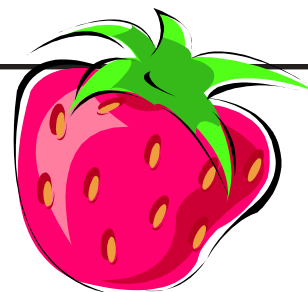




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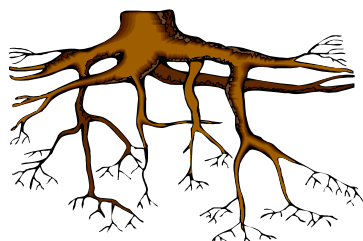


Diane Kaufman

Strawberry Newsletter

Dear Friends;

It's difficult to make much sense of the weather we are having this spring. It's almost as if the months of January and March traded places. Growth is very slow in strawberries as I write this newsletter (3/20/06). However things will happen quickly once temperatures warm up a bit.



Root Rot

Because of unseasonably warm and wet conditions during January, 2006, soils are saturated, with soil temperatures at the 2 inch depth ranging between the mid-40's to low 50's (based on readings at NWREC). As of 3/12/06, we had a total of 36.4 inches of precipitation since 10/1/05 (the date from which fall/winter re-charge of moisture is measured). Last year at this time (3/12/05), we had only received 13.96 inches of precipitation since 10/1/04, which was well below normal. Average precipitation for the periods between 10/1/71 and 3/1/2000 and 10/1/61 and 3/1/90 were 27.40 and 26.87 inches, respectively. Soil temperatures at the 2 inch depth in March usually range between 39 and 58 degrees F and average at around 42 degrees F. There is very little soil microbial activity until soil temperatures average above 45 degrees F. Once mean soil temperatures average between 45 and 50 degrees F, spores of soil-dwelling fungi begin to germinate. This year, the mean soil temperature at the 2 inch depth

(at NWREC) in January was 49 degrees F. Warm soil temperatures coupled with heavy rainfall create good conditions for the development of Phytophthora root rot. Weather projections are calling for wet conditions through March. This would probably be a good time to plan a Ridomil drench or a foliar application of a phosphorus acid based fungicide (Aliette, Fosphite, etc) to the leaves once they begin to grow and expand.

Fruit Rot Control

Sprays to protect against Botrytis fruit rot should begin when the first blossoms open and be repeated at regular 7 to 10 day intervals through bloom. Because Botrytis invades through the blossoms, early timed sprays tend to be more effective against it than

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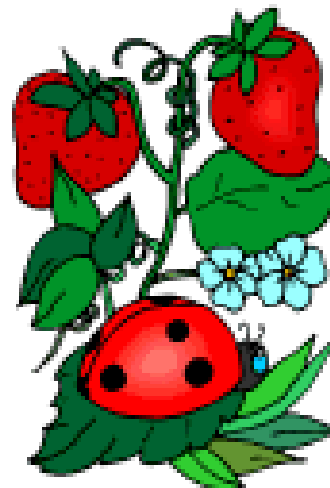
sprays later in the season when there is a lot of green fruit. For this reason, it would probably be best to use those fungicides which are most effective on Botrytis early in the bloom period, and rely more on broader spectrum fungicides later in the bloom cycle.

We presently have several excellent materials to rotate among. Scala, our newest fungicide (fungicide group 9), has recently (2005) received a label for use in strawberries. In a trial conducted by Joe DeFrancesco on Botrytis in Marion blackberries, Scala reduced fruit rot compared to the untreated control, but was not as effective against Botrytis as Elevate or Captevate. Because Scala is in the same fungicide group as one of the active ingredients of Switch (cyprodinil), it would not be a good choice for rotation with Switch. Pristine is a mixture of two active ingredients, pyraclostrobin (fungicide group 11) and boscalid (fungicide group 7). Both Pete Bristow (WSU Plant Pathologist, now retired) and Joe DeFrancesco (OSU) have seen excellent Botrytis control with Pristine in their trials in red raspberries. Although I am unaware of any trials with Pristine for control of Botrytis in strawberries, there is no reason to doubt its effectiveness against Botrytis. Pyraclostrobin (Cabrio) is a strobilurin fungicide with broad spectrum activity against rust and Septoria (raspberries and blackberries), and powdery mildew and common leaf spot in strawberries. By itself, pyraclostrobin is not particularly effective against Botrytis. However, boscalid is an excellent Botrytis material with a mode of action completely different from that of Elevate or either of the two active ingredients in Switch. Switch (fungicide groups 9 cyprodinil and 12 fludioxonil) continues to provide excellent control of Botrytis, and has also shown good activity against Rhizopus, a fungus that tends to attack ripening and over-ripe fruit. Although Elevate (fungicide group 17) alone will not control Cladosporium (which causes black, sunken lesions on fruit), it is very effective against Botrytis. Because Elevate will only control Botrytis, the company has released another material called Captevate, which is a mixture of Elevate and Captan (fungicide group M4; M stands for multi-site). Because Captan is a broad-spectrum fungicide, the Captevate would be a better choice than Elevate alone for use later in the season, when green and ripe fruit

