RED SCALE

Aonidiella aurantii (Maskell)

1 PEST PROFILE

1.1 Distribution and status

Red scale is one of the key elements of the general pest complex and occurs in all production areas. Very few populations of red scale exist that are susceptible to organophosphates (OPs) so OP-resistance is assumed in these guidelines.

If growers are of the opinion that their red scale may be susceptible to OPs they can have them tested by the Diagnostic Centre at CRI - Nelspruit. Where necessary, the Diagnostic Centre should be consulted in regard to the selection and packing of samples for analysis (phone 013 759 8000).

OP resistance in red scale is stable and where OPs have not been used against red scale for many years a high level of resistance remains. This may be partly due to the continued spraying of OPs for pests such as mealybug and citrus thrips, maintaining the selection pressure.

1.2 Description

Both sexes of red scale emerge as pale, yellow crawlers which are not easy to see in the orchard without magnification. However, when they settle they lose their ability to walk, and commence the formation of a soft, white scale-like cover over their bodies. During this phase the first instar nymphs are termed white caps and are easily seen with the naked eye. Healthy nymphal scale subsequently develop a hard, red to orange-coloured cover which gives the pest its name.

Females have a second nymphal instar before the adult stage, both of which are immobile. The adult female has a diameter of 1 to 2 mm and can be readily seen, particularly on green growth and fruit. The scale cover of virgin females tends to be soft and greyish in colour and cannot be lifted without tearing. The mature female has the typical orange-red coloured scale covering which can be readily removed.

In the male, the first instar stage is followed by immobile pre-pupal and pupal stages which culminate in winged adults. In the last immature phases of the male scale its cover becomes elongated in contrast to the circular covers of both immature and mature female scale. Winged male scales are not usually seen in the orchard except on yellow sticky traps or sticky traps of any colour baited with synthetic female sex pheromone. Male red scale are light brown with greyish wings. They have a dark band across their backs and their antennae are long and threadlike.

1.3 Infestation sites on the tree

The first evidence of red scale infestation is the presence of the insects themselves. The tree framework forms the long term population niche of scale infestations. Crawlers, which are attracted to light, fan out to twigs, leaves and fruit. Provided the tree canopies do not touch, inter-tree dispersal of crawlers by wind, birds and other insects is slow. The severity of infestation in new plantings will largely depend on the presence of scale on the nursery trees used.

When crawler settlement on fruit occurs within approximately eight weeks of petal fall, the fruit surface immediately around the nymph expands at a much slower rate than surrounding tissue. Even in the absence of the scale at harvest, this can result in unacceptable pockmarks on the surface of mature fruit. Pockmarks and/or previous infestation sites sometimes do not colour at fruit maturity resulting in “speckling”, another export cull factor. On larger green fruit and foliage, the tissue immediately around the settled insect may become yellow.

1.4 Damage

1.4.1 Symptoms

Heavy infestations of red scale can lead to defoliation and twig die-back, and ultimately the death of the tree. When infestations on tree trunks and branches are severe, longitudinal cracking of the bark can also occur. Apart from pockmarking of fruit, severe infestations can cause fruit drop.

1.4.2 Seasonal occurrence

Red scale is always present in the orchards and two or three overlapping cohorts occur simultaneously. During cold weather, the time between peaks in crawler production by different cohorts can be as long as 65 days whereas during summer the separation of cohorts is often indistinct. The timing of treatments that are more effective against crawlers to coincide with crawler production can therefore be beneficial during the colder months in the cool production regions.

2 MANAGEMENT ASPECTS

2.1 Infestation/Damage assessment

2.1.1 Inspection and treatment thresholds

2.1.1.1 Non-bearing trees

Growers should ensure that all nursery trees purchased are free of scale. However, in practice, occasional infestations do occur. As a result, newly planted orchards need to be inspected for the build-up of red scale and other pests.

