Managing two-spotted mite in production nurseries

Background and general biology

Two-spotted mite (*Tetranychus urticae)* is one of the most important pests of horticultural crops worldwide. Other common names include two-spotted spider mite, red mite and glasshouse red spider mite. It has been associated with up to 1,200 host plant species and has become a serious pest on many fruits, vegetables, trees, shrubs, herbs, herbaceous perennials and ornamental plants and many broadleaf weeds in field and protected settings [1].

The two-spotted mite (TSM) is a spider mite, producing fine silk webbing similar to that produced by spiders. It has piercing mouthparts to feed on the contents of individual leaf cells. As TSM numbers increase, infested leaves exhibit characteristic symptoms of yellow speckling (Fig. 1a). Webbing becomes increasingly apparent and may completely cover the plant if left unchecked (Fig. 1b). TSM can increase to tens of thousands of individuals on a single plant.

Adults are only about 0.6mm in length and immature stages are even smaller. When numbers are low they infest the undersides of leaves, allowing populations to remain undetected to casual observation. However, TSM populations can build to high numbers quickly. Females can produce up to 20 eggs per day (up to 200 eggs in about 12 days) on primary host plant species [2]. Development from egg to adult takes 10 to 20 days, depending on the host plant and temperature. Therefore, TSM can seemingly outbreak overnight, once numbers reach a critical mass. Hot, dry conditions favour TSM development, and spider mites in general.

Fig. 1. TSM on basil (above) showing yellow speckled damage and heavier infestation on strawberry (above).

Host range and varietal resistance

While TSM has been associated with many host plant species, the extent to which it becomes a pest across species and varieties is highly variable. This is exemplified by its capacity to reproduce and develop on each host plant. For example, across eight gerbera varieties, TSM was found to lay between about 2 and 10 eggs per day [3]. On four strawberry varieties, females laid between 3 and 40 eggs over their lifetime [4]. A study on bean, cucumber and rose indicated that females laid 185, 110 and 48 eggs over their lifetime, respectively [2]. This indicates that host plant species and varieties have a diverse range of capacities to support the development of TSM populations to damaging levels.

The biology of TSM on plants relevant to the nursery production industry is largely unknown, due to the diversity of plants produced. Available information simply highlights the need to record the extent of TSM on each host plant grown on the farm. This can then be used to make informed production decisions about the varieties and species which can be grown to minimise TSM risk and the level of monitoring required for different plant species, depending on their susceptibility.

TSM insecticide resistance

One of the main reasons that TSM has become such an important pest around the world is the apparent ease with which insecticide resistance develops within both local and widespread geographic regions. There is now molecular evidence that TSM is able to detoxify a wide range of insecticidal compounds and can rapidly develop tolerance to various chemicals [5]. The ability to detoxify chemicals is probably why virtually every chemical released for the control of TSM that is used consistently in a geographic area results in resistance to that chemical within 2 to 5 years. The extent and speed of resistance is normally correlated to the degree to which the product is applied.

Fig. 2. Adult female TSM, about 0.5mm long.

Table 1 and 2 present a summary of the active ingredients available in Australia for use on TSM, including information on the mode of action group and application; Table 1 is specifically for pesticides that have ornamental use, Table 2 for pesticides that are for specific crops within the nursery industry, but not for all ornamentals. Notes are provided on insecticide resistance with particular focus on Australia. Please be aware that this information is subject to change. Labels and permits should be checked before applying any product and all directions on safe handling and storage should be carefully followed.

Given the likelihood that resistance will eventually develop for any given product, it can be concluded that relying on chemicals to control TSM is a poor long-term plan. It is best to consider insecticide application as a minor but essential part of an overall TSM management plan.

To reduce the occurrence of pesticide resistance, switch between active ingredients and do not overuse any product. It is extremely important to discontinue applying products that have had limited efficacy, as their continued use will increase the rate of development of resistance in your region and will often have long term implications for the use of the product.

Cultural control

There are a number of relatively simple practices to reduce the likelihood that TSM will infest/re-infest your crop.

