Crop Walkers' Guide

Apple

HDC is a division of the Agriculture and Horticulture Development Board

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Credits

Introduction

Every year a significant proportion of the UK apple crop would be lost to insect pests and diseases if growers didn't monitor their crops and employ effective crop protection strategies.

This Crop Walkers' Guide is aimed at assisting growers, supervisors and their staff in the vital task of monitoring apple crops. It is designed for use in the field to help with accurate identification of pests, their predators and diseases within a crop.

Images of key stages in the life cycles of pests, predators and diseases are included along with short easy-to-read comments to help with identification.

As it is impossible to show every symptom of every pest or disease, growers are advised to familiarise themselves with the range of symptoms that can be expressed and be aware of the new problems that occasionally arise.

This Guide does not offer any advice on the measures available for controlling these pests or diseases as both chemical active ingredients and their approvals frequently change. However, having identified a particular pest or disease in their crop, growers should acquaint themselves with the currently available control measures.

Scott Raffle

Horticultural Development Company

Invertebrate Pests

Apple grass aphid

(*Rhopalosiphum insertum*)

- Common on apple and although rarely a serious pest, heavy infestations can cause damage to fruit on some varieties.
- Causes minor curling damage on the rosette leaves in early spring if large populations occur. Adults green with darker longitudinal stripe along back. Antennae and siphunculi short.
- Apple, pear and quince are the winter hosts and grasses (especially annual meadow grass) are summer hosts. It migrates to grasses from May to June, so infestations are rarely seen after this time.

Green apple aphid

(*Aphis pomi*)

- Spring colonies that develop in shoot tips are of little importance. However, winged forms develop in summer and migrate to growing shoots of other apple trees, forming dense colonies which can be damaging. Particularly damaging to young trees.
- Adults are pale green with dark siphunculi. Causes considerable leaf curl, shoot stunting and shoot tip death. If colonies are large, fruit beneath may be contaminated with honeydew and cast skins.
- Overwinters on apple trees, with eggs hatching in April at green cluster.

Rosy apple aphid

(*Dysaphis plantaginea*)

- One of the most damaging apple pests.
- Outer rosette leaves are distorted, turning yellow and curling downwards. Damaged fruits are small, malformed, wrinkled and often develop a rosy colour.
- Overwinters on apple, hatching in early spring before bloom, feeding on buds and outer rosette leaves (often in the centre of the tree). Numbers increase during summer, when winged forms migrate to plantain, but breeding continues on apple into August.

Rosy leaf curling aphid

(*Dysaphis devecta*)

- Widely distributed but minor pest of apple. Infestations often occur on the same tree year after year and spread is slow. Many varieties including Cox and Gala are resistant.
- Easy to distinguish characteristic red colour of leaves, but aphids themselves are very similar to rosy apple aphid.
- Aphids hatch in April at early green cluster and infest the rosette leaves which curl and develop a characteristic red colour. Most colonies die out from mid-summer.

Woolly aphid

(*Eriosoma lanigerum*)

- Attacks vary in intensity, being worse in some years than others, particularly in seasons following mild winters.
- Colonies occur on bark, causing splitting, allowing entry for diseases such as canker. Also lumps on wood where feeding has occurred. The main damage is caused by contamination of fruits and foliage with honeydew, wax, dead aphids etc.
- Inconspicuous young aphids overwinter in cracks or under loose bark. In spring and early summer, woolly aphids are found on spurs, branches and burr knots, later spreading to young growth, particularly water shoots.

Other aphids

- Other aphids, e.g. potato aphid (*Myzus persicae*), green citrus aphid (*Aphis spiraecola*) and black bean aphid (*Aphis fabae*) can occasionally be found on apple, but are not normally damaging.

Leafhoppers

(*Edwardsiana crataegi* and other species)

- A minor pest of apple.
- Nymphs and adults suck sap from the undersides of leaves causing white speckling, especially on older leaves in the centre of the tree. High populations cause leaves to become bleached by the end of the season, which can affect tree vigour and return bloom. Fruits underneath leaves can become contaminated with small brown spots of excrement.
- Two generations per year; spring/summer and autumn.

