

Northern NY Agricultural Development Program 2012 Project Report

Improved Apple Orchard Management, Systems and Rootstocks for Northern NY

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Background:

The Northern New York apple industry is an important segment of New York agriculture (5,000 acres and a farm gate value of \$16 million). However, to remain competitive in the world apple market NNY apple growers need to continue to modernize their orchards to improve orchard production efficiency and fruit quality. Modern high density orchard planting systems, will help improve efficiency, yield and fruit quality and will offer growers the opportunity to plant profitable new varieties.

Although significant research on high density orchards and new rootstocks has been conducted at Geneva and in Western NY, the colder climate of NNY requires that rootstocks and systems be evaluated in Northern NY before they can be recommended and adopted by the growers. This is especially true for rootstocks since a cold winter can kill trees if the rootstock is not sufficiently hardy as was seen in 2002 when more than 20,000 trees on M.7 rootstock were killed in the Champlain valley.

This project focused on developing and extending to growers information on modern, competitive orchard systems that will incorporate disease resistant rootstocks, high planting densities for early production and labor mechanization to reduce costs and on developing improved technology for chemical thinning prediction and for reducing pre-harvest drop of McIntosh apples. The project involved growers through the use of on-farm research plots. These grower based research plots will lead to rapid grower adoption of the results.

Methods:

We conducted 4 experiments with this project.

1. Mechanization of high-density orchard pruning (Everett Orchards, Peru, NY). This project was done in one of our existing orchard systems research and demonstration plots. Is a long-term comparison of 5 orchard systems , which is now 11 years old. In 2012 we began a 3-year program to introduce the use of motorized platforms for reduced labor costs with dormant pruning and the use of a mechanical shearing machine to reduce summer pruning costs. We conducted a pruning workshop in late March where we demonstrated the use of a

motorized pruning platform which increases labor efficiency 25-35% and reduce costs. In July we conducted a summer pruning workshop where we demonstrated a mechanized sidewall-shearing machine to reduce summer pruning costs.

2. Improvement in Chemical Thinning (Forrence Orchards, Peru, NY): In 2012, we conducted a field experiment at Peru, NY with Gala and McIntosh to compare thinning efficacy of four new thinning chemicals PoMaxxa, ACC, ABA and Metamitron. Treatments were applied on May 23, 2012 when king fruitlets were 12mm in diameter. One treatment (10) was applied on June 4, 2012 when king fruit diameter was 20mm.
3. New Rootstock for Northern NY(Forrence Orchards, Peru, NY): This is a 1 acre plot planted in 2008 of 34 new rootstocks from the Geneva apple rootstock breeding program and 3 Malling stocks from England, B.9 from Russia, Ott.3 from Canada, P.22 from Poland and Vineland 1 from Canada with Honeycrisp as the scion. This trial is a comparison of many of the new disease resistant rootstocks from Cornell which have substantial potential in NNY.
4. Control of Preharvest Drop of McIntosh in Northern NY (Chazy Orchards, Chazy, NY): In 2012 we conducted 2 field studies of timing of stop drop chemicals (NAA, and Retain) alone or in combinations to improve pre-harvest drop control of McIntosh. This study is essential for the Champlain Valley since the producers have a high percentage of 1 apple variety (McIntosh) which is prone to pre-harvest drop. By optimizing the use of these chemicals, harvest can be spread out over 5-6 weeks instead of 4 weeks requiring with fewer pickers while still maintaining fruit quality.

Results:

Dormant Pruning with Platforms: Measurements of dormant pruning time using the platforms varied from 20% to 40% less time than with ladders. The best reduction in pruning time was achieved with the Tall Spindle system. With this system the speed of pruning with the platform was high compared with moving a ladder to each tree and climbing up to prune only one or two branches (Figs. 1 and 2).

