

Final Report

FNE 93-31

PROJECT TITLE: NEW SPRAYER TECHNOLOGY FOR REDUCTION OF PESTICIDE USE IN APPLES.

Authors: Mr. W. H. Palmer
Springbrook Orchards, Inc.
Wayne County, New York

Ms. Deborah I. Breth
Cornell Cooperative Extension
Albion, New York

1.OBJECTIVES:

To provide commercial apple growers with an objective evaluation of new airblast sprayer technology that could allow a reduction in the amount of pesticide use by targeting the spray to the actual tree canopy areas. This would allow growers to sustain fruit quality while reducing inputs to the crop.

2.BACKGROUND INFORMATION:

With the help of two private consultants and the excellent research and extension programs of Cornell University, the pesticide programs for control of pests of apples in our commercial apple orchards have been substantially reduced through the use of Integrated Pest Management practices. The next major decrease in pesticide use might be possible through the use of sprayer technology that allows treatment of only the actual target zone rather than broadcast sprays over the whole orchard. Equipment purchased in 1992 demonstrated a potential reduction in pesticide rates per orchard of 20 to 50%. However, actual measurements of spray volumes and pest control were not recorded. Because several such sprayers are now in use in New York orchards, the collection of objective data and demonstration of results would be useful in encouraging other growers to consider this new way of reducing the inputs necessary to produce a marketable crop of apples.

3.PROJECT DESCRIPTION:

Two almost identical, and adjacent orchards, (each about 7 acres) with three different apple varieties (McIntosh, Idared, Rhode Island Greening) were used. The need for pesticide applications were determined by a private consultant, along with observations provided by an Integrated Pest Management (IPM) program scout, insect trap counts, and a weather station that provides scab infection periods predictions (Appendix D). The final market for these apples were processors in New York, Pennsylvania, and Virginia.

The local FMC dealer prepared the sprayer with the FMC Crop Care System (pages 5 & 6 of Appendix D) and installed a Hiniker Acre Counter with a flow meter (Appendix D, Page 7) that accurately recorded the volume of spray applied per block. Block 141E was sprayed with the Crop Care System in operation, and Block 141W was sprayed exactly the same, except the Crop Care System was turned off. The Crop Care System uses sonar sensors at the front of the sprayer to collect information on the presence/absence of foliage. This information is then fed to a computer which turns on the appropriate nozzles at the rear of the sprayer to "target" the spray to only those areas of the orchard where tree canopy is actually present.

Block 141 E had an unsprayed block on the South side and a sprayed block on the East side. Block 141W had a sprayed block on the South side and a pine-tree gully on the West side. Both blocks had a wide uncropped area to the North. In 1992, apple scab had been a problem in both blocks. Pheromone and attractant traps were placed in the orchards and in the untreated block 145.

Fruit damage evaluations were made in both blocks by Deborah Breth (Appendix A), and untreated fruit was evaluated in Block 145 by Mr. Palmer. The sprayer was calibrated (Crop Care System off) several times by the operator, Mr. Scott Palmer, during the season and the spray distribution pattern was adjusted by the private consultant, Jim Eve. At the end of the season, the accuracy of the sprayer and the flow meter was checked by Deborah Breth.

4. RESULTS:

Spray volumes per acre were reduced 10.2-49.7% (average of 29.2%) in the block where the Crop Care System was used, resulting in a savings of \$59.59 per acre in pesticide costs. Savings with the Crop Care System increased after pruning the trees to the "christmas-tree", pyramid shape to eliminate low, over-hanging limbs that had caused the top sonar "eyes" to sense foliage in the tops of the trees when this wasn't really the case (Appendix B). In addition, time savings by allowing the operator to treat more acres with a tankload of spray solution would be realized.

Apple scab was higher in the block where the Crop Care System was used, but the scab was late-appearing lesions that did not affect the processing quality of the fruit (Appendix A). Oblique-banded leafrollers (OBLR) caused damage in both blocks, and processing grades showed 1% damage in both blocks. The OBLR damage was caused by delaying the control spray for too long so that it was not effective on the larger larvae. This grower decision was based on previous experience where similar OBLR levels had not caused any financial loss. As with any system that offers these levels of cost savings, the system will require a higher level of knowledge of what is happening in the block, and less tolerance for problems when they are identified.

Because of the interest shown by Cornell Cooperative Extension and the equipment manufacturer, spray volume savings were also collected on about another 100+ acres of apples in 24 blocks. This information will be included in an expanded report of this project. Results of this project are also combined with other research results in other orchards and presented in a report by Deborah Breth that is included in Appendix A.

One of the ways in which the theoretical pesticide effects on the applicator, environment, and consumer can be evaluated was presented in New York State Life Sciences Bulletin Number 139, 1992: "A Method To Measure The Environmental Impact Of Pesticides" by J. Kovach et. al. We evaluated our pest control program to provide a theoretical "EIQ" (Environmental Impact Quotient) with and without the use of the Crop Care System. The results are given on page 2 of Appendix B. The Crop Care System allowed a 27.1% reduction in the theoretical pesticide impact on the environment.

Block 141 E had an unsprayed block on the South side and a sprayed block on the East side. Block 141W had a sprayed block on the South side and a pine-tree gully on the West side. Both blocks had a wide uncropped area to the North. In 1992, apple scab had been a problem in both blocks. Pheromone and attractant traps were placed in the orchards and in the untreated block 145.