are present. However, because Captevate contains Captan, it will be important to check with processors to make sure there are no restrictions on Captan use. Thiram (fungicide group M3) is another older, broad-spectrum fungicide option. Although Thiram is not as effective as Switch, Elevate, or Pristine on Botrytis, it still provides fairly good control of Botrytis and offers the added benefit of being a broad-spectrum material. Because Captan and Thiram are broad-spectrum fungicides with multi-site activity, they are valuable from the standpoint of resistance management. It is more difficult for organisms to develop resistance to fungicides with multi-site activity than with single-site activity.

Several fungicide manufacturers have begun using the numbering system referred to above to identify different modes of action. This will be very helpful to growers because it will clearly distinguish fungicides by mode of action and facilitate the selection of good rotations based on different modes of action. Fungicides with different group numbers have different modes of action and can, therefore, be rotated without increasing the threat of resistance development.

Although our PNW Disease Management Handbook also lists JMS Stylet Oil as an option for Botrytis control, there is no data from the PNW on its effectiveness. Messenger also is listed; however, research results with Messenger have been disappointing.

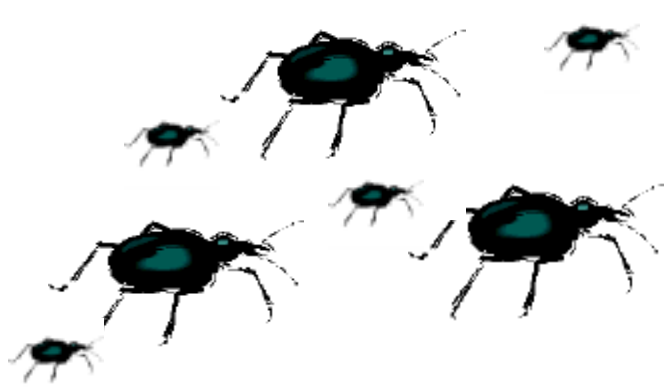




Frost Protection

Because frost can occur here through the last half of April, it is important to have irrigation set up for frost protection. A fine mist of water should be applied continuously during all hours that temperatures remain below 32 degrees F. As water changes from a liquid to a solid, it gives off enough energy to provide about 3 degrees of heat. In general, closed strawberry blossoms can tolerate about 28 degrees F before suffering damage. Blossoms which are open can tolerate 30 degrees F. This may vary somewhat with variety. Because of this, irrigation can make a difference even at temperatures as low as 25 to 27 degrees F. A fine spray mist is still considered the most effective means of frost protection in strawberries.

One other frost protectant measure that may be worth a try if we get a few days warning of a cold snap is a coating of Surround Kaolin Clay on blossoms. In recent research conducted in England, there was significantly less cold damage on potted grape and lemon plants sprayed with kaolin clay (Surround) than on plants sprayed with another protectant or water. As long as there is not a great deal of rainfall, the material should stay on for a few weeks. Although we have no cold protectant data on Surround in the PNW, it may be worth a try on 1 or 2 rows if cold weather develops during bloom. The white coating produced by Surround may also provide the additional benefit of making it difficult for aphids flying overhead to recognize strawberry plants as desirable places to land. Because of this, a pre-bloom to early bloom spray of Surround (before aphids are present) on varieties susceptible to aphid-borne viruses (Hood) may be something to explore.