Due to their small size, non-bearing trees do not have a suitable microclimate for harbouring natural enemies and biological control is generally poor. However, they do lend themselves to spot treatment based on regular, total inspection of each tree. In this regard no infestation threshold is nominated and growers must be guided by the speed with which scale increases and spreads to new growth.

2.1.1.2 Bearing trees

The unavailability of effective, registered corrective treatments (with the possible exception of Lannate) has made it imperative that growers objectively consider the extent to which they can allow scale to become established on fruit during summer and the ability of natural enemy populations to deal with the infestations. The more confidence there is in this area, the higher the levels of infestation that can be tolerated. This confidence will need to be based on accumulated experience of pest and natural enemy activity in the planting concerned, as well as the use of other pest treatment options. Where there is little confidence that scale infestations on fruit can be controlled biologically, then measures must be taken against the population on the tree framework early in the season in order to prevent subsequent crawler movement to fruit.

Control strategies should have the objective of ensuring that natural enemy activity is not disturbed and the scale density remains low over the entire tree. It is particularly important to prevent the establishment of infestations in the crowns of trees. Scale infestations on a particular crop during a season will be correlated with density levels on the wood. In general, the heavier the infestations on the wood the earlier and more intense will be the first crawler movement to fruitlets in the new season. Scale levels on the framework need to be critically assessed to determine whether they present a threat to the new crop.

It is important to accurately assess the scale population density in the planting concerned to ensure that any intervention is tailored to handle the scale pressure. This will be of particular importance in the case of early harvested cultivars where there is often comparatively little time between the establishment of fruit infestations and the harvest date.

<u>Commercial control (Green situation)</u>

Management should be directed towards achieving and maintaining red scale at the low level representing commercial control, where live scales are seldom seen on fruit at harvest. This should be achieved with minimum input of chemical intervention in order to ensure a high level of natural enemy activity.

Framework infestation

Where scale is under commercial control it is difficult to find live scale on the tree framework.

Threat to crop

Density levels can be so low that little or no infestation of the crop occurs. On the other hand, scale can move to fruit during summer which, with subsequent breeding on the fruit,

can cause major crop loss by harvest. Natural enemies can play a decisive role in the extent to which scale move to fruit and become established.

Commercial control under threat (Yellow situation)

Framework infestation

Scale can readily be found all over the framework and if population development is not checked, an emergency situation may be imminent.

Threat to crop

Threat to fruit is similar to that mentioned for the emergency situation.

Emergency control (Red situation)

Framework infestation

The emergency state is characterised by the extremely heavy build-up of scale on the tree framework. This is usually accompanied by a variable amount of leaf drop and die-back of twigs and branches so that general tree condition is in decline.

Threat to crop

If severe infestations on the wood are not contained early in the season, mass movement of crawlers to fruitlets will occur in spring and early summer and may cause severe pockmarking. Continued infestation of fruit during the season leads to fruit drop, fruit with poor texture and high packhouse culls.

2.1.2 Use of pheromone traps

It is often beneficial to **time** treatments for the control of red scale to coincide with the production of crawlers. This is especially the case for insect growth regulators such as Applaud when used during cold weather. This can be done indirectly by monitoring the winged males using pheromone traps. White, disposable traps can be purchased for this purpose or the yellow card traps described for thrips can also be used. Both of these traps will require the addition of a pheromone lure which often comes in the form of an impregnated rubber septum. These septa must be replaced every 4-6 weeks. The use of yellow traps has the advantage that citrus thrips, *Aphytis* and some other natural enemies can be monitored simultaneously.

The monitoring of male red scale is only of value between winter and early summer while distinct flight peaks of the male scales are evident. Later in the season the flight peaks overlap and are difficult to distinguish. If the traps are not being used for the monitoring of other insects they can be hung slightly inside the tree canopy. Approximately one trap should be used per hectare. If the numbers of males are recorded weekly it will become evident when a peak of males has occurred. Scale crawler production will commence 240 degree days (above a developmental threshold of 11.7°C) after the male flight peak (or approximately 25-45 days depending on the temperature).

