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Organic Practices for the Production of Butternut Squash

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Abstract
Growers of organic squash need effective ways to manage insect and disease problems. The squash bug (Anasa tristis) sucks sap, causing leaves to wilt and turn black. The squash vine borer (Melittia cucurbitae) can devastate winter squash plantings. Burrowing by larvae into the base of the stem causes yellowing and wilting. Organic insecticides are expensive, have limited efficacy, require many applications, and some kill beneficial as well as target insects.

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Organic Practices for the Production of Butternut Squash

RFR-A1226

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Introduction

Growers of organic squash need effective ways to manage insect and disease problems. The squash bug (*Anasa tristis*) sucks sap, causing leaves to wilt and turn black. The squash vine borer (*Melittia cucurbitae*) can devastate winter squash plantings. Burrowing by larvae into the base of the stem causes yellowing and wilting. Organic insecticides are expensive, have limited efficacy, require many applications, and some kill beneficial as well as target insects.

Row covers are widely used to protect cucurbit crops from transplant until anthesis (start of bloom) because they accelerate crop development, guard against environmental extremes, and exclude pests. Once row covers are removed, insect pests can rapidly colonize and damage plants. Extended-duration row-cover strategies, despite their major benefits, can restrict pollinator access to flowers. The fact that winter squash has relatively few harvests suggests that full-season row covers may be feasible, with a window of removal for pollination. Alternatively, opening row cover ends or removing covers at anthesis could allow pollination, but may risk squash bug and squash vine borer immigration.

This report focuses on third-year results of a 3-year multi-state effort, with University of Kentucky and Penn State University, to optimize organic growing practices that effectively manage insect and diseases and enhance pollination.

Materials and Methods

Transitioning organic land was used for the experimental plot at the ISU Horticulture Research Station, Ames, Iowa. On June 6, 2012, 10-day-old organic transplants of Betternut 401 butternut squash were planted 2 ft apart in black plastic mulch with drip irrigation and 9-ft row centers. Organic bagged fertilizers, Fertrell® 5-1-1 (66 lb/acre) and Fertrell® 3-4-7 (110 lbs/ acre), were applied two weeks before transplant. Spunbond polypropylene row covers (Agribon® AG-30) were installed on wire hoops immediately after transplanting.

A Latin square was used to examine impacts. Four row-cover treatments were compared: 1) no row covers (control); 2) row covers applied at transplant and removed at anthesis (start of female flower bloom); 3) row covers applied at transplant, ends opened at anthesis, and row covers removed 10 days later; 4) row covers applied at transplant, removed at flowering (July 18), and replaced 21 days later (Aug 8); and 5) row covers removed at harvest (Figure 1).

The Organic Materials Review Institute's registered insecticides and fungicides were applied on a rescue basis only, triggered by results of weekly monitoring. A combination of Pyganic®, Entrust, and insecticidal soap was applied for squash bugs. Weed management was achieved with 6 in. of chopped cornstalk mulch between rows, and composted bark was placed around the transplant holes in the plastic around each seedling before row cover placement.

Populations of insect pests were monitored weekly from transplant through the beginning of harvest using weekly visual counts on five randomly chosen plants from each subplot. Disease incidence was monitored weekly.

Squash were harvested from September 6 to October 11. The number and weight of marketable and cull squash harvested from each subplot was recorded. Culls with a physiological disorder, in which the vine attaches to the underside of the fruit, and unmarketable fruit caused by insect damage, were also noted.

Results and Discussion

The 2012 season was extremely hot and dry with high insect pest pressure. Spring winds damaged the seedlings with no row covers. A mid-September frost accelerated the harvest, killing the plants and damaging the fruit with no row covers. However, no significant differences in yield were observed among treatments (Figure 2).

The most serious pest threat was the squash bug. Egg masses were first seen in late June and within one month over 50 nymphs/plant were observed. In addition, cucumber beetle populations increased to over 30/plant in early August. This triggered several insecticide applications in mid-August. Plants protected by row covers received one to six fewer sprays (Table 1).

A new disease to Iowa, yellow vine disease caused by *Serratia marcescens,* resulted in pre-mature death of over half of the plants in the row cover treatments (except the full-season row-cover treatment) and accelerated harvest in the no row-cover treatment (Figure 3). However, the disease occurred late in the season and apparently did not affect yield. No foliar fungal diseases were observed.

