Complete Process of Apple Cultivation in India

1. Climate Requirements

- **Temperature**: Ideal temperature ranges between **21°C to 24°C** during the growing season.
- **Chilling Hours**: Apple trees require **1,000–1,500 chilling hours** below 7°C during dormancy for proper flowering and fruiting.
- **Altitude**: Best grown at altitudes between **1,500–2,700 meters above sea level**.
- **Rainfall**: Requires **100–125 cm of annual rainfall**, but excessive rain during flowering can affect fruit set.

2. Soil Requirements

- **Type**: Well-drained **loamy soils** rich in organic matter.
- **pH Level**: Ideally between **5.5 and 6.5**.
- **Drainage**: Good drainage is essential to prevent root rot. Avoid heavy clay or waterlogged soils.

3. Selection of Planting Material

- **Varieties**:
  - **Traditional Varieties**: Red Delicious, Golden Delicious, Royal Delicious, American Trel, Granny Smith
  - **Hybrid and Improved Varieties**: HRMN-99, Super Chief, Oregon Spur, Starkrimson
- **Rootstocks**: MM111, MM106 (Semi-dwarf), M9 (Dwarf)
- **Quality**: Disease-free, certified plants from nurseries.

4. Nursery Establishment and Grafting

- Apple plants are propagated through **budding or grafting** on rootstocks.
- **Steps for Nursery Preparation**:
  - Prepare raised nursery beds.
  - Sow seeds for rootstock and allow them to grow for a year.
  - Perform **T-budding** or **whip grafting** with desired varieties.
  - Maintain proper spacing and irrigation in the nursery.

5. Land Preparation

- **Plowing and Leveling**: Land should be **deep-plowed and leveled**.
- **Organic Matter**: Add **well-decomposed FYM (Farmyard Manure) at 10-15 tons/ha**.
- **Pit Digging**:
  - Pits of **1m x 1m x 1m** are dug before planting.
  - Fill pits with **FYM, topsoil, and biofertilizers** for better root growth.

6. Spacing and Plant Population

- **Traditional Orchard**: **6m × 6m spacing**, about **250 trees per hectare**.
- **High-Density Plantation**: **3m × 3m spacing**, up to **1,000 trees per hectare**.
- **Ultra-High Density Plantation**: **1.5m × 1.5m spacing**, over **3,000 trees per hectare** using dwarf rootstocks like M9.

7. Root Dip Treatment Before Planting

- Before transplanting, roots should be dipped in a **Bavistin (fungicide) solution** (0.2%) to prevent fungal infections.
- **Hormone Treatment**: Dipping roots in **IAA (Indole Acetic Acid) solution** enhances root development.

8. Transplanting Process

- **Best Season**: Late winter to early spring (**January–March**) for temperate regions.
- **Procedure**:
  - Plant saplings in prepared pits.
  - Fill with **topsoil mixed with FYM**.
  - Water immediately after planting.
  - Support plants with **stakes** in high-wind areas.

9. Nutrient Management and Fertilization

Growth Stage	Fertilizer Requirement (Per Tree Per Year)
First Year	10 kg FYM, 100 g NPK (12:12:12)
Second Year	20 kg FYM, 250 g NPK
Fruiting Stage	40 kg FYM, 500 g NPK, 100 g Boron

- **Micronutrient Management**: Zinc and Boron sprays help in flower and fruit development.

10. Irrigation and Water Management

- **Frequency**:
  - **Young trees**: Water every **7-10 days** in summer.
  - **Bearing trees**: Water every **15-20 days**.
- **Methods**:
  - **Drip irrigation** (preferred for high-density planting).
  - **Basin irrigation** for traditional planting.
- **Water Stress Effects**: Lack of water can lead to **poor fruit set and low yield**.

11. Pest and Disease Management

Major Pest/ Disease	Control Measure

Codling Moth	Spray Chlorpyrifos (0.05%)
Aphids	Neem oil or Dimethoate (0.03%)
Apple Scab	Spray Mancozeb (0.25%)
Powdery Mildew	Sulfur dusting or Wettable Sulfur (0.2%)

12. Pruning and Training

- **Pruning Time**: Late winter (January–February).
- **Types of Training Systems**:
  - **Modified Central Leader** (for normal orchards).
  - **Spindle Bush** (for high-density planting).

13. Flowering and Pollination

- Apples require **cross-pollination**, so **bee hives** (5–7 hives per hectare) are introduced.
- Pollinizer varieties like Golden Delicious should be **planted at a ratio of 1:8**.

14. Harvesting and Yield

- **Harvesting Time**: August–October (varies by variety and region).
- **Yield (Per Hectare)**:
  - **Traditional Orchard**: **10–15 tons**.
  - **High-Density Orchard**: **40–50 tons**.
  - **Ultra-High Density Orchard**: **60–80 tons**.

Financial Analysis of Apple Cultivation (Per Hectare)

1. Expected Cost of Cultivation

Input	Cost (Rs)
Land Preparation	20,000
Saplings (1000 plants)	3,00,000
Fertilizers & FYM	50,000
Agrochemicals	40,000
Irrigation Setup	70,000
Labour	60,000
Miscellaneous	30,000
Total Cost	**5,70,000**

2. Expected Income (Per Hectare)

Item	Details	Income (Rs)
Yield	50,000 kg	-
Market Rate	Rs 80/kg	-
Total Income	**50,000 × 80**	**40,00,000**

3. Profit Estimation

| Total Revenue | 40,00,000 |
| Total Cost | 5,70,000 |
| Net Profit | 34,30,000 |

Conclusion

Apple farming in India is highly profitable, especially with high-density plantations. While the **initial investment is high**, the **returns are substantial** if proper management practices are followed. The key to success lies in **choosing the right variety, maintaining proper orchard management, and ensuring effective pest control**.

