ICAR-CITH Technical Bulletin-01/2026

Colour Atlas of Diseases, Pests and Disorders of Pome Fruits

ICAR-CENTRAL INSTITUTE OF TEMPERATE HORTICULTURE
Old Airfield Rangreth Srinagar, 191132 (J&K) INDIA

Colour Atlas of Diseases, Pests and Disorders of Pome Fruits

Sajad Un Nabi, Bushra Rasool, Tabasum Manzoor, Zakir Amin, Alka Arora, Mohammad Ashraful Haque, Arun Kishore,Wasim H Raja, Mohd Abas Shah, Om Chand Sharma, Javid I Mir, Ronit Jaiswal, Muneer A Sheikh, Rouf Parray, Mohammad Ansar and Mahendra K Verma

ICAR-Central Institute of Temperate Horticulture
Old Airfield Rangreth Srinagar, 191132 (J&K) India

Published by: Director, ICAR- ICAR-Central Institute of Temperate Horticulture
Old Airfield Rangreth Srinagar, 191132 (J&K) India

Citation: *Sajad Un Nabi, Bushra Rasool, Tabasum Manzoor, Zakir Amin, Alka Arora, Mohammad Ashraful Haque, Arun Kishore, Wasim H Raja, Mohd Abas Shah, Om Chand Sharma, Javid I Mir, Ronit Jaiswal, Muneer A Sheikh, Rouf Parray, Mohammad Ansar and Mahendra K Verma. 2026. Colour Atlas of Diseases, Pests and Disorders of Pome Fruits (Apple, Pear, Quince), Technical bulletin, ICAR-CITH Srinagar, 1-44*

Acknowledgements: *We acknowledge the funding from* ***ICAR-NASF Project*** *on, "Artificial intelligence enabled biotic & abiotic stress detection and advisory mobile application for crops". We also acknowledge the services of* ***Sh. Muzaffar Bashir, Sh Bilal Ahmad Ganai, and Sh Tawseef Ahmad Rather,*** *for helping during collection of photographs in the field.*

First Edition: 2026

Foreword

Temperate Himalayan regions of India, particularly the Union Territories of Jammu & Kashmir, Ladakh, and the state of Himachal Pradesh, are nationally and internationally renowned for its high-quality pome fruits. Among these, apple, pear, and quince constitute the economic backbone of our hill farmers, driving rural prosperity and contributing significantly to the agricultural GDP of the region. Yet, those of us working closely with our farmers are acutely aware of the mounting threats to this vital sector. Year after year, orchards face an onslaught of challenges: from persistent fungal and bacterial diseases that blemish fruit and weaken trees, to a spectrum of insect-pests that can decimate a crop, and increasingly, physiological disorders linked to changing weather patterns and nutritional imbalancesleading to substantial qualitative and quantitative losses.The ICAR-Central Institute of Temperate Horticulture, Srinagar, as the premier research institution in the field, is mandated to address these very challenges. Our research endeavours are focused on developing location-specific, sustainable management strategies to safeguard the horticulture industry. We recognize that the first and most critical step in any successful plant health management program is accurate and timely diagnosis. A misdiagnosis can lead to ineffective control measures, economic loss, and environmental contamination.It is with this understanding that I am delighted to present this technical bulletin, the "Colour Atlas on Diseases, Pests and Disorders of Pome Fruits (Apple, Pear, Quince)". This publication is a culmination of meticulous scientific observation and photographic documentation by our dedicated team of researchers, particularly plant pathologists.This atlas is designed as a practical, user-friendly guide to bridge the gap between the laboratory and the field.

I commend the efforts of the scientists whose hard work has resulted in this comprehensive compilation. I am confident that this colour atlas will prove to be a valuable resource for the entire horticultural development system, ultimately contributing to the production of healthier, more resilient pome fruit crops in our country.

I extend my best wishes to the entire team for their commitment to excellence and urge all users to utilize this knowledge for the betterment of the temperate horticulture sector.

Dr M.K.Verma
(Director)
ICAR-CITH Srinagar

CONTENTS

Chapter	Title	Page No.
1.	**An Introduction to Pome Fruits** **1.1.** Temperate fruits: an overview **1.2.** Pome fruit production in India **1.3.** Growth cycles and climatic requirements **1.4.** Need for an accurate diagnosis **1.5.** Important pome fruits grown in temperate regions of India	**1-2**
2.	**Diseases, Pests and Physiologival Disorders of Pome Fruits** **2.1.** Diseases **2.2.** Pests **2.3.** Physiological Disorders	**3**
3.	**Diseases of Apple** **3.1.** Apple Scab **3.2.** Alternaria Leaf Blotch **3.3.** Powdery Mildew **3.4.** Collar Rot **3.5.** Root Rot **3.6.** Marssonina Leaf Blotch **3.7.** Canker **3.8.** Mosaic Disease **3.9.** Apple Scar Skin Viroid **3.10.** Apple Green Crinkle Disease **3.11.** Glomerella Leaf Spot **3.12.** Sooty Blotch **3.13.** Fly Speck **3.14.** Blue Mold	**4-17**
4.	**Diseases of Pear** **4.1.** Pear Scab **4.2.** Leaf Spot **4.3.** Stony Pit **4.4.** Sooty Blotch and Flyspeck **4.5.** Canker	**18-21**

5.	**Diseases of Quince** **5.1.** Leaf Blight **5.2.** Mosaic Disease	**22-23**
6.	**Pests of Pome Fruits** **6.1.** San Jose Scale **6.2.** Woolly Apple Aphid **6.3.** Mites **6.4.** Apple Stem Borer **6.5.** Codling Moth **6.6.** Aphids **6.7.** Leaf Blotch Miner **6.8.** Pear Psylla **6.9.** Pear Leaf Blister Mite	**24-32**
7.	**Physiological Disorders in Pome Fruits** **7.1.** Water Core **7.2.** Lenticel Blotch **7.3.** Bitter Pit **7.4.** Russeting **7.5.** Internal Cork of Apple	**33-37**

CHAPTER-1.

AN INTRODUCTION TO POME FRUITS

1.1 Temperate Fruits: An Overview

The fruit crops grown in cooler regions of the world, those with distinct winter and summer seasons, are grouped under the category of temperate fruits. Most of them belong to the Rosaceae family and are divided into two main types based on how the fruit is formed. The first type is pome fruits, which include apple, pear, and quince. In these fruits, the fleshy part we eat develops from the floral tube and receptacle that grow and swell around the true fruit core containing the seeds. The second type is stone fruits, all belonging to the genus Prunus. This group includes almond, apricot, cherry, peach, nectarine, and plum. These are characterized by a soft fleshy exterior surrounding a hard, stony shell that protects the seed inside.

On the global stage, a handful of countries account for nearly half of the world's temperate fruit production. Data from sources like FAOSTAT and world trade maps indicate that China, Turkey, the United States, Brazil, Italy, and Spain are the leading producers. China stands out as the largest producer of apples and pears. Turkey leads in cherry and apricot production, while the United States is the foremost producer of almonds.

1.2 Pome Fruit Production in India

In India, the cultivation of temperate fruits is largely confined to the hilly regions of the north. The states of Jammu and Kashmir, Himachal Pradesh, and Uttarakhand possess the agro-climatic conditions necessary for growing these crops. Among the pome fruits, apple holds the most prominent position, forming the economic mainstay for a large number of farming families in these areas. Pear and quince, while occupying a smaller area, are also important components of the regional horticulture.

1.3 Growth Cycles and Climate Requirements

The successful cultivation of pome fruits is closely tied to the climate. These are deciduous plants, meaning they shed their leaves in autumn and enter a state of dormancy to survive the cold winter months. This leaf fall is a protective mechanism against freezing temperatures and desiccating winds.A key physiological requirement for these plants is a period of low temperature during winter, known as the chilling requirement. This cold period is necessary to break dormancy and allow for uniform bud burst and flowering in the following spring. Different species and even different varieties within a species have varying chilling requirements. Generally, apples require more chilling hours than other temperate fruits, followed by apricots, with peaches having a relatively lower requirement. When a variety is grown in a location that does not provide its required chilling, the results can be poor and erratic bud break, delayed foliation, and reduced flowering, ultimately leading to low yields.

1.4 The Need for Accurate Problem Diagnosis

Throughout this annual cycle, pome fruit trees are exposed to various stresses. Fungal, viral and bacterial diseases can infect leaves, fruit, and wood. Insect pests feed on different parts of the tree, often causing direct damage to the fruit. In addition to these living agents, physiological disorders also occur. These are problems caused by non-living factors such as nutrient imbalances, adverse weather conditions, or improper cultural practices. Disorders like bitter pit in apples or cork spot in pears can severely affect fruit quality and marketability.

