

what would have happened without the Promalin spray.

- **Do not apply Promalin and NAA to Delicious in the same year, as small, seedless fruits may develop**

### REDUCTION IN RUSSETING OF GOLDEN DELICIOUS

Rain, high humidity, and fluctuations in temperature during early fruit development may cause Golden Delicious fruit to russet. If severe, this russetting may lower fruit grade. Gibberellins A4+7 application, sold as Provide, will reduce skin russetting that is caused by environmental factors early in the season.

Concentration and timing: Apply 2–4 applications of 15–20 ppm Provide (10–13 ozs./100 gals.) starting at petal fall and continuing at 7 to 10 day intervals. The early applications are most important.

Special considerations:

- Do not apply over 100 gallons of spray per acre.
  - Do not use a surfactant or a spreader-sticker because they may increase russetting.
  - Do not apply more than a total of 40 ozs./acre because return bloom may be reduced.
- **The restricted entry interval is 12 hours.**

### USE OF ETHEPHON TO CONTROL VEGETATIVE GROWTH

Ethephon application to **young non-bearing trees** when shoots are 4–6 inches long (10–14 days after full bloom) has reduced shoot growth and increased flower bud development.

#### **Non-Spur Strains.**

ethephon 1.5–2 pints/100 gals. dilute.

#### **Spur-Type Strains.**

ethephon 1 pint/100 gals. dilute

**The restricted entry interval for Ethrel (ethephon) is 48 hours.**

### Use of Apogee® to Control Vegetative Growth

Apogee has several benefits when applied to apple trees. It reduces terminal growth, thus reducing the time required to dormant prune and summer prune. It increases red color development by increasing light penetration into the tree canopy thereby potentially eliminating the need to summer prune to improve fruit color. It improves spray coverage and therefore, may increase the likelihood of effective pest control, primarily attributed to reduced growth and the resultant reduction in canopy volume and density. It reduces the incidence and severity of fire blight on shoots (shoot blight).

Apogee, prohexidione calcium, reduces terminal growth by inhibiting the synthesis of gibberellins, a group of endogenous hormones that are primarily responsible for the regulation of terminal growth. Once applied, it requires 10 to 14 days to slow growth. It degrades within the tree in a few weeks, so at least one repeat application (and probably more) will be necessary to maintain growth control throughout the growing season, particularly with vigorous cultivars or under environmental conditions favorable for tree growth.

**Time of Application.** Terminal shoot growth in the northeastern United States occurs very rapidly during the early part of the season. Since it requires up to 2 weeks for Apogee to slow growth, it is essential to make the first application when terminal shoots are no longer than 1 to 1.5 inches and when adequate leaf area has emerged to absorb it. This typically occurs during bloom or early petal fall. Apogee has no adverse effects on bees, so the first application can be made while bees are still in the orchard.

Additional applications will be required. Generally a second application is made at a reduced rate 2 to 3 weeks after the first. The need for additional applications will depend upon concentration used and the vigor potential of the trees, which is a combination of factors including cultivar, rootstock, soil, water available, and crop load.

**Amount to Apply.** The label allows application of between 3 and 12 ounces per 100 gallon of dilute spray (62.5 to 250 ppm). We

recommend application of no more than 6 ounces per 100 gallons in the first application, and suggest that 4 or 5 ounces per 100 gallons may be more appropriate. The amount of product that you actually apply will depend upon the tree row volume (TRV). For example, if you decide to apply 6 ounces per 100 gallons of spray on a block with a TRV requiring 200 gallons per acre in a dilute spray, you would apply 12 ounces of Apogee per acre. Rates between 2 to 4 ounces per 100 gallons dilute spray should give adequate growth control in subsequent applications. While we frequently suggest that growth regulators should be applied as a dilute spray, Apogee has been very effective when applied in water volumes less than TRV, as long as the appropriate rate per acre is maintained and good coverage is achieved. Water volumes below 50 gallons per acre are not recommended.

**Apply with a Surfactant.** Absorption and performance of Apogee are improved if a surfactant is included with each application. No one surfactant has been identified as being best, but Regulaid, LI-700, Induce, and Triton B 1956 have been consistently effective. Generally, a surfactant rate of 1 pint per 100 gallons assures good wetting and coverage.

**Use a Water Conditioner.** Apogee may precipitate out of the spray solution, thus becoming ineffective, if it is applied in spray water that is too hard. Further, the addition of a water conditioner may improve the growth-retarding effect of Apogee, regardless of water hardness. Ammonium sulfate should be used with equal weights of Apogee. Alternatively, 2 pints of either of the water conditioners Quest or Choice can replace one pound of ammonium sulfate.

#### **Precautions when Using Apogee.**

Apogee may increase fruit set. This response is particularly pronounced in the Northeast and is linear with increasing Apogee rate. Application of Apogee at petal fall should be restricted to rates below 6 ounces per 100 gallons to minimize effect on increasing fruit set. A more aggressive thinning program will be necessary on blocks that receive Apogee.

Interactions may occur with gibberellin-containing products. Apogee may reduce the

effectiveness of Provide when this product is applied to apples to reduce fruit russetting. However, Apogee does not appear to influence the efficacy of Promalin when used to improve the shape of apples or to modify the response of Accel when applied as a thinner on apples.

Apogee may cause fruit cracking on Empire apples. Although this is not noted every year or in all locations, the response is sufficiently consistent and severe to suggest it should not be used on this cultivar. Fruit cracking has also been noted on Stayman when grown in the mid-Atlantic region.

**Use of Apogee to Control Fire Blight.** Apogee will control fire blight on shoots by inducing resistance in the tree, although the exact mechanism is still unknown. For it to be effective, Apogee must be applied, and growth retardation must occur, before infection. Generally this requires that application must occur a minimum of 10 to 12 days before infection. The active ingredient in Apogee appears not to have any direct effect on the fire blight bacteria. It is not effective on blossom blight, so traditional measures using products labeled for control of the blossom phase are appropriate.

Application of Apogee to control fire blight should be made at the same time as applications to control growth, when shoots are 1 to 1.5 inches in length, and at a rate of 6 ounces per 100 gallons. Higher rates are not recommended because of complications associated with increased fruit set. A second application at the 2 to 4 ounce rate two to three weeks later will be necessary. If signs of bud break are seen later in the summer, a third (or more) application(s) at 2 to 3 ounces per 100 gallons should be made.

## **CALCIUM FOLIAR SPRAYS and POSTHARVEST DIPS**

Calcium (calcium chloride or calcium nitrate) tree sprays have been shown to increase the calcium content of the fruit, and to reduce fruit problems that are associated with inadequate calcium: bitter pit, scald, breakdown, and rot. Foliar sprays should begin about 3 weeks after petal fall and be repeated at