Use of Alternative Row Covers and Pollinators to Manage Insect Pests and Improve Cucurbit Production and Profitability
By Michele Gauger, Ronald Hoover & Thomas Murphy

The cucurbit (cucumber, squash, melon, pumpkin & gourd) crop industry is valued at nearly $1.5 billion in the United States (U.S.). While growers throughout the northeast U.S. recognize the value of including cucurbit species in their vegetable crop rotations and to their farm's bottom line, insect pests can present a significant obstacle to realizing that value.

Management of cucurbit pests such as cucumber beetle, squash bug and squash vine borer poses a greater challenge for those growers utilizing organic or other natural production methods. Although numerous insecticides exist to control all three of these major cucurbit pests, many are not allowable by organic certification or naturally grown standards. Those that are allowed may not be as effective, cost-prohibitive or desirable, especially when many growers are concerned about impacts on native, beneficial and pollinating insect species.

Management of these pests can include hand harvest and destruction of individual insects, along with attempting various cultural controls and insecticide-alternative methods. Growers continue to experiment with techniques such as row covers, delayed planting of cucurbit crops, use of transplants instead of direct seeding, crop rotation, debris removal, resistant cultivars, companion planting and others, as means to control cucurbit pest pressure. Some growers simply over plant some of these crops to produce enough marketable fruit, as many simply accept the oftentimes-huge quality and yield losses caused by the pests. Other growers are unwilling to accept losses and have eliminated cucurbits from their cropping system.

Various published and independent surveys of growers throughout the U.S. have indicated that control of cucurbit pests is a high priority. As costs of production continue to climb, and as the demand for organic produce continues to increase, it is important that many small to mid-sized mixed vegetable growers are able to produce a successful cucurbit crop each year. The need is great to identify a cost-effective, environmentally neutral control method for cucumber beetle, squash bug and vine borer.

Previous research has shown that row covers can have a positive impact on cucurbit crop yields by providing a barrier to insect pests. Although these results are promising, a disadvantage for using row covers is that they need to

be removed to allow natural pollinators access to cucurbit crop flowers. Barrier removal also enables pest insects to access and damage the crop.

Current on-farm research studies being conducted are intended to build upon preliminary work conducted on two farms in 2007 by the host farmers and staff from the Penn State/PASA On-Farm Research (OFR) program. Prior to 2007 two cooperating farms (Tewksbury Grace Farm & White Frost Farm) had nearly total cucurbit crop losses (winter squash, cucumber, pumpkin and zucchini). Both growers were interested in maintaining cucurbits as part of their rotation, since they are valuable crops for direct to consumer and restaurant sales.
Our previous research at both farms involved using the lightest weight, spun-bonded row cover material on the market (Agribon, AG-15), while covering winter squash crops for the entire growing season. The row cover was never removed to provide native pollinators access to crop flowers. Instead, reared pollinators were introduced and maintained for the remainder of the season under the row cover. White Frost Farm also compared yields from covered and non-covered plants that were established both by transplanting and direct-seeded planting.

Both cooperating growers were pleased with crop yields and offered modifications for current trials underway in 2008. As these cooperators increase their knowledge of these insect pest lifecycles, various control methods and other key factors, they will become important teachers to other regional growers on this topic.

Results from the preliminary studies conducted during 2007 have shown exclusion of insect pests on cucurbits with a row cover can be an effective means to improve both yields and quality of fruit. The current study seeks to determine the efficacy and especially the cost effectiveness of exclusions that are more durable than the spun polyester material that was good for only one year's use. Research led us to utilize a woven mesh material in 2008 called Agralan Enviromesh (http://www.agralan.co.uk/com.pest.html).

2008 Cucurbit Research Farm Participants

Cathy and Kit Kelley organically manage, White Frost Farm, near Washingtonville PA (Montour Co.). While the Kelley's farm is not currently certified organic, they use no chemical fertilizer, herbicides or pesticides. The farm consists of 39 acres. Approximately 2 acres are used in the production of

organically grown vegetables marketed at a local farmers' market and two specialty grocery stores in Montour, Union and Northumberland counties.

The Kelley's also have a 150 hen; free-ranging laying flock that is fed certified organic feed exclusively. They raise approximately 200 broilers annually that are also fed exclusively certified organic feed and are raised on pasture via portable range pens.

The Kelleys have had previous pumpkins and winter squash crops decimated by squash bug infestations, and they were part of the preliminary research begun in 2007.

The Kelleys will be using the Enviromesh to cover two hoop house structures approximately 60' x 12'. One hoop house will include direct seeded winter squash (variety Waltham) under black plastic and the second will include transplanted winter squash (same variety) into black plastic mulch. To maximize space in each hoop house additional plantings of lettuce and/or cucumbers will be included.

A comparison planting of uncovered, field plantings will include the same variety of winter squash in two beds using black plastic, measuring 130' x 3'. One bed will be direct seeded and the other utilizing transplants. Yields will be determined by collecting weights and counts of all marketable squash.

Leah and John Tewksbury produce sustainably-grown heirloom vegetables, herbs and Shiitake mushrooms on their farm located on 21 acres of mixed farmland, open meadows and hardwood forest in Muncy Hills area of Montour County. Their produce is hand-cultivated, completely organic, and uses no mechanized equipment such as tractors, rototillers or mowers, on 1.5 acres of raised garden beds. They practice conscientious stewardship of our earthly home through farming and community service. Their heirloom vegetable varieties, which feature old-fashioned or unusual seeds, provide exceptional flavor, nutrition and freshness that can only be found in diversified local farm systems. Their produce is marketed to customers and restaurants in Lycoming, Union and Columbia counties.

Enviromesh row cover will be used on two raised beds measuring 75' x 3' transplanted with winter squash (varieties include varieties Long Island cheese, Sweet meat, Candy roaster, Flat white Boer, Sweet dumpling, Stella blue, Uncle David's dessert, Kabocha black forest, Sunburst patty pan, warted green Hubbard, sugar Hubbard, Guatemalan blue, Jarrahdale, Tahitian) and one 75' x

3’ bed transplanted with cucumbers (varieties Mini white, Fountain, Suhyo long, Marketmore, Babylon, Straight 8, Diva, Tasty Jade, Telegraph, Shantung Suhyo & in three successive plantings).

For comparison a small planting of cucumbers will remain uncovered. Yields will be determined by collecting weights of all varieties of winter squash and cucumbers.

Anne and Eric Nordell have been growing organic produce and herbs for over 20 years at Beech Grove Farm in Trout Run, PA. They also write regularly for the *Small Farmers Journal* about their bio-extensive approach to vegetable production which relies on cover crops and horse-drawn tillage for weed control, soil quality and moisture conservation. Their produce is marketed to customers and restaurants in the Lycoming county area.

At the Nordell’s farm they will be using row cover material to cover a hoop house structure approximately 100’ x 10’.

Plantings will include early lettuce and cucumber (variety Olympian). For comparison a field planting of cucumbers (same variety) will also be transplanted under row cover, with the cover removed at blossom stage. Yields will be determined by marking 3, 10 ft. sections in each row (in the hoop house and in the field trial) and collecting the total number of cucumbers harvested. Also one or two times during the trial the grower will collect a selection of about 15 cucumbers, which will also be weighed.