The use of red scale pheromone traps to determine **infestation** levels and whether or not an orchard requires treatment, has not proved reliable in South Africa and is not recommended.

2.2 Control options

2.2.1 Biological

Although biological control is the cornerstone of IPM, it cannot be treated with the same simplicity as pest control using plant protection products. Some treatments aimed at other pests may result in repercussions of red scale because of their effect on the natural enemies. Examples are the effect of Nemesis on coccinellid predators or pyrethroids on parasitoid wasps.

Natural enemies of red scale include the parasitoid wasps *Aphytis coheni* DeBach (previously considered *A. lingnanensis* Compere), *A. melinus* DeBach, *A. africanus* Quednau, *A. chrysomphali* (Mercet), *Habrolepis rouxi* Compere, *Comperiella bifasciata* Howard and *Aspidiotiphagus lounsburyi* (Berlese & Paoli). Predators include the ladybird beetles *Chilocorus* spp., *Rhizobius lophantae* (Blaisdell), various lacewing species, *Geocorus*

sp. (a predatory homopteran) and a predatory mite, *Cheletogenes ornatus* (Canestrini & Fanzago). *C. nigritus,* the *Aphytis* spp., and occasionally *C. bifasciata* are the principal agents.

When natural enemies succeed in commercially controlling red scale, it opens the door to the similar control of various other pests. Various factors may have to be harmonised to achieve the desired result. These include the selection of suitable plant protection materials for other pests, especially thrips. The promotion of the biological control of red scale should be approached on a proportional and, where possible, a progressive basis. This will enable all staff involved to become familiar with the strategy while maintaining general pest control quality.

Successful biological control of red scale requires efficient scouting and the ability of the grower to react to changes in the infestation levels. A critical aspect is the presence of ants whose activities disturb the natural enemies and can result in unacceptable red scale levels.

In the past some insectaries provided *Aphytis* (and other natural enemies) for commercial release but with the widespread use of generic imidacloprid and pyriproxyfen formulations this practice became unviable and was discontinued. In most citrus production regions the naturally-occurring populations of *Aphytis africanus* will contribute the most towards biological control of red scale, if conserved.

2.2.2 Cultural

Planting of scale-free trees and skirt-pruning of the foliage canopy when trunk barriers or stem treatments are used for ant control, are important factors.

Dead wood should be eliminated and pruning undertaken to facilitate the implementation of the full cover spray intensity that is required for efficient red scale control with foliar sprays.

2.2.3 Plant protection products

After red scale first developed resistance to OPs in the mid-1970s in Limpopo Province, the industry had to re-evaluate its attitude towards chemical control in general. One of the negative aspects of the OP-resistance problem has been the elimination of registered OP-containing spray treatments designed to control the scale once it has reached the fruit (so-called corrective treatments). Residue considerations also restrict the use of many non-OP treatments once the scale has settled on the fruit late in the season.

All the proprietary product options registered for red scale control as foliar sprays are applied as full cover sprays. Because of phytotoxic hazards and/or residue considerations, certain treatments are restricted to particular times of the season.

The registered treatments fall into two basic groups, i.e. preventive and corrective treatments. **Preventive treatments** need to be applied before scale reach the new crop while **corrective treatments** are designed to control scale on both the crop and the framework. However, due to OP resistance and the lack of alternatives, the emphasis is on preventive treatments.

2.2.3.1 Preventive treatments

Precise scale population levels to assist the organisation of preventive spray programmes in a particular season have not been defined. The key elements for achieving this are inspection, ant control and spot treatments to infested areas.

Early preventive treatments are usually applied in winter or spring at 80-100% petal fall or before, while late preventive treatments are usually applied at 10-14 weeks after petal fall. **In the case of treatments containing Horticultural Mineral Oils (HMOs) avoid spraying trees when the relative humidity is low, particularly when less than 30% and/or when the orchard shade temperature is above 30°C**. Failure to observe these precautions can result in the acute effect of burn to foliage and fruit. This will naturally be worse with the higher concentrations of HMOs such as 1%.

