

URBAN/SMALL FARM IPM RESEARCH

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INTRODUCTION

According to the USDA, in 2008, New Mexico cash receipts for vegetable crops amounted to over \$133 million (USDA-ERS, 2009), while the fruit, nut and berry sector amounted to over \$105 million (ranking 13th in the US) (NASS, 2008)). Vegetable and fruit crops are particularly important to the state's small-scale and organic farmers. 95.5% of New Mexico's farms are currently classified as 'small' (i.e., generating \$250,000 or less in sales of agricultural commodities) and the state currently has approximately 200 certified organic growers managing a total of over 200,000 acres.

Many small-scale and organic growers produce a diverse array of crops with various associated pest problems, for which they often have limited control options. Pesticides available to small-scale growers are often older, broad-spectrum compounds that do not fit well into integrated pest management strategies, and non-chemical control techniques that were developed elsewhere do not always perform well under New Mexico growing conditions. Furthermore, very little work has been done on the naturally occurring biological control agents of some of our more important fruit and vegetable pests. There is thus an urgent need to investigate our indigenous natural enemies, to adapt existing control methods for use in New Mexico, and to develop integrated management strategies for pests affecting New Mexico fruit and vegetable crops.

CURRENT PROJECTS

Current projects on vegetable pests are targeted at squash bugs, cucumber beetles, and on the use of insectary plantings to attract and retain beneficial insects.

(i) Squash bug

Work commenced in spring, 2009, on the biology, phenology and control of squash bug, *Anasa tristis*, which stakeholder surveys identified as one of the key pests of concern in New Mexico. The phenological studies seek to determine the insect's seasonal life-history so that planting dates can be adjusted to escape peak populations. These studies have revealed that the squash bug typically emerges from overwintering in the first week of June in north-central New Mexico, and that good crops of summer squash can be obtained by early sowings of quick-maturing varieties such as Early Yellow Crookneck or Early Prolific. Sowing of pumpkins and other winter squash (which have a longer growing season) should be delayed until the second week of July, by which time most of the first generation of squash bug will have died.

Two species of egg parasitoids have been found at Los Lunas: one encyrtid (which has yet to be identified to species level), and a *Trissolcus* species (Scelionidae) which has never before been identified in the US. Current work on these species is focused on determining the critical features of their biology and phenology, on finding ways of enhancing their populations in the field, and on integrating them with other methods of control. A limited series of laboratory feeding trials have been conducted with several potential predators that are common in our field plots, including *Geocoris* sp., a crab spider, and *Nabis* sp. Of these, the crab spider showed the highest rates of predation and survival when confined to a diet of first instar squash bug nymphs. Minute pirate bugs (Anthocoridae) are also common on our squash and pumpkin plants, but their ability to feed and survive on squash bug eggs or nymphs has not yet been evaluated.

Glasshouse-based trials with organically acceptable insecticides have also been conducted and further work is planned to determine the impact of the most effective products on the squash bug's natural enemies.

(ii) Cucumber beetles

Cucumber beetles can be very damaging to newly emerged cucurbit seedlings. These insects emerge earlier in the season than do squash bugs and have a broader adult host range, making them more difficult to control and potentially more damaging. Current work on these beetles is focused on determining the prevalence and seasonal impact of a parasitic tachinid fly that was first found at Los Lunas in 2009, and on the impact of insectary plantings on populations of spotted cucumber beetle (*Diabrotica undecimpunctata*).

(iii) Insectary plants

Field trials are being conducted using border plantings of 'insectary' plants to attract and retain beneficial insects around plots planted with pumpkins. Plots without insectary plants are used as controls in a randomized block design with three replicates in each of two fields (two soil types). Populations of squash bug adults, nymphs and egg masses are monitored weekly, as are beneficial insects and other pest species such as cucumber beetles. The first year of this study revealed a significant negative effect of the insectary plantings on populations of the spotted cucumber beetle, and current work is seeking to confirm this effect and refine the mixture of species used in the insectary plantings.

2. Fruit pests

Current projects on fruit pests include control techniques for peach pests [peach tree borer (*Synanthedon exitiosa*) and peach twig borer (*Anarsia lineatella*)], a survey of stink bugs in orchard ground flora, and evaluation of natural enemies of the cherry/pear sawfly (*Caliroa cerasi*). Future work is planned on organic control of the apple maggot (*Rhagoletis pomonella*) which is currently expanding its range in New Mexico.

(i) Peach tree borer & peach twig borer

The peach tree borer project is being conducted in conjunction with Steve Guldan, Shengrui Yao and David Salazar at the Alcalde Agricultural Science Center. Two approaches are being tested: the use of entomopathogenic nematodes and mating disruption. The peach twig borer project has concentrated on evaluating organically-approved insecticides and validating the use of developmental models for optimum spray timing.

(ii) Stink bug survey

Stink bug damage to peaches is a concern for many growers. This study seeks to fill gaps in our knowledge concerning the seasonal incidence of different species, and the influence of orchard ground flora on their populations.

(iii) Natural enemies of the cherry/pear sawfly (*Caliroa cerasi*)

So far, only one predator has been found: the spined soldier bug (*Podisus maculiventris*), the nymphs of which were observed feeding on *C. cerasi* larvae at Los Lunas ASC. Sawfly larvae and pupae have been reared to adulthood to check for parasitoids, but so far without success.