For those managing orchards, the first and most critical step in addressing any of these problems is correct identification. Mistaking a nutrient deficiency for a viral disease, or confusing one insect's damage with another, can lead to the wrong management response. This wastes time and money and may fail to prevent the damage. This bulletin is prepared with the aim of assisting in that first step. The photographs and descriptions that follow are intended to serve as a practical reference for recognizing the common diseases, pests, and disorders that affect apple, pear, and quince in our region.

Important pome fruit crops grown in temperate regions of world

Apple

Pear

Quince

Table 1: List of major pome fruits s grown in India with area, production and productivity (2020-21)

S.No	Fruits	Area in ha (000)	Production (000 Metric tonnes)	National Productivity T/ha	Worlds Productivity T/ha	World's highest Productivity T/ha
						Yield (Rank 1 country)
1.	Apple	308	2734	8.87	17.56	60.05 (Switzerland)
3.	Pear	42	306	7.20	17.10	89.20 (Montenegro)

Source: http://www.fao.org/faostat/en/#data, http://nhb.gov.in/StatisticsViewer.aspx

CHAPTER -2.

DISEASES, PESTS AND PHYSIOLOGICAL DISORDERS OF POME FRUITS

Pome fruits, including apple, pear, and quince, are vulnerable to a range of biotic and abiotic stresses throughout their growing cycle. These stresses can be broadly grouped into three categories: diseases caused by infectious organisms, damage inflicted by insect and mite pests, and physiological disorders resulting from non-living factors such as weather, nutrition, or management practices.

2.1 Diseases

Infectious diseases in pome fruits are primarily caused by fungi, bacteria, and in some cases, phytoplasmas. Fungal pathogens are the most common and can affect all aerial parts of the tree.

- **Fungal Diseases:** These include foliar diseases like apple scab (*Venturia inaequalis*) and pear scab (*Venturia pirina*), which cause dark, velvety lesions on leaves and fruit, leading to premature leaf drop and fruit cracking. Powdery mildew (*Podosphaera leucotricha*) covers young leaves and shoots with a white fungal growth, stunting growth and reducing fruit set. Fruit rots are significant post-harvest concerns but can also develop in the orchard. Canker diseases, caused by fungi like *Diplodia bulgarica, Botryosphaeria dothidea, Valsa* sp. infect woody tissues, girdling branches and providing entry points for other pathogens.
- **Viral Diseases:** Several viruses infect pome fruits, often going unnoticed initially because they may not produce immediate symptoms. However, they gradually reduce tree vigor, yield, and fruit quality over time. Apple mosaic virus causes bright yellow or cream-colored patches on leaves, which can reduce photosynthetic capacity.

2.2 Pests

Insect and mite pests damage pome fruits by direct feeding on the fruit, leaves, buds, and wood.

- **Direct Fruit Feeders:** The codling moth (*Cydia pomonella*) is a major pest worldwide and is reported in the Union Territory of Ladakh. Its larvae burrow into the apple or pear fruit, feeding on the core and flesh, and leaving behind frass (excrement) at the entry hole, rendering the fruit unmarketable.
- **Sap Feeders and Foliage Pests:** These include, aphids, such as the woolly apple aphid (*Eriosoma-lanigerum*), mites, like the European red mite (*Panonychus ulmi*).
- Borers and Wood Pests: The larvae of various beetles and moths, such as the stem borer, tunnel into the bark and wood of the trunk and limbs.

2.3 Physiological Disorders

Unlike diseases and pests, physiological disorders are not caused by living organisms. They arise from unfavorable environmental conditions, nutritional imbalances, or cultural practices.

- **Nutritional Imbalances**: Bitter pit in apples is a classic example, caused by calcium deficiency in the fruit.
- **Environmental Stress:** Sunburn occurs when fruit is exposed to intense direct sunlight, resulting in pale or brown, sunken patches on the peel.
- Watercore is a disorder where water-soaked areas develop in the flesh of apples, often associated with high temperatures and high sugar levels during maturation.

CHAPTER-3.

DISEASES OF APPLE

3.1. Apple Scab

Causal organism: ***Venturia inaequalis***

Symptoms

- Scab lesions first develop on the lower leaf surface after the green tip stage (March).
- Initially, velvety, olive-green lesions with indistinct borders appear. These lesions gradually turn metallic black as the disease progresses. Severely affected leaves yellowand eventually fall off.
- Infected fruits become distortedand may crack, which allows secondary micro-organisms to enter.

Management

A. Cultural Practices

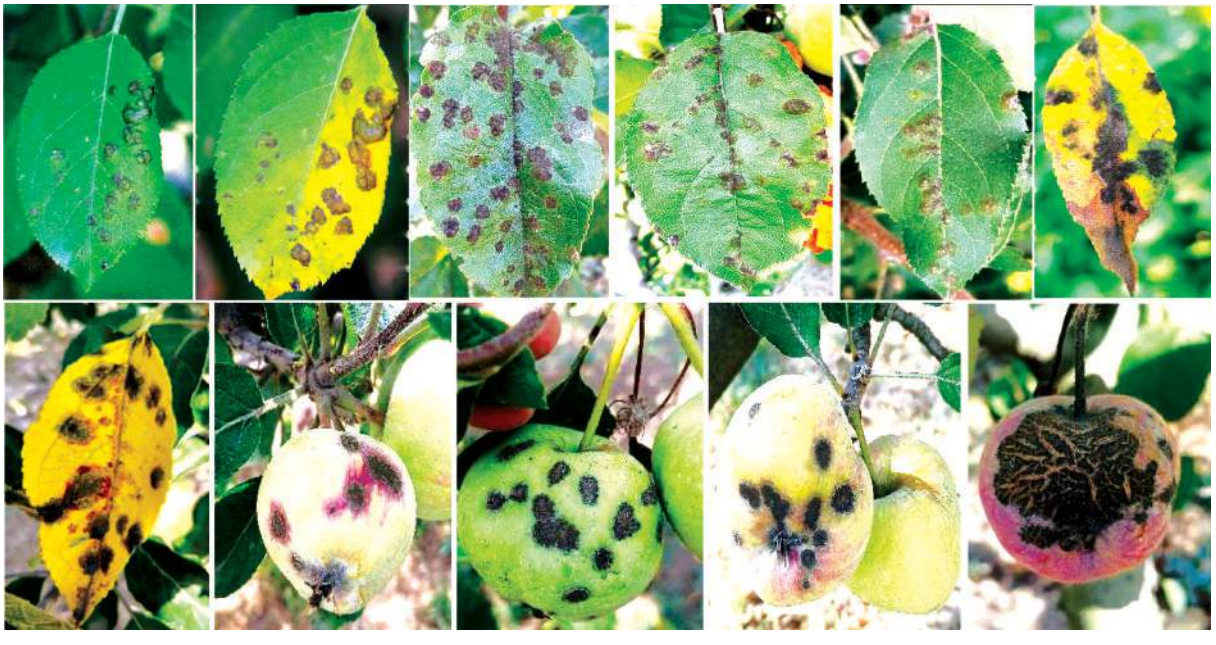
- Remove and destroy infected leaves, twigs, and fruits from the previous season.
- Spray urea @ 0.14% (1400 g per 100 L of water)on fallen leaves. This helps the leaves decompose quickly and reduces this disease for the next season.

B. Chemical Control

Protectant fungicides should be applied at 12-15 day intervals, based on the level of infection. The stage-wise spray schedule is provided in the table below.

S.no.	Stage	Image	Chemical Spray
01	Green Tip Stage		Fluxapyroxad 75 g/L + Difenoconazole 50 g/L SC @ 0.6 ml/L or Dodine @2.0 g/L.
02	Pink Bud Stage		Propineb @ 6.0 g/L or Difenoconazole @ 0.3 ml/L or Hexaconazole 4% + Zineb 68% WP @ 5.0 g/L

03	**Petal fall stage**		Zineb (68%) + Hexaconazole (5%) @1.25 g/L or Metiram 55% + Pyraclostrobin 5% 60 WG @1.0 g/L or Dodine 65 WP @ 0.6 g/L or Dodine 40 SC @ 0.9 ml/L or Tebuconazole 38.9% SC @ 0.4 ml/L or Chlorothalonil 40% + Difenoconazole 4% 44 SC@1.8 ml/L
04	**Fruit Development stage (Pea Shaped)**		Hexaconazole @1.0 ml/L or Flusilazole 40% EC @ 0.8 g/L or Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.2 g/L or Boscalid 25.2% + Pyraclostrobin 12.8% WG @ 0.5 g/L or Metrafenone 500 g/L SC @ 0.2 ml/L
05	**Fruit Development stage (Walnut Shaped)**		Metiram 55% @ 2.0 g/L or Metiram 55% + Pyraclostrobin 5% WG @ 5.0 ml/L or Fluxapyroxad 250 g/L + Pyraclostrobin 250 g/L SC @ 1.26 ml/L or Fluopyram 17.7% + Tebuconazole 17.7% SC @1.5 ml/L or Dodine 40 SC @ 0.9 ml/L or Hexaconazole 4% + Zineb 68% WP @ 5.0 g/L



