

Reduced Chemical Input Production of Peaches

Final Report for ANC91-009

Project Type: Research and Education

Funds awarded in 1991: \$0.00

Projected End Date: 12/31/1994

Matching Non-Federal Funds: \$64,000.00

ACE Funds: \$40,000.00

Region: North Central

State: Michigan

Project Coordinator:

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Project Information

Summary:

Synthetic chemical inputs for peach production in Michigan and the North Central regions of the United States have risen steadily since the turn of the century. It has been increasingly difficult for growers to control certain insects and disease problems through conventional means, and the marketplace is calling for a greater number of fresh products to be grown in a reduced chemical environment. This project brings together science and education from Horticulture, Entomology, Pesticide Research, Weed Science, and the Cooperative Extension Service with grower organizational involvement for the express goal of reducing crop chemical dependency (pesticides, herbicides, and fertilizer) for peaches, and integrates them into one project. It also compares the chemical residues of the more important compounds in the ground water and the fruit for conventional, moderate input, and low input systems under Michigan commercial conditions at the new Southwest Michigan Research and Extension Center (SWMREC), where its mission is direct outreach to growers and consumers. This has been accomplished in three phases. They are: (1) establishment of different orchard systems at SWMREC, (2) educational programs for growers concerning the effectiveness and incorporation of these techniques in grower operations, and (3) to monitor pesticide and fertilizer residues in the fruit and in the ground water.

Highlights of the 1992-94 funding period are as follows. Total synthetic chemical applications for the moderate and low input were reduced from 18 to 9 and 3, respectively, when compared with the control. Weeds were controlled in the low input treatment with straw mulch, and chemical fertilizer was reduced by half in the moderate input, and to zero by using horse manure in the low input. Yields in 1993 ranged from 346 bu/acre for the conventional, 134 bu/acre for the moderate, and 163 bu/acre for the low input. Fruit quality in terms of fruit color and size was greatest for the moderate level, followed by the low input, and the conventional was least, while the conventional had the highest percentage of blemish free at 97.5%, followed by the moderate level, 90.75 % with the low input at a very respectable

82.25%, thus indicating that a very high percentage of the fruit could be grown disease and insect free with a reduction in synthetic chemical applications from 18 to 2. Entophytic rye was effective in reducing Tarnish Plant Bug and leafhopper populations in the low input, and oriental fruit moth disruption was also effective in these plots. It was noted that peach scab became a problem in the low input plots. Through the 3rd growing year, there were no significant differences in winter hardiness, tree growth, leaf nitrogen, ground water nitrate contamination, or triazine residue due to the different treatments. The 1992, and 1993 crop residues indicate that all residue levels are far below EPA's accepted tolerance, and that only iprodione was higher in the conventional than the other plots. In most cases residues were below normal detectable limits. Please see appendix 8 for more detail. Three major grower meetings have focused on this project and it has been the subject of several lay articles.

Project Objectives:

1. To integrate technological advances in the following areas: fertilizer and nutrition, ground cover management, insect and disease control, and horticultural practices into orchard systems and compare them with conventional systems.
2. To demonstrate to growers the effectiveness of these systems.
3. To reduce pesticide and fertilizer inputs into the system, while producing a high quality crop.
4. To monitor ground water and fruit for residues to determine the effect of these systems on contamination.

Research

Research results and discussion:

1. In this project we have integrated several technologies into two different systems, one with moderate chemical input, and one with very low chemical input. We have demonstrated that when compared to the conventional the grower can decrease chemical input very substantially, without a very significant decrease in fruit quality or in the control of insects, diseases, and weeds. However, there was a decrease in yield per acre, likely because the trees were smaller due to the competition from the ground cover. We anticipate that these trees will catch the conventional trees in one to two years. Yield efficiency per tree was also reduced for the moderate and low input plots; this was likely because of the strategy used during thinning to remove any fruit with blemishes, and to not allow fruit to touch one another. This is reflected in larger more colored fruit for these two treatments. However, these yields are still within the mean of those experienced by growers in the same area from trees four years of age.

- The conventional yielded 346 bu/ac compared to 134 and 163 for the moderate and low input, however yield efficiency was 3.8, 2.8 and 3.2 bu/in² for the conventional, moderate and low input, respectively.

- Fruit quality as measured by blemish free fruit was 97.5% conventional, 90.8% moderate, and 82.3% for the low input. Most of the damage in the low was due to peach scab (30%) in one plot. Fruit were larger and had greater color in the moderate and low chemical input plots when compared to the control.

