

PROJECT NO: 4531
TITLE: Pear pest management studies
PERSONNEL: Everett Burts, Entomologist,
WSU Tree Fruit Research Center,
Wenatchee, WA
REPORTING PERIOD: Termination report covering period from 1990-91 to
1993-94

ACCOMPLISHMENTS:

Through studies conducted under this project I developed use strategies for insect growth regulators, enhanced soft pesticide programs for pear IPM, evaluated new pesticides for efficacy against pear pests, monitored pesticides resistance in pear psylla and grape mealybug and determined optimum timing for maximum effectiveness of Agri-Mek against pear psylla. The main contribution to science has been a better understanding on the development and spread of pesticide resistance in arthropod pests of agricultural crops. This work has contributed significantly to development of improved controls for pear psylla and grape mealybug, two pests that seriously threaten the pear industry of the Pacific Northwest.

RESULTS:

1. Development of insect growth regulator (IGR) use strategies: Using fenoxycarb as a model IGR, I developed three use strategies for these compounds in pear pest management programs: post-harvest applications for affecting behavior of winter adult pear psylla, prebloom applications for early season control of pear psylla and summer cover sprays for control of pear psylla, codling moth and leafroller species. The most promising use and the greatest need for IGR's in the pear pest management program is as early season control of pear psylla. I have shown that two prebloom sprays of fenoxycarb (at delayed dormant and clusterbud stages of tree development) provide post-bloom control of pear psylla lasting into July. This treatment also helps control grape mealybug, another serious pest of pear. Substitution of fenoxycarb for pyrethroids in the prebloom program on pear allows predators and parasites to survive in sufficient densities to help control spider mites, pear psylla, grape mealybug and aphids. Post-harvest applications of fenoxycarb terminate diapause in winter-form adult pear psylla. Applications to pear orchards are made in early to mid-October. Treated females mate and lay eggs in late fall and throughout winter when temperatures are warm enough for these activities. Although cold hardiness of pear psylla does not seem to be affected, the untimely reproductive activity reduces body resources that can be diverted to these activities the following spring. Full potential for this use of IGR's against pear psylla cannot be determined until there is a registration for fenoxycarb that will allow area-wide applications. Summer cover sprays of IGR's are effective against codling moth, leafrollers and pear psylla, however, this may not be the best use for

these products on pear. Other approaches to summer control of pear pests such as applications of Agri-Mek for pear psylla, B.t formulations for leafrollers and pheromone confusion of codling moth, may provide better IPM on this crop.

2. Soft pesticides in pear IPM programs: During the course of this project I developed soft pesticides programs for the control of pear psylla and other pests of pear. The substitution of wettable sulfur or lime sulfur in dormant and delayed dormant sprays provided acceptable control of pear psylla and allowed increased survival of beneficial species, including predatory mites and predaceous bugs. Frequent applications of soaps or diatomaceous earth as foliage sprays help control pear psylla and grape mealybug, but the resulting heavy deposits from diatomaceous earth sprays can stimulate spider mite populations.

3. Field screening of new pesticides: Pesticides under development that show promise for control of pear pests include Admire (Miles Inc), Stalker (American Cyanamid Co.), BAS 300 (BASF Corp.) and S71639 (Valent Corp). All four compounds represent new chemistry, which makes them effective against pests resistant to currently available pesticides. Admire is active against pear psylla, grape mealybug and aphids; Stalker and BAS 300 are effective against pear psylla. Admire and Stalker are far enough along in development that experimental labels allowing limited grower use should soon be granted. This stage of development also makes possible Section 18 labels for emergency use. Bas 300 and S 71639 are still in early stages of development.

4. Resistance monitoring and laboratory screening of new products: During the past three years I have monitored the development and spread of resistance to pyrethroids in pear psylla. This resistance has intensified over the period so that registered products are no longer effective anywhere in areas of commercial pear production. In some areas pear psylla is now resistant to Baythroid, a third generation pyrethroid with chemistry to circumvent resistance. At this time pyrethroids do more harm than good in most areas because they are very destructive of beneficial species. I also developed a protocol for monitoring psyllid susceptibility to Agri-Mek and during the last two years have checked several populations, including some from Hood River and Medford Oregon, for possible resistance to this compound. To date all results indicate that there has been no loss of effectiveness of Agri-Mek against pear psylla. I also developed a protocol for screening pesticides in the laboratory for their efficacy against grape mealybug. Using this protocol I identified populations resistant to parathion and diazinon. Products effective against resistant populations include Admire (NTN 33893), Lorsban, Guthion, Sevin and Imidan.