3. 2. Alternaria Leaf Blotch

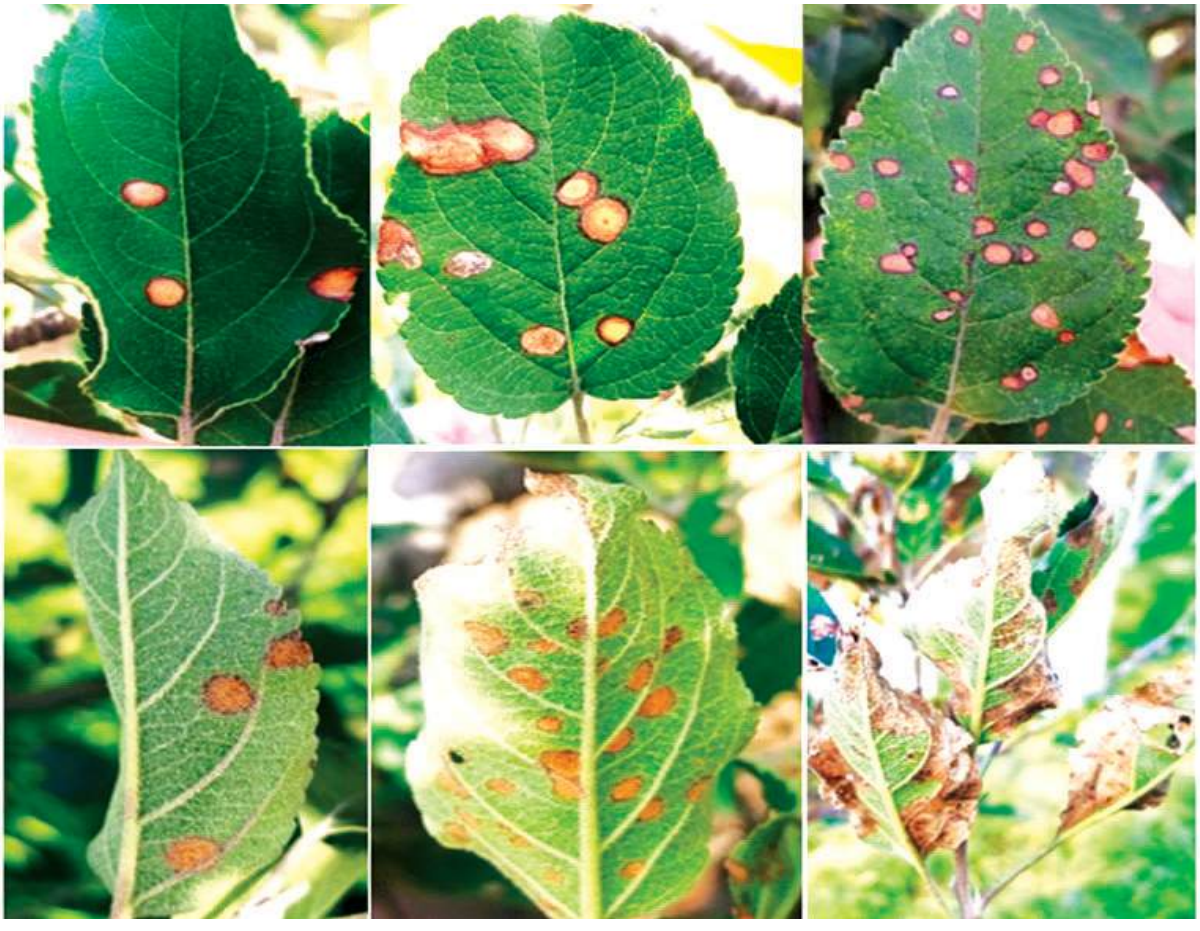
Causal organism: ***Alternaria mali***

Symptoms

- Symptoms first appear in late spring (May) or early summer (July) as small, round, purplish or black spots. These spots gradually get bigger with a brownish-purple border.
- The spots may join together or grow bigger and become irregular, often forming a frog-eye appearance.
- Severe infections can cause early leaf and fruit drop in apple orchards.

Management

- Remove and destroy last year's infected leaves, branches, and fruits to prevent the build-up of disease for the next season.
- Apply fungicides based on the severity of infection or as required, spray Tebuconazole 6.7 % + Captan 26.9 % SC @ 6 ml/L or Fluxapyroxad 250 g/l + Pyraclostrobin 250 g/l 500 SC @ 1.26 ml/L or Fluopyram 17.7% + Tebuconazole 17.7% SC @ 1.5 ml/L or Hexaconazole 4% + Zineb 68% WP @ 5 ml/L.



3.3. Powdery Mildew

Causal organism: ***Podosphaera leucotricha***

Symptoms

Powdery mildew affects young shoots, leaves, flowersand fruits. The symptoms are most noticeable on the leavesandfruits. Early-maturing apple varieties like Mollies Deliciousand Gala are susceptible to this disease.

- The disease appears in spring when buds develop into new leaves and shoots.
- Small patches of white or grey powdery growth appear on the underside of leaves.
- Leaves become purplish, growlonger and narrower than normal, and the margins curl.
- Twigs may be coveredwith powdery growth.
- Infected fruits remain small and deformedand often develop aroughened surface.

Management

- Remove infected flower and shoot buds from the previous year.
- Apply foliar fungicides to prevent secondary infections and protect fruits. Spray every 12–15 days from the Green Tip Stage until terminal shoot growth ends (around midsummer).
- Recommended fungicides:
- Green Tip stage: Fluxapyroxad 75 g/L + Difenoconazole 50 g/L SC @ 0.6 ml/L
- Pink Bud stage: Hexaconazole 4% + Zineb 68% WP @ 5 g/L
- Do not skip pre-bloom sprays, as they are essential for controlling this disease early.

3.4. Collar rot

Causal organism: ***Phytophthora cactorum***

Symptoms

- Pathogen attacks the lower 30 inches (76 cm) of apple trunks.
- Infections start at the root-trunk junction, causing yellow leaves and small, undersized leaves with excessive fruiting on affected trees.
- Bark at the soil line becomes slimy and rotten, forming cankered areas. The wounds are irregular in shape, usually rough and oval and expand rapidly, girdling the tree.

Management

A. Cultural Practices

- Avoid waterlogging in orchards by providing proper drainage.
- Mix a small amount of lime with sand (1:3) and add it to the soil around the tree canopy.
- Remove infected material from around the tree base.

B. Chemical Control

- Cut away dead bark with a sharp knife.
- Apply Bordeaux paste or Metalaxyl 72 WP (Ridomil) on the cut areas.



3.5. Root Rot

Causal organism: ***Dematophora necatrix***

Symptoms

- Early symptoms of root rot are difficult to detect, by the time leaves show symptoms, the disease is usually severe.
- Infected trees show yellow leaves.
- Severely affected trees have small, few leaves, may produce excessive fruit, and roots may smell fishy. In serious cases, the tree dies.
- Trees with rotten roots are weak and can be easily blown over by strong winds.

Management

A. Cultural Practices

- Avoid waterlogging around trees.
- Add a small mix of lime and sand (1:3) around the base.
- Use tolerant rootstocks such as CG.30, CG.6210, M.9, or seedling rootstocks.

B. Chemical Control

- Remove soil around the tree base to 6–9 inches deep.
- Drench the area 2–3 times with one of the following:
- Carbendazim 50 WP @ 1 g/L of water or at the onset of the rainy season, apply Aureofungin (0.05%) + copper sulphate (0.05%) as a soil drench to a depth of 15–20 cm.
- Hexaconazole 5% + Captan 70% (Wave) @ 2 g/L of water
- Thiophanate-methyl (Roko) @ 0.5 g/L of water
- Make holes 12–18 cm deep and 2 inches in diameter around the canopy, repeating every 15–30 days.
- Sterilize the soil with 3% formaldehyde.

3.6. Marssonina Leaf Blotch

Causal organism: ***Marssonina coronaria***

Symptoms

- The disease first appears as dark green circular patches on the upper surface of the leaf, which develop into brown spots 5–10 mm in size that gradually turn dark brown.
- As the disease progresses, spots also appear on the lower surface of the leaf.
- Small black acervuli (fruiting bodies) are visible on the leaf surface.
- When many lesions occur, they merge to form large dark brown blotches, and the surrounding leaf tissue turns yellow.

Management

A. Cultural Practices

- Maintain proper sanitation by destroying fallen leaves in autumn.
- Prune trees properly to improve air circulation within the foliage.

B. Chemical Control

- Protective fungicide sprays can significantly reduce disease incidence.
- Highly effective fungicides include:
- Metiram 70% WG @ 6 g/L of water
- Mancozeb 60% + Pyraclostrobin 5% w/w WG 7 g/L of water

3.7. Canker

Cankers appear as sunken, dead areas on bark around buds, leaf scars, shoots, or wounds. The center of the canker dies, and the bark flakes off.