Common green capsid

(*Lygocoris pabulinus*)

- Widespread pest of apple and pear which can cause significant damage in some years.
- Nymphs and adults puncture leaves in shoot tips causing holes and shoot distortion. Nymphs puncture developing fruits causing irregular corky scars and misshapen fruits.
- Overwinters in the shoots of woody plants including apple and pear and especially on rootstock sucker growth. Adults feed on shoots and fruits until early May when they migrate to herbaceous hosts.

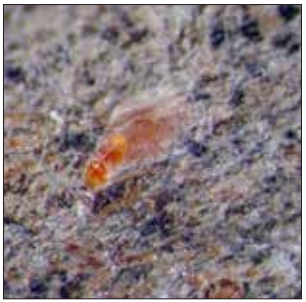
Apple sucker

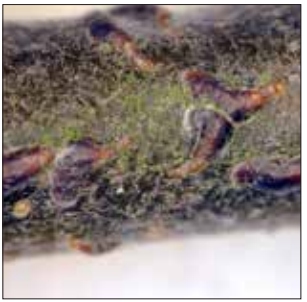
(*Psylla mali*)

- A minor pest of conventional apple orchards, but is more important in organic production.
- Sucks sap of green tissue in buds and blossom trusses, leaving drops of honeydew and conspicuous white waxy threads. Feeding leads to brown discolouration of petals and blossom buds and, where damage is severe, buds may be killed. The brown discolouration can be mistaken for frost injury.
- One generation occurs each year, with eggs overwintering on the bark and hatching into nymphs at bud burst.

Mussel scale

(*Lepidosaphes ulmi*)

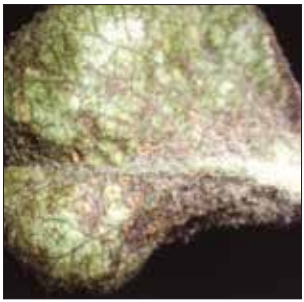


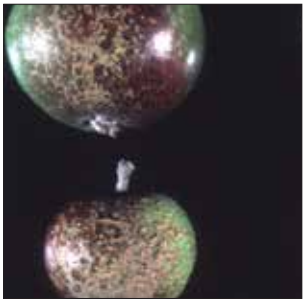


- An increasing problem in apple with one generation per year.
- Unlike other scale insects, this is shaped like a mussel rather than being round. Feeds on sap and can contaminate the surface of fruits at harvest and debilitate tree.
- Females lay eggs in autumn under scales before they die. Crawlers emerge from May for up to 6 weeks, dispersing over the tree.

Apple rust mite

(*Aculus schlechtentali*)





- An important secondary pest of apple.
- Males and females feed on developing flowers and fruitlets. Young rosette leaves become dull, puckered and shrivelled. Russeting occurs on fruitlets, mainly around the calyx, and on the cheek of the fruit. Damage can be confused with frost eye, but the latter occurs as a clearly defined ring round the calyx.
- Several overlapping generations occur. Adult females overwinter behind vegetative buds between the bud and the stem of the previous season's extension growth.

Flat scarlet mite

(*Cenopalpus pulcher*)

- A minor pest of apple with one generation per year.
- Affected leaves turn yellow with necrotic patches and also become bronzed. Where severe, premature leaf drop occurs. Feeding around the eye and stalk of the fruit leads to russeting.
- Females overwinter in bark and become active in April, invading foliage and flower/fruit clusters in May. Eggs are laid in wood in April and later on the mid rib beneath leaf hairs, hatching out from late June onwards.

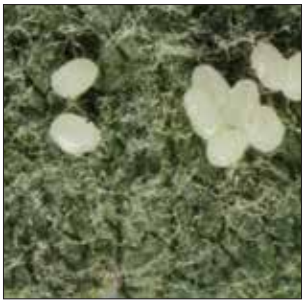
Fruit tree red spider mite

(*Panonychus ulmi*)

- An important secondary pest of apple normally regulated by the orchard predatory mite *Typhlodromus pyri*.
- Mites feed on the undersides of leaves initially, causing a light brown speckling of the foliage, but as damage increases, leaves become dull green / brownish then silvery bronze and premature leaf fall occurs. Large numbers of mites in spring can give rise to fruit russeting.
- Overwinters as eggs on the bark, mainly around fruiting spurs. Eggs hatch in late April or May, around blossom time, with five or six generations per year.