Application of 1% HMO sprays to wilted trees can result in fruit and leaf drop. Trees must be irrigated at least 3 days prior to spraying. If

soils are light, do not allow the interval between irrigation and spraying to exceed 5 days. For heavy soils this interval should not exceed 9 days. During the post-spray period avoid letting trees with obvious residues become wilted.

The use of OP-oil mixtures in winter or spring can only be justified when there are additional pests such as mealybug, circular purple, mussel or powdery scale present which are still susceptible to OPs. It must also be remembered that the use of **heavy** HMOs at 0.5% or higher with OPs in winter and spring may have a detrimental effect on the blossom and yield of the subsequent crop. However, this is unlikely to happen with **light or medium** HMOs, especially at the lower concentrations used with chemicals such as abamectin or Movento.

2.2.3.2 Corrective spray treatments

Red scale on fruit in late summer should be checked for parasitism under a microscope before assuming that it is alive and a spray is required.

If a corrective spray treatment is necessary to prevent live scale being on the fruit at harvest it should be applied before 50% of the fruit are infested with one or more live nymphal or adult red scale. Adherence to this treatment threshold is important because it is difficult to get adequate spray coverage when branches are weighed down by fruit. Where the likelihood of a corrective spray treatment is high, regular orchard inspection is essential. Inspection should commence 8-9 weeks after petal fall and operate on a fortnightly basis. Note that although Lannate is registered as a corrective treatment for the suppression of OP resistant scale, it causes only approximately 70% mortality. It is therefore most effective when used in the presence of large numbers of red scale natural enemies. Movento is also not very effective as a corrective option because it does not cause much contact mortality in adults. It is therefore not registered as such.

2.2.3.3 Green situation spray programme

Maintaining commercial control with the minimum intervention with proprietary products requires a good understanding of scale infestation levels and natural enemy activity. However, complicating the situation is the necessity to apply pest control measures for other pests such as early season thrips, mealybug and other scales. As a result, even when red scale is under commercial control one or two treatments may be considered necessary to maintain control because biocontrol is compromised. Successful biological control of red scale requires efficient scouting and the ability of the grower to react quickly should the situation change. Inspection and experience will determine whether chemical intervention is required.

2.2.3.4 Yellow situation spray programme

Two treatments are usually required in a particular season to obtain commercial control. It is usually adequate to apply the first treatment in spring. However, if there is a possibility that tree condition will decline between harvest and spring as a result of scale attack then it will probably be safer to treat the infestation as an emergency. The second spray application should be applied 7-11 weeks after petal fall, depending on the oil content.

2.2.3.5 Red situation spray programme

With the trees variably facing terminal decline as a result of the scale infestation, the emergency treatment programme must begin as soon as possible after harvest. The first application will need to be made in early or late winter, depending on the cultivar involved. The second treatment needs to be applied in spring before mass crawler movement to fruitlets occurs that can cause commercially significant pockmarking. The third treatment is applied 7-11 weeks after petal fall depending on whether, and how much, oil is used.

2.2.3.6 Horticultural mineral oils

<u>Mode of action and efficacy</u>

In contrast to synthetic insecticides which are toxic to scale by virtue of their action on the nervous system or general physiology, HMO generally has a physical action. Oil adheres readily to the insect and blocks the respiratory system openings resulting in suffocation. In

general it appears that oil is more readily able to do this against the full range of scale developmental stages on the leaves or wood than on the fruit. Perhaps this is due to the ability of mature scale to seal down their scale covers more securely on the comparatively smooth, uniform fruit surface than on the leaves or wood. On fruit, oil-only treatments are most toxic to first instar nymphs, with degree of toxicity being related to both oil grade and oil concentration. If an oil treatment is intended to stop a scale infestation on fruit, treatment should be applied before the scales infesting fruit have developed past the first instar nymphal stage.