Aphid Control/Virus Concerns

For many years we could expect Totem to show no symptoms of decline even when infected with two or three of the aphid-borne viruses. During those years it took infection by all four of the common aphid-borne viruses to cause decline in Totem. This was in contrast to Hood, which can tolerate infection by no more than one of the aphid-borne viruses before showing signs of decline. Recently, however, there has been some evidence that the virus tolerance of Totem is becoming less effective due to changes in the virus complex or the virus strains present. During the last two years, plantings of Totem in British Columbia and Washington have shown signs of decline from infection by three or four of the aphid-borne viruses. This is alarming because it signals the movement of all four viruses in strawberry fields. Because no one in B.C. suspected Totem of succumbing to aphid-borne viruses, weak areas of fields were often misdiagnosed and attributed to root rot. Only recently has decline due to aphid-borne viruses been confirmed. Because of this, Totem growers in B.C. have begun treating for aphids. Although virus decline of Totem has not been confirmed in Oregon at this time, strawberry growers here should be aware of this situation and be alert for unusual symptoms in Totem.

For many years Totem growers in Oregon were able to conserve native predator mite (*Neoseiulus fallacis*) populations by reducing or eliminating sprays for aphids. Good populations of predator mites have led to a reduction in two-spotted spider mite populations. Unfortunately, a reduction in virus tolerance in Totem could lead to increased application of aphid-control

insecticides. Therefore, this is probably a good time to discuss some of these materials.

The first treatment is usually made when aphids first appear (usually mid-April), with repeat applications at 2 to 4 week intervals until around mid-July. The best way to know if aphids are present is to check the undersides of new leaves on several plants. We have several insecticides for control of aphids. Unfortunately most of them are at least moderately toxic to *N. fallacis*.

Actara – Can make one application pre-bloom and one application post-bloom. Active ingredient is thiamethoxam, which has the same mode of action as imidacloprid (below), but is considered less toxic to *N. fallacis* than imidacloprid.

Admire or Provado – Admire is the soil-applied formulation and Provado is the foliar-applied formulation of imidacloprid. Do not apply Provado when bees are actively foraging. Imidacloprid is considered moderately toxic to *N. fallacis*.

Diazinon – Do not use at bloom. Considered toxic to *N. fallacis*.

Dibrom – Considered toxic to *N. fallacis*

Endosulfan/Thiodan – Use only when daytime temperatures are expected to exceed 70 degrees F.

Apply in late evening to avoid bee poisoning during bloom. The aphid rate (1 lb ai/A) is moderately toxic to *N. fallacis*. The cyclamen mite rate (2 lb ai/A) is highly toxic to *N. fallacis*)

Lannate – Do not use during bloom. Toxic to *N. fallacis*.

Lorsban – Do not use during bloom. Highly toxic to *N. fallacis*

Malathion – Less toxic to *N. fallacis* than most other materials on this list

M-Pede – insecticidal soap. Probably the least toxic material to *N. fallacis* on this list. However, no residual control.

Because Oregon no longer has a 24-C label for Metasystox-R, Oregon strawberry growers can no longer use it.

One other aphid control strategy worth considering is application of Surround. Surround is a kaolin-clay material that creates a white film on plants that deters

insects. Aphids flying overhead are stimulated to land when they see young green growth on a dark background. By coating leaves in white, Surround makes plants unrecognizable to several insects.



New Products for Spider Mite Control

Because there have been some new registrations for spider mite control in strawberries, it seemed a good idea to review them at this time. The following products are registered for spider mite control in strawberries: Acramite (14 day PHI); Agri-mek (3 day PHI); Danitol (3 day PHI); Dicofol/Kelthane (2 day PHI Difocal, 3 day PHI Kelthane); Kanemite (1 day PHI); M-Pede insecticidal soap (0 day PHI); Oberon (3 day PHI); Savey (3 day PHI); Vendex (1 day PHI), and Zeal (1 day PHI).

Oberon is the most recent addition to this list.

