2003 Report: for Southern Region Small Fruit Consortium

Title: Evaluation of Wintertime Sprays of Soybean Oil to Delay Flower Bud Phenology and Thin Fruit of Rabbiteye and Southern Highbush Blueberries

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Objectives:
1) To determine if soybean oil sprays after the completion of endodormancy may delay flower bud phenology of rabbiteye and southern highbush blueberries.
2) To determine if the soybean oil treatments may thin flower buds and thus thin fruit.
3) To compare a new formulation of soybean oil to one previously used in tree fruit trials.
4) To evaluate the concentration effects of the new soybean oil formulation on bloom delay and fruit thinning.

Justification: Acreage of southern highbush and rabbiteye blueberries is increasing, mostly in the Southeast. Spears et al. reported in 1998 that the acreage in southern highbush was predicted to increase from 1,300 acres in 1998 to 6,500 acres in 2008. Rabbiteye blueberries were predicted to increase from 8,500 acre to 12,600 acres.

Late winter frost is a primary cause of yield reduction of rabbiteye and southern highbush blueberries. Boland (2002) reported in an Impact Statement from the Univ. of Georgia that frost during bloom can wipe out an entire southern highbush crop. He reported a crop loss of 80% in Brantley County, Georgia. Delay of blueberry bloom by even a few days may reduce crop loss. Our research has shown that sprays of 8% to 10% soybean oil in late January to early February in Tennessee can delay peach bloom by up to seven days. The oil sprays also caused peach flower bud mortality in a predictable dose-response relationship. If blueberry flower buds can be thinned by soybean oil sprays, then costs associated with labor to reduce crop load may be reduced.

Our previous research used a soybean oil formulation (TNsoy1), with Latron B-1956 premixed at a rate of 10% of the soybean oil concentration before adding to the spray water. The formulation controlled mites and insects, delayed peach bloom and thinned peach flower buds. However, the emulsion separated quickly in the spray tank, and the adjuvant was a costly component of the formulation. Our laboratory is making new formulations that are more stable in emulsion than TNsoy1.

Methodologies: Trials comparing the effects of soybean oil formulations and concentrations were conducted on rabbiteye blueberries in commercial plantings in Tennessee and North Carolina. All treatments were applied during the last week of February, 2003. Mature 'Tifblue' bushes near Spring City, Tenn. were sprayed to runoff with water (control); 5%, or 8% a.i. (soybean oil) TNsoy1, TNsoy10a (our newest soybean oil formulation), or Golden Natural (a commercial formulation. The treatments were arranged in a randomized complete design with seven replications. Similar trials were conducted on 'Tifblue' and 'Climax' plants near Unicoi, Tenn. and on 'Tifblue' and 'Centurion' at Conover, N.C. A trial using young plants of various Southern highbush cultivars as replications was conducted at the Mountain Crop Research Station, Fletcher, N.C. to compare effects of 8% oil sprays of the formulations.

Twenty-five buds/plant were sampled at random from the upper-exterior of each plant at Spring City and Unicoi at 14-21 days after treatment. The buds were dissected to determine injury of buds. The 'Tifblue' plants at Conover were located in a frost-prone site and were exposed to a freeze

during bloom. More than 100 buds per treatment of 'Tifblue' and 'Centurion' were cut and evaluated for cold damage. The 'Tifblue' trial was discontinued after the freeze. Flower bud development was evaluated periodically using a scale published by Spiers (1978). Starting at first flower opening, bloom opening (%) was periodically rated.

Two limbs per plant were enclosed in mesh bags before harvest. Fruit were harvested from the limbs at approximately weekly intervals. Mean fruit size and distribution of percentage of total harvest by dates were determined.

Results: The 8% oil sprays of each formulation delayed flower bud development and early spring flowering (rating date: 22 Apr.) of 'Tifblue' rabbiteye blueberries at Unicoi and at Spring City (bloom rating date: 11 Apr.). The 8% oil sprays also tended to delay bud development and flowering of 'Climax' plants. The flower bud development and early season flowering of 'Centurion' plants at Conover was slightly delayed by the 8% sprays of Golden Natural or TNsoy1 but not by TNsoy10a. The 8% sprays delayed 'Tifblue' flower bud development at Conover, however, a freeze terminated the trial. Early flower bud development of the young Southern highbush cultivars at Fletcher tended to be slightly delayed in early March, however anthesis was not delayed. The 5% sprays had very little effect on flower phenology. The TNsoy1 and Golden Natural tended to be slightly more effective than TNsoy10a. Besides delaying fruit bud development, the 8% sprays caused noticeable delay in leaf development in the early spring on some plants.

The determination of flower bud mortality may indicate the potential of oil treatments to reduce the number of flowers, thus perhaps reducing crop load.. 'Climax' plants sprayed with 8% TNsoy1 or TNsoy10a tended to have more aborted flower ovaries (21 days after treatment) than untreated plants. However, oil sprayed 'Tifblue' plants at Unicoi or Spring City had similar bud mortality to control plants. Sprays of 8% oil slightly reduced crop-load of 'Tifblue' and 'Climax' plants at Spring City and Unicoi. 'Tifblue' and 'Centurion' plants at Conover were rated during bloom for cold damage. Plants sprayed with 8% Golden Natural or TNsoy10a had less cold damage to flowers than did control plants.

The oil sprays generally had little, if any, effect on berry size. Berries tended be slightly larger in the trial at Fletcher but slightly smaller in the trial at Unicoi.

Conclusions: The 8% oil sprays delayed the development of flower buds in late winter and anthesis of early developing flowers. The 8% treatments were associated with increased flower bud damage (at Unicoi and Spring City) at approximately two to three weeks after treatment but were also associated with less cold damage later in the spring near time of bloom (at Conover). The 5% soybean oil sprays had very little affect on flowering or fruiting of blueberries.The tested rates had little effect on berry size. The effects were less than found in previous trials on peaches. The lesser effects may have been due timing of applications; previous trials on peaches were applied two-three weeks earlier. Or, blueberries may be more tolerant of higher soybean oil concentrations than peaches (higher rates have not yet been tested). However, the higher rates will probably cause more bud mortality. Too high of bud mortality will, of course reduce yield, but determination of an oil dose-response (bud mortality) relationship may provide a means of chemically thinning blueberries in the future.

The TNsoy10a formulation was very stable in emulsion but appeared to wash-off the plants more quickly than the other two formulations. The TNsoy1 had very good wash-off tolerance but remained emulsified in spray water for less than a minute without agitation. The Golden Natural formulation remained in emulsion in sprayer for an acceptable period of time and had fair resistance to wash-off.

Impact Statements: Sprays of soybean oil formulations in late winter may in the future provide means by which to delay early anthesis of blueberry flowers and to reduce the number of blueberry flowers and thus reduce crop load.