The physical properties used by Standards South Africa to grade HMOs are presented in Table 1 below. Based on the temperature at which 50% of the product distils under reduced air pressure, or the length of their carbon chains, they are categorised from ultra-light to extra-heavy. To qualify as an HMO, oils must also have:

- A distillation temperature range (in °C at 1.333 kPa) between 10% and 90% recovery, of 50°C or less.
- An unsulfonated residue of more than 92%.
- A paraffinic molecule content of more than 60%.
- A viscosity at 40°C of 6-22 mm^2/s. Note that viscosity is lowered when paraffinicity is increased.

In general the heavier the oil, the better the efficacy and the more likely it is to have detrimental effects on the fruit or crop. During the 1980s and 1990s, oils that did not qualify as HMOs such as Citrex and locally-blended narrow distillation range heavy oils were used because they were readily available at a good price. However, the detrimental chronic effects caused by these oils created the impression that all HMOs were risky to use on citrus, no matter what concentration. Current examples of safer available oils in their grades are as follows. Ultra-light: Wenfinex or Citrole 60. Medium: H&R medium, Orchex 796, Citrole 100. Medium-heavy: SK Eco Oil.

The recommended oil dosages for the control of red scale are presented in Table 2, including a total safe dosage for the season. The lower dosages in each recommended range should be used in the Cape provinces or under conditions where trees are more susceptible to stress from oils. The lower dosages should also be used for the more sensitive cultivars. **The degree of sensitivity of cultivars increases in the following order: lemons, Marsh grapefruit and Valencias, navel oranges, red grapefruit, tangelos and midseasons, Clementine, satsuma and other mandarins.**

Table 1. Properties of Horticultural Mineral Oils that determine the oil grade.

Oil grade	Distillation in °C at 1.333 kPa		Typical carbon number
	50 % (volume fraction) recovery	Acceptable range	
Ultra-light	195	185-210	C19 to C20
Light	215	211-220	C21 to C22
Medium	225	221-230	C23 to C24
Medium-heavy	235	231-240	C25
Heavy	245	241-250	C26
Extra-heavy	255	251-265	≥C27

Effects on fruit

Heavy grade HMO sprays applied to green fruit from mid-summer to autumn can retard or even prevent satisfactory colour development. This is dependent on the oil grade and concentration. Heavy grade HMOs can also detrimentally influence the total soluble solids content of fruit when applied late in the season.

Effects on yield

High concentration, heavier-grade HMO sprays applied in the pre-harvest period commencing late-summer can reduce blossom and yield of the following season. This also applies to sprays applied from harvest to petal fall. However, sprays applied between leaf axil bud swell and budburst in spring, generally have less impact than at the above-mentioned times. In regard to crop yield, trees are most susceptible to oil damage at petal fall. During the two-month period after petal fall, natural fruit drop can be increased by high concentration (>0.5%) oil sprays, particularly if the trees are stressed.

During each season there is a short period when the detrimental effect of a **single spray** containing a high oil concentration is likely to be at its lowest level, provided other acute stress factors are absent. In normal circumstances in the subtropical areas, this period stretches from about the end of November to early January. In the Cape areas it is considered to be from Christmas to the third week of January. Application of **double sprays** containing a high concentration of oil in the foregoing periods will probably exert a larger detrimental influence on the various factors mentioned so the total amount of oil used during this time should be considered (Table 2).

Sprays of low concentrations (0.3% and below) of grades of HMOs lighter than heavy oil are unlikely to have any detrimental effect on crop yield, internal quality or colour, unless trees are under stress.

Table 2. Red scale control based on Horticultural Mineral Oils alone.

Treatment time and remarks	HMO grade and concentration (%)[1]			
	Ultra light or Light	Medium	Medium/Heavy[2]	Heavy or Extra heavy[2]
Winter application: from budswell to budburst (July to August).	1.25-1.4	1.0-1.25	Do not use >0.3%	Do not use
Early summer application: 4-9 weeks after petal fall. If scale is moving onto the fruit.	0.75-1.0	0.5-0.8	0.5-0.7	0.3-0.6
Mid-summer application: 10-14 weeks after petal fall.	1.4-1.75	1.25-1.5	1.0-1.4	0.8-1.3
Maximum, combined amount of oil from more than one application permitted between 4 weeks after petal fall and harvest.	2.0-2.5	1.75-2.3	1.6-2.1	1.4-1.9

[1] Lower concentrations are to be used in the Cape provinces and the higher concentrations elsewhere.
[2] Do not use on mandarins.

