Naphthalene Acetic Acid and Apogee Control Growth in the Tops of Dwarf Apple Trees

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For a number of years in Europe, orchardists have used high concentrations of naphthalene acetic acid (NAA, as Tre-hold Sprout Inhibitor) mixed in a flexible pruning paint as a way to suppress growth in the top of high-density, dwarf apple trees. This technique may also be valuable for North American orchardists by providing an additional tool to control growth in dwarf trees without having to resort to pruning.

To study the potential of NAA for growth suppression, four trials were conducted in 2004 (Fruit Notes, Summer, 2005) and two in 2005 (Fruit Notes, Spring, 2006) at the UMass Cold Spring Orchard Research & Education Center, Belchertown, MA. Together, the results from these six trials suggested that 1.5% NAA in a carrier painted as a 3-inch band around the trunk could give significant growth reduction in the top of young apple trees. Also, it appeared that the carrier for the NAA could affect the result, with more flexible carriers with longer drying possible increasing the degree of growth suppression. Further, treating one-year-old wood caused greater reductions that treating older wood.

The objectives of the trials presented here were to determine if differences exist in the efficacy of NAA treatment with various commercially available carriers, to examine the response of trees treated with higher concentrations of NAA applied to older wood, and to compare results to directed Apogee applications.

Materials & Methods

In 2006, seven trials were conducted at the Rutgers Snyder Research & Extension Farm in Pittstown, NJ, and one was conducted at Tougas Family Farm in Northborough, MA. The source of NAA was Tre-hold Sprout Inhibitor A112 (15.1% NAA) provided by Amvac Chemical Corporation (also sold by Monterey Chemical Company as Sucker Stopper Concentrate). Trials utilized various carriers for the NAA to determine if there were differences among commercially available paints and trunk-treating compounds. These carriers included standard, interior, white latex paint, Tanglefoot Pruning Sealer (black, asphalt based), Tanglefoot Tree Sealer (green, latex based), and Tanglefoot Tree Wound (black, latex based). Most treatments were applied at the base of one-year-old wood and were at a rate of 1.5% NAA. Two experiments at Rutgers Snyder Research & Extension Farm, however, treated older wood with higher concentrations of NAA (3 and 4%). Timing was from early bloom through petal fall. Apogee was also included, but was applied only to the top of trees to differentially reduce growth in the top and not the bottom. Experimental details are provided on Tables 1 and 2.

Results

In 2006 (Table 1) at early bloom, 4-yr-old BeniShogun Fuji/B.9, Rising Sun Fuji/B.9, September Wonder Fuji/B.9, Early Auvil Fuji/B.9, and Macoun/B.9 apple trees were treated with NAA (1.5% in interior white latex paint or Tanglefoot Tree Wound, Pruning Sealer, or Tree Sealer) in a 3-inch band completely around the central leader at the base of one-year-old wood. An additional group of BeniShogun Fuji and Macoun trees were treated above the base of one-

Table 1. Growth in 2006 as affected by treatments applied to the tops of super spindle apple trees at or near bloom in 2006. Macoun, Golden Supreme, and Buckeye Gala were planted in 2002, and the Fuji strains were planted in 2003. Rutgers Snyder Research & Extension Farm, Pittstown, NJ.[z]

