

# Agrotechnology of Low Chilling Apple (*Malus domestica* Borkh.)

CSIR-Institute of Himalayan Bioresource Technology  
Palampur, Himachal Pradesh – 176 061, INDIA



## Introduction

Apple (*Malus domestica* Borkh.) is an important fruit, believed to have originated in South-West Asia, the Caucasus, and the Hindu Kush region. In India, it was introduced by Captain Lee in 1865 in the Kullu Valley of Himachal Pradesh. Apples are the fourth most produced fruit in the world, following oranges, bananas, and grapes. Most apple varieties require 1000-1600 hours of chilling period, but there are some varieties which require low chilling hours (300-500 hours) and can be grown in low hills and plain areas also. The institute have standardized agrotechnology for low chilling apple varieties.

These varieties require less chilling and can be grown in areas at an altitude of 300-1200 meters. During flowering, a temperature of 20-25°C is ideal for bee activity and pollination. Extended periods of cold and wet weather can reduce fruit setting. Apples can be grown in areas with annual rainfall ranging from 25-37 cm to heavy rainfall of 125-175 cm.



### Soil Requirements and Land Preparation

For optimal apple growth, well-drained loamy soil with a pH of 5.5-6.5 is required. The soil should not have a hard surface or waterlogging, and heavy soil should be avoided. For high-density orchards, plants are grown on dwarf and semi-dwarf rootstocks, and the site should be level or gently sloped. Land preparation begins 1-2 months before planting, which includes removing bushes, grass, stones, and pebbles, taking soil samples, ensuring proper drainage, and performing solarization or fumigation.



Preparation of Pit hole

### Low chilling apple varieties

Anna, Dorset Golden, Fuji, Gala, Imperial Gala, Mollie's Delicious, Mutsu, Pink Lady, and Royal Gala. When selecting rootstocks, it is important to consider factors such as the variety's growth habit, height, fertility, soil moisture, and air circulation.

Recommended rootstocks in India include M 27 (very dwarf), M 9 (dwarf), M 7, M 26, M 106 (semi-dwarf), and MM 104, MM 109, MM 111 (semi-vigorous to vigorous). MM 111 is drought-tolerant. CSIR-IHBT developed technology for growing virus free rootstock, which was transferred to tissue culture companies.



### Planting Method

The best time of planting of apple is December-February. The pits, measuring 1x1x1 m (in the fertile soil pit size can be reduced to 50x50x50 cm), are dug a month before planting. Each pit is filled with a mix of 40-50 kg well-rotted FYM, 1 kg Single Super Phosphate (SSP), and 50 g Malathion dust. After planting, the pits are watered to settle the contents. Tree basins are then mulched with 10 cm of dry grass to conserve moisture and control weeds.



### Intercultural operations

Spray of simazine at the rate of 4 kg per hectare in March, followed by two protected sprays of glyphosate @ 800 mL per hectare at monthly intervals in July and August have been found very effective to control the weeds in apple orchards.

### Training and Pruning

For young trees, start training in the first or second year using a Central Leader or Vase Shape system. For established trees, prune in late winter/early spring to remove dead wood and thin crowded branches. Light summer pruning can help maintain shape. And the best time of pruning is during dormant season (December-January).

Avoid heavy pruning on low-chilling varieties in spring to protect early fruiting and prevent excessive growth.

### Nutrient Management

#### Soil pH:

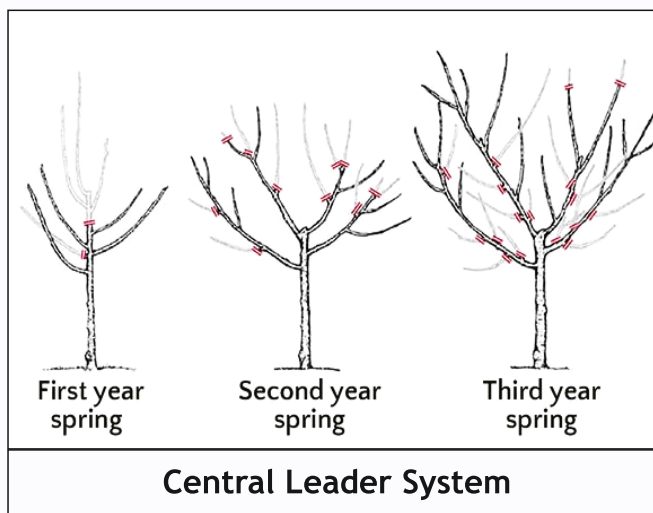
The first step in effective nutrient management is to maintain the soil pH between 5.5 and 6.5. Maintaining pH within this range maximizes the availability of nutrients for plants.

#### Fertigation Schedule:

Recommended dosage (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O)-70:35:70 grams/tree/year. Nitrogen is applied in two split doses. Half dose of N is applied one month before flowering (March) and remaining half dose one month after fruit set. FYM along with full doses of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O is applied during (December-Januray). Additionally, apply 10 kg FYM or 5 kg vermicompost (for one-year-old plants) and increase the quantity for plants older than 10 years.

### Irrigation

In apple orchards, water requirements typically range from 30-40 liters every 10-15 days. Irrigation is done as needed using rainwater, drip, or sprinklers. The most critical periods of water requirement are April to July.



### Foliar Application:

Nutrient	Quantity	Time
Nitrogen	Urea 0.5% (2 sprays)	After petal fall and one month later
Boron	Boric Acid 0.1% (2 sprays)	During flowering and after blooming
Zinc	Zinc Sulfate 0.5%	After petal fall
Manganese	Manganese Sulfate 0.4%	After petal fall
Calcium	Calcium Chloride 0.5%	30-45 days before fruit harvest

### Pest and Disease Management

Crop protection is a vital aspect of apple cultivation. Major pests include the apple borer and fungi. Major diseases include, anthracnose, and powdery mildew. The selection of appropriate pesticides and fungicides is necessary.

- San Jose Scale & Mites - Horticulture Mineral Oil (2 L / 200 L of water)
- Aphids - Malathion (200 L / 200 L of water)
- Wooly Apple Aphid - Chlorpyrifos (400 mL / 200 L of water)
- Thrips - Thiacloprid (100 mL / 200 L of water)

### Conclusion

Low-chilling varieties are bringing innovation to apple farming, and regional farmers are in the process of adopting them. By using proper climate, soil, management practices, and scientific techniques, farmers can achieve better yields and profits from apple cultivation.

CSIR-IHBT have promoted the cultivation of these varieties in north east Indian states, viz. Mizoram, Manipur, Meghalaya, Arunachal Pradesh in association with MISTIC, Mizoram and NERCORMP (North East Council), Shillong, Meghalaya.

### Income-Expenditure:

Total income : ₹5,60,000 /hectare/year

Net profit : ₹4,80,000 /hectare/year

#### Technology Information:

Dr Rakesh Kumar  
Chief Scientist,  
Agrotechnology Division,  
Phone: +911894 233341,  
Email: [rakesh.kumar03@csir.res.in](mailto:rakesh.kumar03@csir.res.in)

#### For further information, Contact:

The Director  
CSIR-Institute of Himalayan  
Bioresource Technology, Palampur, HP, India  
Phone: +911894 230411, Fax: +911894 230433  
Email: [director.ihbt@csir.res.in](mailto:director.ihbt@csir.res.in)  
Website: <http://www.ihbt.res.in>