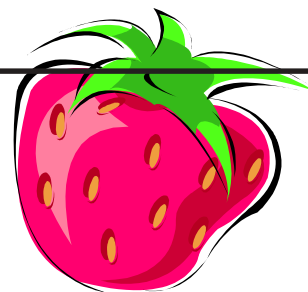




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# Strawberry Newsletter

Dear Friends,

With the cold, wet weather this spring, strawberry plants have been growing slowly and only third year fields are in bloom as I write this letter. However, with one or two days in the 60's things will change quickly. With bloom imminent, this is a good time to discuss such topics as fruit rot control, frost protection, weevils, root rot, herbicides, and fertilizer nitrogen.

## 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 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.

Although Botrytis is the main pathogen that usually comes to mind when we think about fruit rot, it is important to realize that it is not the only organism capable

of attacking ripening fruit. The fungus Rhizopus can also contribute to fruit rot and be quite aggressive under certain circumstances. Fruit infected with Rhizopus is slightly discolored, gradually turning light brown. It rapidly softens and collapses, and juices leak out of it. Under humid conditions, the fruit is soon covered with dense, fluffy white spores with black tips (these look different from the gray fuzzy spores of Botrytis). However, the spores are not always visible or obvious under hot, dry conditions. Rhizopus can survive on plant debris on and in the soil between seasons, so populations can build up over time. The fungus Cladosporium can also attack strawberries, causing dark, sunken spots on the fruit. Both of these organisms tend to attack fruit later, when it is ripening.

It is important to understand that some of the new, narrow-spectrum fungicides which are designed to control one specific organism, may not control Rhizopus or any of the other organisms that can occasionally attack ripening fruit. Although Elevate has tended to perform better than Captan or Thiram against Botrytis in trials conducted on strawberries in OR and WA, it has shown no activity against Rhizopus. In a trial conducted in 2000 by Pete Bristow at WSU, Switch was most effective

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against *Rhizopus*, followed closely by Thiram, and then Captan. Elevate was no better than the control against *Rhizopus*.

As new fungicides become increasingly narrow in their spectrum, we must become increasingly aware of other potential rot organisms and begin approaching fruit rot in a more strategic and integrated way. It is very frustrating to spend a good deal of money and effort working to control Botrytis, only to have ones fruit rot in the field from some other organism.

**...the best thing we can do is to continue to incorporate broad spectrum materials into our control programs.**

For many years we have relied on old broad-spectrum fungicides, such as Benlate, Captan, Thiram, and Ziram without knowing all of the various fungi they were affecting. Although we were applying them for Botrytis control, they were probably reducing populations of several potential fruit pathogens. We have been so focused on Botrytis, and to some extent, *Rhizopus*, that we have not given much thought to the other organisms which were being controlled as well. As fungicides become more narrow in their spectrum of control, it is possible that some of these organisms may be able to find a niche and thrive. Until we understand the ecology of different organisms on ripening fruit more fully, the best thing we can do is to continue to incorporate broad spectrum materials into our control programs. Because Botrytis infects through the blossom, using those materials most effective on Botrytis early in the season makes sense. Because *Rhizopus* appears to attack fruit which is already formed, using broader spectrum materials later in the season makes sense.

Looking specifically at the fruit rot fungicides labeled for use in strawberries, we have Switch, Elevate, Captan, Thiram Granuflo, JMS Stylet Oil,

and Messenger. Because Rovral can not be used past first bloom, it is no longer useful for fruit rot control in strawberries. Because resistance to Elevate and Switch is not an issue at this time, these two fungicides would probably be considered the most effective for control of Botrytis. In order to protect the useful life of these two materials, it is important to alternate them with other materials, and not apply either material more than twice during the growing season. It is also important to remember that Switch (good control of *Rhizopus*) is a broader spectrum material than Elevate (poor control of *Rhizopus*). Thiram has consistently performed better than Captan against Botrytis in trials conducted by Joe DeFrancesco and Pete Bristow. Although Thiram is not as effective as Switch or Elevate on Botrytis, it still provides fairly good control and offers the added benefit of being a broad-spectrum material. Captan is still considered somewhat effective on Botrytis in OR and WA and also offers the benefit of being a broad-spectrum material. There is no data from the PNW on the effectiveness of JMS Stylet Oil against Botrytis. Research results with Messenger have been disappointing. Incorporating an older broad-spectrum fungicide (Thiram or Captan) in a tank-mix with Switch or Elevate is also an option, however there is no data comparing the effectiveness of rotations versus tank mixes.



## 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 °F. As water changes from a liquid to a solid, it gives off enough energy to provide about 3 °F of heat. In general, closed straw-

berry blossoms can tolerate about 28 °F before suffering damage. Blossoms which are open can tolerate 30 °F. This may vary somewhat with variety. Because of this, irrigation can make a difference even at temperatures as low as 25 ° to 27 °F. A fine spray mist is still considered the most effective means of frost protection in strawberries.