5. Timing Agri-Mek sprays for maximum efficacy against pear psylla: Agri-Mek has a very short residual life when exposed to sunlight. Residual control of insects and mites results from absorption of this material into leaves, where it escapes breakdown. Because pear foliage loses its ability to absorb Agri-Mek as it gets older, early post-bloom applications are most effective. Agri-Mek provides the most lasting control of mites and pear psylla when applied shortly after petal fall; it is not effective when applied in late July or later.

PUBLICATIONS AND OTHER DISSEMINATION OF INFORMATION:

1. Publications:

Beers, E. H., S. C. Hoyt and E. C. Burts. 1990. Effect of tree fruit species on residual activity of avermectin B₁ to *Tetranychus urticae* and *Panonychus ulmi*. J. Econ. Entomol. 83:961-964.

Van de Baan, H. E., B. A. Croft and E. C. Burts. 1990. Resistance to the pyrethroid fenvalerate in pear psylla, *Psylla pyricola* Foerster (Homoptera: Psyllidae), in Northwestern USA. Crop Protection 9: 185-189.

Etienne, J. C., T. X. Nguyen and E. C. Burts 1992. Susceptibility of *Cacopsylla pyri* and *C. pyricola* (Homoptera: Psyllidae) to Avermectin B₁ applied topically and as residues on pear foliage. Jour. Econ. Entomol. 85: 182-186.

Burts, E. C. 1990. Pear psylla, lab screening of insect growth regulators. Insecticide and Acaricide Tests 15: 42.

Burts, E. C. 1990. Agri-Mek baseline data for pear psylla nymphs. Insecticide and Acaricide Tests 15: 43.

Burts, E. C. 1990. Agri-Mek baseline data for pear psylla adults. Insecticide and Acaricide Tests 15:43.

Beers, E. H., E. C. Burts and S. C. Hoyt. 1990. Length of acaricide activity of avermectin B₁ residues in apple and pear foliage. Proc. International Colloquium of Integrated Pest Management in pear orchards. Alcobaca, Portugal. Bulletin SROP, 1990 / XIII / 2: 79-82.

Burts, E. C. 1990. Pyrethroid resistance in pear psylla in western North America. Proc. International Colloquium of Integrated Pest Management in pear orchards, Alcobaca, Portugal. Bulletin SROP, 1990 / XIII / 2: 100-105.

Burts, E. C. 1990. Grape mealybug (Homoptera: Pseudococcidae) on apple and pear in North-Central Washington. Bulletin SROP, 1990 / XIII / 2: 170-172.

Burts, E. C. 1991. Pear, grape mealybug control. Insecticide and Acaricide Tests 16: 22.

Burts, E. C. 1991. Pear, insecticide evaluations. Insecticide and Acaricide Tests 16: 23-24.

Burts, E. C. 1991. Pear psylla control with S 71639. Insecticide and Acaricide Tests 16: 22.

Burts, E. C. 1991. Pear, grape mealybug control. Insecticide and Acaricide Tests 16: 25-26.

- Burts, E. C. 1991. Laboratory tests with insect growth regulators on pear psylla. *Insecticide and Acaricide Tests* 16: 26.
- Burts, E. C. 1991. Insegar rate study. *Insecticide and Acaricide Tests* 16: 26-27.
- Burts, E. C. 1991. Prebloom applications of Insegar for control of pear psylla. *Insecticide and Acaricide Tests* 16 27-28.
- Burts, E. C. 1992. Pear psylla control, now and in the future. *Goodfruit Grower*. 44 (9).
- Burts, E. C. 1992. Agri-Mek timing study, Wenatchee. *Insecticide and Acaricide Tests* 17: 43.
- Burts, E. C. 1992. Pear Agri-Mek timing study, Orondo. *Insecticide and Acaricide Tests* 17: 43-44.
- Burts, E. C. 1992. Pear prebloom applications of Insegar for control of pear psylla. *Insecticide and Acaricide Tests* 17: 44-45.
- Burts, E. C. 1992. Pear, soft pesticide tests. *Insecticide and Acaricide Tests* 17:45-47.
- Burts, E. C. 1992. Pear, pesticide evaluations. *Insecticide and Acaricide Tests* 17: 47-48.