Summer Pruning with a Side Wall Shearing Machine: Summer sidewall shearing was fast and left the trees with a “manicured” look (Figs. 3-9). The cost and time amounted to a fraction of the time (5%) to do manual summer pruning. When the sidewall shearing was done in August some fruits were cut off. Fruit counts showed that then number of fruits cut off was 2-5% and would be no more than dropped to the ground by hand thinning. Light exposure measurements showed that the summer sidewall shearing improved light intensity in the lower part of the canopy by about 25% and by about 10% in the mid-level of the canopy. There was little improvement of light exposure in the top of the canopy. The trees we used in these studies the canopies were already quite well shaped for good light distribution and the shearing removed only a small portion of the shoots and thus had a small effect on light distribution in the canopy. The sidewall shearing treatments did not induce any substantial shoot re-growth when done in mid- to late summer. However, with the early timing (early June) we saw the development of short re-growths with a terminal bud, which likely will be flower buds next spring. At harvest there were no large differences in fruit color among treatments. However, the sidewall shearing treatments had slightly better fruit color than the unshowered controls.

Chemical Thinning Experiment: With Gala the greatest thinning was achieved with Maxcel +Fruitone L but there was no significant difference with any of the chemicals. The greatest improvement in fruit size was achieved with Maxcel and PoMaxxa but fruit size of most of the other thinning treatments was not significantly different. The greatest improvement in crop value was with Fruitone + Sevin but crop value was not significantly different from any of the chemical treatments. PoMaxxa gave similar thinning as Fruitone L whether combined with Sevin or with Maxcel. Metamitron gave similar thinning as the other chemical treatments but fruit size was not as good as with Maxcel and PoMaxxa. With McIntosh there was little or no thinning with most treatments except Maxcel+Sevin. Neither Metamitron, ABA or ACC thinned significantly. The greatest fruit size was with the Maxcel + Sevin treatment but was not significantly different than Maxcel+PoMaxxa. The greatest crop value was with the Maxcel + Sevin treatment but was not significantly different than Maxcel + PoMaxxa.

Control of Preharvest Drop of McIntosh: The plant growth regulator 'Retain' had a significant and dramatic effect on preventing preharvest drop of McIntosh in 2012 in the Champlain Valley. Even at the last harvest date (Oct. 5) cumulative drop of the Retain treatments did not exceed 27% while the untreated controls or the NAA treated trees had 60% or greater drop. The best drop control was achieved with Retain + PoMaxxa applied 28 days before normal harvest but this treatment was not significantly better than Retain alone at 28 DBH, Retain + Fruitone L at 28 DBH or the Half rate of Retain + Fruitone L at 14 DBH. The split rate of Retain alone applied at 28 and 14 DBH or the split rate of Retain + Fruitone L applied at 28 + 14 DBH were slightly inferior in this study by the last sampling date on Oct. 5. PoMaxxa alone or Fruitone L alone did not reduce preharvest drop of McIntosh in the Champlain Valley of NY state in 2012.

At Forrence Orchards, all treatments with Retain significantly reduced fruit drop at commercial harvest (Sept. 12) and at the late harvest on Oct. 4. The untreated control trees had moderate drop of 34%. The split application of Retain (167g/acre) plus 10ppm NAA gave the best drop control. The full rate of Retain applied early (Aug. 15) (Trt 2) had similar drop control as the split application treatment. The half rate of Retain applied once on Aug. 24 gave less drop control than the other treatments with Retain and NAA. Visual observations indicated that the fruit color on the split application (Trt 4) was the best. In this large demonstration trial the value of Retain was evident in all treatments. The split application of Retain and NAA gave excellent drop control with the best color. The fruit is all placed in CA storage with both a MCP and without MCP to determine if the addition of NAA in the second spray has any negative effects on fruit quality after long-term storage.

Discussion:

Apple growers in NY are already beginning to implement platforms for winter pruning and at least 2 growers have begun using sidewall shearing. Our results in 2012 were very positive for the adoption of platforms to improve dormant pruning labor efficiency. At least 30 growers have either purchased or built platforms in the last 3 years. Many others are trying to evaluate the economics of the purchase. The results of this project will help them determine the economic value of this technology.

