### Symptoms-

- Powdery growth appears on both sides of leaf surface, twigs and fruits
- The leaves become small and distorted
- Leaves fall and premature fruit fall is common in severely affected trees
- High humidity and cloudy weather favour the disease development and spread

### Management-

- Spraying with Sulfex @2.5 gm/litre of water
- Removal of water shoots
- Affected plant parts should be removed

## 3. Leaf Fall and fruit rot

### Symptoms-

- This is an important disease in mandarin orange in heavy rainfall areas and is caused by *Photophthora palmivora*
- The infection starts as water soaked lesions at the base of the leaves and spreads upwards
- The leaves rot and shed, leaving the tree naked. The fruits affected by this disease become soft and start rotting. The basal portion of the fruit stalk becomes weak and fruit drop takes place

## Management-

- It can be managed by spraying 1% Bordeaux mixture (a mixture of 1kg lime, 1kg Copper Sulphate and 100 lit of water) two to three times. The first spray should be given prior to the outbreak of monsoon, the second during the middle part of monsoon and the third in the later part of monsoon on a clear sunny day.

## 4. Anthracnose or wither tip

### Symptoms-

- This is caused by *Colletotrichum gloeosporoides* on weak plants of lime, lemon and mandarin
- In affected trees, brown, pimple like cloudy spots occurs on the matured leaves
- The twigs shrivel and assume a silvery grey appearance
- Healthy trees are rarely affected
- When the disease leads to defoliation and drying of the tips of twigs, it is called wither tip
- The main symptoms of the disease are shedding of leaves and dieback of twigs

### Management-

- The affected branches should be pruned off, and the tree sprayed with Bordeaux mixture (3:3:50) i.e, a mixture of 3 kg lime, 3kg Copper Sulphate 50 lit of water
- Spraying of Blitox or Fytolan @0.3% (45g in 15lit of water for one tree) can control the disease

## MAJOR PESTS:-

### 1. Citrus trunk borer

#### Symptoms-

- It is a serious pest in the North eastern region, most severe in uncared gardens
- The larva of the insects bore into the stem, trunk and branches and makes a tunnel inside them



- It excretes a yellowish white powdery thread which is quite prominent

#### Management-

- A simple remedy is to clean the tunnel with a long pointed wire or needle and plugging the tunnel with petrol, kerosene or Carbon Sulphide, etc. afterwards it is covered with mud
- Cut and burn the affected twigs
- Soil treatment with lindane dust @40 to 50g per tree upto 6 to 8cm deep around the trees (0.5m diameter) helps in checking the borer attack
- Dislodge the adults by vigorously shaking the tree, thereafter, collect and destroy them

## 2. Citrus bark borer

#### Symptoms-

- This is another serious pest of citrus in this region
- The caterpillar feeds on the bark and thus destroys its translocating tissues
- It produces a mass of fine silvers of wood and pellets of excreta, mixed with a silky adhesive material on the branches and stems of the trees

#### Management-

- The control are the same as that for citrus trunk borer

## 3. Lemon butterfly

#### Symptoms-

- The larvae of lemon butterfly eat the tender leaves making irregular dents on all sides, especially in younger plantations and nursery plants
- This insect is active throughout the year in this region
- It lays minute eggs on the margins and tips of fresh tender leaves. These hatch into small, half to one centimetre long caterpillars with white marks

## Management-

- They can be removed by examining the plants regularly for caterpillars
- While in nursery and young plantations mechanical collection (hand picking) and destruction of its larval stages is effective
- As a habit, they feed from margin inwards reaching the midrib. A spray of 1kg neem cake in 10 litres of water is useful by acting as a repellent
- Spray with Thiodan 35EC @1-1.5l/litre of water if incidence is serious

## 4. Aphids

### Symptoms-

- Adults and nymphs suck the sap from tender parts of leaves and shoots
- Affected leaves in severe cases curl up and get deformed
- The aphids excrete sweet honey like substance on which black sooty mould grows

### Management-

- Foliar spray with Dimecron 85WC @0.5ml/litre of water during flush periods at weekly intervals controls the pest effectively

Foliar spray of 0.5 ml methyl demeton or monocrotophos, 0.7ml quinalphos, dimethoate or malathion (in a litre of water) at weekly intervals control the pest effectively



*Published by:*

Agriculture Information Wing

Directorate of Agriculture

Period of Revision: July 2018