1. TSM can be found on a large number of hosts, including weeds. Wherever possible, reduce weeds that may harbour TSM, particularly solanaceous weeds, clover and mallows.
2. Avoid introducing infested seedlings or other plant material into the crop.
3. Remove/quarantine old, infested plants that may be a source of mites for new plantings. Dispose of plants thoughtfully; even though spider mites cannot fly, they are wind-dispersed and can travel surprising distances. Throw-outs should be placed in a closed bin in a relatively isolated area to reduce the chance of reinfestation. TSM can move from plant to plant if leaves are touching. If possible, move plants such that severely infested plants are not touching other plants with lesser infestations.
4. In glasshouses, mite-proof screens and doors can sometimes be installed to reduce the likelihood of pests entering the glasshouse.
5. Spider mites are easily spread by people. Therefore, reduce staff movement in and through areas that are known to have mite populations. Visit these areas last and do not re-enter 'clean' areas.
6. Spider mites thrive in warm, dry condisitons, but not in wet, humid conditions. Overhead watering may help reduce populations of TSM. However, be aware that wet plants are more difficult to monitor when using methods such as beating. Increased vigilance may be required in favourable conditions.
7. Identify infestations early through regular monitoring.
8. Examine monitoring records to determine patterns in farm infestations. If particular areas of your farm or certain crops/varieties consistently become infested, devote more search efforts to those areas.

Monitoring TSM

Before any informed management decision can be made, knowledge of the extent of the infestation is required so that the most appropriate actions can be determined. The best way to collect such information is to regularly monitor your crop. This involves inspecting a small percentage of the crop (1 to 10%) in all areas of your farm. Hotspots can be treated more effectively when they cover small areas. Moving through the crop in an M or Z pattern can help pick up localised hotspots that might otherwise be missed if only the edges are searched. Plants should be monitored visually (looking for speckled or damaged plants) and by gently, but firmly, hitting foliage against a beating tray (which can be a folder, bucket or plastic plate). The beating tray should be a single colour; white or black is preferable as this will allow moving organisms to be more visible. Beating plants is a relatively efficient way of monitoring for insects and mites that can be knocked from plants, including herbivorous and predatory mites, aphids, thrips, lady beetles, small caterpillars, whiteflies and a variety of other insects. Once something is found, a 10-15x hand-lens can be used to inspect the catch. Record the number of plants inspected and the number with any given pest in each area of your farm. More detailed information (e.g. a rough indication of the level of infestation) may also be useful, particularly for determining how effective management actions have been. Accurate records can help you determine long-term patterns of host use on your farm and thus help in allocating search efforts.

Monitor your crop once or twice per week, depending on pest pressure and environmental conditions. During hot-dry periods monitor twice per week; during cooler periods, once per week may be sufficient. Good monitoring is key to successful pest management. Poor or infrequent monitoring is likely to lead to poor control and increased costs. Early identification of TSM in your crop is extremely important for cost-effective management of the pest.

For crops such as cotton, reasonably precise pest population levels have been determined in relation to certain management actions. Such crops cover vast areas and are individually associated with high levels of research. However, the nursery industry includes thousands of host plant species with variable capacities to withstand pest attack, so exact threshold densities have not been recommended. Recording pest numbers and the consequences of particular management actions is imperative for determining pest threshold levels. This is often best done in consultation with experienced IPM crop consultants, department of agriculture or primary industries entomologists and/or biological control producers.

I have TSM, what do I do now?

There are a number of questions that you need to consider before taking action. The main question to ask is: what is the extent of the infestation?

1. If the pest infestation is relatively light, biological control is likely to give the most effective long-term control. However, keep in mind that certain pesticides may have a long residual and may preclude effective release of certain biocontrol species. Speak to the supplier of the predators if in doubt.
    1.1.1. If you choose to apply predators, consider the expected environmental conditions over the next 7 days. If temperatures will be high, try *N. californicus* or *T. occidentalis*; otherwise release *P. persimilis*, as it is more voracious.
2. If the pest infestation is moderate to high, but only in small areas, spot spray with a low residual, predator-friendly pesticide and release predators to clean up the rest. Such pesticides include insecticidal soaps, petroleum oils and Acramite (always check labels before application). Other chemicals may also be suitable (refer to Table 1) if resistance is not too high, e.g. abamectin and clofentezine.
3. If the pest infestation is moderate to high across a widespread area, spray all areas to knock back the population and then release predators.
4. Investigate whether predators are already present and if so, at what population level. Moderate to high predator populations can rapidly reduce spider mite populations, particularly *P. persimilis*, which can readily eat TSM to extinction in short periods. If there are sufficient predators, there is no need to release more.