Treatment[y]	Leader growth (2006, cm)	Number of lateral branches	Average length of laterals (cm)	Total shoot growth (cm)
BeniShogun® Fuji/B.9 – 1-year-old wood				
Control	26.6 a	6.9 a	11.5 a	114 a
Tree Wound + 1.5% NAA	14.7 ab	1.6 b	7.7 ab	28 b
Pruning Sealer + 1.5% NAA	24.0 a	1.6 b	6.7 ab	36 b
Tree Sealer + 1.5% NAA	20.1 ab	1.9 b	5.7 b	32 b
Latex paint + 1.5% NAA	18.9 ab	2.7 b	5.2 b	38 b
Apogee	10.4 b	7.0 a	5.1 b	49 b
Macoun/B.9 – 1-year-old wood				
Control	25.8 a	6.2 a	8.8 a	89 a
Tree Wound + 1.5% NAA	19.0 a	4.6 a	7.9 a	55 a
Prunig Sealer + 1.5% NAA	24.6 a	5.2 a	7.3 a	62 a
Tree Sealer + 1.5% NAA	22.0 a	5.2 a	8.4 a	69 a
Latex paint + 1.5% NAA	24.6 a	6.0 a	8.6 a	79 a
Apogee	16.8 a	7.2 a	5.9 a	60 a
Rising Sun™ Fuji/B.9 – 1-year-old wood				
Control	31.9 a	10.1 ab	14.7 ab	160 b
Tree Sealer + 1.5% NAA	24.7 a	6.4 b	9.7 a	89 c
Tree Sealer (green latex)	35.0 a	12.8 a	17.2 a	256 a
September Wonder Fuji®/B.9 – 1-year-old wood				
Control	27.3 ab	3.4 b	9.5 b	63 b
Tree Wound + 1.5% NAA	19.8 b	1.8 b	10.7 b	39 b
Tree Wound (black latex)	31.0 a	7.0 a	14.8 a	139 a
Early Auvil Fuji™/B.9 – 1-year-old wood				
Control	39.7 a	10.1 a	17.2 a	230 a
Pruning Sealer + 1.5% NAA	23.5 b	3.7 b	8.1 b	57 b
Pruning Sealer (black asphalt)	35.5 ab	9.9 a	15.5 a	199 a
Golden Supreme/B.9 – 3-year-old wood				
Control	31.1 a	8.0 a	8.7 a	103 a
Tree Wound + 4% NAA	24.8 ab	6.1 a	9.9 a	83 a
Apogee	20.8 b	7.8 a	7.6 a	79 a
Buckeye Gala®/B.9 – 2-year-old wood				
Control	29.6 a	7.1 a	10.5 a	112 a
Tree Wound + 3% NAA	25.3 ab	7.1 a	7.5 ab	81 a
Apogee	21.4 b	7.4 a	6.1 b	70 a

[z]All shoots arising from the previous season's leader growth were measured, the terminal growth presented as the leader, lateral growth presented as the number and average length, and all growth from that previous season's leader presented as total shoot growth. Mean separation within column and cultivar by Duncan's New Multiple Range Test ($P = 0.05$).

[y] NAA treatments were at 1.5% and were applied at early bloom (April 26, 2006). Latex paint was standard, white, interior latex. Pruning Sealer (black asphalt), Tree Sealer (green latex), and Tree Wound (black latex) are different Tanglefoot Company products. NAA treatments were applied in a 7.6-cm (3-inch) band around the trunk at the base of 1-year-old wood (BeniShogun, Macoun, Rising Sun, September Wonder, and Early Auvil), at the base of 2-year-old wood (Buckeye), or at the base of 3-year-old wood (Golden Supreme). Apogee® was applied twice at 125 ppm (6 ounce/100 gallons) along with ammonium sulfate at 0.05% (6 ounces/100 gallons) and Regulaid® at 0.1% (0.4 quart/100 gallons) on April 26 and May 22, 2006. Application was to all canopy above the base of 1-year-old wood (BeniShogun and Macoun), 2-year-old wood (Buckeye Gala), or 3-year-old wood (Golden Supreme) on the trunk.

Table 2. Growth in 2006 as affected by treatments applied to the tops of super spindle apple trees at or near bloom in 2006. Macoun trees on M.9 rootstock were planted in 2005 at Tougas Family Farm, Northborough, MA.[z]

Treatment[y]	Leader growth (2006, cm)	Number of lateral branches	Average length of laterals (cm)	Total shoot growth (cm)
Control	53.1 ab	4.0 a	15.1 a	102 ab
Apogee	11.5 e	4.1 a	5.8 c	34 c
Latex paint (white)	49.1 ab	2.9 a	20.0 a	95 ab
Pruning Sealer (black asphalt)	56.0 a	3.0 a	16.7 a	102 ab
Tree Sealer (green latex)	47.7 ab	4.0 a	19.7 a	119 a
Tree Wound (black latex)	46.1 b	3.6 a	13.9 ab	88 b
Latex paint + 1.5% NAA	36.1 c	2.5 a	7.9 bc	57 c
Pruning Sealer + 1.5% NAA	30.4 cd	2.3 a	5.8 c	45 c
Tree Sealer + 1.5% NAA	27.3 d	3.5 a	8.4 bc	54 c
Tree Wound + 1.5% NAA	31.4 cd	2.1 a	5.7 c	45 c

[z]All shoots arising from the previous season's leader growth were measured, the terminal growth presented as the leader, lateral growth presented as the number and average length, and all growth from that previous season's leader presented as total shoot growth. Mean separation within column by Duncan's New Multiple Range Test ($P = 0.05$).