Blastobasis moth

(*Blastobasis decolorella*)



- A highly damaging but local pest of apple.
- Large areas of skin or flesh are removed, often near to stalk in tightly clustered varieties. Wounds tend to weep and become covered by a sticky mass of black frass.
- Adults lay eggs on foliage or amongst debris in the tree. Larvae feed from July to October. There is one significant generation per year and partial second generation in autumn.

Codling moth

(*Cydia pomonella*)

- Key pest of apple causing economic damage at low population densities.
- Larvae burrow through skin (often at the calyx) into the flesh and through to the core. The entry point is prominent and red-ringed, characteristically blocked by dry frass.
- There is one complete and one partial generation per year, though two generations can occur in hot summers.

Fruit tree tortrix moth

(*Archips podana*)

- A moderately important pest of apple.
- Young caterpillars make small, shallow holes in the skin of fruits in July and August. Larger caterpillars graze shallow, irregular patches in the skin, especially at the point where fruits are in contact.
- One main generation per year and a partial second in August and September.

Light brown apple moth

(*Epiphyas postvittana*)

- Minor, but sporadic pest of apple, probably susceptible to cold winters.
- Larvae found in shoot tips where they web leaves together with silk. Later larvae feed between leaves and fruit causing surface damage to fruit. Young larvae may enter fruit through calyx.
- At least two generations per year in the UK. First generation larvae occur on fruit and leaves in June/July and the second generation larvae overwinter probably in leaf litter.

Summer fruit tortrix moth

(*Adoxophyes orana*)

- An important secondary pest of apples and pears, especially in East and South East of England.
- Overwintering larvae feed in the blossom clusters and can graze on receptacle of the flower and young fruitlets. These heal to form early scars. First and second generation larvae cause small holes and grazing on the fruit skin from July until September.
- Two generations per year.

Winter moth

(*Operophtera brumata*)

- An important pest of apple which causes direct damage to fruit.
- Larvae emerge in spring and feed on foliage and fruitlets until June, biting holes in fruits, which either drop prematurely or develop into malformed fruits with corky scars.
- Adult females crawl up the trunk in winter and lay eggs in crevices in the bark. One generation per year.

Clouded drab

(*Orthosia incerta*)

- Minor pest of apple and pear feeding on foliage and fruits in early summer.
- Larva has a single pale stripe down the back and moves with a looping action. Early larvae feed in blossom trusses and later on can make large holes in fruits.
- Adults occur from March to early June.

Leopard moth

(*Zeuzera pyrina*)

- Minor pest of apple which has a wide variety of woody hosts including plum and cherry.
- Caterpillars begin to feed on leaf stalk and vein, bud and shoots. Later damage is seen as dead branches and finally caterpillars can move to the heartwood of the trunk. Caterpillars up to 60 mm long with yellow body and black spots. Young trees are more vulnerable. Look for signs like the presence of frass at entry holes in the stems.
- Larval development takes 2-3 years.

Bud moth

(*Spinota ocellana*)

- Common pest of apple that also occurs on pear.
- Can feed on fruit if web spun to the surface.
- Adults occur from mid-June to mid-August with larvae feeding from August to September in a tube-like shelter of silk.

Apple clearwing moth

(*Synanthedon myopaeformis*)

- Local and uncommon pest of apple.
- Larvae tunnel just below the bark and form winding galleries. Bark peels off readily and in severe infestations blackish patches appear on the bark from which masses of sticky sap can exude.
- Adults appear in June or July and lay eggs in crevices in the bark. Larval development is 20 months.

Apple sawfly

(*Hoplocampa testudinea*)

- A common pest of apple.
- Hatching larvae burrow into the receptacle of the flower, often just beneath the skin causing characteristic ribbon scars. Larger larvae burrow into the apple core, making large holes which are contaminated with brown, wet frass.
- The pest overwinters as a cocoon in the soil with adults emerging around blossom time and laying eggs in the receptacle. One generation each year.

