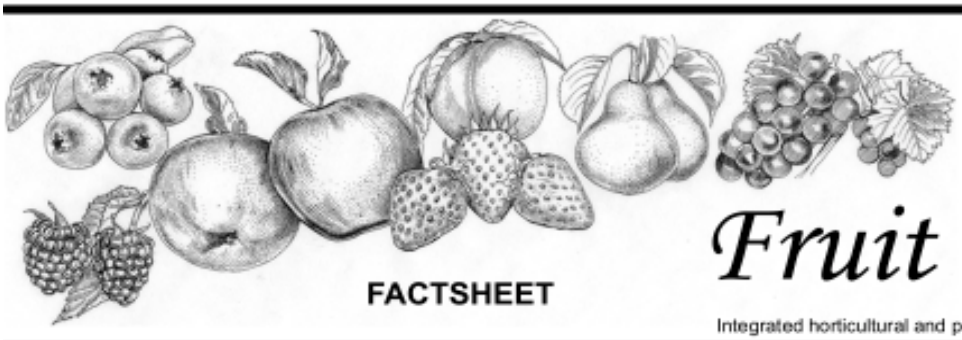

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Apogee® - A New Growth Retardant for Apples

Duane W. Greene and Wesley R. Autio

Department of Plant & Soil Sciences, University of Massachusetts

Registration was recently approved for the new growth retardant Apogee® for use on apples in Massachusetts. The purpose of this communication is to update information based on recent research and observations made during the second year of commercial use.

Research has confirmed that the Apogee can have 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 on apples and in some instances will replace the need to summer prune. It reduces the incidence and severity of fire blight on shoots (shoot blight). Improved spray coverage and reduced disease pressure have also been cited as benefits of Apogee, primarily attributed to reduced growth and the resultant reduction in canopy volume and density.

Apogee, prohexidione calcium, reduces terminal growth by inhibiting the synthesis of gibberellins, a group of endogenous hormones that are primarily responsible for regulation of terminal growth in apple trees. Once applied, Apogee requires between 10 and 14 days to slow growth. It degrades within the trees in a few weeks, so at least one repeat application may be necessary to maintain growth control throughout the whole growing season.

Patterns of terminal growth and fruit set characteristics differ among regions in the country. Likewise, the response to Apogee appears to differ depending upon the area of the country where it is used. Therefore, a regional interpretation of the label is necessary to obtain maximum response and satisfaction from this compound.

Time of Application

Terminal shoot growth in the Northeast and the northern tier of the United States proceeds rapidly during the early part of the season. Since it requires up to 2 weeks for Apogee to slow growth effectively, it is essential to make the first application when terminal shoots are no longer than 1 to 1.5 inches. This usually coincides with late bloom or petal fall. The first application is made at this time, since sufficient leaf area has developed to absorb Apogee. Satisfaction from the use of Apogee will depend upon making the first application at this time, and no later. It has no detrimental effects on bees, so the first application can be made before the bees are removed from the orchard.

Amount to Apply

The label suggests rates of application between 3 and 12 ounces per 100 gallons of dilute spray (62.5 to 250 ppm). It may be applied as a single spray, or more frequently as multiple sprays. The amount of Apogee to apply during the season will depend upon tree vigor, tree size, and growth potential. The amount that you should apply at any one time per acre 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 of trees with a TRV requiring 200 gallons per acre in a dilute spray, you would apply 12 ounces of Apogee per acre. While we frequently suggest that plant growth regulators should be applied dilute, Apogee has been used very effectively when applied in water volumes less that

TRV, as long as thorough coverage is achieved. Water volumes below 50 gallons per acre are not recommended.

BASF provided on the label a number of scenarios involving concentration to apply and the number of applications to make under several growth-control circumstances. Experts who have worked with this compound for several years do not agree on the amount to apply initially, how many applications to make, and how to decide when it is appropriate to make additional applications. These decisions are particularly challenging in the Northeast, because the amount of Apogee required to retard growth early in the season may result in excessive fruit set and thus in increased thinning challenges. Growers may be required to use the trial-and-error method initially to determine the best combination for use in their situation.

We suggest an initial application at 1 to 1.5 inches of growth of no more than 6 ounces per 100 gallons. If you have a vigorous block of trees and you do not want to assume the responsibility of monitoring the resumption of growth on a nearly daily basis, we recommend that you make a second application of 3 to 6 ounces per 100 gallons 2 weeks after the first. That may be all the Apogee that you need to apply for the year. If you are willing to invest the time in frequent monitoring, you may wait until you see the first signs of regrowth in the tops of the tress, then apply 3 to 6 ounces of Apogee per 100 gallons. A third application of 3 to 6 ounces per 100 gallons may be necessary only under the most extreme situations where vegetative growth is very vigorous or where 3 ounces per 100 gallons was used in the two previous sprays.

