

PESTS OF POME FRUITS AND THEIR MANAGEMENT

Abstract

Pome fruits, including apples, pears, and quince, are integral components of the Rosaceae family, exhibiting a unique structure with a thick membrane surrounding tiny seeds.

However, these fruits are susceptible to a multitude of insect pests that pose significant challenges to orchard productivity. This review provides an overview of key insect pests affecting pome fruits, such as maggots, codling moths, leaf miners, psyllids, aphids, and mites. The severity of infestation categorizes these pests as major or minor, with direct and indirect impacts on fruit quality and yield. Historically, pest management involved physical treatments like picking and discarding infested fruits, weed control, and post-harvest fruit treatment. Nevertheless, with advancements in science and technology, modern approaches have emerged. Integrated Pest Management (IPM) strategies, combining biological, cultural, and chemical methods, play a pivotal role in sustainable pest control. Pheromone traps, insecticides, and beneficial insects are essential components of these strategies. Over 70 insect pests and mites specifically target pome fruits, necessitating a comprehensive and dynamic management approach. Successful pest control is vital to mitigate yield loss, minimize winter damage, and protect trees from insect assaults. This abstract underscores the evolving landscape of pest management in pome fruits, emphasizing the importance of adopting innovative and environmentally friendly methods to ensure the health and productivity of orchards.

Keywords: Pome fruits, IPM strategies, Woolly Apple Aphid, *Trichogramma platneri*, unmarketablem.

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I. INTRODUCTION

Pome fruits belong to the *Rosaceae* family, and subfamily *pomoideae*. They are fruits with a thick membrane around a centre of many tiny seeds. The membrane is wrapped in a fleshy layer that may be eaten. Trees are deciduous and have a dormant winter phase that need freezing temperatures in order to break dormancy effectively in the spring. Pome fruits include apples, pears, and quince, which are produced from spring flower through late fall harvest (Knee, 1993). Maggot, codling moth, and other internal fruit eaters are examples of direct pests. Indirect pests include leaf miners, psyllids, aphids, and mites, which do not directly harm fruits. When categorised according to the severity of their infestation, these pests are also referred to as major and minor pests (Atwal and Dhaliwal, 1997). More than 70 insect pests and mites attack apple and pear fruits, often known as Pome fruits, causing significant damage (Abrol, 2015). Damage to pome fruit trees diminishes yield and makes them more vulnerable to winter damage or insect assault. Pest control in pome fruits has long been a difficult task for farmers. Physical treatment of trees and orchards dominated early pest management. Picking and discarding of pest-infested fruits from trees, reducing weeds on the orchard floor, treating harvested fruit, and limiting pest movement in second-hand boxes were all part of this operation. But with advancements in science and technology, newer and newer methods have been discovered to manage the insect pests of pome fruits. Some of the important insect pests of pome fruits include:

- 1. European Red Mite (*Panonychus ulmi*):** The European red mite (ERM) is a destructive pest known to infest various fruit trees, including pome and stone fruit trees, as well as nuts and berries. These mites typically deposit their eggs during the winter period in the vicinity of buds and spurs, concealed within the tree's bark. The reddish-orange overwintering eggs are spherical or slightly flattened and have a short stalk on top. Eggs hatched on the underside of leaves during the growth season are yellowish, spherical, and lack a stalk. (Hardman *et al.*, 1985). It was reported in North America for the first time in 1911. It was first observed in India in 1974, in the states of Jammu & Kashmir, Himachal Pradesh, and Uttarakhand. In practically all apple-growing areas, *Panonychus ulmi* has established itself as a major pest. (Khajuria and Sharma 1996). In India, *P. ulmi* has been documented on a variety of plants, including peach, plum, apple, wheat, fig, hibiscus, tomato, apricot, and ivy in the Jammu and Kashmir region, as reported by Kumar and Bhalla in 1993. In regions characterized by arid conditions, the European red mite stands out as the most menacing pest. The pace of its development is strongly influenced by temperature, with a slower rate during the spring and autumn seasons and a more rapid progression during the hot summer months. Sexual and parthenogenetic reproductions are also possible. When they're active, they'll be discovered in the foliage, penetrating leaf tissue and sucking up the sap that flows out. European red mites eat apple leaves by putting their mouthparts into individual cells and sucking off the juices, including the chlorophyll. By mid-July, if there is enough feeding, the leaves may take on a bronze look. Serious feeding injury can lead to premature leaf drop, poor fruit colour, lower fruit size and quality, and reduced fruit set the next year, as well as a reduction in the number of fruit buds for the next season's harvest. The European red mite is a pest of many trees, although the apple is the most affected. The bottom leaf surface is more affected than the upper leaf surface. (Kim *et al.*, 2008; Marcic, 2007). Pruning and destruction of infested twigs/branches during dormancy to reduce overwintered population as the egg laying is being noticed on these twigs by ERM. Application of dormant oil prior to bloom, scouting the orchard regularly after the petal fall stage through August, application of