There are many situations which may alter the above options. For instance, if an application of a highly toxic pesticide was required for a different pest, low residual chemicals will be the only option until the area is safe for release of predators. In addition, previous chemical applications may preclude further applications in that season (e.g. clofentezine). Extreme environmental conditions will preclude the release of predators and chemical application/s will be required. Other practical constraints may also alter management decisions, for example, if the consignment must be shipped within a short period, there is probably limited value in applying predators.

Fig. 3. An adult *P. persimilis* feeding on an adult TSM.

Using predators to control pests is more difficult, since there are more factors to consider than simply which product to apply. However, when used correctly they can be just as cost-effective as chemicals and can extend the life expectancy of good pesticides through reduction of resistance.

Biological control

There are currently three effective spider mite predators commercially available in Australia, and a handful of other predators that sometimes will eat spider mites if other food is not available. The biology of each species is unique, making them more effective under different scenarios or environmental conditions. Below are listed some of the strengths and weaknesses of each predator. However, contact your biological control provider to confirm the best course of action, particularly when ordering for the first time. Suppliers of biological control agents are listed at http://www.goodbugs.org.au/index.html

Phytoseiulus persimilis

Phytoseiulus persimilis is used worldwide to control spider mites and eats all stages of TSM on a wide range of plant species in agricultural settings. Adult *P. persimilis* are able to prey on up to 20 young TSM or seven adults per day, while immature predators feed on eggs and immature stages of TSM. All *P. persimilis* are orange-red in appearance; immatures are paler in colour and adults are darker. Like almost all predatory mites, *P. persimilis* is very fast-moving compared to their spider mite prey, and has a tear-drop shaped body (Fig. 3).

Phytoseiulus persimilis reproduces faster than TSM at warm temperatures (around 26-28°C), developing from egg to adult in about half the time of TSM. This is a great benefit as numbers of predators can build up faster than their prey. The sex ratio of *P. persimilis* is 4:1 female:male, with about 2-3 eggs laid per female per day [6]. This means that 80% of adults are egg-laying females, allowing rapid population increase. Temperatures above 30°C reduce the ability of *P. persimilis* to control TSM significantly. Humidity lower than about 60% greatly impacts the ability of *P. persimilis* to control TSM; for example, it was found that when eggs were held at 50% humidity they did not hatch. These predators are extremely voracious and can cause local extinction of spider mites relatively quickly. However, they are specialists of spider mites; once their prey is no longer present they will disperse or die out. If leaves of adjacent plants are not touching, try to release some *P. persimilis* onto each plant.

There are four providers of *P. persimilis* in Australia: Bioworks (NSW), Biomites (Qld), Bugs For Bugs (Qld) and Manchil IPM Services (WA). Refer to your provider for instructions on release and cost.

Neoseiulus californicus (= *Amblyseius californicus*)

Fig. 4. Neoseiulus californicus feeding on eggs. Photo by Dan Papacek.

Neoseiulus californicus (Fig. 4) is more robust than *P. persimilis*, being able to tolerate a wider range of temperatures and humidity conditions. It also survives at low TSM densities because it is able to eat alternative prey (including broad mite and cyclamen mite) and pollen. Under typical glasshouse conditions, *N. californicus* develops from egg to adult in 4 to10 days (which is faster than TSM) and females lay about 60 eggs over their lifetime, generally 2 or 3 per day. Reproductive rate increases up to about 35°C, above which it stops. The sex ratio of *N. californicus* is 2:1 female:male, so about 66% of adults are female and can lay eggs. Therefore, populations of *N. californicus* are not likely to increase as fast as those of *P. persimilis*, assuming that both are at optimal environmental conditions.

They can survive short periods above 40°C and below freezing and tolerate a wide humidity range (greater than 40%, but they prefer conditions around 80% humidity). When prey is scarce some *N. californicus* disperse over the crop; however, most will stay in the crop awaiting new prey to arrive. Female *N. californicus* can feed on up to 20 TSM per day, depending on the stage and density of TSM encountered; eggs, larvae and nymphs are consumed at higher rates than adult TSM [7].

There are two providers of *N. californicus* in Australia: Bugs For Bugs (Qld) and Biological Servies (SA). Refer to your provider for instructions on release and cost.