Application requirements

The full cover, film wet spray requirement for HMOs also applies where they are used in mixtures with other pesticides for scale control. To effect maximum control, mixtures must be applied at this intensity for individual scales to receive an oil coating wherever they may be situated on the tree.

Mixing and agitation

When preparing the mixture, add all the oil required to half the water required and agitate rapidly to ensure good mixing. Then add the remainder of the water while continuing to agitate. During the spraying operation the agitator must be able to churn all the water in the full spray tank. The agitator blades must sweep close to the tank floor so that even the last few litres of spray mixture are agitated. If this is not done there is a good chance that some trees will get virtually pure oil at the end of each tank of mixture and may be damaged.

To prevent lumps forming when mixing oil and wettable powder, the prescribed amount of powder must first be added to half the water required while agitating as described above. After thorough mixing the required oil and the remainder of the water must be added to the mixture while maintaining agitation.

Concentration of sprays

Always apply oil as a dilute (1X) full cover spray. Never use concentrated oil mixtures in mistblowers at reduced volume because the longer the spray mixture remains wet on the plant, the better the efficacy.

Storage of oil

Store unused oil in the shade to avoid deterioration of the formulated product.

2.2.3.7 Carbamates

The use of 100 g/hl Lannate plus 150 ml Bladbuff has been registered as a corrective treatment, but will only suppress red scale infestations and is unlikely to control them completely.

Because of its quick breakdown to non-toxic components it is considered to be relatively IPM friendly, however, it has a high initial impact on most natural enemies and due to its effect on predatory mites may result in an outbreak of citrus red mite.

2.2.3.8 Organophosphates

The development of OP resistance has limited the usefulness of these chemicals on resistant red scale populations. If an OP is to be used as a full cover spray for the control of another pest such as mealybug the addition of 0.3 to 0.5% oil will have some impact on red scale because this amount of oil alone will kill scale crawlers.

2.2.3.9 Insect growth regulators (IGRs)

These pesticides act on insects by interfering with their metamorphosis, growth or reproduction. However, some have been shown to be non-selective and may detrimentally affect natural enemy populations. They are not considered to be IPM friendly, but may nevertheless be useful when red scale populations are high and out of biological control, or, in the case of Applaud, when mealybug also requires a treatment. Efficacy is improved if treatments are timed to coincide with crawler movement. This is particularly important for Applaud in winter or spring in cold areas. Details of the registered products available are:

- **Applaud + light/medium HMO** (30 g + 250-500 ml + 10 ml spreader/sticker/hl).

Apply 2 sprays 28 days apart.

- **Nemesis + medium or heavy HMO** (30 ml + 200-300 ml/hl)

The lower oil dosage of 200 ml/hl should be used if spraying heavy HMO at petal fall.

Situation 1: Where two or three Nemesis applications were made in the previous season a single spray at petal fall or shortly thereafter is allowed for the maintenance of commercial control. In this case the oil can also be replaced with certain wetters (see label).

Situation 2: Red scale under commercial control. Apply 2 sprays.

In KwaZulu-Natal, Limpopo, North-West Province and Mpumalanga apply:
Spray 1: At budburst, but not earlier than August 15
Spray 2: 80-100% petal fall

In Eastern, Western and Northern Cape:
Spray 1: 80-100% petal drop
Spray 2: December/early January, but with 500 ml oil/100 hl

Situation 3: Red scale not under commercial control. Apply 2-3 sprays.