balanced doses of fertilisers and proper irrigation, and use of reduced risk insecticides to help conserve predatory arthropods that attack ERM are all recommended best management practises for this pest. To control the population of ERM, conservation, mass production, and mass release of predatory mites (*Amblyseius fallacis*) and lady bird beetles should be undertaken.

- 2. Woolly Apple Aphid (*Eriosoma lanigerum*):** The woolly apple aphid is a minuscule, soft-bodied insect that sustains itself by using a piercing and sucking feeding method. Although encounters with these aphids are infrequent, their presence can pose significant challenges to fruit-bearing trees. Woolly apple aphids have a tendency to infest various parts of the tree, including the roots, trunks, limbs, shoots, and, on rare occasions, even the fruit. The term 'woolly' in their name pertains to the waxy secretions they produce as a protective measure against potential predators. These bark-feeding aphids have masses of white, wool-like waxy coverings covering their bodies, while the aphids themselves are purple. The aphid goes through two stages during the winter: egg stage and immature nymphal stage. Nymphs hibernate on the tree's roots underground. During the summer, after establishing new colonies, the migrants produced many generations. Aphids belonging to the woolly apple variety tend to establish colonies in wound sites found on apple tree trunks, limbs, twigs, and roots. These aphids engage in feeding activities both above and below the ground, with the subterranean root feeding being the most detrimental, particularly to young plants, as outlined by Atwal and Dhaliwal in 1997. Root feeding by these aphids leads to the formation of galls, which obstruct the normal flow of nutrients. This disruption results in consequences such as stunted growth, the risk of uprooting. Honeydew and sooty mould will be a concern if populations are high, and aphids may enter the calyx end of the fruit. While managing the pest, Chaubatia paste should be used to remove excessive water sprouts and to cover gaps, crevices, and wounds created by pruning. Planting aphid-resistant rootstocks (MM 106 and MM 111) and taking action when aphids infest 10% of pruning scars. *Aphelinus mali* is a parasite that can take over an airborne colony and entirely rule it. In the absence of this parasite, aerial colonies can grow rapidly, and woolly aphids can be discovered in the apple's calyx. Woolly apple aphid outbreaks are most common after the usage of pyrethroids, which kill the aphid's natural enemies. Spraying dormant oils after they've been latent for a while (HMOs). To conserve natural enemies, judicious use of chemical insecticides is required. In certain situations, using an organophosphate plus oil during the delayed dormant phase has resulted in season-long control, or at the very least suppression throughout the summer. When populations grow, an effective pesticide can be used at any time during the season. It's important to plan ahead for a fall epidemic and make sure the pesticide's preharvest interval is followed. Other pesticides (such as IGRs, neonicotinoids, and other innovative modes of action) have largely replaced organophosphates, which have little or no toxicity to the woolly apple aphid but may be similarly deadly to its natural enemies.
- 3. San Jose Scale (*Diaspidiotus perniciosus*):** San Jose scale is a piercing-sucking pest that attacks apple, peach, plum, and pear trees. It's a sucking pest that feeds by injecting a toxin into the plant, causing discoloration in certain areas. This insect feeds on the twigs, limbs, and fruits of trees. This bug can damage tree limbs or entire trees in as little as 2-3 years if numbers are not regulated. Scale infestation is indicated by purplish-red halos on juvenile bark. This little insect sometimes goes unseen until vast colonies have grown. These small yellow insects roam around on bark and foliage at random before settling