Coconut

Common Pests and Diseases

Diseases

Category : Fungal

Bud rot and nutfall Phytophthora spp.

Fusarium solani

Fusarium moniliforme

Graphium spp.

Coconut tree infected with bud rot pathogen Phytophthora palmivora

Symptoms

Chlorosis of youngest open leaves; leaves rapidly turning necrotic; necrotic spots on leaf bases; unopened spear leaves can be pulled away from the plant easily; removal of unopened spear leaves reveals soft, pink-red tissue with foul smell; leaf necrosis spreading through central crown leaves; woody parts of plant may have water-soaked, pink lesions with dark borders; infected inflorescences abort nuts.

Cause

Oomycete

Comments

Palms between 14 and 40 years old most susceptible; disease occurs in all coconut growing regions; diseases emergence favored by high rainfall.

Management

Control of the disease is reliant on good sanitation practices and the use of appropriate systemic fungicides; remove all infected debris and dead trees from plantation and destroy; irrigate trees early in the day to allow surfaces to dry off during the day.

Ganoderma butt rot Ganoderma spp.

Fruiting bodies

Close-up of Ganoderma root and butt rot fruiting bodies

Ganoderma root and butt rot (Ganoderma australe) fruiting bodies

Symptoms

Older fronds turning yellow and gradually wilting and drooping; fronds collapsing and dying; internal tissue of lower stem discolored; overall reduction in vigor.

Cause

Fungi

Comments

Fungi may enter through wounds on trunk or pruning wounds.
Management
Spacing trees widely limits the chance of infection through root grafts; avoid damaging tree trunks with tools and machinery; remove any dead or severely damaged trees from plantation immediately, including any that have been killed by natural processes; if a site is known to be infected with the disease, the ground should be fallowed for at least 1 year prior to a new plantation being established.

Gray leaf blight Pestalotiopsis palmarum

Symptom

Pestalotiopsis leaf spot (Pestalotiopsis palm arum) sign
Symptoms
Small, yellow-brown spots on leaflets which develop gray centers and dark green borders; lesions coalesce to form large necrotic patches; tips of leaflets turning gray; canopy has blighted appearance.
Cause
Fungus
Comments
Fungi will colonize young, wounded or weakened tissues; disease emergence favored by high rainfall and high humidity.
Management
Disease usually only merits control in coconut nurseries as infection of mature coconut palms are rare; appropriate broad spectrum protective fungicides should be applied.

Lethal bole rot Marasmiellus cocophilus

Symptoms
Oldest leaves of palm turning yellow and wilting; reddish-brown rot in bole tissue; destruction of root system
Cause
Fungus
Comments
Some grasses such as Bermuda grass have been reported as alternative hosts fro the fungi
Management
Any infected trees must be uprooted and burned; area can only be replanted once soil is treated for the disease

Stem bleeding disease Chalara paradoxa (syn. Thielaviopsis paradoxa, Ceratocystis paradoxa)

The canopy of the coconut in the center is wilted and necrotic due to a trunk infection by Thielaviopsis paradoxa.

Only one side of this trunk has significant rot due to Thielaviopsis paradoxa. The fungus rots the trunk tissue from the outside to the inside.

The three coconuts on the left have died from Thielaviopsis trunk rot. The palm in the foreground exhibits trunk collapse.

The trunk of this coconut was just beginning to exhibit "stem bleeding", but the large rusty-brown area at the top was already soft.

Trunk collapse due to stem bleeding disease

Stem bleeding on a coconut trunk. The top of the blackened area was very soft and could be easily pushed in with the fingers.
Symptoms
Soft, yellow rot on trunk; affected areas are dark and turn black as they mature; a reddish-brown liquid may ooze from rotting regions and spill down trunk.
Cause
Fungus
Comments
Fungi enter the trunk through wounds.
Management
Avoid wounding palms with machinery and tools to reduce disease incidence; disease can be controlled with applications of the fungicide benomyl where registered; infected trees should be removed and destroyed as soon as possible.
Category : Viral

Cadang-cadang Coconut cadang-cadang viroid (CCCVd)

Area with cadang-cadang disease showing trees in the early, medium and late stages of the disease.
Symptoms
Newly formed nuts more rounded than in previous years; nuts exhibit scarring on the surface; chlorotic spots on leaves; stunted inflorescences with tip necrosis; leaves begin to decline in size and number; death of palm.
Cause

Viroid
Comments
No vector has been identified.
Management
There is currently no known method of controlling the disease.