Types of Cankers

Different pathogens cause cankers, and their symptoms vary depending on the pathogen, tree variety, and age. The main types of cankers found in the Kashmir Valley are:

1. Apple Dieback and Bark Canker (Botryodiplodiatheobromae)

- Causes sunken lesions with cracks along and across the bark.

2. Stem Bark Canker (Botryosphaeria dothidea)

- Appears on sunburned or injured branches as black, brittle patches with many cracks.
- On young trees, reddish-brown sunken areas with purplish edges may grow, form cracks, and girdle the branch.

3. Smoky or Black Rot Canker (Botryosphaeria obtusa)

- Cracks form along lesion edges, temporarily slowing canker growth.
- Bark loosens and may separate from the wood, and blister-like fruiting bodies may appear.

4. Valsa Canker (Valsa ambiens)

- Starts around fruit scars, twig stubs, or injuries as sunken, water-soaked areas with pink centers.
- Edges of the lesion wrinkle, peel, and often turn purplish as the disease spreads.

5. Phomopsis Canker (Phomopsis mali)

- Small brown spots appear along twigs and grow sunken.
- Bark turns dark brown, becomes papery, peels off, and the twigs may die.

Management

A. Cultural Practices

- Remove cankers during winter pruning.
- Scrape the cankered area with a sharp knife, including some healthy bark.
- Collect and burn all pruned material to prevent spreading the disease. Do not leave young cankered shoots in the orchard.

B. Canker Paint

- Apply protective paint immediately after pruning to prevent this disease.
- Apply paint right after pruning or scraping the affected area. Effective wound treatments include:
- Carbendazim 50WP + Copper Oxychloride 60WP in linseed oil (1:2:5)
- Chaubattia paint (copper carbonate, lead oxide, linseed oil in 1:1:1.25 ratio)
- Bordeaux paint (copper sulphate, lime, linseed oil in 1:2:3 ratio)

3.8. Mosaic Disease

Causal organism: Apple mosaic virus (AMV); Apple Necrotic Mosaic Virus (ApNMV)
Host: Apple, Pear

Apple Mosaic Virus (ApMV)

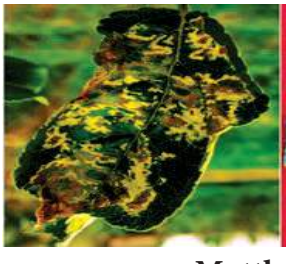
- Leaves show pale yellow or bright cream-colored spots, bands, rings, mosaic patterns, or mottling, especially in spring.
- Infected leaves may fall off early.
- The tree may show reduced growth overall.

Apple Necrotic Mosaic Virus (ApNMV)

- Apple Necrotic Mosaic Virus (ApNMV) is a recently identified virus responsible for mosaic diseases in apples.
- Infected leaves display irregular yellow mosaic patterns and ring spots that eventually turn brown and die (necrosis), particularly during summer.
- Severe infection can lead to premature leaf drop, which may reduce the tree's overall vigor and photosynthetic capacity.

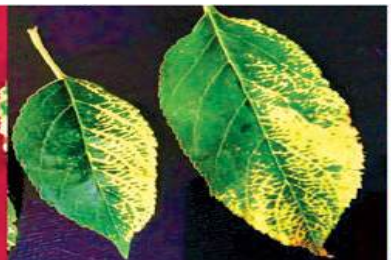
Management

- Avoid using graft or bud wood from infected trees.
- Prune virus-infected plants with proper sterilization of pruning tools.
- Certified virus-free planting material (rootstock and scion) should be sourced from reputable nurseries, as this is the only reliable way to prevent introduction.
- Immediately rogue and destroy infected trees in nurseries and young orchards to prevent secondary spread via natural root grafting.




Mottled Type


Leopard Type

Secund Type


Annular Type

3.9. Apple Scar Skin Viroid (ASSVd)

Causal Organism:

Apple scar skin viroid (ASSVd), a small, circular single-stranded RNA pathogen belonging to the genus *Apscaviroid.*

Symptoms

- Brown, necrotic patches (scar skin) develop on the fruit surface, often accompanied by fissures or cracks, rendering the fruit unmarketable.
- Dapple apple symptoms appear as circular, discolored spots, typically near the calyx (blossom) end, which enlarge as the fruit matures.
- Affected fruit are often smaller than normal and may show cork-like spots or russeting on the skin.
- The leaves and bark of infected trees generally remain symptomless, making visual detection difficult without fruit present.
- In severe cases, symptoms can include fruit deformation and significant reduction in both fruit quality and yield.

Management:

1. Always plant certified viroid-free rootstocks and scions sourced from reputable certification programs.
2. Avoid establishing new apple orchards near pear trees, as pears are often latently infected and can serve as a silent reservoir for the viroid.
3. Practice strict sanitation by disinfecting all pruning and grafting tools (e.g., with a bleach solution) between trees to prevent mechanical transmission.
4. Promptly rogue (remove and destroy) any symptomatic trees in the orchard to eliminate the inoculum source and prevent spread via root grafting.
5. For valuable germplasm, utilize laboratory techniques like thermotherapy combined with shoot tip grafting to eliminate the viroid, though this is not a field treatment.

Apple Scar Skin Disease

3.10. Apple Green Crinkle Disease

Causal Organism:

A specific sequence variant of *Apple stem pitting virus* (ASPV), family *Betaflexiviridae.*

Symptoms:

- Fruit deformity develops when fruits reach 1-2 cm in diameter, with depressions appearing on the surface leading to malformed, irregularly shaped fruit at harvest.
- Brownish-red spots or wart-like swellings appear on the surface, often covered with rough russeting; cracks may develop in severe cases.
- Beneath the surface depressions, the vascular tissue becomes distinctly green-colored, hard, and distorted.
- Affected fruits are significantly smaller (up to 22% size reduction in 'Granny Smith'), and symptoms may appear on only one or a few branches rather than the entire tree.
- Leaves and bark remain symptomless, and symptom expression is temperature-dependent (masked if mean daily temperature exceeds 12°C after bloom).

Management:

- The foundation of control is prevention; always plant certified virus-tested rootstocks and scions sourced from reputable certification programs.
- Promptly remove and destroy infected trees; dig a trench around infected trees before removal to root grafts and prevent spread to neighboring trees.
- Strictly top-working (grafting onto) infected trees, and never collect propagation wood from trees with unknown health status.
- Avoid planting new orchards adjacent to older, untested orchards where the disease may be present without visible symptoms.
- For preserving valuable germplasm, utilize laboratory techniques like heat treatment (38°C for 70 days) combined with shoot-tip grafting to eliminate the virus.

Apple Green Crinckle Disease

3.11. Glomerella Leaf Spot

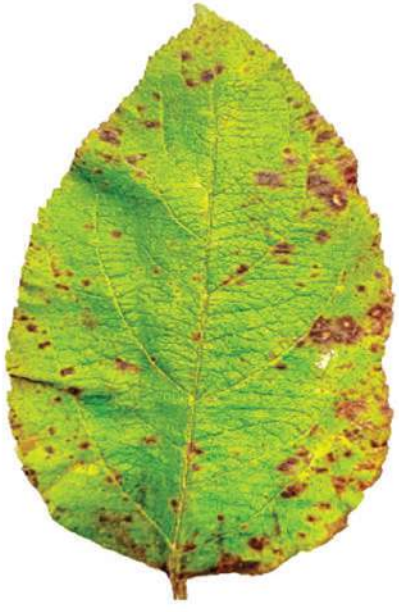
Causal organism: *Glomerella cingulata*

Symptoms

- Small brown to ochre necrotic spots appear, which enlarge irregularly and cause yellowing.
- The disease appears during the summer season and affects both leaves and fruits.
- Under warm and hot conditions, severe defoliation may occur.
- Small, round, slightly sunken and corky spots develop on the fruit. These spots are about 0.5–3 mm in size and 0.5–2 mm deep, and are often surrounded by a red margin.

Management

- Prune and remove infected shoots, dead branches, and fruit mummies.
- After harvest, remove fallen leaves or spray urea @ 0.14% (1400 g per 100 L of water)on fallen leaves.
- Improve air flow in trees and avoid excess moisture.
- Grow resistant varieties; varieties 'Golden Delicious' are more susceptible.



3.12. Sooty Blotch

Causal Organism: *Gloedespomigena*

Symptoms

- Brown, black, or grey spots form on the fruit, creating blotches.
- The fungus only affects the outer surface, and the blotches can often be rubbed off easily.

3.13. Fly Speck

Causal Organism: ***Schizothyriumpomi***

Symptoms

- Small, shiny black dots appear on the fruit in groups of 6 to 50 or more.
- These dots have clear borders and are harder to rub off compared to sooty blotch.