down for the long haul. Crawlers will secrete a waxy covering over their bodies a few days after settling down, which will protect them from insecticides. This insect overwinters on the tree as an immature scale, and there are usually two generations every year (Atwal and Dhaliwal, 1997). Timing applications of dormant oil to smother overwintering scales, infested nursery plantations, buds, and graft materials should all be avoided as best management techniques for this pest. During the dormant season, inspect prunings for San Jose scale to make sure it hasn't formed in the tree tops. Scale can also be found on fruit after it has been harvested. In biological control, *Encarsia perniciosi* and *Aphytis diaspidis* (San Jose Scale Parasitoids) can be mass produced and dispersed to keep the San Jose Scale population in check. Using pheromone traps and degree day models to track male activity, shade trees like willow, poplar should not be grown in and around fruit orchards. Using insecticides to target crawlers and juvenile scales and pruning badly affected branches during the dormant period and burning them helps to prevent the pest from building up. San Jose scale infestations can be treated by the standard orchard method of delayed dormant spraying, although extensive encrustations often necessitate extra pesticide applications. If the dormant spray fails to provide adequate control, treatments administered immediately after the crawlers emerge are also useful. It is critical to avoid using insecticides indiscriminately in order to protect natural adversaries.

- 4. Codling Moth (*Cydia pomonella*):** The codling moth is characterized by its gray appearance with distinctive bronze-colored patches on its wings. Throughout the winter, it survives as a fully developed caterpillar, often taking shelter beneath the tree's bark or in leaf litter surrounding the base of apple trees. Although the codling moth can infest various fruit-bearing plants, it has a strong preference for apples. During the night time, female codling moths deposit their eggs on or near ripening fruits. The larval stage of the codling moths life cycle is the most significant and destructive, marked by a brown head capsule and a body that is white to pinkish-white in color. These larvae primarily consume fruit as their source of sustenance. Because it is a direct pest, it causes serious damage to the fruit. Caterpillars feed by burrowing into fruits, ruining the fruit and leaving a path of solid insect faeces known as frass behind. Neonate larvae feed on seed after entering the fruit through the calyx. Fruits that have been infested lose their form and fall early. Apple fruits are rendered unmarketable in 30 to 70% of cases due to both exterior and interior feeding damage by larvae. Every year, this insect produces two or three generations (Atwal and Dhaliwal, 1997). Regular scouting of trees and fruits for damage is one of the best control methods for this insect (including frass on the exterior of fruits), Scrape away loose bark from trunks to prevent Codling moth caterpillars from overwintering. Throughout the season, pheromone traps and degree day models should be used to track adult flight activity and time insecticide applications appropriately. Remove and destroy all fallen fruits that contain caterpillars as soon as possible to aid in insect population control. Although some predators, such as spiders and carabid beetles, may eat codling moth larvae or pupae, natural biological control is ineffective. Releases of the microscopic wasp *Trichogramma platneri*, in combination with mating disruption or soft insecticides, have been used successfully to manage codling moth in commercial walnut and pear plantations. The ultimate goal of an insecticide programme is for pesticide residues to be present at egg hatch, so that the tiniest, most sensitive caterpillars are exposed right away as they try to penetrate fruits. Pheromone traps can be used to track adult emergence and mass capture. Spray of insecticides should be done if more than five adults are captured in the trap/week.