Coconut foliar decay Coconut foliar decay virus (CFDV)

Symptoms
Some varieties which have the disease may show no symptoms, others exhibit partial yellowing of leaves which begins to spread to leaf tip; necrosis of petioles causing leaves to die and hang from palm canopy
Cause
Virus
Comments
Transmitted by leaf hoppers
Category : Other

Lethal yellowing (Palm lethal yellowing) Candidatus Phytoplasma palmae (PLY)

Infected trees

Damage due to lethal yellowing

Lethal yellowing infected coconut trees

Infected coconut trees

Lethal yellowing infected palm

Symptoms of lethal yellowing on coconut palm

Lethal yellowing damaged tree

Cocos nucifera spear leaf is dying just as the last leaves are discoloring due to lethal yellow phtyoplasma

Symptoms of lethal yellowing on coconut palm

Symptoms
Premature dropping of fruit; fruit with brown-black water-soaked appearance; necrosis of inflorescences; flower stalks turn black; lower, older leaves turning yellow; entire crown turning yellow; yellow leaves turn brown, dry out and hang from canopy.
Cause
Phytoplasma
Comments
May be transmitted by leaf hoppers.
Management
The most effective method of managing the disease is to plant resistant coconut varieties such as Malayan dwarf or Maypan; antibiotic treatment is effective but not usually practical for large scale plantings.

Pests

Category : Insects

Coconut bug Pseudotheraptus wayi

Symptoms
Damged and/or aborted flowersd; sunken necrotic lesions and scars on nuts; young nuts may exude gum (gummosis) and die; many nuts fall from tree; adult insect is a brown-red with well-developed wings; nymphs are brown-red or green in color with long antennae and feed at the calyx of the nut
Cause
Insect
Comments
The coconut bug is one of the most damaging pests of coconut in Africa; just two bugs per palm can cause severe damage
Management
Natural enemies of the coconut bug include weaver ants, conserve bushes and trees around plantation which are habitats for weaver ants or intercrop with mango, guava or citrus which are attractive to weaver ants; connect canopy with ropes or sticks to allow weaver ants to move between trees

Coconut leafroller Omiodes blackburni (earlier Hedylepta blackburni)

Coconut leafroller (Hedylepta blackburni) damage to coconut plant

Damage due to coconut leafrollers

Coconut leafroller larvae

Coconut leafroller (Hedylepta blackburni) adult

Coconut leafroller (Hedylepta blackburni) larvae damage to coconut leaves.

Coconut leafroller pupae and frass

Coconut leafroller feeding on leaves

Coconut leafroller pupa, larva and frass.

Coconut leafroller rolls leaf near midrib of frond
Symptoms
The larvae feeds on under surface of leaves. Usually they found protected by silken web. Initially they feed on the lower epidermis leaving the upper epidermis intact. The larvae often fold two sides of leaflets by a silken thread and feed inside. The later stage larvae feeds on both upper and lower epidermis of leaves. Severe infestation leads to skeletonization of fronds.
Cause
Insect
Comments
The insect is quite common in high wind areas.
Management
Encourage natural enemies in the orchard.

Coconut rhinoceros beetle Oryctes rhinoceros

Damaged coconut frond

coconut rhinoceros beetle (Oryctes rhinoceros) adult

Lure and trap for Coconut Rhinoceros Beetle

coconut rhinoceros beetle injury to young coconut tree

coconut rhinoceros beetle (Oryctes rhinoceros) pupae

Damage due to coconut rhinoceros beetle

Rhinoceros beetle damage

Coconut rhinoceros beetle larvae

coconut rhinoceros beetle (Oryctes rhinoceros) injured trees

Damage due to rhinoceros beetle

Coconut Rhinoceros Beetle (CRB)

The Asiatic rhinoceros beetle or coconut rhinoceros beetle (Oryctes rhinoceros) damage to coconut
Symptoms
V-shaped cuts in palm fronds or holes in leaf midribs caused by beetles boring into crown to feed; adult insect is a large black beetle with a curved spine on its head; larvae are creamy white grubs with brown heads and 3 sets of prolegs at the anterior (head) end.
Cause
Insect
Comments
Beetles are nocturnal and fly at night; also a damaging pest of oil palm.
Management
Destroy any decaying logs in plantation by chopping and burning to kill any larvae that may be inside; remove any dead trees from plantation and destroy by burning; plant a cover crop to deter egg laying by females as they do not lay eggs in areas covered by vegetation; hooked wire can be used to extract larvae that are boring into young crowns.

Coconut scale Aspidiotus destructor

coconut scale (Aspidiotus destructor) infestation

coconut scale (Aspidiotus destructor)

Scale on coconut foliage

Coconut scale (Aspidiotus destructor) adults

Coconut scale infestation

Coconut scale damage

coconut scale (Aspidiotus destructor) adults and early instars

coconut scale (Pinnaspis buxi)

Coconut scale damage
Symptoms
Pale yellow spots on leaves; entire leaves yellowing; leaves turning brown and dropping prematurely; adult insect is a flattened oval, resembling a scale, which is red-brown in color.
Cause
Insect
Comments
Insect also attacks other crops such as tea and mango.
Management
May be possible to control coconut scale by pruning infested parts of trees and destroying by burning; chemical control may be necessary.