Management

- Avoid planting shade trees around orchards.
- Prune and train trees properly to improve air circulation.
- Use protective fungicides like: Metiram 55% + Pyraclostrobin 5% WG @ 5.0 ml/L orMancozeb 75WP @ 3 gm/L of water or Ziram 80WP @ 2 gm/L of water. Apply these fungicides at the beginning of infection to prevent this spread.

3.14. Blue Mold of Apple

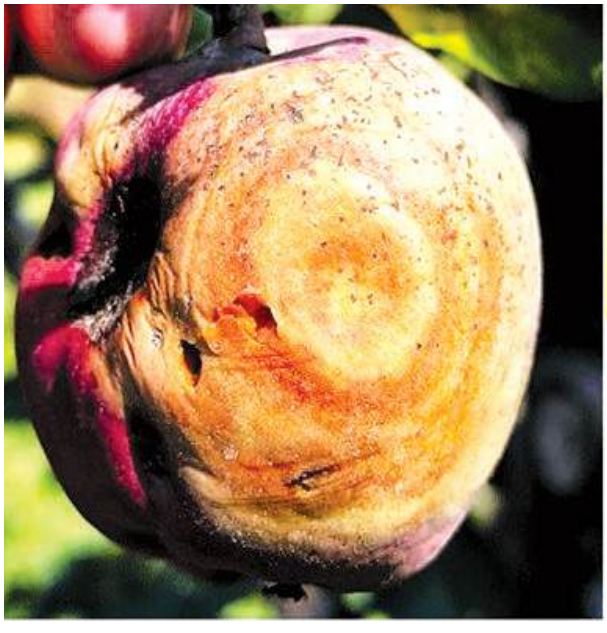
Causal Organism: ***Botrytis spp./Penicillium expansum***

Symptoms

- A post-harvest disease affecting only mature fruits.
- Commonly causes rot in stored apples and pears.
- Soft, watery patches develop on the fruit surface, usually originating from wounds or lenticels.
- Infected fruits produce a characteristic mouldy odour and unpleasant flavour.

Management

- Avoid wounds and injuries during harvesting, packing and storage.
- Remove and destroy decaying fruits daily from packing houses and storage areas.
- Apply post-harvest chemical treatment with Benlate @ 0.5 g per litre of water.



CHAPTER-4.

DISEASES OF PEAR

4.1. Pear Scab

Causal organism: ***Venturia pirina***

Symptoms

- The disease is more pronounced on the cultivar 'Kashmiri Nakh'.
- Symptoms are more clearly seen on fruits than on leaves.
- On leaves, velvety olive-green to brown round spots appear on both surfaces.
- On fruits, scab spots first appear at the calyx end, near the sepals.
- Later, these spots become hard, corky, and canker-like.

Management

- Collect and destroy fallen leaves from the orchard.
- Start spraying fungicides from the pink bud stage.
- Give 4–5 fungicide sprays at 12–15 day intervals.
- Use any one of the following fungicides: Mancozeb @ 0.3%;Dodine @ 0.06%; Propineb @ 0.3%; Captan @ 0.3%; Carbendazim + Mancozeb @ 0.25%; Flusilazole @ 0.02%; Difenoconazole @ 0.03%
- Spray protectant and systemic fungicides alternately for better management.

4.2. Leaf Spot

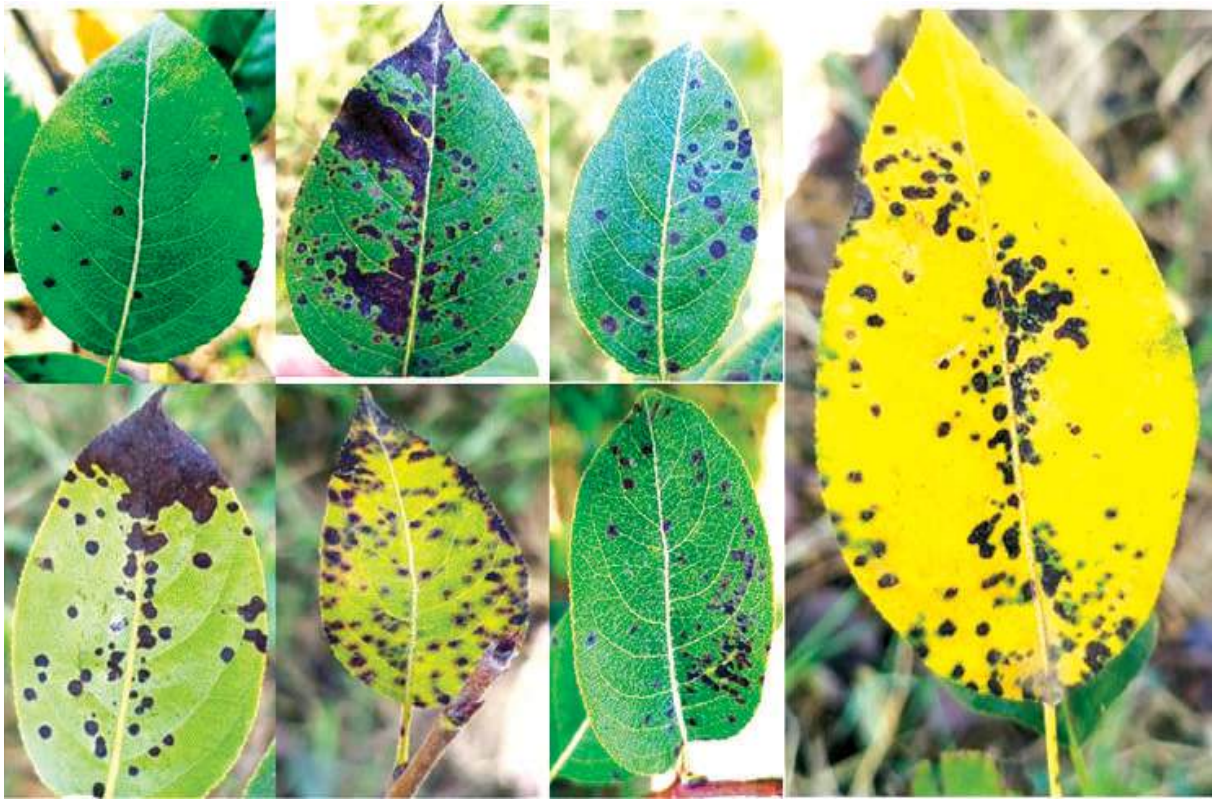
Causal Organism: ***Alternaria spp.***

Symptoms

- Small red to purple spots appear on young leaves.
- Tiny black dots appear in the centre of the spots.
- Severe infection causes early dropping of leaves.
- On fruits, sunken black spots develop.

Management

- Collect and destroy fallen leaves from the orchard.
- Give3–5 fungicide sprays at12–15 day intervals, starting from thepink bud stage.
- Use any one of the following fungicides: Dodine 65 WP @0.06%; Propineb 70 WP @ 0.3%; Captan 50 WP @ 0.3%; Mancozeb 75 WP @0.3%; Carbendazim 50 WP @ 0.05%; Thiophanate methyl 70 WP @ 0.05%; Carbendazim 12% + Mancozeb 63% @ 0.25%



4.3. Stony Pit of Pear

Causal Organism: ***Pear stony pit virus***

Symptoms

1. Stony pit of pear is caused by a virus and is also known as dimpling disease.
2. Symptoms appear about three weeks after petal fall. Dark green patches develop on the fruit surface. Growth around these areas is reduced, causing the fruit to become pitted, irregular, and deformed.
3. Severely affected fruits become hard and gritty, making them difficult to cut. Such fruits are unattractive and not fit for sale.

Management

• Use certified virus-free planting material, including rootstocks, trees, and budwood, obtained from reliable nurseries.

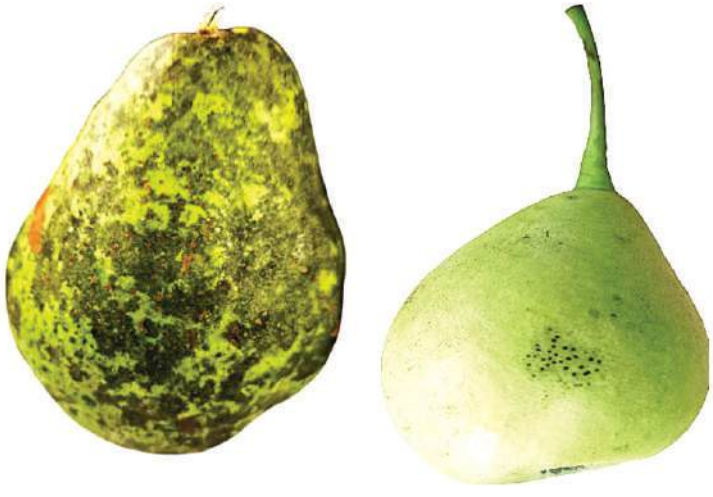
4.4. Sooty Blotch and Fly Speck

Causal Organisms

- Sooty blotch:*Gloeodespomigena*
- Fly speck: *Zygophiala jamaicensis*

Symptoms

- Both diseases appear together on the fruit surface and may look like a single disease.
- The disease becomes more severe in late summer, especially after rainfall.
- Sooty blotch:
- Causes dull blacktogrey patches on the fruit.
- Spots have indistinct or unclear margins.
- Fly speck:
- Produces small, round, shiny black spots.
- Spots look like fly droppings.
- These diseases are more common on fruits growing in shady areas and on crowded branches.
- Damage is mainly due to poor fruit appearance, which reduces market quality.