Typhlodromus occidentalis (= *Metaseiulus* and *Galendromus occidentalis*)

Typhlodromus occidentalis (Fig. 5) has similar biology to *N. californicus* in that it is more robust than *P. persimilis*, being able to withstand greater climatic extremes, and consumes prey other than spider mites (e.g. rust mites). Under typical glasshouse conditions, *T. occidentalis* develops from egg to adult in 6 to 12 days, depending upon temperature [8]. Optimal environmental conditions are between 20 and 32°C and greater than 40 to 50% humidity, although a lower humidity may be tolerated if prey are abundant [9, 10]. Temperatures above 40°C and as low as 10°C can be tolerated, although development and feeding are much reduced and low temperatures may induce diapause (hibernation). Diapause can allow *T. occidentalis* to remain established once the temperature increases, assuming that pesticides that cause mortality are not applied.

Fig. 5. *Typhlodromus occidentalis* feeding on TSM eggs. Photo by Marilyn Steiner.

Adult *T. occidentalis* can consume 12 to 15 spider mites per day; immature individuals consume fewer spider mites. Females lay 1 to 3 eggs per day, depending on temperature, laying a total of 25 to 35 eggs over their lifetime of 10 to 30 days [11]. When prey is scarce, *T. occidentalis* becomes more active, dispersing to areas that may have prey. There is evidence that *T. occidentalis* may tolerate many organophosphate chemicals and is resistant to azinphos-methyl. At relatively low rates suitable for integrated pest management (IPM), miticides such as Apollo, Omite, Unimite, Torque and Pyranica are relatively safe to use.

There is only one provider for *T. occidentalis* in Australia, Biological Services (SA). Contact the supplier for instructions on release and cost.

Other predators

There are a variety of additional predators that sometimes will consume certain spider mite stages, particularly eggs. Presence of these species may contribute to a reduction of TSM populations, but are unlikely to reduce them significantly in their own right. These include *Typhlodromips montdorensis* (Bugs For Bugs), *N. cucumeris* (Biological services and Manchil IPM) and *Orius armatus* (Manchil IPM), all of which are primarily thrips predators, although *T. montdorensis* is also a good whitefly predator.

Conclusion

There is no one method that can completely manage TSM all of the time. The best way forward is to take preventative steps to reduce the likelihood of TSM infestation and monitor crops regularly. There are many factors which may influence the action taken. A balanced approach is appropriate to successfully manage TSM cost effectively. As stated above, regular and thorough monitoring will allow for management of pest populations while they are relatively low in numbers. Low infestations generally require fewer actions, be they pesticide applications or predator releases, which will equate to lower costs.

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Table 1. Pesticides currently registered or with minor use permit in Australia for ornamental use against two spotted mite, *Tetranychus urticae*, including notes on their use, toxicity to beneficial organisms and the level of resistance (which has been combined according to mode of action group). Check full product labels and/or permits to determine suitability of use.