Mealybugs (Pineapple mealybug, Striped mealybug, Cocoa mealybug, etc.) Dysmicoccus brevipes
Ferrisia virgata
Planococcus lilacinus

Coconut (Cocos nucifera): Mealybugs and scales on leaflet

coconut mealybugs (Nipaecoccus nipae) tended by ants

Coconut mealybug damage

Coconut mealybugs (Nipaecoccus nipae)

Coconut mealybug (Nipaecoccus nipae) adult

Colony of coconut mealybugs (Nipaecoccus nipae)

Adults of coconut mealybug (Nipaecoccus nipae)
Symptoms
Flattened oval to round disc-like insect covered in waxy substance on tree branches; insects attract ants which may also be present; insect colony may also be associated with growth of sooty mold due to fungal colonization of sugary honeydew excreted by the insect; symptoms of direct insect damage not well documented but trees may exhibit symptoms of cocoa swollen shoot (see disease entry).
Cause
Insect
Comments
Insects have a wide host range; often tended by ants which farm them for their sugary honeydew secretions; transmit Cocoa swollen shoot virus.
Management
Mealybugs can potentially be controlled by natural enemies such as lady beetles but are commonly controlled using chemicals; chemical pesticides may also decrease populations of natural enemies leading to mealybug outbreaks.
Category : Mites

Eriophyid coconut mite Aceria guerreronis

Coconut: Eriophyid mites injury to nuts

Coconut mite damage coconut fruits

Coconut mite feeding injury

Mite damage
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Cause

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Comments
No vector has been identified.
Management
There is currently no known method of controlling the disease.
Coconut foliar decay Coconut foliar decay virus (CFDV)
Symptoms
Some varieties which have the disease may show no symptoms, others exhibit partial yellowing of leaves which begins to spread to leaf tip; necrosis of petioles causing leaves to die and hang from palm canopy
Cause
Virus
Comments
Transmitted by leaf hoppers
Category : Other
Lethal yellowing (Palm lethal yellowing) Candidatus Phytoplasma palmae (PLY)

Infected trees

Damage due to lethal yellowing

Lethal yellowing infected coconut trees

Infected coconut trees

Lethal yellowing infected palm

Symptoms of lethal yellowing on coconut palm

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Cocos nucifera spear leaf is dying just as the last leaves are discoloring due to lethal yellow phtyoplasma

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Symptoms
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Insect
Comments
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Management
Natural enemies of the coconut bug include weaver ants, conserve bushes and trees around plantation which are habitats for weaver ants or intercrop with mango, guava or citrus which are attractive to weaver ants; connect canopy with ropes or sticks to allow weaver ants to move between trees
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Coconut leafroller (Hedylepta blackburni) damage to coconut plant

Damage due to coconut leafrollers

Coconut leafroller larvae

Coconut leafroller (Hedylepta blackburni) adult

Coconut leafroller (Hedylepta blackburni) larvae damage to coconut leaves.

Coconut leafroller pupae and frass

Coconut leafroller feeding on leaves

Coconut leafroller pupa, larva and frass.

Coconut leafroller rolls leaf near midrib of frond
Symptoms
The larvae feeds on under surface of leaves. Usually they found protected by silken web. Initially they feed on the lower epidermis leaving the upper epidermis intact. The larvae often fold two sides of leaflets by a silken thread and feed inside. The later stage larvae feeds on both upper and lower epidermis of leaves. Severe infestation leads to skeletonization of fronds.
Cause
Insect
Comments
The insect is quite common in high wind areas.
Management
Encourage natural enemies in the orchard.
Coconut rhinoceros beetle Oryctes rhinoceros

Damaged coconut frond

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Lure and trap for Coconut Rhinoceros Beetle

coconut rhinoceros beetle injury to young coconut tree

coconut rhinoceros beetle (Oryctes rhinoceros) pupae

Damage due to coconut rhinoceros beetle

Rhinoceros beetle damage

Coconut rhinoceros beetle larvae

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Symptoms
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Cause
Insect
Comments
Beetles are nocturnal and fly at night; also a damaging pest of oil palm.
Management
Destroy any decaying logs in plantation by chopping and burning to kill any larvae that may be inside; remove any dead trees from plantation and destroy by burning; plant a cover crop to deter egg laying by females as they do not lay eggs in areas covered by vegetation; hooked wire can be used to extract larvae that are boring into young crowns.
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coconut scale (Aspidiotus destructor) infestation

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Scale on coconut foliage

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Coconut scale infestation

Coconut scale damage

coconut scale (Aspidiotus destructor) adults and early instars

coconut scale (Pinnaspis buxi)

Coconut scale damage
Symptoms
Pale yellow spots on leaves; entire leaves yellowing; leaves turning brown and dropping prematurely; adult insect is a flattened oval, resembling a scale, which is red-brown in color.
Cause
Insect
Comments
Insect also attacks other crops such as tea and mango.
Management
May be possible to control coconut scale by pruning infested parts of trees and destroying by burning; chemical control may be necessary.
Mealybugs (Pineapple mealybug, Striped mealybug, Cocoa mealybug, etc.)
Dysmicoccus brevipes
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Coconut (Cocos nucifera): Mealybugs and scales on leaflet

coconut mealybugs (Nipaecoccus nipae) tended by ants

Coconut mealybug damage

Coconut mealybugs (Nipaecoccus nipae)

Coconut mealybug (Nipaecoccus nipae) adult

Colony of coconut mealybugs (Nipaecoccus nipae)