Management

- Do proper training, pruning, and thinning to avoid crowded branches.
- Follow fungicide sprays recommended for fruit and leaf diseases.
- At first appearance of disease, spray: Ziram 80 WP @ 0.2%, or Ziram 27 W/V @ 0.6%, or Zineb 75 WP @ 0.3%
- Dip harvested fruits in a 5% bleaching powder solution or sodium hypochlorite for 10 minutes. Wipe fruits dry using a coarse cloth before packing.

4.5. Canker

- Same as in case of Apple

CHAPTER-5.

DISEASES OF QUINCE

5.1. Leaf Blight

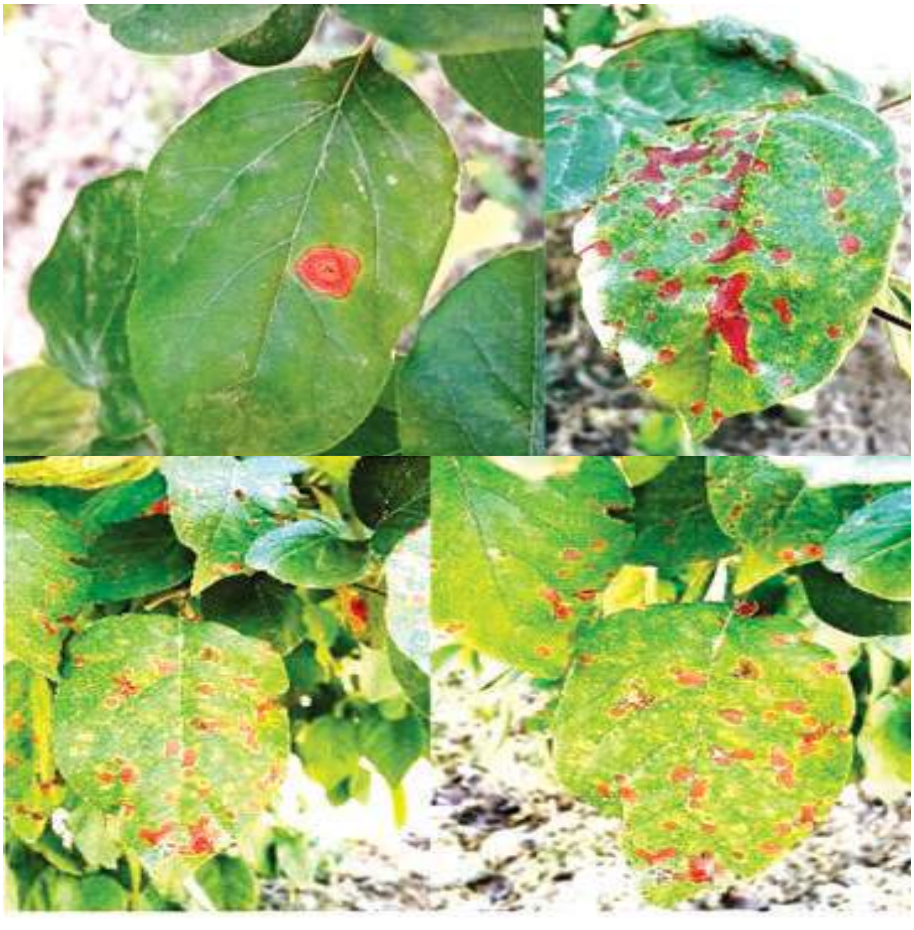
Causal organism: ***Alternaria alternata***

Symptoms:

- Dark circular spots with concentric rings on leaves.
- Spots may enlarge and coalesce, leading to leaf yellowing and premature defoliation.
- Fruit can also show spots and become distorted.

Management

- Collect and destroy fallen leaves from the orchard.
- Use any one of the following fungicides: Dodine 65 WP @0.06%; Propineb 70 WP @ 0.3%; Captan 50 WP @ 0.3%; Mancozeb 75 WP @0.3%; Carbendazim 50 WP @ 0.05%; Thiophanate methyl 70 WP @ 0.05%; Carbendazim 12% + Mancozeb 63% @ 0.25%



5.2 Mosaic

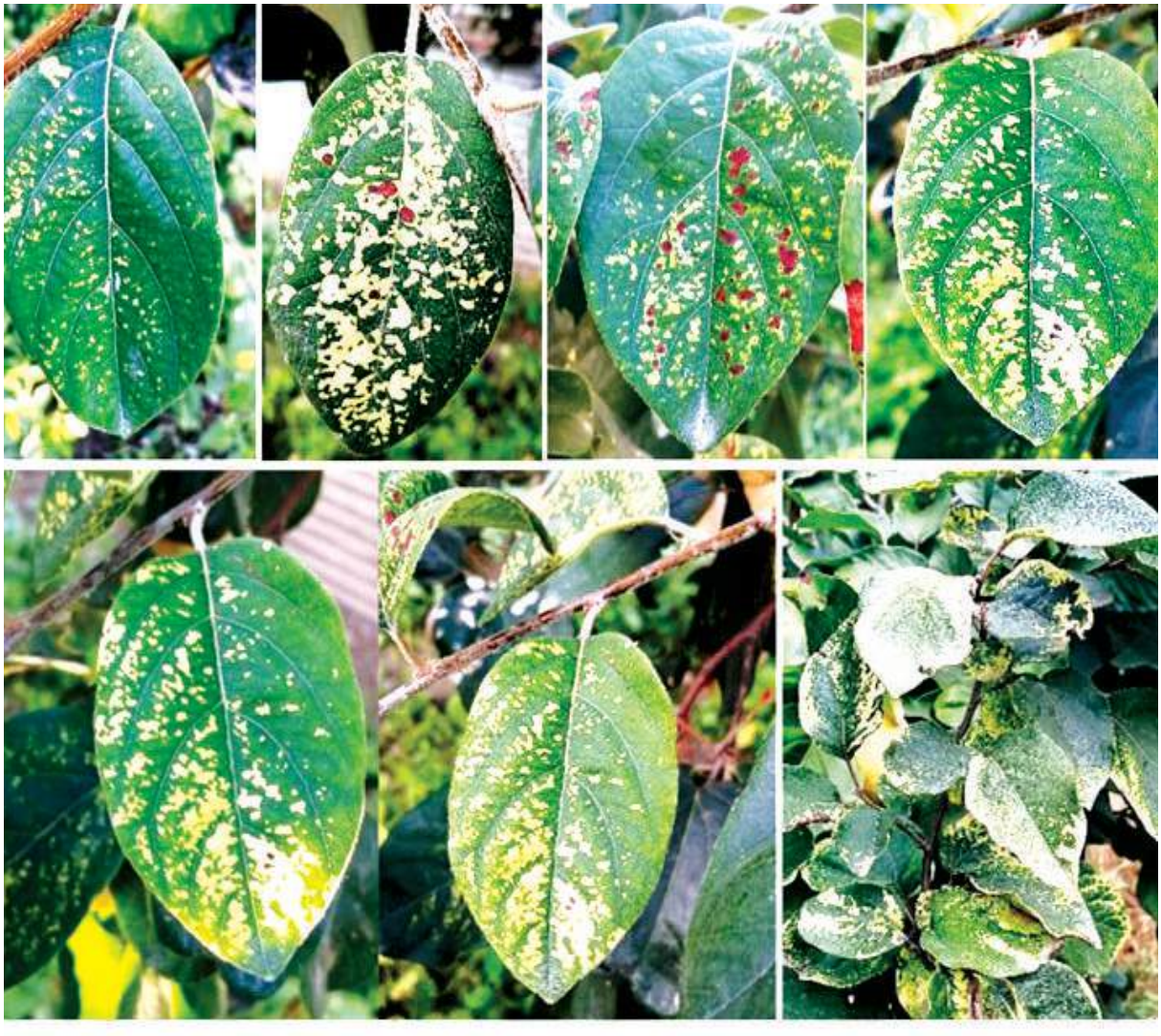
Causal organism: ***Apple mosaic virus (AMV)***

Symptoms

- Leaves show pale yellow or bright cream-colored spots, bands, rings, mosaic patterns, or mottling, especially in spring.
- Infected leaves may fall off early.
- The tree may show reduced growth overall.

