

2006 Research Report: to Southern Region Small Fruit Consortium, for continuation of 2005 project:

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 the effects of soybean oil sprays on 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 evaluate the concentration effects of soybean oil 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. 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. In our studies in 2004, late winter sprays of soybean oil delayed bloom of 'Climax' and 'Legacy' plants by approximately four days.

Methodologies:

Experiment 1. 'Legacy' southern highbush blueberry plants at the Middle Tennessee Experiment Station, Spring Hill, Tenn. were sprayed on 22 Feb. with 0% (control), 6%, 9%, or 12% soybean oil (Golden Natural, 93 % soybean oil a.i., Stoller Enterprises, Inc. Houston, Texas). The treatments were arranged in a randomized complete design with five replications. Flower bud abortion was evaluated by sampling 25 flower buds/plant on 21 Mar., dissecting, and visually examining buds for browning of ovaries. Flower bud development was evaluated by visually rating flower buds using the scale (Spiers, 1978. J. Amer. Soc. Hort. Sci. 103: 452-455): 1=Dormant, none swollen, 2=visible swelling of bud, scales separating, 3=bud scales separated, apices of flowers visible, 4=individual flowers distinguishable in bud, bud scales abscised, 5=individual flowers distinctly separated, corollas unexpanded and closed, 6=corollas completely expanded and open, first bloom. Percentage open bloom was rated every 2-3 days starting at first bloom. Fruit were harvested for yield and 50 berry samples taken weekly for the first four weeks to determine berry size.

Experiment 2: We applied sprays of water (control), 5% TNsoy14 (96% soybean oil, a.i.), 500 ppm abscisic acid (ABA # 30025), or the combination of oil and ABA on 4 Mar. (a month later than we normally apply oil for bloom delay) to ‘Climax’ blueberries in a commercial planting in Spring City, Tenn. (seven replications). The ABA was applied with 0.5% Tween 20 as an adjuvant. ABA is a natural hormone that is generally considered a promoter of dormancy. We had intended to use Golden Natural however, the registration for was removed by EPA in late 2004. We developed several new formulations (Tns soy12, Tns soy13, and Tns soy14) and used Tns soy14 in this trial.

Flower bud development and bloom was rated as described in experiment 1. Since the trial was conducted on a grower’s location, the entire plant was not harvested for yield. A rating of the crop load (amount of fruit on the plant) was made on 23 June using the scale 1=no fruit, 2=light crop, 3=adequate/desired amount of fruit, 4=abundant crop/ more than desired, 5=very heavy crop. The upper fruit-bearing shoots from a single trunk were covered with a mesh bag (~18 inches length) to protect fruit against birds until harvest. Ripe fruit were harvested from the netted shoots on 23 and 30 June and 1 July, transported to Knoxville, counted and weighted.

Results:

Experiment 1. Sprays of 6%, 9%, and 12% Golden Natural resulted in delays of 50% open bloom of approximately 2, 4 and 9 days, respectively, but also in 9%, 35% and 87% mortality of flower buds. ‘Legacy’ yields (first four weeks of harvest) were 11.6 lbs/plant, 13.7 lbs/plant (18% increase), and 10.3 lbs/plant when previously sprayed with 0%, 6% and 9% soybean oil, respectively. However plants treated with 12% oil had only 4.5 lbs/bush. Berry size from plants sprayed with 6%, 9%, and 12% soybean oil were 17% (1.28 g/berry), 14% (1.24 g/berry), and 23% (1.25 g/berry), respectively, larger than control berries (1.09 g/berry).

Experiment 2. Blooming was delayed by spraying 5% TNsoy14 or 500 ppm ABA. The combination of oil plus ABA caused slightly more delay of flowering. Our previous research showed soybean oil spray aided the penetration of captan through apple leaf cuticles, causing more captan phytotoxicity. Berry size was not affected by the treatments. Crop load was slightly decreased by the Tns soy14 + ABA (3.5 rating) treatment compared to the unsprayed plants (3.8 rating). Perhaps the soybean oil can aid the penetration of ABA into fruit buds and cause further delay of bud break/bloom in the spring.

Conclusions:

Application of 12% oil caused too much flower bud mortality to young ‘Legacy plants. Spraying 9% oil delayed bloom by about four days, increased berry size by 14%, but decreased plant yields by 12% compared to unsprayed plants. Spraying 6% oil delayed bloom by 2 days, increased berry size by 17% and yield by 18%.

Impact Statement:

Spraying high rates (6-9%) of emulsified soybean oil in late winter can delay blueberry bloom, thin fruit buds and increase berry size. We developed Tns soy14, a soybean oil formulation with either all-natural or food-grade adjuvants. Thus, it meets requirements for organic growers to use as a bloom delay plant growth regulator or as a pesticide.

Citation(s) for any publications arising from the project:

Deyton, D. E., C. E. Sams, J.R. Ballington and J.C. Cummins. 2005. Bloom Delay and Fruit Thinning of Blueberry with Soybean Oil. HortScience. 40:792. (Abstr.)