Acramite – (bifenazate, a diphenyl compound) is active on immatures and adults as a contact material, and also has ovicidal activity (controls eggs). Toxic to bees. Can be used safely in conjunction with many beneficial insects/mites, particularly *Neoseiulus fallacis* (the predator mite that controls two-spotted spider mites in strawberries), beneficial beetles (*Stethorus* and lady-bird beetles), and lacewings. Can provide up to 21 days of control.

Agri-Mek – (a natural fermentation product of a soil microorganism) effective on spider mite immatures and adults. No ovicidal activity. Toxic to bees on contact. Controls by both contact and stomach poison activity. Slow-acting, although mites become immobilized after exposure.

Danitol – (fenpropathrin, a synthetic pyrethroid compound) is active on all stages of spider mites, including eggs. Effective at cool temperatures. Can also be used for control of spittlebug and certain

insects in the beetle (coleopteran) and moth (lepidopteran) families. Potentially harmful to beneficials.

Dicofol/Kelthane – (an organo-chlorine compound) effective on immatures and adults. Has a long residual. Harmful to predatory mite *N. fallacis*.

Kanemite - (acequinocyl, a quinine compound) controls all stages of spider mites, and provides a quick knockdown and long residual. It is a contact material and, therefore, requires good coverage. It is considered relatively safe to most predacious mites and beneficial insects. Do not apply successive applications. Injury has been reported to some strawberry varieties, so may be best tried on a few rows prior to spraying the entire planting. There is a one year plant-back restriction to crops other than strawberries.

Oberon – (spiromesifen) contact material with activity on all stages of two-spotted spider mite; however more effective on juveniles than adults.

Savey – (hexythiazox, a carboxamide compound) controls eggs and immatures; will not control adults.

Control lasts 30 to 60 days. Non-toxic to bees. Considered relatively safe to beneficials.

Vendex – (fenbutatin-oxide, an organic tin compound) effective on immatures and adults; no ovicidal activity.

A contact miticide requiring good coverage. Mites are paralyzed prior to death and sometimes take 2-3 days to die. Works best when temperatures at application are above 70 degrees F. Gives long lasting control.

Considered relatively safe to bees, and beneficial insects and mites.

Zeal - (etoxazole, an oxazoline compound) is effective on eggs and immature spider mites, but not adults. It inhibits molting. It is best applied when mite populations are relatively low. It will not control the cyclamen mite.

M-Pede – is an insectical soap that kills insects and mites on contact and has no residual activity.

Even though we have several chemicals to choose from, it is important to remember that our first line of defense against two-spotted spider mites is the predator mite, *Neoseiulus fallacis*. *N. fallacis* is native here and it is an excellent predator of two-spotted spider mites in strawberries. Because of this, it is important to select chemicals that are considered

reasonably benign to *N. fallacis* and other beneficial insects/mites.



Cyclamen Mite Control

Cyclamen mite control in the field is definitely a challenge. Because cyclamen mites live deep inside the buds, the key to chemical control lies in good penetration of chemicals down into the crown. This requires generous amounts of water (200 gallons/A or more), high sprayer pressure, and limited leaf growth so that there is good access and penetration down into the crown. The best times to control the cyclamen mite are, therefore, in early spring, while the canopy is still small, and after mowing old leaves at renovation.

Chemical options include: Dicofol or Kelthane; endosulfan, and diazinon. Endosulfan was very effective in our research on cyclamen mite in the mid 1990's when applied during the times stated above. Predator mites may also play an important role in managing cyclamen mite populations. Because endosulfan is detrimental to our main predator mite, *N. fallacis*, it should be applied only in early spring and at renovation.



Weed control

We recently received another Section 18 label for the use of Spartan on new strawberry plantings, and on established plantings during renovation and during

winter dormancy.

We also recently received a label for the use of Aim herbicide in strawberries. Aim is a post-emergence herbicide with activity only against certain small, (no more than about 4 inches high) broadleaf weeds. It can be used prior to planting and in established plantings using a hooded sprayer. Refer to label (Preplant burndown and Hooded sprayer application sections) for specific use information. Do not apply more than 1.98 fl. oz (0.031 lb ai)/A during the pre-plant timing and no more than 4.4 fl. oz (0.064 lb ai)/A in season, as a row middle application.

**Strawberry Open House is scheduled for Wednesday,
June 14, 1:00 p.m. - mark your calendars.**



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