Additives with Apogee

Surfactants. With Apogee, it is recommended that a surfactant be used at a rate of 1 pint per 100 gallons to assure good wetting and coverage. No one surfactant has been identified as being the best, but Regulaid®, LI-700®, and Triton B 1956® have been used effectively. While silicone-based surfactants such as Silwet or Silgard offer advantages for enhanced uptake with other plant growth regulators, they do not appear to be clearly superior to the less expensive surfactants just mentioned. Work continues to identify appropriate surfactants for use with Apogee.

Water conditioning. If the water Apogee is applied in is hard and contains 500 ppm or greater calcium, the effect of Apogee will be reduced. In this case, it will be necessary to add an equal weight of ammonium sulfate with Apogee. Two pints of either of the water conditioners Quest or Choice can replace one pound of ammonium sulfate. Research this past year indicated that the addition of a water conditioner may improve the growth-retarding effects of Apogee, regardless of hardness of water.

Foliar Nutrient Spray Interactions

The Apogee label recommends that foliar nutrient sprays should not be tank mixed with Apogee. This warning is especially appropriate for calcium chloride and other calcium-containing products. In the presence of calcium, Apogee will precipitate in the tank, clog nozzles and screens, and reduce tree response. If you are using calcium chloride sprays, residues left on the leaves may reduce the effectiveness of later Apogee applications.

Increased Fruit Set

Apogee may increase fruit set and make thinning more difficult. This response is particularly pronounced in the Northeast and is linear with increasing concentration. In the majority of cases where 12 ounce per 100 gallons is used, fruit set will be increased with a corresponding decrease in fruit size. Increased fruit set has also been noted with 6 ounce per 100 gallon. On Apogee-treated trees, we recommend a more aggressive thinning to reduce crop load to the desired level.

Use with Promalin®, Provide®, and Accel®

Promalin, Provide, and Accel are gibberellin-containing products that are applied in the bloom-postbloom period to improve fruit shape, to reduce fruit russeting, and to thin, respectively. Apogee will inhibit gibberellin production in the tree. Apogee does not diminish the response to either Promalin or Accel. However, Apogee may reduce the effectiveness of Provide when applied to apples to reduce fruit russeting.

Fruit Quality the Year of Application

We have noted no direct effects of Apogee on fruit quality or storage potential in the year of application or in the following year. The effects that it has on increased fruit red color are indirect and can

be attributed to increased light exposure resulting from growth retardation.

Return Bloom

In general, we feel that Apogee does not have any direct influence on increasing flower-bud formation. Even when there is substantial growth retardation, large increases in flower-bud formation usually are not seen. However, in circumstances where it increased fruit set, and there was not follow up with aggressive thinning, reduced return bloom has been noted.

Use of Apogee to Control Fire Blight

Apogee will control fire blight on shoots by inducing resistance in the tree. For it to be effective, it 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 to not have any direct effect on the fire blight bacteria. It is not effective on blossom blight, so traditional control measures using streptomycin 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 at a rate of 6 ounces per 100 gallons. The label allows application rates up to 12 ounces per 100 gallons. While a higher rate is quite effective for controlling fire blight, it frequently increases fruit set, makes thinning difficult, and may ultimately result in small fruit size. A second application at the 3 to 6 ounce rate two to three weeks later will be necessary. Look for signs of bud break, and if it is observed a third application at 3 ounces per 100 gallons may be necessary.

Estimated cost and amount of Apogee per application to use for vegetative growth control and reduction of fire blight at a range of dilute gallons per acre.

Dilute gallons per acre	Ounces per acre at:			Cost ($90/pound)[1] per acre at:		
	3 oz. per 100 gal.	6 oz. per 100 gal.	12 oz. per 100 gal.	3 oz. per 100 gal.	6 oz. per 100 gal.	12 oz. per 100 gal.
100	3	6	12	$17	$34	$68
150	4.5	9	18	$25	$51	$101
200	6	12	24	$34	$68	$135
250	7.5	15	30	$42	$84	$169
300	9	18	36	$51	$101	$203
350	10.5	21	42	$59	$118	$236
400	12	24	48	$68	$135	$270

[1]Actual cost may vary depending upon source and region.

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