Adults of coconut mealybug (Nipaecoccus nipae)
Symptoms
Flattened oval to round disc-like insect covered in waxy substance on tree branches; insects attract ants which may also be present; insect colony may also be associated with growth of sooty mold due to fungal colonization of sugary honeydew excreted by the insect; symptoms of direct insect damage not well documented but trees may exhibit symptoms of cocoa swollen shoot (see disease entry).
Cause
Insect
Comments
Insects have a wide host range; often tended by ants which farm them for their sugary honeydew secretions; transmit Cocoa swollen shoot virus.
Management
Mealybugs can potentially be controlled by natural enemies such as lady beetles but are commonly controlled using chemicals; chemical pesticides may also decrease populations of natural enemies leading to mealybug outbreaks.
Category : Mites
Eriophyid coconut mite Aceria guerreronis

Coconut: Eriophyid mites injury to nuts

Coconut mite damage coconut fruits

Coconut mite feeding injury

Mite damage

Scarring of coconut fruits due to coconut mites

Eriophyid mites feeding injury to coconut

Mite feeding injury

Symptoms due to coconut mite infestation

Coconut mite damage on fruits of coconut
Symptoms
The mites suck sap from young nuts. Generally they feed on meristematic zone, i.e., the area which is covered by perianth. The infestation starts very early. As the nut develops the feeding leaves brown fissures that extending down from the perianth. The nut becomes small and distorted.
Cause
Mites
Comments
The mites spread through the wind. It causes yield loss from 30 to 60 per cent.
Management
Provide proper fertilizer and water for trees to withstand mite damage. Encourage natural enemies of mite in the orchard. If infestation is severe, apply suitable insecticide by root feeding or stem injection.
Category : Nematodes
Red ring nematode (Coconut palm nematode) Bursaphelenchus cocophilus
Symptoms
Nuts falling prematurely; withering inflorescences; yellowing leaves which then turn brown; orange to red-brown ring of discoloration when a cross section is taken of lower stem.
Cause
Nematode
Comments
Nematode spread to palms via American palm weevils and sugarcane weevils.
Management
If a tree becomes infected it should be removed and destroyed; control of the disease is currently limited to efforts to control the weevil which transmits the nematode to the palms.

Scarring of coconut fruits due to coconut mites

Eriophyid mites feeding injury to coconut

Mite feeding injury

Symptoms due to coconut mite infestation

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Symptoms
The mites suck sap from young nuts. Generally they feed on meristematic zone, i.e., the area which is covered by perianth. The infestation starts very early. As the nut develops the feeding leaves brown fissures that extending down from the perianth. The nut becomes small and distorted.
Cause
Mites
Comments
The mites spread through the wind. It causes yield loss from 30 to 60 per cent.
Management
Provide proper fertilizer and water for trees to withstand mite damage. Encourage natural enemies of mite in the orchard. If infestation is severe, apply suitable insecticide by root feeding or stem injection.

Category : Nematodes

Red ring nematode (Coconut palm nematode) Bursaphelenchus cocophilus

Symptoms
Nuts falling prematurely; withering inflorescences; yellowing leaves which then turn brown; orange to red-brown ring of discoloration when a cross section is taken of lower stem.
Cause
Nematode
Comments
Nematode spread to palms via American palm weevils and sugarcane weevils.
Management
If a tree becomes infected it should be removed and destroyed; control of the disease is currently limited to efforts to control the weevil which transmits the nematode to the palms.

Grapes

Grapes
Buy Products for your crop
Crop Protection
Package of Practices
Expectation
BharatAgri Smart Farming
Standard Farming
Expected Fertilizer and Agrochemical Expenditure
$ 83,000
Expected Harvest
20 tones/Acre
Expected Income (Rs)
¥6,00,000
Expected Fertilizer and Agrochemical Expenditure
¥ 98,000
Expected Harvest
16 tonnes/Acre
Expected Income (Rs)
$ 4,80,000

Favourable climate

Temperature
In its natural habitat, the crop bears fruit during the hot and dry period and undergoes dormancy during the period of severe cold.
It tolerates frost during resting stage but is very susceptible during growing period.
Temperature ranging from 15-35 C is ideal for shoot growth and normal physiological processes of the grapevine.
Vines do not grow and fruit well when the temperature falls below 10 C.
Crop Water Requirement
Total seasonal requirements vary between 500 and 1200 mm, depending mainly on climate and length of growing period.

Favourable soil

Type
The best soil types for grapes are known to be well-drained loan to sandy loam with good organic matter.
Poorly drained, alkaline soils should be avoided. pH
Soils having pH value from 6.5 to 7.5 are most suitable.
If pH is < 6.5 add Lime.
If pH is >7.5 add Gypsum.

Planting material

Thompson seedless
Special Characteristic

Clusters are medium to large, cylindrical to conical shaped, heavily shouldered that ripen in about 130-140 days after pruning. The berries are seedless, small to medium-sized, oval to ellipsoidal in shape, soft berry skin, and greenish-white to golden in colour with firm, juicy pulp. The majority of exported grapes from India consist of this variety.

Anab-e-Shahi
Special Characteristic

Buy Agri Products
8%1
Package of Practices
This variety is grown in the states of Andhra Pradesh, Punjab, Haryana and Karnataka. It is widely adaptable to different Agro-climatic conditions. This variety is late maturing and heavy yielding. Berries are elongated, medium large, seeded and amber coloured when fully ripe. Juice is clear and sweet with TSS 14-16%. It is highly susceptible to downy mildew. Average yield is 35 t/ha. Fruits have a good keeping quality and mostly used for table purpose.