As in the previous two years, the no row-cover treatment had the fewest culls resulting from vine attachment (Figure 2). We believe that the vine attachment problem is a weakness of the cultivar Betternut 401, and it was clearly made worse under the row covers, as in past years. High heat appeared to inhibit female flower production and may have exacerbated the vine attachment cull problem.

Conclusion

All treatments resulted in similar yields, but with very different grower inputs. Several factors including labor, costs, local and seasonal insect and disease problems, and climate must be considered when growers adopt organic practices. Row covers protected the seedlings from high winds, and an intensive program of insecticidal sprays, sometimes applied twice weekly, were required to keep plants alive and obtain acceptable yield. The season-long row-cover treatment protected fruit from a damaging later season frost, saved six insecticide sprays, prevented the occurrence of yellow vine decline, and had yields similar to those of the other row-cover treatments.

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Table 1. Summary of organic production of butternut squash using row covers in 2012.

Row cover treatment	Number of sprays*	CYVD%**	Dates: Row covers removed	Dates: First cuke beetles	Dates: First squash bug eggs	First harvest
1 No row-cover control	7	56	NA	June 28	June 22	Sept 23
2 Row covers removed at anthesis	6	18	July 18	July 25	Sept 22	Sept 9***
3 Open ends at anthesis; row covers removed 10 days later	5	4	July 27	Aug 2	Sept 22	Sept 22
4 On-off-on season-long row covers	1	0	Off July 18 On Aug 8	Aug 2	Sept 22	Sept 22

*Sprays (Pyganic/Entrust/Soap) were applied when plants had an average of either 1 squash bug egg mass or 10 cucumber beetles per plant.
**Yellow vine decline caused by *Serratia marcescents* and spread through squash bugs.
***Plants were almost dead.

Figure 1. Row-cover treatments during anthesis.

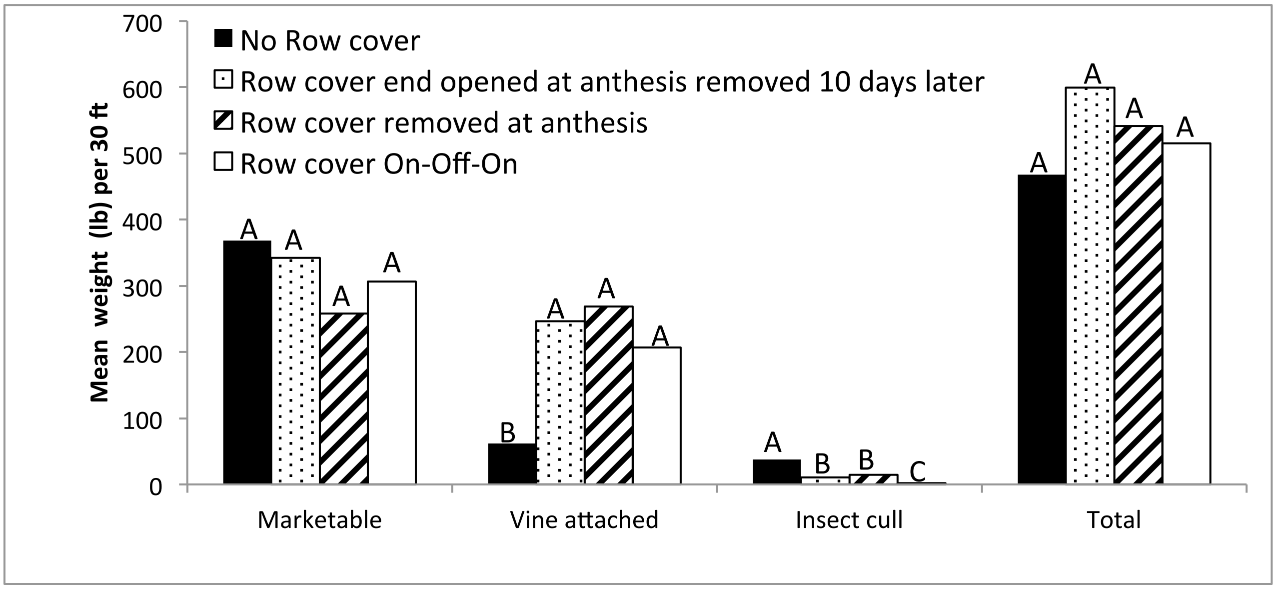

Figure 2. Mean weight (lb) for marketable squash, fruit with vine attached, insect culls, and total harvest for four row-cover treatments in 30-ft-long replicated plots.

Figure 3. Cucurbit yellow vine disease (symptoms left) was newly discovered in Iowa and is vectored by squash bugs (right).