2. Proceedings:

- Beers, E. H., E. C. Burts and S. C. Hoyt. 1990. Length of acaricide activity of avermectin B₁ residues in apple and pear foliage. *Proc. International Colloquium of Integrated Pest Management in pear orchards*. Alcobaca, Portugal. *Bulletin SROP, 1990 / XIII / 2: 79-82.*
- Burts, E. C. 1990. Pyrethroid resistance in pear psylla in western North America. *Proc. International Colloquium of Integrated Pest Management in pear orchards*, Alcobaca, Portugal. *Bulletin SROP, 1990 / XIII / 2: 100-105.*
- Burts, E. C. 1990. Grape mealybug (Homoptera: Pseudococcidae) on apple and pear in North-Central Washington. *Bulletin SROP, 1990 / XIII / 2: 170-172.*
- Reidl, H. W., W. Barnett, E. H. Beers, J. F. Brunner, E. C. Burts, B. A. Croft, P. W. Shearer, and P. H. Westigard. 1992. Current status of monitoring and management of insecticide and miticide resistance on deciduous tree fruit in the western United States. *International Symposium on Integrated Plant Protection in Orchards*, University of Godollo, Godollo, Hungary, 1-5 August, 1990. *Acta Phytopathologica et Entomologica, Hungarica. 27: 535-544.*

3. Technical reports:

Burts, E. C. 1990. Protocols for evaluation of insect growth regulators on tree fruits. Annual meeting ESA.

Burts, E. C. 1991, 1992, & 1993. Reports to Western Orchard Pest and Disease Management Conference, Portland.

Burts, E. C. 1991. Pesticide resistance in pear psylla, Annual meeting ESA.

Burts, E. C. 1991. Grape mealybug on apple and pear in Central Washington, Annual meeting Pacific Br. ESA.

Burts, E. C. 1992. Soft pesticides and hard trees. Pesticide resistance management conference, Annual meeting ESA.

4. Popular articles:

Burts, E. C. 1992. Pear psylla control, now and in the future. Goodfruit Grower. 44 (9).

5. Talks at grower meetings

Manson Horticulture meeting, Manson, Jan. 22, 1991

Pear Day, Wenatchee, Jan. 24, 1991.

Washington Tree Fruit Research Commission., Feb. 19, 1991

Pear Day Program, Tonasket, Feb. 26, 1991

North Central Washington Fieldmens' meeting, Mar. 15, 1990

North Central Washington Fieldmens' meeting, April 18, 1991

Yakima Valley warehouse managers and fieldmen, May 15, 1991

NCW warehouse managers and fieldmen, May 16, 1991

Washington State Hort. Assoc. meeting, Wenatchee, Dec., 1991

Pear Day, Yakima, Jan. 16, 1991.

Pear Day, Wenatchee, Jan. 26, 1990.

Columbia Fruit Growers Assoc., Wenatchee, Jan 28, 1992

Dovex Growers Assoc., Wenatchee, Jan 31, 1992

Okanogan Hort. and Traffic Assoc., Feb. 7, 1992
Washington Tree Fruit Research Commission., Feb. 20 1992
Wilbur Ellis growers' meeting, Wenatchee, Feb. 24, 1992.
Northwest Producers for Biorational Agriculture, Mar. 18, 1992
Northwest Producers for Biorational Agriculture, May 24, 1992
Wilbur Ellis Fieldmens' meeting, Wenatchee, June 9, 1992
North Central Washington Fieldmens' meeting, June 18, 1992
Wilbur Ellis growers' meeting, Wenatchee, 1/12/93.
Dovex growers' meeting, 1/15/93.
G. S. Long growers' meeting, Yakima, 1/19/93.
Pear day, Wenatchee, 1/21/93.
Wilbur Ellis growers' 4531 Termination rpt meeting, Yakima, 1/26/93.
Okanogan Hort. Day, 2/5/93.
Entiat Hort. Day, 2/16/93.
Other:
Burts, E. C., W. B. Hill & M. Doerr. 1993 Grape Mealybug on Apple and Pear.
14 min. video.