Red globe
Special Characteristic

Buy Agri Products

Package of Practices
Clusters are big, berries very bold (22-25 mm diameter), red round, seeded with meaty pulp. It is a late ripening variety and takes more than 135 days from pruning. It has good keeping qualities and can be cold stored for at least 3 months. Fruit yield is about 20-25 tons per hectare

Sharad seedless

The berries are bluish black with crisp pulp, oblong to elliptical in shape and highly responsive to Gibberellin treatment for berry size. The fruit quality is better when ripening coincides during cool climate. It has a medium maturity and takes about 125 days from pruning for harvesting. Quality yields of 15-18 tons per hectare can be obtained with proper canopy management, bunch and berry thinning and berry sizing. However, the berries are susceptible to the bleaching as a result of SO2 injury during storage in fruit boxes lined with grape guards. Hence the variety is not suitable for long duration storage/ shipment, but can be exported to short distant/ quick accessible markets.

Cheema sahibi

Open pollinated seedling Pandhani sahibi. Vigorous & High yielding, Bunches are long, Conical, Oral berries, Late ripening & shipping quality is poor due to weak pedical attachment

Land preparation
The land is tilled and laid into plots of 120 m x 180 m separated by 3 m wide roads.
Land within a plot is levelled perfectly to have a gradient of less than 1 percent in any direction to ensure uniform discharge of water through the emitters of drip irrigation systems.

Trenches of 75 cm width, 75 cm depth and 118 m length in a north-south direction with a gap of 3 m between trenches are opened with heavy machinery.
They are closed with topsoil, up to a height of 45 cm after 15 days exposure to sun.
The remaining gap is filled with a mixture of soil, cattle manure, single superphosphate, sulphate of potash and micro-nutrients.
Usually, 50 kg of cattle manure, 2.5 kg of superphosphate, 0.5 kg of sulphate of potash and 50 g each of $ZnSO_4$ and $FeSO_4$ are added to the soil for every running meter length of the trench.
Land is leveled by a tractor or bulldozer as per the requirement, soil type and gradient.
In case of drip irrigation, leveling need not be perfect.
The size of the plot will vary with the type of training system used.
In case of bower and telephone or "T" trellis the ideal size could be 60 X 80 m. and 90 X 120 m. respectively.

Spacing and Plant Population
Varieties

Row to Row	3.0 m
Plant to Plant	2.0 m
Plant Population	7,333

Nutrient Management
Package of Practices
As vineyard soils are either sandy loams or heavy clays, the usage of organic manure has assumed high importance in India.
A standard dose of 200:200:400 kg of N, P205 and K20 per acre is followed in light sandy soils, while 265:
350:265 kg per acre are applied for heavy clay soils.
The annual dose is fixed based on the petiole analysis carried out at 45 days after spur pruning.
While 40 percent of the annual dose is given through organic sources, 60 percent is given as inorganic fertilizer.
Calcium ammonium nitrate is usually not used.
Sulphate of potash is the only source of potash used in place of muriate, particularly in heavy clay soils.
Recently application of soluble fertilizers through drip irrigation is picking up.
40 percent of N, 50 percent of P205 and 33 percent of K20 of the annual dose is given during the growth season and the rest in the fruiting season.

Irrigation
Since grapes are grown in areas where the evapotranspiration exceeds the precipitation, irrigation is essential.
Less than 10 percent of the vineyard areas are surface irrigated, while the rest is irrigated by drip systems.
Water requirement is calculated based on the pan evaporation using 0.8 as the crop factor.
Water is applied at different rates at different stages of vine growth and berry development.

Intercultural Operations
Weed Management
Weeds between the rows of vines are removed mechanically by tractor drawn implements.
Within the rows, weeds are manually hoed and removed.

Harvesting
Number of harvests
In North India, plants start fruiting after two years of planting.
Berries start ripening from the end of May in early varieties.
However, most of the varieties are harvested after they have changed colour near the tip and have become sweet.
A day prior to picking, the broken, decayed, deformed, under-sized berries are removed.
The clusters are usually harvested during the early hours of the day before the temperature rises above
20 C.

Yield
Total harvest quantity
Yield varies according to variety and climatic conditions etc.
The average yield of Anab-e-Shahi and Bangalore blue is 40-50 tonnes/ha while that of seedless varieties is 20 tonnes/ha.
Average yield of 20-22 tonnes/ha.is considered good.

Complete Process of Jowar Cultivation in India

1. Favorable Climate

- **Temperature**: Thrives best in temperatures **between 26°C and 33°C**.
- **Rainfall**: Requires **30–100 cm** of rainfall; excessive moisture can harm the crop.
- **Growing Season**:
  - **Kharif (June-July planting, October-November harvesting)** – requires moderate rainfall.
  - **Rabi (September-October planting, January-February harvesting)** – cultivated in low rainfall areas.
  - **Summer (January-February planting, May-June harvesting)** – requires irrigation support.

2. Suitable Soil

- **Best Soil Type**: Well-drained, **medium to deep black soil, sandy loam, or red soil**.
- **pH Range**: **6.0 to 7.5** is ideal.
- **Waterlogging**: Jowar is **drought-resistant** but sensitive to waterlogging.