- 5. Apple Maggot (*Rhagoletis pomonella*):** Apple maggots are microscopic worms that damage and destroy apples and other fruits by tunnelling through them. The mature stage of the fly is roughly the size of a normal house fly. Apple maggots may be found all over the world, and while they favour apples, they will eat just about any fruit they can get their hands on. Plum, cherry, apricot, pear, blueberries, strawberries, and just about any other plant that produces a delicious, full-bodied fruit have all been known to be infested. Females will insert their eggs under the fruit's skin, leaving small dimples and depressions. Apples infested early in the season will mature with bumps. Larval feeding damage is evident in the form of well-defined brown tunnels that traverse through the flesh of the fruit. Fruits heavily affected by this damage can become mushy and fall prematurely, even a minor level of infestation during storage can lead to fruit spoilage. This type of harm is reminiscent of what's caused by codling moth (*Cydia pomonella*). Codling moth larvae exhibit a distinct behavior where they create one or two tunnels through the fruit, reaching the core, where they consume seeds and inner fruit tissue, often leaving behind fecal pellets. On the other hand, apple maggots possess a unique wedge-shaped body with two small black hooks extending from the pointed "head" end while they are feeding. Distinguishing features of codling moth larvae include their brown to dark brown heads and six legs. In contrast, apple maggots lack a head capsule, do not have any legs, and showcase a wedge-shaped body with two small black hooks extending from the pointed "head" end while feeding. Research conducted by Yee and Goughnour in 2006 documented that codling moth larvae grow to a size of approximately 20mm, which is twice the size of apple maggot larvae.
- 6. Rosy Apple Aphid (*Dysaphis plantaginea*):** The rosy apple aphid, scientifically known as *Dysaphis plantaginea* (Passerini) (Homoptera: Aphididae), poses a significant threat to apple orchards as one of the most detrimental pests. These aphids employ a survival strategy of laying their eggs in the crevices of tree bark, bud axils, and twigs of apple trees during the winter months. The concern among fruit growers is that even at low population densities, where visual monitoring is impractical, this pest can cause substantial damage to apple fruits. Prolonged infestations also have adverse effects on shoot growth and the subsequent formation of flowers over the winter season, a fact documented by Alford in 1984 and van Frankenhuyzen in 1992. This species follows a typical pattern for heteroecious aphids, overwintering as eggs on its primary host plant. After the silver tip stage in their development, the eggs of rosy apple aphids hatch, and the newly emerged aphids are initially dark green but change to a purple hue as they mature into adults. These aphids feed and reproduce on apple trees until mid-summer, at which point they move to new host plants for sustenance. Their presence leads to a reduction or cessation of growth in the affected shoots and nearby fruit-bearing branches. Moreover, damaged branches may yield fewer or no blooms in the following year. The impact of rosy apple aphids can vary from one year to the next, causing significant damage in some years and minimal harm in others if left untreated. Indications of injury often include tightly curled leaves that become red and develop dry, necrotic patches following the petal fall stage of growth. As effective pesticide coverage becomes challenging after leaf curling, it is advisable to address this insect pest during the "pink stage" of bud development, before significant leaf curling occurs. To manage this pest effectively, recommended practices include applying dormant oil between the green tip and "half-inch green" growth stages to control newly hatched aphids. Regular monitoring of leaf terminals is crucial to identify live aphid colonies, and action should be taken

when 5% of apple leaf terminals are infested. It is essential to use insecticides thoughtfully to protect natural predators and maintain ecological balance.

