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Title: Blossom Thinning Pennsylvania Apples Using the Pollen Tube Growth Model

Submitted to: Patti Keller, Secretary, SHAP Research Committee

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Proposed Project

7/1/2019 - 6/30/2020

Total Project Request: \$8,789

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Please reference PSU Ref. Number in all correspondence.

Research Grant Proposal for 2019

State Horticultural Association of Pennsylvania

Blossom Thinning Pennsylvania Apples Using the Pollen Tube Growth Model

Personnel: Dr. Jim Schupp, Penn State Fruit Research and Extension Center, Biglerville, PA.
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Duration: Two years (New)

Justification: This project addresses the SHAP Research priorities: Crop Load Management and Integration of New Technology for Improved Farm Efficiency and Decision Making. Chemical thinning is a labelled use under federal laws. Lime sulfur, when tank mixed with horticultural spray oil, (OLS), is an effective blossom thinner. Studies by the author in NY and PA between 2000 and 2006 showed that OLS was a safe and consistent thinner. While the local manufacturer of lime sulfur has labeled their product to specifically prohibit this use, a new lime sulfur label from another company has been approved for Pennsylvania, permitting this use starting in 2019. Pennsylvania apple growers will now have a legal and effective blossom thinner option. The typical rates for thinning are 2% oil and 2% lime sulfur, applied with enough water to get thorough and even coverage, typically 50 -100 gallons of water per acre. Thinning with OLS has been an established practice in Washington State for many years, and is considered a safe, reliable thinner.

OLS thins blossoms by interrupting pollen tube growth in the style, thus preventing fertilization of the ovules. Scientists at Virginia Tech have developed pollen tube growth models (PTGM) for several commercially-important apple varieties, which are used to determine the timing of the OLS sprays. By using the model, growers apply the first spray as soon as the model indicates that enough blossoms have been fertilized to set a full crop. Then the model is restarted to account for blossoms that have not yet opened, and to time one or more follow-up sprays to prevent additional fruit from setting. The PTGM will be on the NEWA network starting in 2019, making it much easier and convenient for grower to use.

In a season with warm temperatures, such as 2018, blossom opening, and pollen tube growth can be very rapid. Under such conditions the PTGM can call for two sprays of OLS in 24 hours. Two sprays of OLS within such a short time can result in stunted chlorotic spur leaf growth. Since spur leaves are important for early fruit growth, this can result in effective thinning without the expected increase in fruit size. Mild fruit russeting, which wasn't observed in previous trials, was observed in 2018, when two OLS sprays were made within 24 hours, followed by slow drying conditions. While OLS timed by the PTGM promises to be a consistent new thinner and will extend the window of effective thinning sprays, further research is needed to assure that that apple growers can obtain safe, consistent blossom thinning.

Objectives: The objective of this study is to evaluate lower rates of oil and/or lime sulfur for thinning efficacy, fruit size and leaf and fruit phytotoxicity of apples.

Procedures: Tall spindle Golden Delicious / Bud.9 apple trees at the FREC will be sprayed with OLS tank mixes, using the PTGM to determine the timing of the sprays. Treatments will be applied by air-blast sprayer calibrated to apply 100 gallons of water per acre. The treatments will be as shown in the table below:

TREATMENT	JMS STYLET OIL (%)	LIME SULFUR (%)
1	0	0
2	1.0	1.5
3	1.0	2.0
4	1.5	1.5
5	1.5	2.0
6	2.0	1.5
7	2.0	2.0

Leaf and fruit russeting will be rated. Fruit set, yield, fruit size distribution will be evaluated.

Budget:

Wages: \$8000.00
 Fringe (0.781): \$624.00
Supplies: \$165.00
 Total: \$8789.00

Budget Justification: Wage and associated fringe are needed to measure style length, monitor blossom opening and run the model; to conduct fruit set and phytotoxicity ratings; and to evaluate yield, fruit size and fruit russet at harvest. Flags, tags and bags are needed for labelling plots and fruit samples.

Fringe Benefits

Fringe benefits are computed using the fixed rates of 38.97% applicable to Category I Salaries, 14.74% applicable to Category II Graduate Assistants, 7.81% applicable to Category III Salaries and Wages, 0.18% applicable to Category IV Student Wages, and 25.34% for Category V, Postdoctoral Scholars and Fellows, for fiscal year 2019 (July 1, 2018, through June 30, 2019). If this proposal is funded, the rates quoted above shall, at the time of funding, be subject to adjustment for any period subsequent to June 30, 2019, if superseding Government approved rates have been established. Fringe benefit rates are negotiated and approved by the Office of Naval Research, Penn State’s cognizant federal agency.

Other Support: PI salary and research orchard maintenance provided by Penn State University.