3. Selection of Planting Material (Seeds)

- **Recommended Hybrid and Improved Varieties**:
  - **Kharif Varieties**: CSH-5, CSH-9, CSV-10, CSV-15
  - **Rabi Varieties**: M 35-1, CSV-216R
  - **Dual-Purpose (Grain + Fodder) Varieties**: CSH 13, CSH 16, SPV 462
- **Seed Rate**:
  - **Rainfed conditions**: **8–10 kg/ha**
  - **Irrigated conditions**: **12–15 kg/ha**
- **Seed Treatment**:
  - Treat with **Thiram or Captan (2 g/kg of seed)** to prevent fungal diseases.
  - Soak seeds in **1% Potassium Chloride solution** for 6 hours to improve germination.

4. Nursery Preparation

- Direct sowing is preferred; nursery raising is done only for **transplanting in high-yielding systems**.
- For nursery-based cultivation:
  - Use **raised beds** with well-decomposed organic manure.
  - Maintain **moist but not waterlogged soil conditions**.

5. Land Preparation

- **Plowing**: Deep plowing **twice** followed by harrowing.
- **Leveling**: Ensures uniform water distribution.
- **Soil Enrichment**: Apply **10-15 tons of FYM (Farmyard Manure) per hectare** before last plowing.

6. Sowing, Spacing, and Plant Population

- **Sowing Methods**:
    - **Broadcasting** (Traditional, uneven plant distribution).
    - **Line Sowing** (Recommended for better yield).
    - **Drilling** (Using seed drills for uniform depth).
- **Spacing**:
    - **Grain Purpose**: **45 cm × 12 cm** (ideal plant population of **1,85,000 plants/ha**).
    - **Fodder Purpose**: **30 cm × 10 cm** (higher plant density).
    - **High-Density Farming**: **22 cm × 5 cm** (for silage and biomass).

7. Root Dip Treatment (For Transplanting Systems)

- In cases where seedlings are raised in nurseries:
    - Dip roots in **Azospirillum biofertilizer** (to enhance nitrogen fixation).
    - Treat with **Bavistin (fungicide) at 0.2%** before planting.

8. Sowing/Transplanting Process

- **Best Time**:
    - Kharif: June-July
    - Rabi: September-October
    - Summer: January-February
- **Depth**: Sow at **2-4 cm depth**.
- **Water Management**: If rainfall is insufficient, apply **light irrigation immediately after sowing**.

9. Nutrient Management (Fertilization Schedule)

Growth Stage	Fertilizer Requirement (Per Hectare)
Before Sowing	10-15 tons FYM + 20 kg P_2O_5 + 40 kg K_2O
15-20 Days After Sowing	40 kg Nitrogen (Urea)
35-40 Days After Sowing	40 kg Nitrogen (Urea)

- **Micronutrient Spray**:
    - **Zinc sulfate (0.5%)** if zinc deficiency is observed.

- **Boron spray (0.2%)** improves grain quality.

10. Irrigation and Water Management

- **Critical Growth Stages for Irrigation**:
    1. Germination
    2. Flowering
    3. Grain Formation
- **Number of Irrigations**:
    1. **Rainfed crops**: 2-3 irrigations during drought.
    2. **Irrigated crops**: 5-6 irrigations, depending on soil type.
- **Water Conservation**:
    1. **Mulching** with crop residues helps retain moisture.
    2. **Intercropping** with legumes improves water-use efficiency.

11. Weed and Pest Management

- **Weed Control**:
    - **Pre-emergence herbicide**: Atrazine (0.5 kg/ha).
    - **Manual Weeding**: At 15 and 30 days after sowing.
- **Pests & Diseases**:
    - **Stem Borer**: Spray **Chlorantraniliprole (0.1%)**.
    - **Shoot Fly**: Apply **Carbofuran granules (5%)** in the soil.
    - **Grain Mold**: Spray **Mancozeb (0.3%)** during flowering.

12. Harvesting and Expected Yield

- **Maturity Duration**:
    - **Kharif Crop**: 100-120 days
    - **Rabi Crop**: 120-140 days
    - **Summer Crop**: 90-100 days
- **Signs of Maturity**:
    - Grains become **hard and glossy**.
    - Moisture content reduces to **20%**.
- **Yield per Hectare**:
    - **Rainfed conditions**: **15-20 quintals/ha**.
    - **Irrigated conditions**: **35-40 quintals/ha**.
    - **Fodder Yield**: **40-50 tons/ha**.

Financial Analysis of Jowar Cultivation in Maharashtra (Per Hectare)

1. Expected Cost of Cultivation

Input	Cost (Rs)
Land Preparation	6,000
Seed Cost (10-15 kg)	2,500
Fertilizers & FYM	8,000
Agrochemicals	3,500
Irrigation	5,000
Labor (Weeding, Harvesting)	10,000
Miscellaneous	5,000
Total Cost	**40,000**

2. Expected Income (Per Hectare)

Item	Details	Income (Rs)
Yield	**35 quintals (3500 kg)**	-
Market Rate	Rs **30/kg**	-
Total Income	**3500 × 30**	**1,05,000**