Management

- Avoid using graft or bud wood from infected trees.
- Prune virus-infected plants with proper sterilization of pruning tools.



CHAPTER-6.

PESTS OF POME FRUITS

6.1. San Jose Scale

Scientific name: ***Quadraspidiotusperniciosus***

Host: Apple, Pear, other fruit trees

Damage:

- Nymphs and female scales attack all above-ground parts of the plant.
- The feeding site turns a characteristic purplish-red colour.
- Initially, plant growth is checked, but as the scale population increases, the plant may die.
- Fruits develop distinct "measles-like" spots on the surface.

Management

S.No.	Method	Control Measures
01	Cultural/Mechanical	• Use healthy, pest-free planting material. • Avoid planting shade trees near the orchard. • Prune and burn heavily infested branches. • Scrape scales carefully from branches.
02	Biological	• Parasitoids Encarsia perniciosi and Aphytis proclia and the ladybird beetle (Chilocorus infernalis) are natural enemies of this pest. • Avoid unnecessary use of insecticides to protect beneficial insects.
03	Chemical	• Pink bud stage: Spray 2% Horticultural Mineral Oil (HMO). • Petal fall stage: Hexythiazox @ 1 ml/L or Oxy-demeton methyl @ 1 ml/L. • Pre harvest (20-25 days before harvest) stage: Oxy-demeton methyl @ 1 ml/L.

6.2. Woolly Apple Aphid

Scientific name: ***Eriosoma lanigerum***
Host: Apple and Pear

Damage:

- White cottony flakes hang on infested parts of the tree.
- Aphids weaken the tree by sucking sap from branches, twigs, and roots, reduce growth of tree.
- Nymphs and adults suck cell sap from the bark of twigs and underground parts.
- Underground feeding causes large knots on roots.
- Severe infested plants have a short fibrous root system and yellowish foliage, making them easy to uproot.

Management

S. no.	Method	Control Measures
01	**Mechanical**	• Remove excessive water. Cover cracks, crevices, and pruning wounds with Chaubatia paste to stop infestation. • Use Mailing Merton (MM series) rootstocks, resistant to woolly aphid. • Spray 2% HMO before buds break.
02	**Biological**	• Parasitoids Phelinus mali are natural enemies of this pest and helps to keep the population under check. • Avoid unnecessary use of insecticides to protect beneficial insects.
03	**Chemical**	• After harvest of fruits, spray Chlorpyriphos 20 EC @ 3 ml per litre of water on fruit trees. • For root infestation, drench the canopy area with Chlorpyriphos 20 EC (3 ml/L water), or apply Carbofuran 3% CG (100 g per tree) by hoeing 5 cm of soil around the trunk during December or March

6.3. Mites

Common Species:

- European red mite: *Panonychus ulmi*
- Two-spotted spider mite:*Tetranychus urticae*
- Host plants: Apple, pear and other fruit crops

Damage:

- Leaves become speckled but insevere infestationleaves turn dull green, brownish-yellow, or bronzed, giving a burnt appearance.
- Infestation can cause early leaf drop, reduced fruit size, stunted growth, weakened buds, poor fruit set, and premature fruit drop.
- Damaged leaves are also more prone to fungal infections, which can increase crop loss.

Management

S.No.	Method	Control Measures
01	**Mechanical**	• Maintain plant vigour with balanced fertilizers and proper irrigation. • Prune and destroy infested twigs and branches during dormancy. • Spray Horticultural Mineral Oil (HMO) @ 2% (2 L/100 L water)
02	**Biological**	• Ladybird beetles (Stethorus punctum) and predatory mites (Amblyseius fallacis) are important natural enemies of mites and should be protected. • Anthocorid bugs (Blaptostethus pallescens) feed on eggs of two-spotted spider mites.
03	**Chemical**	• Petal fall stage: Spray Etoxazole @ 0.4 ml/L Hexythiazox @1 ml/L or Fenzaquin 0.5 ml/L or Spiromesifen @ 0.6 ml/L of water. • Fruit set (pea size): Hexythiazox @ 1 ml/L or Fenpyroximate @ 0.5 ml/L or Spiromesifen @ 0.6 ml/L of water. • Fruit development – I: Propargite 1 ml/L or Fenpyroximate @ 0.5 ml/L of water. • Fruit development – II: Fenzaquin 0.5 ml/L or Hexythiazox 5@1 ml/L or Spiromesifen @ 0.6 ml/L or Summer oil @ 7.5 ml/L of water. • Fruit development – III: Propargite 1 ml/L or Fenzaquin @ 0.4 ml/L water or Propargite 42% + Hexythiazox 2% EC @ 1 ml/L of water

6.4. Apple Stem Borer

Scientific name: ***Apriona cinerea***
Host: Apple, Pear and other fruit trees

Damage:

- Grubs bore large holes (½ to 4 inches) in stems and branches.
- Sawdust comes out of the holes.
- Adults also damage the trees inside the tunnels.
- Severely infested trees may dry up and die.

Management
Cultural/Mechanical:

- Apply balanced fertilizers to keep trees healthy.
- Remove and destroy heavily infested branches, twigs, and dead trees.
- Insert a flexible wire into live holes and move it up and down to kill larvae.

Chemical:

- Clean the holes and plug with cotton soaked in Dichlorvos 76 EC (3 ml/L of water), or Petrol, 4% formalin, or Naphthalene balls (1 per hole) from May to September, then seal with mud.
- Spray Chlorpyrifos (1ml/L of water)in the last week of April during adult emergence.

6.5. Codling Moth

Scientific name: ***Cydia pomonella***
Host: Apple and other deciduous fruits (Ladakh)

Damage:

- This pest direct attacks the fruit, cause severe damage.
- Newly hatched (neonate) larvae enter the fruit through the calyx and feed on the pulp and seeds.
- Fully grown larvae create large exit holes when leaving the fruit.
- Infested fruits often become deformed, drop prematurely, and 30–70 per cent may beunmarketable, leading to significant yield loss.

Management:

1. Cultural/Mechanical:

- Scrape loose bark from trunks in August–September to remove shelter for overwintering larvae.
- Wrap trunks with gunny bags or corrugated cardboard in August–September to trap mature larvae; remove and destroy them.
- Collect and destroy all fallen fruits containing larvae to reduce pest population.

Biological:

- Release Trichogramma cacoeciae (egg parasitoid) 100–5000 per tree:
- 1st generation: 1st week of June, 10–15 days after chemical sprays.
- 2nd generation: Last week of June to 1st week of July.

Chemical:

- After petal fall, when adult moths start emerging, spray Chlorpyrifos 20 EC @ 1ml/L of water, or Dimethoate 30 EC @ 1 ml/ L of water. Repeat spray 2–3 weeks later.
- Use pheromone traps to monitor adults (4 traps per orchard). Replace lure and liner every 15 days. Spray insecticide if more than 5 adults per trap per week are caught.

6.6. Aphid

Scientific name: ***Aphis pomi***
Host: Apple, Pear and other fruit trees

Damage:

- Aphids suck sap from leaves and young shoots.
- Leaves become curled, distorted, yellow or brown.
- Heavy infestation reduces shoot growth and leads to honeydew secretion, which promotes sooty mould on leaves and fruits.
- In untreated orchards, severe infestation may weaken trees, reduce fruit set, andcause 30–40 per cent yield loss

Management:

- Spray Horticultural Mineral Oil (HMO) @ 2% during late dormant stage.
- Spray Dimethoate 30 EC @ 1 ml /L of water, or Imidacloprid 17.8 SL@ 0.28 ml/L of water apply during late May or early June.

6.7. Leaf Blotch Miner

Scientific name:*Leucoptera malifoliella*
Host: Apple, Pear and other fruit trees

Damage:

- Larvae make mines inside leaves tissue, forming blotch-like transparent patches on apple leaves.
- With heavy infestation, the mined leaves dry prematurely and fall off, causing early defoliation.
- Severe attack can lead to 40–60 per cent loss of leaf area, which weakens the tree and results in reduced fruit size and poor fruit quality.

Management:

- Spray Dimethoate 30 EC @ 1 ml per litre of water after petal fall to control the infestation.

6.8. Pear Psylla

Scientific name: ***Psylla pyricola***
Host: Pear

Damage:

- Heavy infestations cause small, deformed fruits and premature leaf or fruit drop.
- First-generation nymphs attack blossoms, which can weaken or kill fruit buds, affecting the next season's crop.
- Young shoot tips are heavily attacked, stunting tree growth.
- Nymphs produce honeydew, which leads to sooty mold on leaves, shoots, and fruits, reducing photosynthesis.