## The Spring Nitrogen Debate

With many strawberry fields growing slowly this spring, this seemed a good time to re-print the nitrogen article from my April, 2001 newsletter. It may help some people decide whether or not to apply a bit of N fertilizer this spring to “jump-start” some growth:

I remember Arden Sheets often recommending the application of 10-20 lb N/A in the spring to strawberry plantings that appeared to be growing a bit slowly or had poor color. I continued to make this recommendation under the same circumstances, but I was always a little uneasy because there was no real data as to how this would ultimately affect yield. I also wondered if these N rates would result in softer fruit. The application of as little as 10 lb N/A seemed to help jump-start the plants and green them up nicely, thereby making everyone feel better, but no one seemed to know if spring N would ultimately affect yield or fruit quality. During the last 2 years, OSU Berry Specialist, Bernadine Strik, has attempted to begin answering some of these questions. Thanks to her work, we now have a better understanding of how nitrogen applied at different times is used by the plant, but the ultimate question of whether or not spring applied N will increase yields remains unanswered. In Bernadine’s

trial at NWREC, the application of 25 lb N/A in spring (in addition to 50 lb N applied at renovation) showed a trend for higher yields in 1999 compared to 50 lb N/A applied during renovation with no added N in spring. However, this was not the case in 2000 when there were no differences in yield with additional spring N. When the yields from 1999 and 2000 are added together, it appears that the additional spring N may have made a slight difference (8.7 kg fruit/plot with no spring N vs. 10.4 kg fruit/plot on average with spring N), but it is difficult to say if this is significant. Why did the spring N appear to benefit yield one year, but not the other? What conclusions can we draw from this work thus far?

Although a definitive answer to the question of effect of spring N on yield continues to elude us, there are certain conclusions that can be drawn from this work. 1. There was no difference among treatments in fruit size, firmness, or % rot in 1999 or 2000. Thus,

the addition of 25 lb N in spring did not have a deleterious affect on fruit quality. 2. Granular application of N was much more effective

than foliar application in terms of amount of N actually taken up by the plant. Whereas 25% of the spring applied granular N was taken up by the plants, less than 5% of the spring foliar-applied N was taken up. 3. Granular N applied in spring goes to the leaves, not to the trusses or developing fruit. This explains why even a small amount of N goes a long way toward greening up plants and encouraging leaf growth. However, this also explains why most researchers have been concerned about the application of too much N in spring: more leaf growth results in bigger canopies, which can result in more potential for fruit rot and decrease picking efficiency.

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# Weed Control Issues

## A. Herbicides for New Plantings

Growers putting in new plantings this spring have the following herbicide choices:

1. Spartan: Because we were granted another Section 18 label for the use of Spartan, it can be applied over the top of new strawberry plants immediately after planting. I think most people who applied Spartan immediately after planting last year were happy with the results.

2. Prowl (non-bearing only): The way the Prowl label is written it allows for broadcast application of Prowl to the ground prior to transplanting strawberries. Because Prowl is good on grasses and Spartan tends to be weak on grasses, using both makes sense.

3. Cobra: (non-bearing only): Cobra is similar to Goal in the amount of burn it causes on new strawberry leaves, however the spectrum of weed control is not as broad as it was with Goal or as it is with Spartan. It can be applied immediately before or after transplanting. Cobra will not control grasses.

4. Devrinol: Devrinol tends to be stronger on grasses than broadleaves. Many growers have had disappointing results with Devrinol in recent years, however, because its strength is in grass control and it also controls chickweed (one broadleaf weed only marginally controlled by Spartan), it may be beneficial in tank-mix with Spartan.

5. Select or Poast: Both of these herbicides are in the same family and are exclusively grass herbicides. They should be applied to actively growing grasses when they are 2 to 4 inches high. We received the label for the use of Select in strawberries two years ago. Although we had the use of Poast for several years, the fact that it does not control annual bluegrass limited its usefulness in strawberries. Select is effective on annual bluegrass and will give fair to good control of quackgrass.

B. Please note: as of this time (4/25/03) we

still do **not** have a label for the use of Stinger herbicide in strawberries. Because of the delay in getting the actual label, we probably will not have use of it in time for this spring.

## Diagnosing and Treating Weak Spots in a Field

April to early May is an excellent time to see weak areas of fields and diagnose problems by doing a bit of digging. If the problem is root weevils, the larvae will be easily visible feeding on the roots at this time of year. They usually begin to pupate by mid-late April. Of about 300 weevils I extracted from potted primroses in my garden last week, about 5 were pupa, so they are developing at a fairly normal rate despite our cold, wet weather. If weevils have been a recurrent problem, this would also be a good time to look for any overwintering adults. Because the overwintering adults (usually 10 to 25% of the total population) begin laying eggs by late April/early May, now is a good time to look for adults (this will probably require going out at night with a flashlight) and determine whether control is necessary at this time. We are usually so focused on the main population that overwinters as larvae and emerges in late May-June, that we can forget to look for overwintering adults and treat before they begin laying eggs.

This is also an excellent time to diagnose root rot. Although root rot was not prevalent during the last few years due to our recent dry winters, soils have been wet enough this spring to make root rot a concern. Strawberry plants dug at this time of year should have several new milky-white roots with masses of fine feeder roots. If few new roots are present, this could indicate root rot. Red stele (Phytophthora root rot) is easily seen at this time of year by scraping down to the center of the root (the

stele) with a fingernail or pocket knife. The center of new roots should also be a milky-white. If the center is brick-red in color, this indicates red stele. If there are few new roots and those present have very few feeder roots, this can indicate black root rot. Although there is no treatment for black root rot, Aliette fungicide is effective at managing red stele in strawberries. Aliette should be applied to the leaves once new growth is present.

If you have some weak areas of concern and would like some assistance in digging or interpreting what you see, feel free to give me a call.

# Things to do – April/May

- As temperatures begin to warm up, it will be a good idea to examine newly formed leaves for aphids and older leaves for two-spotted spider mites and predator mites.



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