Fall Foliar Urea
for Bacterial Canker Management

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Bacterial canker (bc) is a complex disease that involves the bacterial pathogen *Pseudomonas syringae.* Why is it that some orchards are chronically plagued with bc while others are never affected? Plant pathologists use a "disease triangle" to explain this phenomenon. Three things must exist in order for a disease to occur. First, the disease organism, or pathogen, must be present. Second, environmental conditions conducive for disease development must exist. Third, you must have a susceptible host.

Pseudomonas syringae is a very common epiphyte. This means that it is probably present at some level on the surface of trees in all almond and stonefruit orchards in Stanislaus County. Also, temperature and moisture conditions for bacterial growth are generally present in all orchards every winter. So if the bacterium is probably present in every orchard and environmental conditions are pretty similar among orchards, what is it that makes the difference? It is the third part of the triangle - host susceptibility. IT IS THE CONDITION OF THE TREE THAT WILL DETERMINE WHETHER OR NOT BACTERIAL CANKER WILL OCCUR AND HOW SEVERE IT WILL BE IN YOUR ORCHARD. Therefore, our best means to manage bacterial canker is to keep the trees as resistant as possible.

There are several factors that can influence a tree's resistance to bacterial canker. If a tree's tissue is damaged by frost, it is more susceptible to invasion and colonization by *Pseudomonas* bacteria. Ring nematode feeding on root tips also increases a tree's susceptibility to bacterial canker. In addition, recent trials have shown that low nitrogen status can increase the danger of this disease.

Pseudomonas syringae bacteria produce and release syringomycin, a substance toxic to tissues of almond and stonefruit trees. This is the reason why tissue colonized by the bacteria turns brown and dies. A tree that is able to suppress production of syringomycin will have at least partial resistance to the disease. A gene within the *Pseudomonas* bacteria is responsible for producing this toxin. It appears that higher nitrogen content within peach tree tissue reduces the expression of this gene. <u>In other words, trees with higher nitrogen content don't allow the bacteria to produce as much toxin and are therefore more resistant to bacterial canker</u>.

Fall foliar urea sprays can be an effective way to boost the nitrogen content of almond and stonefruit trees. This is especially true for orchards that have weakened root systems from nematode feeding or other soil problems. Scott Johnson, UC pomology specialist at the UC Kearney Ag Center, has shown that 80% or more of the urea-nitrogen from a fall foliar spray is absorbed into the leaf within 24 hours. It is then re-mobilized into the woody tissue within 4 – 6 days to be stored for use the following spring.

I tried the fall foliar urea sprays in our fumigation trial on Patterson Road to see if I could increase the trees' resistance to bacterial canker. This spray was in addition to the grower's normal (and very adequate) nutrition program. The trial is in a third generation peach orchard growing in very sandy ground. My application was October 29, 2002 when the orchard was at the end of its second-leaf. Using a commercial air blast sprayer, I added 100 lb. of low biuret urea per 100 gallons of water per acre. It took about 10 minutes of agitation for the urea to dissolve. I sprayed trees in fumigated and unfumigated areas of the orchard. Other trees were

treated with calcium chloride foliar sprays (4 quarts per acre) periodically through the season. In December, a student working under UC Davis plant pathologist, Bruce Kirkpatrick, injected treated and untreated trees with the *Pseudomonas syringae* bacteria to determine if the fertilizer treatments made the trees more resistant to bacterial canker. After about two months, the inoculated shoots were collected and the severity of bacterial canker disease was assessed by measuring the lesions that grew in inoculated shoots.

We had some very clear results. From the table on the next page, you can see that trees growing in fumigated areas were much more resistant to the bacterial canker pathogen. Bacterial canker lesions in fumigated trees grew only about one inch during those two months. In contrast, lesions in unfumigated trees grew about one foot. However, when we treated unfumigated trees with a fall foliar urea spray, lesions only grew about an inch – about the same as in trees fumigated with methyl bromide! So it appears that a fall foliar urea spray may really help with resistance to bacterial canker. The calcium treatments helped also, but results were not as dramatic as the urea treatment. We plan to repeat this test this winter.

Foliar urea may advance defoliation (similar to zinc sulfate sprays) due to marginal leaf burn. The suggestion at this time is 100 pounds of low biuret urea (yes, I said 100 pounds) per acre. This will give you close to 50 pounds of N per acre. The time of application should be in October; September is too early to start defoliation and by November excessive senescence can be under way. I have not tested less than 100 lb. of low biuret urea per acre. I do not know if the same effects could be achieved with a lower rate. Regular urea is less expensive than low biuret urea and can probably be used safely in peaches for a fall spray. Apparently urea produced in some overseas plants can reach dangerously high biuret levels. High biuret can cause excessive shoot or bud burn. I have not yet tested this spray in almonds but plan to try various rates this fall.

Effects of Fumigation and Foliar Urea or Calcium on Bacterial Canker Lesion Length

Foliar Fertilizer Spray	Preplant Methyl Bromide Fumigation?	Lesion Length (mm)	
Grower's fertility program	No	301	a
Supplemental calcium sprays	No	78	b
Supplemental urea spray	No	27	c
Grower's fertility program	Yes	26	c
Supplemental calcium sprays	Yes	23	c
Supplemental urea spray	Yes	20	c