Fruit damage evaluations were made in both blocks by Deborah Breth (Appendix A), and untreated fruit was evaluated in Block 145 by Mr. Palmer. The sprayer was calibrated (Crop Care System off) several times by the operator, Mr. Scott Palmer, during the season and the spray distribution pattern was adjusted by the private consultant, Jim Eve. At the end of the season, the accuracy of the sprayer and the flow meter was checked by Deborah Breth.

4. RESULTS:

Spray volumes per acre were reduced 10.2-49.7% (average of 29.2%) in the block where the Crop Care System was used, resulting in a savings of \$59.59 per acre in pesticide costs. Savings with the Crop Care System increased after pruning the trees to the "christmas-tree", pyramid shape to eliminate low, over-hanging limbs that had caused the top sonar "eyes" to sense foliage in the tops of the trees when this wasn't really the case (Appendix B). In addition, time savings by allowing the operator to treat more acres with a tankload of spray solution would be realized.

Apple scab was higher in the block where the Crop Care System was used, but the scab was late-appearing lesions that did not affect the processing quality of the fruit (Appendix A). Oblique-banded leafrollers (OBLR) caused damage in both blocks, and processing grades showed 1% damage in both blocks. The OBLR damage was caused by delaying the control spray for too long so that it was not effective on the larger larvae. This grower decision was based on previous experience where similar OBLR levels had not caused any financial loss. As with any system that offers these levels of cost savings, the system will require a higher level of knowledge of what is happening in the block, and less tolerance for problems when they are identified.

Because of the interest shown by Cornell Cooperative Extension and the equipment manufacturer, spray volume savings were also collected on about another 100+ acres of apples in 24 blocks. This information will be included in an expanded report of this project. Results of this project are also combined with other research results in other orchards and presented in a report by Deborah Breth that is included in Appendix A.

One of the ways in which the theoretical pesticide effects on the applicator, environment, and consumer can be evaluated was presented in New York State Life Sciences Bulletin Number 139, 1992: "A Method To Measure The Environmental Impact Of Pesticides" by J. Kovach et. al. We evaluated our pest control program to provide a theoretical "EIQ" (Environmental Impact Quotient) with and without the use of the Crop Care System. The results are given on page 2 of Appendix B. The Crop Care System allowed a 27.1% reduction in the theoretical pesticide impact on the environment.

5. OUTREACH EFFORTS:

The main goal of the project was to share the results with other people who could use the information to allow reduction of pesticide use on apples while sustaining the quality of the fruit. To achieve that end, not only was Integrated Pest Management used, but also integration of all the various participants into getting the information to the growers and others in the following ways (Appendix C):

Deborah Breth, Cornell Cooperative Extension:

Grower meeting on September 1 with about 50 growers in attendance to discuss results of the project.

Publication of results which integrate project data with data obtained from other orchards in Wayne County.

Jim Eve: Advisor to several growers who are using the Crop Care System and information gathered in this project will be used to increase the efficiency of that equipment as well as to provide advice on the potential problems.

"Butch" McQueen and FMC: The local dealer and manufacturer can use the data to provide objective (rather than just testimonial) information to other growers who might be contemplating this technology to reduce pesticide use, while at the same time, sustaining the quality of the fruit produced. Publications, such as the one attached, can be used to reach growers throughout the region. The dealer and manufacturer can use the information collected in this project to encourage growers to make use of additional scouting and proper trimming of their orchards to enhance the performance of the system.

The grower, W. H. Palmer: Because news of the project had reached other people, Mr. Palmer was invited to participate in an EPA/USDA/ Industry Workshop on reducing pesticide drift with orchard airblast sprayers. This meeting, held in Washington, provided an opportunity to share the preliminary results of the project which demonstrated a way to reduce off-target pesticide effects through use of currently available technology.

6. SUGGESTIONS FOR CONTINUED REDUCTION IN PESTICIDE USE ON APPLES:

We are seeing the possible reoccurrence of some old pests like Mullien Plant Bug and a late-season Sawfly pest that may prevent us from reducing our pesticide programs any further. On the other hand, we will be changing the kinds of pesticides to those that are easier on non-target organisms such as predaceous mites. We will be using the "EIQ" rating system developed by J. Kovach et.al. to lower the theoretical environmental impact of the kinds of pesticides we use.

We will be adjusting our pruning practices to convert as many of our orchards to the "palmette" shape which tends to allow the Crop Care System to be more effective.

We are going to ask FMC to help with modifications to the sprayer to put the sonar units ("eyes") on a tower. This will get the top units up higher and should give more accurate vision of the presence/absence of foliage in the higher areas of the tree.

This Winter, we are planning to redo the Crop Care System wiring on the sprayer to prevent some of the minor breakdowns of the System we experienced in 1993.

We will continue to collect data in 1994 to see if the results can be repeated, and perhaps improved.

We will be contacting the pesticide manufacturers to let them know of our results and any possible label recommendations they may want to make.

We will be sending our results to the EPA/Industry Task Force on Drift Reduction with airblast Sprayers and offering to cooperate in any projects that might be helpful in solving this problem.

7. PHOTOGRAPHIC SLIDES ARE INCLUDED IN APPENDIX E.