- 7. Plum Curculio (*Conotrachelus nenuphar*):** The plum curculio, scientifically known as *Conotrachelus nenuphar*, is a small weevil characterized by its distinctive 'snout' shape. It feeds by chewing and tearing, and both its adult and larval stages are notorious for causing significant damage. This pest is a major threat to pome and stone fruits, as documented by Racette *et al.* in 1992 and Vincent *et al.* in 1999. Plum curculio becomes active in spring, particularly during warm and rainy weather conditions, targeting a range of fruits such as plum, apple, peach, apricot, cherry, and other pome and orchard stone fruits. The female curculio lays its eggs beneath the fruit's skin, leaving behind noticeable lumps or crescent-shaped scars that are visible to the naked eye. This activity results in substantial harm to the fruit, with fruits that have been burrowed through falling to the ground and perishing, while scarred fruits show initial signs of egg laying and feeding. During the winter, adult plum curculios overwinter in leaf litter in wooded areas. They make their appearance in orchards during the bloom period but become most active after the 'petal fall' stage, when temperatures reach 70 degrees Fahrenheit or higher. These nocturnal adults feed on buds, flowers, and newly ripened fruit, causing a distinctive type of fruit deformation known as 'cat-facing.' Female curculios deposit eggs by creating 'C-shaped' lesions on fruit, and the scarring resulting from these wounds can render the produce unsuitable for the market. Larvae consume the fruit, leading to premature fruit drop, after which they complete their development within the fallen fruit and emerge to pupate in the soil. Effectively managing plum curculio requires vigilant tree monitoring and the application of various treatments throughout the year to maintain the health of growing trees. This includes proper fertilization, mulching, and watering to enhance the trees' resistance to infestation, along with regular inspection of new fruits for initial signs of injury. Suggested management techniques involve the monitoring of adult insects through the use of insect beating sheets, which are positioned under trees to capture insects that fall off when branches are shaken or struck. Additionally, the application of insecticides during the 'petal fall' or 'first cover' phases of fruit tree growth is recommended. Pruning fruit trees during dormancy can also help create conditions less favorable for plum curculio adults. Eliminating unattended or wild fruit trees that could potentially serve as extra sources of food and mating sites is another vital control strategy.
- 8. Japanese Beetle (*Popillia japonica*):** *Popillia japonica*, commonly known as the Japanese beetle, is a pest that poses a significant threat to a wide range of agricultural, horticultural, and ornamental plants, as highlighted by Shanovich *et al.* in 2019. It exhibits a strong preference for plants within the Rosaceae family, with apple trees (*Malus domestica* Borkh.) being particularly favored host plants, as noted by Potter and Held in 2002. While *Popillia japonica* feeds on the foliage of apple trees, it has been found to be incapable of causing damage to intact fruits, as observed by Pires and Koch in 2020. Japanese beetles can inflict serious damage to orchard shrubs and trees. The adult scarab beetles feed on the foliage, flowers, and fruits of various tree fruit species. However, they are not limited to orchard crops and can consume hundreds of plant species, both within orchards and in the surrounding environment. Due to their broad host range and the ability to travel long distances, managing them in a specific crop can be quite challenging. Adult Japanese beetles primarily feed on the surface of foliage, targeting areas between leaf veins, which results in a characteristic skeletonized appearance of the leaves. These beetles spend the winter as white grubs in the soil before

emerging in the spring to mate, feed, and lay eggs. Their peak activity usually spans two to four weeks, after which their populations start to decline, though isolated adults may still be present. It's important to note that Japanese beetle grubs are not harmful to small fruit orchards, and adult beetles do not lay eggs on fruit-bearing bushes or trees. Each year sees a new generation of Japanese beetles emerging. Effective management strategies for this insect include implementing control measures at the first signs of beetle presence, before they gather in larger groups, ensuring thorough pesticide coverage of trees, and accepting some degree of feeding damage on mature trees while taking action to prevent further attraction of these beetles.

