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# Citrus Notes



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## How Much Fertilizer?

Remember the leaf sample you had analyzed last summer? Well, dig out the report and also last year's fertilizer bill. The bill should give you the amount of nitrogen you applied. With some calculations you can have this information in terms of pounds of nitrogen used per tree. Next, look at the leaf analysis report and see where the trees were in the summer. At this point, you can decide if the amount used last year was enough, too much, or too little.

If last spring's nitrogen applications gave leaf tissue levels that were in the adequate or optimum range, then similar amounts can be used this year—and checked by obtaining a leaf sample later this summer. If the leaf percentages were in the low or high range, adjust this year's application accordingly.

## Fruit Color and Nitrogen Fertilization

Nutrition research has provided the guidelines for application amounts and timing. The citrus industry has standards that enable fertilization programs to be designed for maximum production and quality.

One of the principles learned from this research is that the citrus tree requires and uses nitrogen when it begins to grow, flower, and set fruit in the spring. It has also been established that highest color and least re-greening are associated with early applications of proper amounts. With Valencias, it has been found that summer applications of N result in a greater re-greening when the fruit matures and is held late.

## Money Grows On Trees

A blank space in the orchard costs you something. You'll spend about \$19 for cultural operations each year including irrigation, spraying, and wind machine air over the open spots. Some taxes are involved, too. For a few dollars more, you can put in a young vigorous tree, and the money you're spending on blank spaces will accomplish something. In a few years, it will pay you back.

Blank spaces aren't the only spots that fail to pay their own way. It's not unusual to find one-third of the orchards are producing one-half of the fruit. The other two-thirds have trees that loaf along with 2 or 3 boxes each season. What can be done for such trees?

Give them the proper treatment – like gently lifting them out of the ground.

A tree culling and replacement program can be set up with a rating system to guide removals. A simple chart or map showing trees that should be replaced tells a lot about the producing ability of a grove. An inventory of this type also helps with other management procedures, such as showing where changes in the irrigation system might be needed. Why not analyze your grove this spring?

## Flooding and Root Injury

Prolonged saturation of soil poses problems of root damage developing this season. Spring rains are more hazardous for root injury since the trees are becoming active with new growth and waterlogged roots can't keep up with this

demand. Roots can drown and be subject to invasion by various organisms capable of additional injury.

The most desirable underground environment for healthy roots is one that provides adequate drainage of excess water from the root zone during the growing season.

The historical rainfall pattern for the San Joaquin Valley indicates a good probability of more water to be added to soils already filled. Provisions should be made for removing surface accumulations out of orchards as soon as possible. Pondered water creates the greatest risk.

### **Brown Rot Gummosis**

Ponding, saturated soil and extended rainfall events create the opportunity for invasion of the soil fungus *Phytophthora*.

### **Symptoms**

An early symptom of *Phytophthora* gummosis is sap oozing from small cracks in the infected bark, giving the tree a bleeding appearance. The gumming may be washed off during heavy rain. The bark stays firm, dries, and eventually cracks and sloughs off. Lesions spread around the circumference of the trunk, slowly girdling the tree. Decline may occur rapidly within a year, especially under conditions favorable for disease development, or may occur over several years.

### **Comments on the Disease**

*Phytophthora* fungi are present in almost all citrus orchards. Under moist conditions, the fungi produce large numbers of motile zoospores, which are splashed onto the tree trunks. The *Phytophthora* species causing gummosis develop rapidly under moist, cool conditions. Hot summer weather slows disease spread and helps drying and healing of the lesions.

Secondary infections often occur through lesions created by *Phytophthora*. These infections kill and discolor the wood, in contrast to *Phytophthora* infections, which do not discolor wood.

### **Brown Rot Gummosis Treatment Options**

Inspect your orchard several times a year for disease symptoms. Look for signs of gumming on the lower trunk and crown, and for soil buildup around the crown; do not allow bud unions to get buried. Wrappers on young trees should be lifted or removed for inspection. When you detect gum lesions, check soil and drainage conditions. Systemic fungicides can control *Phytophthora* gummosis and copper sprays can be used to protect against infection.



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PlantShield HC by BioWorks, Inc. received a Special Local Need registration in California for management of *Hyphoderma* gummosis of citrus. The Section 24C was issued in July 2008. The active ingredient is a patented fungus, *Trichoderma harzianum* strain T-22, that protects plants from many plant pathogens. The product PlantShield HC is sold in California as a biological soil amendment for nursery and ornamental crops and now the label has been expanded to allow foliar and branch treatments of citrus trees in production. Specifically, the label allows the biological control material to be a treatment of wood-exposing wounds of citrus in California.

The pathogen *Hyphoderma sambuci* causes the disease *Hyphoderma* gummosis of citrus trees. *Hyphoderma* gummosis has only recently been

described causing disease on lemons and potentially other citrus crops in California. Symptoms include yellowing of leaves, branch cankers and dieback of entire scaffold branches, as well as eventual tree death. The organism is a wood decay fungus that belongs to the Basidiomycota and enters woody plants through wood-exposing wounds. Air-borne basidiospores are actively released from fruiting bodies, deposited on pruning wounds or other injuries, and germinate in wet environments. The colorless, thin-walled spores are not long-lived; however, once the fungus is established in the wood of the tree, the organism can persist for years producing numerous annual fruiting bodies (and more spores!). Although research has been conducted on the use of wound-protecting fungicides against wood decaying fungi, fungicides are not systemic in wood and only provide a superficial barrier that can be breached by the fungus. As the wounds heal, drying occurs and subsequent cracks in the wound expose untreated areas.

In our research, treatments with this biological control PlantShield HC were very successful in protecting wood-exposing wounds from the wood decay pathogen *H sambuci* due to its ability to colonize host tissue and allow for natural wound healing and preventing invasion by the pathogen. Thus, the biological control organism provides

protection by excluding the pathogen as a primary colonizer. *Trichoderma* species are also known mycoparasites. Thus, these species can parasitize other fungi. Thus, parasitism is an additional mechanism of plant protection.

### **Gum Production With Hypoderma**

Currently, PlantShield HC is an EPA-registered and OMR1-approved organic product for use on selected crops in the United States, including California. The new use of the biological control is for protecting tree wounds where wood is exposed. The Section 24C label is for most citrus-producing counties in California including: Fresno, Imperial, Kern, Kings, Madera, Riverside, San Bernardino, San Diego, Stanislaus, Tulare, and Ventura. The treatment is applied with a non-air-assisted (high volume) sprayer or hand application with a paint brush following pruning or other wood exposing injuries. Pruning wounds and other wood exposing injuries should be treated as soon as possible after pruning or within 4 to 5 days (application should be done at temperatures above 48F). A total of one to two applications can be made to wood-exposing injuries. There are no restrictive entry interval (REI) requirements. PlantShield HC should not be applied within 30 days of harvest of lemons. For specific directions on usage and disposal; follow the current label.

### **Gum Production With Hypoderma**



### **Staining in Wood with Hypoderma**



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