Dock sawfly

(*Ametastegia glabrata*)

- A sporadic pest which can cause significant damage when it occurs.
- Autumn larvae may burrow into apples with characteristic damage of a round entry hole (2mm diameter) surrounded by a reddish ring.
- Two to three generations each year with adults occurring through summer.

Apple blossom weevil

(*Anthonomus pomorum*)

- An increasing problem with reduced use of broad spectrum insecticides and a particular problem in organic orchards.
- One generation per year, with adults emerging in February and March, feeding on buds. Eggs are laid in flower buds and young larvae graze on flower parts.
- Affected flowers develop a brown cap and fail to develop, falling from the tree.

Rhynchites weevil

(*Rhynchites aequatus*)

- A local but destructive pest of apple which is increasing in importance.
- In spring, adults drill small cylindrical holes into the fruitlet flesh. Feeding can continue until July. Eggs may be laid at the base of holes and larvae feed on the surrounding flesh. Attacked apples remain marked and distorted, although the holes tend to close up as the fruitlets grow.
- One generation per year.

Phyllobius weevil

(Various species)

- Common and widespread with various hosts. Not normally considered a significant pest.
- Feeds on leaves and flower petals causing notching at the edges.
- More common in fruit trees in the spring.

Apple leaf midge

(*Dasineura mali*)

- A widespread pest of all apple varieties, but especially Bramley. Trees with vigorous shoot growth are attacked most heavily. Important on nursery or young trees during establishment.
- Larvae attack both young leaves in growing points, but also rosette leaves. Feeding causes tight leaf curling and growth reduction.
- There are typically three generations per year with adults emerging in late April or May, often during or shortly after bloom.

Leaf miners

(Various species)

- Common and widespread with various hosts. Not considered significant pests.
- Silvery white to brown tracks or patches in leaves. Larvae chew between the epidermis of the leaf, where they pupate.
- Usually occur late in the season.

Apple leaf skeletoniser

(*Choreutis pariana*)

- Locally common pest of apple and pear.
- Larvae graze on upper surface of leaf, later rolling the leaves with webbing. Pupates under leaf. Second generation can feed on surface of fruit.
- Adults hibernate in debris and lay eggs on leaves in April. A second generation can occur in August.

Mammal damage

- Deer and rabbits are common and local pests of apple.
- Stripping of the bark at ground level or higher for deer.
- Often occurs during winter months when other food sources are scarce.

Introduced and Naturally Occurring Predators

B

Predatory bugs




- Includes Anthocorids, some Mirids and Orius species.
- Feed on a variety of pests, including aphids, midge larvae, scale insects, psyllids, mites, caterpillars and insect eggs.
- Both adults and nymphs are predatory.
- Adults are good flyers and can migrate into orchards.

Lacewings

- Particularly good predators of aphids.
- All larvae and some adults are predators.

Ladybirds

- Aphids are the preferred prey, but ladybirds will also feed on moth eggs, midge larvae, small caterpillars and mites.
- Both adults and larvae are predatory.
- All stages of the lifecycle can be found in the crop.

Earwigs

- Important predators of woolly apple aphid and pear sucker. Also feed on scale insects, midge larvae, other aphids and caterpillars.
- A useful nocturnal generalist predator on perennial crops.
- Over-winters in soil in and around orchard.
- Can feed on shoots causing damage along mid-rib or on anthers of flowers.

Predatory beetles

- Generally found feeding on soil stages of pests on the ground, including caterpillars; only occasionally found feeding on trees.
- Both larvae and adults of many species found in orchards are predatory.
- Some rove beetles can be seen feeding in trees at night.

Spiders and harvestmen

- Web-spinning or actively hunting generalist predators of many fruit pests.
- Predatory potential in orchards probably underrated as often active at night.

Parasitoid wasps and flies

- Parasitic flies and wasps are important biocontrol agents of many insect pests including aphids, fruit flies and caterpillars.
- Different species of parasite may be specific to different species of pest, e.g. *Aphelinus mali* for woolly apple aphid, *Platygaster demades* for apple leaf midge and *Aphytis mytilaspidis* for mussel scale.
- Adult wasps lay eggs in aphids, which then have a characteristic mummified appearance.
- Larvae usually develop internally, but can be external.