9. **The Stem Borer *Aeolesthes sarta* (Solsky):** *Aeolesthes sarta* (Solsky) (Coleoptera: Cerambycidae) is a widespread stem borer pest of Apple, cherry, apricot, peach, pear, plum, and mulberry. The adults have dark brown elytra with speckled yellowish pubescence. After mating, the females begin laying eggs in the wounds and crevices of the host trees' dry woody sections. In three years, the life cycle is completed. The newly hatched grubs feed on the bark first, creating zigzag pathways in the process. They dig into the sap wood and feed on it. Although the affected trees may not die for a long time, their vigour and output are harmed. Typically, multiple generations develop on the same tree before it is killed. During the summer, they feed rapidly and produce frass while exiting from holes. Their feeding leads to a reduction in sap flow in the affected branch or trunk area, eventually causing the tree's demise. In contrast, during the winter, well-nourished grubs may remain inactive within their tunnels. Their feeding and the resultant damage to woody tissues significantly lower the tree's vitality, causing parts of it to wither and rendering the tree unproductive over time. The frass exiting the holes can be used to locate the pest, which should be collected and disposed of. Employing a light trap can assist in capturing the beetles. Traditional insecticide sprays prove ineffective because the pest resides within the woody portions. To control this issue, the only viable methods involve finding the feeding holes, clearing the passageway, and introducing poisons. Another approach is to insert wire into the stem to eliminate the grubs.
10. **The Apple Root Borer, *Dorysthenes hugelii* (Redtenbacher):** Living and dead roots of apple trees are the major hosts of this borer, but other hosts such as apricot, cherry, peach, pear, walnut, and a few forest trees are also attacked. Due to its underground destructive stage, it is difficult to detect a root borer infestation early on. Infested trees show common signs such as sparse foliage, a shaky, stunted, and weak upright stance, and grow shaky, stunted, and weak as the infestation progresses. Oval longitudinal cuts (2.5-15 cm long) on the stem and branches of afflicted trees that make them vulnerable to secondary pests such as stem borer and diseases such as cankers, resulting in tree death in 3-4 years (Sharma and Khajuria, 1997). Adult beetles emerge, eggs are laid, and grubs feed on roots, all of which are critical stages in the life cycle of the root borer for the spread of infestation and the loss of apple orchards. After the first monsoon downpour, the beetle emerges from the dirt. The grubs eat the roots, girdle them, and consume the internal tissues. As a result, the primary roots are severely injured from the base, and the trees, especially the young ones, die away, while the older ones grow weak and tumble down in strong winds. In order to arrange proper timing of management measures against the target pest, the emergence pattern and time of adult beetle activity must be evaluated in connection to rainfall in order to check the occurrence of this pest. Orchards should not be planted in sandy, dry soil. Inter-culturing in the orchard aids in grub control. Use well-

rotted FYM that has been thoroughly mixed with the soil surrounding the tree. Once an infestation has occurred, fumigants should be used to treat the tree basins.

- 11. Blossom Thrips(*Thrips Sp.*):** Thrips represent economically significant pests for deciduous fruit trees, as they directly affect fruit development by laying their eggs in floral buds and blooms (Pearsall and Myers, 2000). Various species of thrips, such as *Thrips flavus*, *T. florum*, *Haplothrips tenuipennis*, *Frankliniella dampfi*, and *Taeniothrips rhopalantennalis*, hold importance in temperate fruit orchards (Broughton *et al.*, 2011; Shellhorn *et al.*, 2010). A variety of temperate fruit crops, including apple, pear, peach, plum, and apricot, are infested by these pests. Thrips are little insects with asymmetrical rasping and sucking mouthparts that cause plant damage. Nymphs and adults lacerate floral parts and injure vegetative buds. As a result of the sickly appearance and withering of the affected blooms, fruit set is reduced and the fruits break off prematurely. Flowers are lacerated by both nymphs and adults. Thrips eating on the buds can cause sap to ooze from the wounded places. On infested blossoms, brownish spots appear later at the base of stamens, styles, and petals. Injury can cause the petals to bend and the fruit set to be reduced. Traditionally, a common method for sampling thrips populations on apple blossoms involves examining bud samples, dissecting them, and then either shaking the contents onto white paper or a Petri dish coated with Vaseline. Calculating the economic threshold for thrips requires consideration of various factors. Among the practical and effective methods for managing apple blossom thrips (ABT), chemical control stands out as a valuable option for orchard growers (Ahmad *et al.*, 2019). The thrip population can be reduced by keeping the orchard ground clean and clear of weeds. The most effective application of insecticides for natural enemy conservation can also be an effective approach to manage their population.
- 12. The Pear psylla:** Pear Psylla (*Psylla pyricola* Foerster) is a significant pear pest causing fruit russet, psylla shock, and pear decline (Beers *et al.* 1993). Both nymphs and adults suck the sap and create honeydew, which drips onto the fruits and leaves and forms sooty mould, lowering the quality of the fruit. Pear psylla (*Psylla pyricola* F.) causes tree stunting, premature leaf drop, reduced fruit size, and premature fruit drop at high densities, resulting in significant output losses. (Westigard and Zwick, 1972). These symptoms are known as psylla shock, and they are caused by a toxin found in feeding saliva. *Psylla pyricola* F., an adult pear psylla, acts as a vector for the mycoplasma-like organism that causes pear decline disease and transmits it to the tree while feeding. The sensitive foliage of young shoots and water sprouts is where nymphs and adults get their sap. Honeydew can run onto fruit, leaving dark russet spots or streaks that make the fruit unmarketable(Hall and Ehler, 1979).In management, among chemical insecticides thiacloprid 21.7 SC @ 0.4 ml/litre has shown effective results in reducing psyllid population followed by imidacloprid 17.8 SL @ 0.4 ml/litre (Nissaret *et al.*, 2017). Avoid encouraging excessive vigour. Remove suckers from the tree's interior, which kills psylla eggs and nymphs while also increasing spray coverage. Because of the increased risk of fire blight disease and the potential for rinsing insecticide applications from trees, overhead irrigation may help control psylla pressure. However, this is not a common practise due to the increased risk of fire blight disease and the potential for rinsing insecticide applications from trees.