[y] NAA treatments were at 1.5% and were applied just after petal fall (3-5mm fruit diameter, May 18, 2006). Latex paint was standard, white, interior latex. Pruning Sealer (black asphalt), Tree Sealer (green latex), and Tree Wound (black latex) are different Tanglefoot Company products. NAA treatments were applied in a 7.6-cm (3-inch) band around the trunk at the base of 1-year-old wood. Apogee® was applied at 250 ppm (12 ounce/100 gallons) along with ammonium sulfate at 0.1% (12 ounces/100 gallons) and Regulaid® at 0.1% (0.4 quart/100 gallons) on May 18, 2006. Application was to all canopy above the base of 1-year-old wood.

year-old wood with Apogee (6 ounces/100 gallons, with surfactant and ammonium sulfate, on April 26 and May 22). NAA carrier did not affect the response. NAA reduced leader growth by 26%, number of laterals above the application by 47%, average length of laterals by 25%, and total growth above the application by 51%. Apogee reduced leader growth by 48%, average length of laterals by 42%, and total growth by 45% but did not affect number of laterals.

Treating older wood with 3-4% NAA caused small but statistically nonsignificant reductions in vegetative growth (Table 1).

Also in 2006 (Table 2), at petal fall, one-year-old Macoun/M.9 were treated with NAA at 1.5% in the same carriers and in the same manner as noted above. At the same time, Apogee (12 ounces/100 gallons, with surfactant and ammonium sulfate) was applied on May 18 to one group of trees above the base of one-year-old wood. Carriers did not alter the effects of NAA or affect growth themselves. NAA application reduced leader growth by 41%, number of laterals above the application by 35%, average length laterals by 54%, and total shoot growth above the application by 51%. Apogee reduced leader growth by 78%, average length of laterals by 62%, and total shoot growth by 70% but did not affect the number of laterals.

Conclusions

These results show clearly that both NAA and

Apogee differentially reduced growth in the top of dwarf apple trees and may be a viable commercial tool for managing such trees. Combined with results from the two previous years, the best response from NAA is obtained from application at 1.5% in a reasonable flexible tree paint in a 3-inch band at the base of one-year-old wood. Treatment at or near bloom gives a good response.

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Evaluation of New Fruit Acres (FA) Named/Numbered Peach Varieties/ Selections

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In 2005, evaluation of new named and numbered peach selections from the Fruit Acres (FA) peach breeding program in southwest Michigan (Annette and Randy Bjorge) continued at the UMass Cold Spring Orchard Research & Education Center in Belchertown. These newer, generally highly coloring varieties are a promising alternative (primarily because they are highly red colored) to currently planted peach cultivars for direct-market Massachusetts peach growers. However, little has been reported on their general hardiness and adaptability to this area. This evaluation is an ongoing partnership with International Plant Management (IPM), Lawrence, MI.

Fruit from FA named and numbered peach trees planted from 2001-04 were harvested and evaluated (10-peach sample) in 2005 over a period from July 26 to September 29. Note that all trees are planted at high-density (4-5 feet between trees) and grown to a perpendicular-V training system. Brief results of this 2005 evaluation of named FA cultivars are presented in Table 1. Numbered FA selections (FA-XXX, 24 of them) were evaluated but not included per a confidentiality agreement with IPM.

Risingstar and Blazingstar are probably already the most widely planted FA peaches in Massachusetts. In fact, we already grow them commercially at the UMass Cold Spring Orchard. Blazingstar is a little less bud hardy than we might like. Earlystar (FA-101) and Brightstar (FA-102) are newly named and appear very promising, particularly Earlystar because of its early harvest. Among the rest, Redstar and Starfire are 'red-color enhanced' alternatives to Redhaven, while Allstar does not appear to stand out. Blushingstar is a white-flesh peach that has some promise, however, very uneven ripening may be an issue.

These named FA cultivars will continue to be evaluated in 2006, along with a more limited number of the numbered selections as some of these have already been discontinued by IPM and trees will be removed this growing season.