Predatory midge larvae

(*Aphidoletes aphidimyza*)

- Important in June-August for control of aphids.
- Female lays eggs near to aphid colonies.
- Larvae are the predatory stage.

Hoverflies

- Larvae feed mainly on aphids, but also other small prey.
- Adults are not predatory, but many feed on pollen and nectar, so may be important pollinators.

Predatory mites

(*Aphidoletes aphidimyza*)

- *Typhlodromus pyri* has 3-4 generations per year and is an excellent predator of red spider mite and rust mite.
- Predatory mites are very small and active. They are normally colourless or pale depending on what they have been feeding on.
- Commonly seen on the underside of leaf bases where many of their prey are found.

Bacillus thuringiensis

- Widely used as a foliar spray to control feeding caterpillars.
- Bacterial toxin paralyses and destroys the cells of the insect's gut wall, allowing the gut contents to enter the insect's body cavity and bloodstream.
- Poisoned insects die within 2 or 3 days, but stop feeding soon after ingesting.

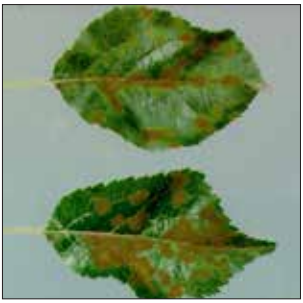
Parasitic nematodes

- These minute worm-like parasites (microscopic) occur naturally, but can be applied as a drench to control diapausing caterpillars.
- They kill their prey by causing septicemia.

C

Apple scab

(*Venturia inaequalis*)



- One of the most important diseases of apple.
- Apple scab infects most parts of the tree most notably leaves, wood and fruits as scab lesions.
- On leaves scab lesions appear as velvety brown/olive green spots, becoming more diffuse with age.
- Lesions on young fruit are velvety brown/olive green. As the fruit enlarge the lesions become brown and corky.

Apple powdery mildew

(*Podosphaera leucotricha*)

- Overwinter dormant infection appears as silvered shoots on trees. Primary mildewed blossoms appear at pink bud and primary vegetative mildew emerges when extension growth starts. Infected terminals are usually stunted and covered in fungal mycelium.
- Secondary mildew infection on leaves appears as whitish felt-like patches often associated with chlorotic spots on upper leaf surface.
- Affected fruit exhibit a net-like russet. White mycelium may be present on some varieties.

Apple canker

(*Nectria galligena*)

- A very serious disease of apple which causes serious losses as a result of cankers on trees and a fruit rot (Nectria eye rot). Canker is favoured by wet weather.
- Mature cankers are readily identified as flaky dark brown bark lesions surrounded by swollen wound tissue. Red or white fruiting bodies may be present. Trees infected with canker show brown staining in wood when cut.
- Other canker forming fungi include blossom wilt, brown rot and fireblight. Refer to the apple best practice guide (Table 2.28.3) for distinctions.

Coral spot

(*Nectria cinnabarina*)

- Coral spot is a common saprophyte on dead twigs and branches of many trees and bushes but may occasionally cause disease (pathogenic).
- Fungus generally attacks dead or damaged branches, or small pruning snags, but may extend into living parts.
- Dead branches become covered in characteristic coral pink pustules. Later darker red fruiting bodies may appear.

Blossom wilt

(*Monolinia laxa f. sp. mali*)

- The fungus attacks flowers causing them to wilt, turn brown and collapse. Symptoms appear from petal fall onwards. Wilted flowers have a distinctive fetid smell similar to sweet chestnut flowers.
- Disease progresses into spurs and branches, forming cankers characterised by brown zones of infection which support grey pustules of sporulating mycelium.
- Blossom wilt can be confused with other diseases causing wilting blossoms and cankers. Refer to the apple best practice guide (Tables 2.28.3 and 2.28.4) for distinctions.

Brown rot

(*Monilinia fructigena*)

- Causes significant losses in the orchard and in store. All varieties are susceptible.
- Brown rot is visible on infected fruits as a circular pale-mid brown firm rot associated with wounds. Eventually, rot spreads to whole of fruit and becomes covered in buff-coloured pustules.
- The fungus overwinters both as cankers and on mummified fruit. Cankers are usually located at the base of dead fruiting spurs where watermarking may be present.

