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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

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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, protect 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 second-year results of a three-year multi-state effort, with University of Kentucky and Pennsylvania 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 8, 2011, 10 day-old organic transplants of Betternut 401 winter squash were planted 2 ft apart in black plastic mulch with drip irrigation and 9-ft row centers. Organic bagged fertilizer—Fertrell® 5-1-1 (66 lb/acre) and Fertrell® 3-4-7 (110 lb/ acre) were applied two weeks before transplant. Spunbond polypropylene row covers (Agribon® AG-30) were installed on wire hoops immediately after transplanting.

Four row cover treatments were compared as follows: 1) No row covers (control); 2) Row covers applied at transplant and removed at anthesis (start of female 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 22) and replaced 18 days later (Aug. 8); row covers removed at harvest (Figure 1).

OMRI-registered insecticides and fungicides were applied on a rescue basis only, triggered by results of weekly monitoring. Pyganic® was applied for squash bugs. Microthiol® (sulfur) was applied to control powdery mildew and Champ 50WG® (copper) was used to control cucurbit anthracnose, which is caused by the fungus *Colletotrichum orbiculare*. Weed management was achieved with 6 in. of chopped corn stalk mulch between rows and composted bark was placed around the opening 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 September 16. 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, were also noted.

Results and Discussion

A September killing frost accelerated the harvest and reduced the storage life of the squash. Plants under the season-long row-cover treatment were not damaged by the cold.

The most serious pest threat was the squash bug in which egg masses were first seen in late July and within one month over 50 nymphs per plant were observed. Also cucumber beetle populations increased to over 30 per plant in mid-August. This triggered weekly Pyganic sprays on exposed plants. Plants protected by row covers received one to three less sprays (Table 1).

Early season occurrence of anthracnose was effectively controlled using two sprays of copper hydroxide on the no row cover treatment, whereas row cover treatments eliminated one or two applications. All treatments received a sulfur/Pyganic spray on August 8, immediately before the replacement of the season-long row covers. Bacterial wilt was not detected.

As in 2010, the no-row cover and season-long-row cover treatments had the highest marketable yield and the fewest of culls due to vine attachment (Figure 2, Table 1).

In conclusion, several factors must be considered when growers adopt row covers. The season-long row-cover treatments protected the fruit from a damaging frost, saved two fungicide and three insecticide sprays, and had similar yields to the no-row cover treatment. Removal of the row cover for 18 days during flowering allowed for adequate pollination. Poor performance of the 10-day-after anthesis row-cover removal treatment suggests problems with pollinator access, as was observed in 2010.

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Table 1. Summary of organic production of butternut using row covers in 2011.

Row cover treatment	Number of sprays			Dates			Weight (lb) per 30-ft plot*	
	Pyganic	Copper	Sulfur	Row covers removed	First cuke beetles	First squash bug eggs	Market -able	Cull**
1 No row covers	4	2	1	NA	July 5	July 27	105 a	26 ab
2 Row covers removed at anthesis	4	1	1	July 22	July 22	Aug. 10	97 ab	54 b
3 Open ends at anthesis; row covers removed 10 days later	3	0	1	Aug 1	Aug. 10	Aug. 19	73 b	40 ab
4 Season-long row covers	1	0	1	Off July 22, on Aug 8	NA	NA	120 a	24 a

*Means followed by the same letter are not significantly different within column ($P \leq 0.05$).
**Culls with vine attached to fruit.

Figure 1. Season-long row covers removed during flowering for pollination.

Figure 2. Cull squash with vine attached.