Our results with summer sidewall shearing were positive in 2012 but will require 2 more years to fully determine if this approach has long term positive results or if negative tree growth will negate the labor savings from mechanical sidewall shearing. If side-wall shearing in the summer can reduce summer pruning costs by 95% and improve fruit color without negative effects on return bloom or vigorous growth response it will also have a significant impact on orchard profitability. Results from 2012 are encouraging so far in that there was no regrowth from the sidewall shearing treatments with the Tall Spindle system. We plan to continue the 5 trials we started in 2012 by repeating the same treatments on the same trees for the next 2 years. A long-term strategy that our grower in France has implemented is to use annual side-wall shearing of Tall Spindle trees for 3 successive years with no other dormant pruning but in the third year to add a dormant winter corrective pruning to remove limbs that have become large and are causing internal canopy shading and poor fruit quality. Such a pruning strategy could reduce total annual pruning costs in Tall Spindle orchards by about 65% and help NY apple growers remain profitable and competitive.

Results of our chemical thinning study indicate that the new chemical thinning agent 'PoMaxxa' performed very similarly to Fruitone L in thinning and fruit size improvement with Gala and McIntosh in 2012 in the Champlain Valley of NY. There was a numeric advantage to PoMaxxa over Fruitone L but the difference was not significant.

Our studies to control pre-harvest drop support the idea of including NAA with Retain sprays and gives good evidence that lower rates of Retain will provide good drop control when combined with NAA. Retain is an excellent plant growth regulator for reducing preharvest fruit drop, fruit cracking and fruit greasiness. It usually provides excellent drop control except in hot years. Our trials over the last three years in Western NY, the Hudson Valley and the Champlain Valley have shown that when NAA is mixed with Retain at 2-3 weeks before normal harvest, or NAA is applied one week after Retain, then drop control is improved without any negative effects on fruit quality or fruit storage life after 45 and 90 days under regular cold storage conditions (33°F) or under CA conditions. It appears that both products work better together than either product alone. The Retain prevents ethylene production induced by the NAA and the two chemicals together jointly prevent abscission zone formation and provide improved preharvest drop control compared to either product alone. In 2011 we recommended for the first time the combination of Retain and NAA for improved drop control.

Conclusions/Outcomes/Impacts:

- Our results with motorized pruning platforms indicate that if a grower can achieve a 25-30% reduction in dormant pruning costs it will have a significant positive impact on profitability.
- Such a pruning strategy could reduce total annual pruning costs in Tall Spindle orchards by about 65% and help NY apple growers remain profitable and competitive.
- Results of our chemical thinning study indicate that the new chemical thinning agent 'PoMaxxa' performed very similarly
- Our studies to control pre-harvest drop support the idea of including NAA with Retain sprays and gives good evidence that lower rates of Retain will provide good drop control when combined with NAA.

Outreach:

In February 2012, we made a presentation at the Northern NY winter fruit schools on Honeycrisp management and reducing pre-harvest drop of McIntosh using results from this project. In March 2012 we organized a winter pruning workshops at the orchard systems plot on Everett Fruit Farm to teach tree pruning and training for high density orchards. We also demonstrated a motorized pruning platform which can increase labor efficiency and reduce costs. In May of 2012 we held a twilight meeting to discuss the results of our thinning research trial done in 2011 and give suggestions for chemical thinning in 2012 of McIntosh and Honeycrisp. During August 2012 we organized a field day in the orchard systems and rootstock plots where growers learned about the project and the production technologies necessary for management of high-density apple orchards. At the field day we demonstrated mechanized sidewall shearing with a machine to reduce summer pruning costs. We had very good attendance at each of the workshops where we provided a pruning demonstration of mature tall spindle trees and invited growers to prune on the platform. The growers were appreciative of the hands on learning experience and some who have been hesitant to plant the tall spindle system or adopt pruning platforms became enthused to adopt these technologies.

Next steps:

In Dec. of 2013 will publish our results on the economics of orchard systems in NNY in the NY Fruit Quarterly magazine which is sent to all tree fruit growers in the state. We are also organizing an in-depth school in March 2013 to introduce to growers the concepts of precision thinning and precision irrigation which is the topic of our new project with NNYARP

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