Management:

- Spray Horticultural Mineral Oil (HMO) 2% in late dormant stage.
- For light infestation, spray 3 weeks after petal fall with Dimethoate 21.7 SC @ 1 ml/L of water or Thiacloprid @ 0.4 ml/L of water. For heavy infestation, repeat the spray 3 weeks later.

6.9. Pear Leaf Blister Mite

Scientific name: ***Eriophyes pyri***
Host: Pear

Damage:

- Blisters on leaves start green, then turn reddish, brown, or black.
- Blisters are raised and corky on the underside of leaves.
- Light infestation causes little damage, but severe attack may cause distorted leaves, early leaf fall and fruit damage
- Mites overwinter under bud scales and attack new buds in spring.

Management:

Cultural/Mechanical:

- Pick and destroy blistered leaves before they turn red.
- Avoid water stress; mulch trees in spring to conserve moisture.
- Spray HMO 2% during delayed dormant stage.

Biological Control:

- Predatory mites feed on blister mites:
- *Amblyseius finlandicus*
- *Typhlodromus occidentalis*

Chemical:

- For severe infestation spray Fenpyroximate 5 SC (1ml/L of water) or Fenazaquin (0.50 ml/L of water).

CHAPTER-7.

PHYSIOLOGICAL DISORDERS IN POME FRUITS

7.1. Water Core

Symptoms:

- Small water-soaked areas inside the fruit flesh appear, especially in August (common in Cox's Orange Pippin variety).
- These areas join to form larger water-soaked, glassy patches.
- Severe fruits look glassy from outside and have poor storage life.
- Such fruits should be sold soon after harvest.

Cause:

- Deficiency calcium in the fruit.
- Rapid sugar accumulation in the flesh leads to water-soaked appearance.
- Excess nitrogen and potassium, which reduce calcium absorption.
- Poor calcium translocation during fruit development.

Management:

- Spray calcium chloride @ 3 g per litre during the first week of July.
- Repeat spray after 21 days depending on weather.

7.2. Lenticel Blotch of Apple

Symptoms:

- Small, lens-shaped (circular or oval) brown spots on the fruit surface.
- Spots may enlarge and merge, forming bigger blotches.
- In severe cases, fruit surface cracks or becomes deformed making the fruits more susceptible to secondary infections.
- Fruits may fall prematurely or become unmarketable.

Cause:

- Calcium deficiency in fruits during development.
- Excess nitrogen and potassium, which reduce calcium absorption.
- Uneven soil moisture or drought stress, limiting calcium movement.
- Rapid fruit growth causing poor calcium distribution.

Management:

- Apply calcium chloride @ 2–3 g per litre of water as foliar spray during fruit development (starting from 3–4 weeks after fruit set).
- Apply well-decomposed farmyard manure to improve calcium uptake.
- Avoid excessive nitrogen and potassium, as they reduce calcium absorption
- Maintain even soil moisture, avoid drought or water stress.

7.3. Bitter Pit

Symptoms:

- Small brown corky spots under the skin, usually near the calyx; more on fruit from vigorous, upright branches.

Cause:

- Low calcium in fruit flesh
- High K and Mg interfere with Ca uptake
- Ca deficiency weakens cell membranes cause cell death
- Initiates 4–6 weeks after petal fall

Management:

- Avoid excessive nitrogen and magnesium.
- Maintain moderate tree vigor, proper irrigation, summer pruning.
- Apply calcium sprays ($CaCl_2$ or $Ca(NO_3)_2$ 3–6 times at 2–4 week intervals starting mid-June.
- Postharvest dips in 2–3% calcium solution may reduce incidence.
- Harvest fruit at proper maturity.

7.4. Russeting

- **Occurrence:** Appears shortly after petal fall, especially in humid conditions.
- **Susceptible Fruits:** Apples with thin cuticle; fruits exposed to sunlight.

Symptoms:

- Rough, brown, corky patches on fruit skin.
- Cracks or ruptures on the fruit surface.
- Frost during blossom or early fruit formation may worsen it.

Causes:

- Damage to epidermal cells in the first 30–40 days after petal fall.
- Cool, wet weather or sudden moisture changes.
- Frost injury during flowering or early fruit growth.
- Uneven application of sprays (copper, zinc, calcium, Ferbam, Syllit).

Management:

- Grow resistant varieties.
- Provide proper irrigation and balanced fertilization.
- Maintain good pest and disease control.

7.5. Internal Cork of Apple

Internal cork is a physiological disorder of apples caused by a deficiency of boron, leading to the formation of brown, corky lesions deep within the fruit's flesh.

Causes

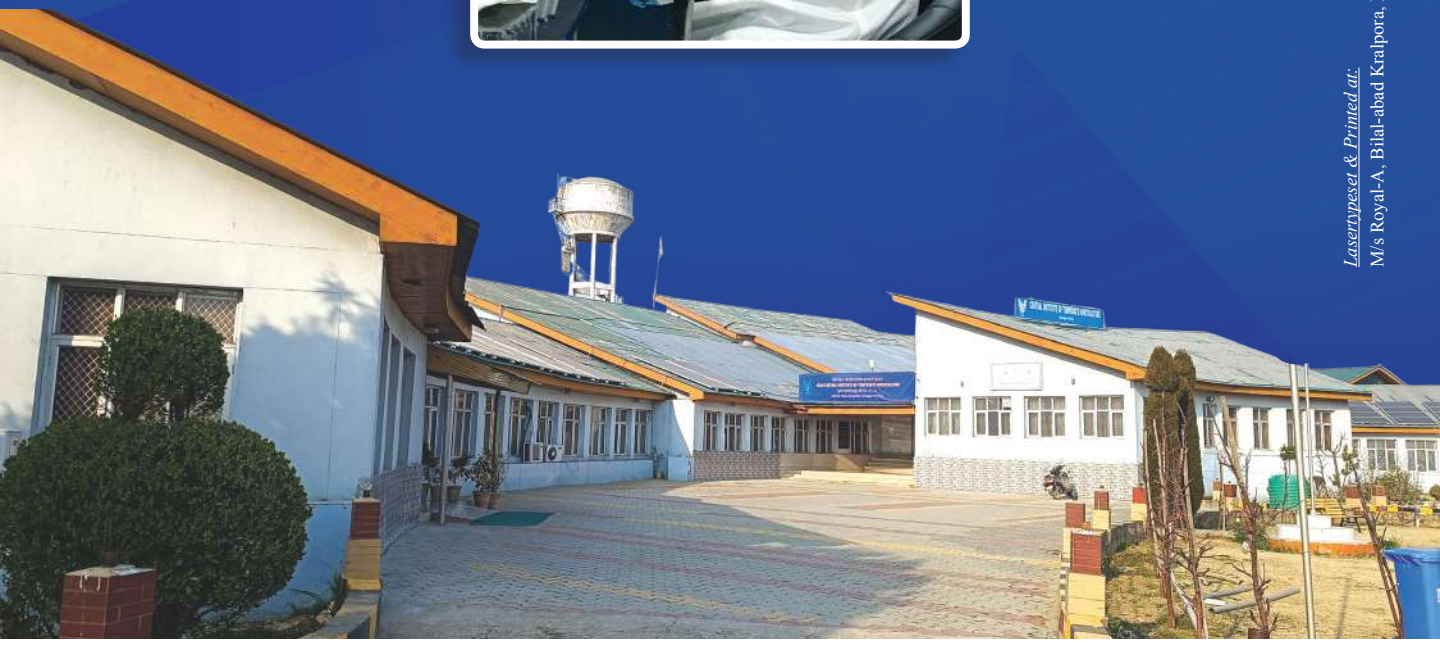
- Internal cork is primarily caused by a lack of available boron in the soil, which is essential for normal cell wall development and sugar translocation in the plant.
- It is most common in sandy, low-organic matter soils, alkaline soils (high pH), or during drought conditions when boron uptake is limited.

Symptoms

- The primary symptoms are brown, water-soaked lesions or dry, corky patches that develop deep within the fruit flesh, often near the core.
- Affected fruit may be deformed externally, and the symptoms are usually not visible on the skin, only appearing when the fruit is cut open.

Management

- Management relies on confirming deficiency through leaf or fruit analysis and applying boron accordingly.
- The most effective method is a foliar spray of a soluble boron product (like Solubor®). Recommendations include applying 3 sprays starting at petal fall and repeated at 2–3 week intervals, or applying autumn sprays to increase boron in the following spring's flowers.



Lasertypeset & Printed at:
M/s Royal-A, Bilal-abad Kralpora, Bagh-I- Mehtab Srinagar-190019

भाकृअनुप
ICAR

ICAR-CENTRAL INSTITUTE OF TEMPERATE HORTICULTURE

Old Airfield Rangreth Srinagar, 191132 (J&K) INDIA

44 Pages *(Total Pages Include index and printed information)*
Size : 19.05 x 26.67 cm
M R P Rs. 35. 00
Inclusive of all taxex