Mode of action group	Active ingredient	Example product name	Registration information	Limits on applications per season	Action[1]	Other information	Toxicity to beneficials[2]	Notes on insecticide resistance
2B	Dicofol	Kelthane, Farmoz Miti-Fol EC	Ornamentals	None	C	Apply at first appearance. May cause damage to some ornamentals including, chrysanthemums, gardenias, hibiscus, roses and fuchsia, particularly in hot weather	H – 1-2 week residual, low toxicity to other predators.	Low to moderate resistance reported in SEQ roses [13].
3A	Bifenthrin	Talstar 80SC,	Ornamentals	10-14 day intervals, as needed	C, I	Compatible with various products. Spray when populations are low for best results	H – 8-12 weeks residual	Widespread high levels of resistance to Bifenthrin in Australian cotton [14] and other pyrethroids.
3A	Tau-Fluvalinate	Yates Mavrik	Ornamentals	None for ornamentals	C	Apply before populations are well established	H – unknown residual	
6A	Abamectin	Vertimec/Farmoz sorceror	Ornamentals	No more than twice per season	T, I	May be used with summer oil but may cause phytotoxicity. Apply when numbers are low.	M – 1 week residual	SARDI anecdotal evidence of near complete resistance to avermectin products [3]. Occasional abamectin resistance has been detected at high levels in Australian horticulture [14]. Resistance appears to be unstable and reverts over time.
6B	Milbemectin	Ultiflora	Ornamentals	No more than 2 non-consecutive sprays per season	T (in young leaves), I	May take 7-14 days to reach maximum mite control. Apply when populations are low. May have some phytotoxicity to some ornamental plants	H – unknown residual	
10A	Clofentezine	Appollo	Ornamentals	Once per season only	C, O	Apply when numbers are low.	L – No residual	Complete product failure to clofentezine has been estimated if more than 1 application is made per season, although this may be as high as 4 in different regions (based on tree orchards in WA). Similarly on SEQ roses, sporadic high level resistance to clofentezine and hexythiazox [13]. Once resistance has occurred, resistance remains indefinitely [15].
10A	Hexythiazox	Calibre 100EC	Ornamentals	Once per season only	C, O, I	Do not apply any 10A group more than once per season. Apply with either a recommended adulticide (where Biocontrol is not being practiced) or a non-ionic surfactant (where Biocontrol is being practiced). Apply well before infestation reaches economic damage.	L – No residual	
12A	Fenbutatin oxide	Torque	Ornamentals, **but Qld, NSW, Vic, SA, WA and NT only**.	None	C, I	Apply at first signs of mite activity. Thorough coverage essential as mites move into areas that are not sprayed and then reinfest crop.	L – virtually no residual	Fenbutatin-oxide has sporadic high level resistance (based on SEQ roses) [13]. High level resistance develops easily, but is unstable and reverts over time.
12B	Diafenthiuron	Pegasus	PER11971 for non-food, nursery stock and non-bearing, fruit trees.	Not to be sprayed consecutively or within 6 weeks of each other; do not apply products from same mode of action group more than twice per growing season.	C, I	Treat while populations are low	H – 1 week residual for *P. persimilis*, L – no residual for *A. californicus*	

Mode of action group	Active ingredient	Example product name	Registration information	Limits on applications per season	Action[1]	Other information	Toxicity to beneficials[2]	Notes on insecticide resistance
12C	Propargite	Omite 300W	Ornamentals	None	C	May be quite phytotoxic to some ornamentals; wear protective gear to re-enter up to up to 32 days after application.	L-M – 1 week residual	Occasional detection of low levels of resistance in Australian cotton [14] and roses [13]; high level resistance sometimes.
21A	Tebufenpyrad	Pyranica	Ornamentals	Once per season	C, I	Compatible with a range of products; may cause phytotoxicity to some crops including chrysanthemums and gerberas.	M-H – 2 weeks residual	High resistance to tebufenpyrad confirmed in Australia in 1997, after just 5 years on the market. Resistance is also reported in Japan, Korea and Europe [17].
22A	Azadirachtin A and B	Azamax, NeemAzal	Ornamentals	Reapply 7-10 days when pests are present	C, I	Apply with botanical oil but phytotoxicity may occur, particularly on sensitive plant species such as ferns, poinsettias and African violets.	L – 1 week residual	Not reported, no resistance levels appear to be published.
25, but debate over exact mode of action [18].	Bifenazate	Acramite	Non-food nursery stock (PER 11972)	No more than 1-2 per season, depending on crop.	C	Apply when populations are low	L-M – 1 week residual. Very minor toxicity to *P. persimilis* [19].	First reported in the Netherlands in 2008, but has also been reported in Japan and Italy. Shows cross-resistance to acequinocyl (which is not yet available in Australia) [18].
None	Petroleum oil	Hortico white oil insecticide, DC Tron Plus, Biocover horticultural oil	Varies by label, **some with ornamental registration** varies.	None-but certain recommendations are made – see label details	C	Possible phytotoxicity at high temperatures when mixed with other products. Can be used as a spreader with other products	L-M – no residual	Resistance not reported and appears untested. Can be very effective in controlling TSM.
None	Potassium salts of fatty acids	Natrasoap, Muticrop bugguard	Ornamentals	None	C	Apply to run-off. Can produce phytotoxic effects, particularly at higher concentrations and in high temperatures.	M – no residual	
Y	Sulfur as wettable sulfur	Barmac Wettable Sulphar, Top Wettable Sulphur	Ornamentals: Varies by state	None	C	Applications at high temperatures can cause phytotoxicity	L-M – 0-1 week residual	Not reported