2. The project was demonstrated to growers in meetings (Feb, Southwest Michigan Hort. meetings; and two field days during the season at SWMREC) and by field

observations. Effectiveness was demonstrated in the following key areas:

- Weeds were controlled with mulch.
- Manure and 1/2 rate N through the drip had leaf N values similar to the conventional.
- Control of tarnished plant bud populations were excellent for all three management strategies, indicating that either the moderate or low chemical input was equivalent to the conventional practice.
- The management strategy in the low chemical plots for the leafhopper *P. irroratus* was equal in effectiveness to the conventional, and better than the moderate chemical input.
- Oriental fruit moth was controlled in all three management strategies, however we demonstrated that OFM mating disruption in conjunction with perimeter spraying could give excellent control on plots as small as 1 acre.
- There were no significant differences in cold hardiness between the treatments. (Please see appendix 1,2 ,3 and 4 for more details.)

3. Chemical inputs were reduced significantly in the moderate and low chemical plots when compared to the conventional. The moderate received .5 of the rate of synthetic fertilizer compared to the control and 0 for the low chemical input. (Please see appendix 1 table 1 for more details.)

- Total synthetic chemical applications for the moderate and low input were reduced from 18 for the conventional to 9 and 2, respectively.

4. At harvest, fruit samples were analyzed for pesticide residues, and simazine was analyzed for in the soil, and nitrate was determined from soil water samples six feet below the ground surface.

- There were no differences in simazine residues and the levels of nitrate were highest for the manure treatment, followed by the conventional ground application, and the moderate chemical input when .5 rate N was injected through the drip system.
- All fruit residue levels detected were well below the EPA tolerance levels for peach fruit with no treatment differences.

Research conclusions:

We have demonstrated that peaches can be grown in a reduced chemical manner (less than 1/4 of the conventional) with acceptable fruit quality and yield. However this management strategy did not result in a lower amount of chemical residue in the fruit, but did reduce nitrate in the water below the trees. Several of the individual techniques employed in this study could be adopted by growers, they are:

- N application through the drip at .5 the ground rate
- Endophytic rye for the control of TPB and leafhoppers
- OFM control by mating disruption and perimeter spraying
- Brown rot control by sulfur and sanitation
- Control of weeds by straw mulch

Economic Analysis

Preliminary study conducted to date are in appendix 9, which compares the conventional with the low input. Currently a potential PhD student is using this study as part of graduate education.

Farmer Adoption

Changes in Practice

Since we are dealing with a long lived production system, adoption is slow. However growers are beginning to use the practices outlined in 4 above, plus:

- High density planting systems.
- Summer pruning.
- Ground cover management, mowing to control leafhoppers.
- Chemical sprays based on monitoring where possible.
- N rate based on leaf analysis.
- Perimeter spraying.
- OFM mating disruption.

Operational Recommendations.

That reduced chemical culture of peach is possible, that it is a labor intensive practice that requires skilled scouting, and that if chemical applications are made according to label with properly calibrated equipment, residues in the fruit using this system will not be significantly lower. However, ground water nitrate levels are lower.

Producer Involvement (in 1991-94)

Number of growers/producers in attendance at:

Workshops.....45

Conferences..150

Field days....100

Participation Summary

Educational & Outreach Activities

PARTICIPATION SUMMARY:

Education/outreach description:

Plans are currently being made for the dissemination of the findings. The horticultural information will be submitted to the Journal for the American Society for Horticultural Science. Two papers are in press at international meetings, and three oral presentations have been made at scientific meetings. The entomological and pathological information will be submitted to the appropriate scientific journals. Lay articles have already been written for the Great Lakes Fruit Grower News and local newspapers.

Project Outcomes

Recommendations:

Areas needing additional study

- Economic analysis, and development of a decision support model.
- On-farm demonstrations with growers in different areas of the state.

- Development of systems for other major fruit crops.

Information Products

- [Effects of Different Levels of Chemical Input on Michigan Peach Orchard Soils \(Conference/Presentation Material\)](#)
- [PeachMod.XLS An Analysis of MED Densit 217 Trees Per Acre Peach Orchard and Potential Profit of the System \(Charts\)](#)
- [Ground cover and agricultural practices manipulation in controlling tarnished plant bug population in peach orchard Michigan 1993 \(Publication\)](#)
- [PeachCon.XLS An Analysis of MED Densit 217 Trees Per Acre Peach Orchard and Potential Profit of the System \(Charts\)](#)
- [Pesticide Residues in Peach Prunus Persica L. Newhaven Fruit Grown Under IPM and Conventional Pest Control \(Publication\)](#)

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