Botrytis dry eye rot

(*Botrytis cinerea*)

- Botrytis is rarely seen in the orchard as a fruit rot.
- On apple it may be visible as a dry-eye rot lesion at the calyx end of the fruit. Symptoms vary from a slight skin red blemish on one side of the calyx to a distinct one-sided dry sunken lesion.
- Botrytis dry eye rot may be confused with other eye rots such as those caused by Nectria.

Silver leaf

(*Chondrostereum purpureum*)

- A wood rotting fungus that frequently attacks apple trees, particularly those that have undergone major pruning.
- Leaves have a characteristic silver appearance. Necrotic areas may appear on severely affected leaves. Affected branches, when cut, often show purple discolouration in the wood.
- Bracket-shaped fruiting bodies are produced on dead branches in the autumn. These have a light purple lower surface and pale brown hairy upper surface (variable in size and shape, usually 1.5-3 cm across and 0.2-0.5 cm thick). Fruiting bodies never found on live wood.

Fungal leaf spots

(Species not identified)

- Occasionally seen in the summer especially in orchards managed organically. Present on leaves and fruit.
- Initially small brown spots are visible on leaves, which later develop a white centre.
- On fruit, spots vary from small red/dark circular blemishes to white sunken spots with distinct darker margin.
- Fungal leaf spots can be confused with general spotting on Cox apple leaves called Cox spot, which is thought to be a physiological disorder.

Sooty blotch and fly speck

(*Gloedes pomigena and Schizothyrium pomi*)

- Two distinct diseases of apple which tend to occur in wet seasons and shady orchards.
- Sooty blotch is characterised by olive green to dull black blotches on the surface of near mature fruit, usually from late July/August onwards. Infection is only superficial but quite difficult to rub off.
- Fly speck is evident as clusters of black shiny round dots on fruit that resemble fly excreta. Individual dots are clearly separated and easily distinguished from more diffuse blotches of sooty blotch.

Crown rot and collar rot

(*Phytophthora cactorum and Phytophthora syringae*)

- Crown rot is a disease of the rootstock affecting young trees in the first two years of establishment. Collar rot is a disease of the scion which usually only attacks mature trees (>10 years).
- Symptoms include yellowing of the foliage, poor extension growth and premature autumn colouring. A distinctive orange/red-brown rot beneath the bark of the root stock or trunk is characteristic of crown rot and collar rot respectively. Lesions may have distinct alcoholic smell.
- Crown rot symptoms may be confused with those of waterlogging which result in similar foliar symptoms.

Fireblight

(*Erwinia amylovora*)

- A bacterial disease most commonly found on pear, but can cause significant losses on susceptible apple varieties. Young apple trees are particularly susceptible.
- The first obvious symptoms are dead blossom or dark brown leaves hanging from the branch. Bark of diseased branches is dark green-brown and often water soaked.
- The tips of infected shoots wilt without browning. Later leaves and stem become brown. Golden droplets of bacterial ooze may be seen on infected stems. Do not confuse with other cankers or blossom wilt. Refer to the apple best practice guide (Tables 2.28.3 and 2.28.4) for distinctions.

Apple mosaic virus

- Most commercial varieties are affected. Golden Delicious, Discovery and Gala are particularly sensitive.
- Symptoms initially occur in spring on foliage as mottles varying from yellow to cream. Become more net-like on the main leaves and sometimes partial or complete yellowing of leaves through the growing season.
- Symptoms may be confused with those of herbicide damage particularly by glyphosate. However, herbicide damage is usually accompanied by leaf distortion and generally restricted to the lower branches of the tree.

Apple replant disease

- Most commonly occurs when orchards are re-planted on land previously cropped with apples but may also occur when apple is planted into soils which have not previously grown apple.
- Affected trees grow poorly due to a reduced root system which results in poor shoot growth and cropping. Tree trunks often remain skinny.