13. Green Apple Aphid (*Aphis pomi*): The aphid feeds on immature apples every now and again, causing them to become deformed. Heavy infection, particularly of young trees, can cause stunting and, in extreme cases, leaf loss, causing significant damage in nurseries, where plants of the sensitive age might become irreversibly damaged. The older the tree, the less it suffers. *Aphis pomi* infests young shoots, causing leaf curling and honeydew production, which causes fruit discoloration. (Oatman and Legner 1961, Madsen et al. 1961, Blommers 1994). The green apple aphid doesn't have a secondary host. It causes leaf curl in apple (*Malus* spp.) and related plants such as pear (*Pyrus*), hawthorn (*Crataegus*), Sorbus, and Cotoneaster by feeding in dense colonies on the young stems and undersides of leaves. Ants frequently visit colonies. Sexual forms emerge in the autumn, and females may lay huge egg masses on twigs after mating. If not repressed, it results in considerable yield reductions. (Hagley, 1989). Aphids are preyed upon by a variety of natural enemies. Key natural predators, such as lady beetles, green lacewings, brown lacewings, and syrphid fly larvae, play a significant role in organic pest control. To manage pests organically, approved options include using insecticidal soap, authorized narrow-range oils, and azadirachtin (Neemix). To minimize early damage and potentially eliminate the need for extra treatments, it's advisable to apply dormant oil spray later in the day. In the case of young trees heavily infested with pests, chemical insecticide treatments in the spring might be necessary.

14. Pin/Shot Hole Borer (*Scolytusnitidus*): Adult females inflict damage to pome trees by girdling a shot-hole in the inner bark (the phloem-cambial zone) on twigs, branches, or trunks. Frass often falls to the soil's surface as a result of this activity. The presence of bark beetles can be detected by little emerging holes in the bark. Using the emerging holes to remove the bark often reveals dead and deteriorated inner bark. Galleries can be found beneath the bark, preventing food and water from being blocked. The tree does not show signs in the early stages of the attack, but its growth is slowed. The foliage and fruit output of infested trees are reduced (Hussain *et al.*, 2018). Adults and grubs create galleries and pinholes in the plant's sapwood and hardwood. Perforation of the surface of infested branches occurs, followed by yellowing and wilting of the leaves. A severe infestation may result in the tree's death. Borings on the bark can occasionally indicate holes. During the autumn, management measures include pruning and destroying borer-infested branches. Borer attacks can be reduced by using a well-balanced fertiliser application. Keep clipped branches/twigs and old tree trunks from the previous year in the orchard to catch shot hole borer egg laying adults and destroy them later. A 1:6 mixture of Carbaryl 50 WP and dirt can be used to plaster the holes.

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