In KwaZulu-Natal, Limpopo Province, North-West Province and Mpumalanga:
Spray 1: At budburst, but not earlier than 15 August
Spray 2: 80-100% petal fall
Spray 3: Late November or December

In Eastern, Western and Northern Cape:
Spray 1: August
Spray 2: As above
Spray 3: December or January

Do not spray when the temperature exceeds 30°C.

2.2.3.10 Chloronicotinyls

Confidor 700 WG is registered as a soil treatment for the control of red scale on bearing trees up to 15 years old. The dosage is **4.5 g product in 1 ℓ water poured around the base of the tree trunk**. This should be followed by an irrigation cycle within 24 hours. The treatment should be applied at **green bud** flower development stage and only one treatment is permitted per season. Trees under water stress should not be treated with Confidor. Lemon trees should be stripped before applying to the trees at green bud in July/August. Only the first set after this application will be protected. Confidor WG can be used in drip or microsprinkler irrigation systems but control may be inconsistent depending on the quality of the irrigation system. This treatment will also control aphids, citrus psylla and citrus leafminer. It will also give some suppression of mealybug and citrus thrips. Several generic 350 SC imidacloprid formulations are available and can be used in the same way as Confidor 700 WG but at the dosage of **9 ml** per bearing tree.

Confidor SL (200 g/ℓ) may be available as a special order and can be used as a trunk application on citrus other than lemons. Apply 15 ml undiluted in a band around the trunk of the tree. Do not use if other trunk treatments have been used. It will also control aphids.

Mospilan 200 SP is registered as a full cover film spray for bearing citrus other than lemons at 50 g/hl. This treatment should be applied soon after petal fall. It will also control aphids, leafminer, psylla, mealybug, and thrips, but has been known to cause pest repercussions, particularly if full cover is not achieved.

Mospilan 222 SL is registered as a trunk treatment (2.0-3.0 ml/m^2 canopy surface area) and should be applied from mid-October to mid-December. It will also control aphids, leafminer, psylla and mealybugs and is more IPM-compatible than the spray. Generic equivalents are available.

2.2.3.11 Spirotetramat

Movento 240 SC is extremely systemic and moves both upwards and downwards in the plant. Apart from being detrimental to predatory mites it is very IPM compatible. Movento must be applied as a foliar spray with 0.3% of light or medium HMO in order to be fully effective and can be applied as a single rate of 20 ml/hl water or as two applications of 10 ml/hl, approximately 4 weeks apart. The latter option fits in well with black spot sprays and is the preferred strategy. This product is closely related to Envidor and will suppress mites.

2.2.3.12 Scale control in tree crowns

Growers should remember that it is always difficult to reach scale in the crowns of tall trees with low profile spray machines. Tall trees often have higher scale densities in the crowns than on the rest of the tree as a result of inadequate spray coverage.

Where necessary, high scale densities in tree crowns should be sprayed manually from a tower at the same time as the remainder of the tree is sprayed from ground level. Where this cannot be done simultaneously, allow an interval of at least 10 days between spraying bottoms and tops of trees with oil. The oil hazard warnings will also apply to the crowns when only that part of the tree is treated.

2.2.3.13 Descaling machines in packhouses

Following the onset of OP resistance in various production areas, descaling machines were installed in most packhouses to clean heavily infested fruit. These efficient machines use high-pressure water jets to blast scale off fruit. However, the descaling treatment has a major disadvantage. When a live scale is blasted off a fruit the scale mouthparts remain embedded in the fruit tissue and can exude juice for several days. The juice spreads across the fruit surface and forms an ideal substrate for the growth of unsightly black fungi. When many live scales are removed from a fruit the subsequent fungal growth can render such a fruit unmarketable. This type of blemish causes serious problems overseas. It has been found that treatment with hot water followed by the application of the fungicide Imazalil, suppresses the fungal growth to some extent but this cannot be relied upon. Fruit that were heavily infested with live scale before descaling should therefore not be exported. The foregoing problem will not apply to fruit that are only infested with dead scale.

By 1992 the need for descaling machines had been much reduced but most packhouses continue to use them to clean fruit.