Acknowledgements

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Photographic credits

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A14 (TR) Blastobasis larva, **EMR**
A14 (BL) Blastobasis adult, **EMR**
A14 (BR) Blastobasis feeding scars to Cox fruit, **EMR**
A15 (TL) Codling moth egg, **EMR**
A15 (TR) Codling moth larva in apple, **EMR**
A15 (BL) Codling moth adult, **EMR**
A15 (BR) Codling moth damage to Bramley, **EMR**
A16 (TL) Tortrix larva, **EMR**
A16 (TR) Tortrix damage to leaves, **EMR**
A16 (BL) Fruit tree tortrix damage to eye of apple, **EMR**
A16 (BR) Tortrix damage to apple, **EMR**
A17 (TL) Light brown apple moth adult, **EMR**
A17 (TR) Light brown apple moth larva, **EMR**
A17 (BL) Light brown apple moth caterpillar in web, **EMR**
A17 (BR) Light brown apple moth leaf roll, **EMR**
A18 (TL) Summer fruit tortrix adult, **EMR**
A18 (TR) Summer fruit tortrix caterpillar, **EMR**
A18 (BL) Summer fruit tortrix caterpillar in truss, **EMR**
A18 (BR) Summer fruit tortrix damage to apple, **EMR**
A19 (TL) Winter moth larva, **EMR**
A19 (TR) Winter moth larva, **EMR**
A19 (BL) Winter moth larva on apple truss, **EMR**
A19 (BR) Winter moth damage to apple fruit, **EMR**
A20 (W) Clouded drab caterpillar and fruitlet damage, **EMR**
A21 (TL) Leopard moth, **EMR**
A21 (TR) Leopard moth caterpillar, **EMR**
A21 (BL) Leopard moth larvae frass, **EMR**
A21 (BR) Leopard moth entry at graft union, **EMR**
A22 (W) Bud moth caterpillar feeding on flower buds, **EMR**
A23 (T) Apple clearwing moth adult, **EMR**
A23 (B) Adult apple clearwing moths mating, **EMR**
A24 (TL) Apple sawfly adult, **EMR**
A24 (TR) Apple sawfly wet frass on Cox fruitlets, **EMR**
A24 (BL) Apple sawfly damage, **EMR**
A24 (BR) Apple sawfly ribbon scar, **EMR**
A25 (T) Dock sawfly, **Murray**
A25 (B) Dock sawfly damage, **QPO**
A26 (TL) Apple blossom weevil adult, **EMR**
A26 (TR) Apple blossom weevil larva, **EMR**
A26 (BL) Apple blossom weevil capped blossoms, **EMR**
A26 (BR) Apple blossom weevil damaged Fiesta fruit eye, **EMR**
A27 (TL) Rhynchites aequatus adult on apple fruitlet, **EMR**
A27 (TR) Rhynchites damage to Braeburn, **EMR**
A27 (BL) Rhynchites damage to Gala fruits, **EMR**
A27 (BR) Rhynchites damage to Gala fruit, **EMR**
A28 (T) Phyllobius species, **EMR**
A28 (B) Phyllobius on apple, **EMR**
A29 (TL) Apple leaf midge female egg laying, **EMR**
A29 (TR) Apple leaf midge eggs, **EMR**

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A29 (BL) Apple leaf midge larvae, **EMR**
A29 (BR) Apple leaf midge damage, **EMR**
A30 (TL) Blotch leaf miner on apple, **EMR**
A30 (TR) Leaf mine on apple, **EMR**
A30 (BL) Phyllonorycter mine on Bramley, **EMR**
A30 (BR) Stigmella malella leaf mine, **EMR**
A31 (T) Apple leaf skeletoniser caterpillar,**EMR**
A31 (B) Apple leaf skeletoniser damage, **EMR**
A32 (L) Tree guard, **EMR**
A32 (R) Mammal damage to trunk of tree, **EMR**