1 Action: C = contact; S = systemic; I = ingestion; T = translaminar;

2 In the context of the table, beneficials refers to *P. persimilis, T occidentalis* and *N. californicus*. Summarised primarily from *The Good Bug Book* [20], http://www.koppert.com/, http://www.biologicalservices.com.au/, http://www.bugsforbugs.com.au/ and http://www.ipm.ucdavis.edu/

3 http://www.sardi.sa.gov.au/pestsdiseases/horticulture/horticultural_pests/integrated_pest_management/resources/greenhouse_pests/two_spotted_mite

Table 2. Pesticides that have limited use for the nursery industry because they do not have an "ornamental" permit or registration in Australia for use against two spotted mite, *Tetranychus urticae*, including notes on their use, toxicity to beneficial organisms and the level of resistance (which has been combined according to mode of action group). Check full product labels and/or permits to determine suitability of use.

Mode of action group	Active ingredient	Example product name	Registration information	Limits on applications per season	Action[1]	Other information	Toxicity to beneficials[2]	Notes on insecticide resistance
1B	Disulfoton	David Grays Disulfoton 50	**Various broad acre crops, but no ornamentals**	None, but do not spray where resistance is suspected	S, I	Sow with seeds. Toxic to vertebrates.		TSM has recorded virtually complete resistance to dimethoate (1B chemical) and thiodicarb (1A chemical) in Australian cotton [12]. Phorate granules and dimethoate completely ineffective on roses in SEQ [13]. Organophosphates, in general, are very ineffective against TSM.
1B	Methidathion	Supracide 400, Suprathion	Registered for TSM for apples and pears, **but not ornamentals;** varies by state	None	C, I	Leaf scorching of young tender foliage may occur	H 1-3 weeks residual	
1B	Omethoate	Folimat 800	Registered for mites for carnations, chrysanthemums, pelargoniums, roses, callistemons, *Eucalyptus* spp., *Grevillea* spp., paperbarks and wattles, **but not ornamentals**	None	C, S, I	Compatible with some oils; 1 day re-entry period	H – 8 weeks residual	
1B	Phorate	Thimet 100G/200G, Umet 100/200G	**Carnations, dahlias, chrysanthemums, lily bulbs, azaleas, roses and other woody ornamentals only – in soils only**	None	C, S, I	Must be worked into ground and watered in	Not known	
10B	Etoxazole	Paramite	Various, **but not for ornamentals**, PER8577 for specific leafy and woody herbs	Once per season only	C, T, I	If there are more than 2 adults per leaf and 15% or more leaves are infested, spray a knockdown with a chemical from another group before using this product.	Acute toxicity is low, but reproductive capacity is significantly reduced – 4-8 weeks residual.	Complete product failure to clofentezine, a closely related product, has been estimated if more than 1 application is made per season, although this may be as high as 4 in different regions (based on tree orchards in WA). Similarly on SEQ roses, sporadic high level resistance to clofentezine and hexythiazox [13]. Once resistance has occurred, resistance remains indefinitely [15].
13A	Chlorfenapyr	Secure/Intrepid 360SC	**PER 8633 for many leafy and woody herbs. Various, but not ornamentals.**	Maximum of 2-4 non-consecutive applications depending on crop.	C, T, I	Use low rates if predatory mites are present. Apply when pest numbers are low.	(M – H) – 2 weeks residual	Widespread, low/moderate resistance has been detected in Australian cotton [14]. In nectarines, resistance was detected after a single application [16]. Resistance remains stable for long periods.
21A	Pyridaben	Sanmite	**Registered for apples, pears, stone fruit, bananas, grapes and roses, but not ornamentals.**		C		H – 1 week residual	High resistance to tebufenpyrad, of the same mode of action group, confirmed in Australia in 1997, after just 5 years on the market. Resistance is also reported in Japan, Korea and Europe [17].
None	Emulsifiable botanical oils	Eco-oil	Ornamentals – **Home garden use only**, PER 10311 and 6976 allow use in greenhouse and hydroponic capsicums, cucumbers and lettuce and Rubus spp.	Do not apply more than three sprays within 8 weeks.	C	Do not apply above 35°C or to plants suffering heat or moisture stress	L – no residual	Resistance not reported and appears untested. Can be very effective in controlling TSM.
X	Oxythioquinox	Morestan	Registered for TSM**, but not on ornamentals**	No limits	C	Can be mixed with certain products, spray at low temperatures to avoid leaf scorch	H – 2-3 weeks residual	Not reported.