3. Profit Estimation

| Total Revenue | 1,05,000 |
| Total Cost | 40,000 |
| Net Profit | 65,000 |

Tomato

Tomato
Buy Products for your crop
Crop Protection
Package of Practices
Expectation
BharatAgri Smart Farming
Standard Farming
Expected Fertilizer and
Agrochemical Expenditure
¥41,000
Expected Harvest
18 Tons/acre
900 crates/acre
Expected Income (Rs)
¥1,80,000
Expected Fertilizer and
Agrochemical Expenditure
¥48,000
Expected Harvest
14 Tons/acre
700 crates/acre
Expected Income (Rs)
¥1,40,000

Favourable climate

Climate
• Heavy rains, cloudy weather at the time of flowering and fruiting is harmful as it favours dropping of flowers and fruits.
• The plants cannot withstand frost and high humidity.
• High humidity leads to rotting of fruits.
• Bright sunshine at the time of fruit set helps to develop dark red coloured fruits.
Temperature
• Temperature below 10°C retards plant development.
• If temperature goes beyond 33°C, fruit development will be adversely affected.
• Temperature above 38°C at initial growth stage retard the growth.
• A temperature ranging from 21-24°C is ideal for tomato.
Crop Water Requirement
• Generally Grown in irrigated areas.
• To grow high quality tomato, drip with plastic mulching is recommended.
• Crop requires large amount of water at vegetative stage (upto 30 days).
• Crop water requirement- equivalent to 600-900 mm rainfall

Favourable soil

Favourable Soil
Type
• Loamy soil with good water holding capacity pH
• Required range- 6.0-7.5

- If pH is <6.0 add Lime.
- If pH is >7.5 add Gypsum.

Planting material

Abhilash F1
Duration
Special Characteristic
⑥ ②器.3%国

Package of Practices
Yield
150.0 Days
Recommended for Kharif season
Plant Type: Strong
Fruit Colour: Attractive Red
Average Fruit Weight: 80 - 100 gm
Fruit Shape: Flat Round Firmness & Shelf life:
Good
Days to First Harvest:65 - 70 days
180.0 Quintal/Acre
Shine tomato Jumbo F1 hybrid
Duration
150.0 Days
Special Characteristic
Yield
Recommended for all season
Variety type :
Determinant
Fruit Colour: Red
Fruit Shape: Flat Round
Days to First Harvest:55-60 days
Tolerant: Virus and diseases
180.0 Quintal/Acre

Nursery preparation

- For transplanting in 1 acre area, 0.08 acre (3 Guntha) nursery is required.
- Prepare six beds of size 3 m length X 1 m width X 15 cm height.
- Sow the seeds 2-3 cm deep in line at 10 cm apart and cover with soil.
- Water the nursery beds daily twice till germination and once after germination.
- 4-5 days before transplanting reduce the quantity of water application to the nursery beds to harden the seedlings and one day before transplanting give light irrigation.

OR

- Fill the protrays with Cocopeat @ 1.2 kg per protray.
- Sow the treated seeds in protrays @ 1 seed per cell.
- Cover the seed with cocopeat and keep the protrays one above the other and cover with a polythene sheet till germination starts (5 Days).
- After 6 days, place the protrays with germinated seeds individually on the raised beds inside a shade net.

Nursery Duration
- Duration- 25-30 days
- Plants are ready for transplanting when leaves become dark green in color and stem become thick.

Seed Rate
Varieties
150.0 - 160.0 gram/acre
Seed Treatment
50.0 - 60.0 gram/acre

Land preparation

Land preparation
• Plough the land 1 or 2 times based on soil type.
• Mix the following in field and keep it in open air for 10 days for proper decomposition -
FYM- 2 tons
Composting Bacteria- 3 kg
• Spread the above mixture over soil and run rotavator to the entire field making the soil as a fine tilth.
Bed preparation
• Bed preparation- Prepare beds of 120 cm width and 90 cm apart with the help of tractor.

Spacing and plant population
Varieties
Row to Row 2.9 ft
Plant to Plant 0.9 ft
Plant Population 16,858
Hybrid
Row to Row 2.4 ft
Plant to Plant 0.9 ft
Plant Population 20,370

Root Dip Treatment
• Take 20 liter water in flat container.
• Mix 40 gram Mancozeb + 40 ml Imidacloprid.
• Dip the roots for 15 mins in solution before transplanting.
• For plants in pro trays- Dip the pro trays in container for 5 min.

Transplanting
• Transplant the seedlings on the beds 30 cm apart.

Nutrient management

For varieties 80:40:40 N:P:K kg/acre.
•At transplanting apply-
Urea- 87 kg
Single Super Phosphate- 246 kg
Muriate of Potash- 67 kg
• 20 Days after transplant-Urea- 28 kg
• 40 Days after transplant-Urea- 28 kg
• 60 Days after transplant-Urea- 28 kg
• For Hybrids 120:60:60 N:P:K kg/acre.
• At transplanting apply-

Urea- 130 kg
Single Super Phosphate- 375 kg
Muriate of Potash- 100 kg

- 20 Days after transplant-Urea- 44 kg
- 40 Days after transplant-Urea- 44 kg
- 60 Days after transplant-Urea- 44 kg

Irrigation

Number of harvests

- 8 to 10

Harvesting duration

- 70 to 110 days after transplanting.

Harvesting interval

- 3 days

Yield
Each harvest quantity

- Varieties- 50 crates/acre
- Hybrid- 90 crates/acre

Total harvest quantity

- Varieties- 500 crates/acre
- Hybrid- 900 crates/acre