Section B – Introduced and naturally occurring predators
B1 (TL) Adult Deraecoris species, **EMR**
B1 (TR) Atractotomus mali, **EMR**
B1 (BL) Adult mirid in apple shoot, **EMR**
B1 (BR) Anthocoris nemoralis, **EMR**
B2 (T) Lacewing adult, **EMR**
B2 (B) Lacewing larva on apple eating green apple aphid, **EMR**
B3 (TL) Harlequin ladybird adult, **EMR**
B3 (TR) Seven spot ladybird adult, **EMR**
B3 (BL) Ladybird larva, **EMR**
B3 (BR) Ladybird pupae, **EMR**
B4 (TL) Earwig with eggs, **EMR**
B4 (TR) Earwig with nymphs, **EMR**
B4 (BL) Earwig eating aphid, **EMR**
B4 (BR) Earwig eating midge larva, **EMR**
B5 (TL) Ground beetle adult, **EMR**
B5 (TR) Rove beetle adult, **EMR**
B5 (BL) Ground beetle larvae, **EMR**
B5 (BR) Cantharid beetle, **EMR**
B6 (TL) Spider, **EMR**
B6 (TR) Spider, **EMR**
B6 (B) Harvestman eating aphid, **EMR**
B7 (TL) Parasitic wasp with aphids, **EMR**
B7 (TR) Summer fruit tortrix ectoparasite, **EMR**
B7 (BL) Noctuid caterpillar with parasitoid, **EMR**
B7 (BR) Tortrix caterpillar with parasitoids, **EMR**
B8 (TL) Aphidoletes adult, **EMR**
B8 (TR) Aphidoletes larvae feeding on aphid, **EMR**
B8 (B) Predatory midge larvae in Aphis pomi colony, **EMR**
B9 (TL) Hoverfly adult on blossom, **EMR**
B9 (TR) Hoverfly pupa, **EMR**
B9 (BL) Hoverfly larva, **EMR**
B9 (BR) Hoverfly larva, **EMR**
B10 (T) Typhlodromus on apple leaf, **EMR**
B10 (BL) Typhlodromus pyri and fruit tree red spider mite, **EMR**
B10 (BR) Typhlodromus pyri, **EMR**
B11 (T) Caterpillars on brassica before treatment with Bacillus thuringiensis, **Interfarm**
B11 (B) Caterpillars on brassica after treatment with Bacillus thuringiensis, **Interfarm**
B12 (T) Caterpillar parasitised by nematodes, **EMR**

B12 (B) Nematodes in caterpillar, **EMR**

Section C – Diseases
C1 (TL) Scab on leaf, **EMR**
C1 (TR) Apple late scab, **EMR**
C1 (BL) Apple wood scab, **EMR**
C1 (BR) Scab on fruit, **EMR**
C2 (TL) Primary blossom mildew, **EMR**
C2 (TR) Secondary mildew on shoot, **EMR**
C2 (BL) Silvered shoots, **EMR**
C2 (BR) Mildew fruit russet, **EMR**
C3 (TL) Nectria canker with perithecia, **Wageningen**
C3 (TR) Nectria foot canker, **Wageningen**
C3 (BL) Canker on trunk of cv. Zari, **EMR**
C3 (BR) Nectria eye rot, **EMR**
C4 (W) Coral spot, **EMR**
C5 (T) Blossom wilt canker, **EMR**
C5 (BL) Blossom wilt in orchard, **EMR**
C6 (TL) Brown rot canker, **EMR**
C6 (TR) Brown rot infection on fruit, **EMR**
C7 (T) Botrytis dry eye rot, **EMR**
C7 (B) Botrytis dry eye rot on Bramley, **EMR**
C8 (T) Silver leaf on plum tree, **EMR**
C8 (B) Silver leaf fruiting bodies on wood, **EMR**
C9 (W) Leaf spot, **EMR**
C10 (T) Fly speck, **EMR**
C10 (BL) Sooty blotch, **EMR**
C11 (T) Crown rot tree symptoms, **EMR**
C11 (BL) Collar rot trunk lesion, **EMR**
C11 (BR) Crown rot rootstock lesion, **EMR**
C12 (TL) Apple tree infected with fireblight, **MSU**
C12 (TR) Brown withered shoot infected with fireblight, **MSU**
C12 (BL) Oozing shoot infected with fireblight, **MSU**
C12 (BR) Apple fruit infected with fireblight, **MSU**
C13 (TL) Apple mosaic virus on leaf, **EMR**
C14 (W) Stunted five year old trees, **EMR**

Key
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(T) = Top, (B) = Bottom, (L) = Left, (R) = Right, (W) = Whole page

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