

# **An Examination of Kaolin Particle Film for Insect Pest Management in Organic Winter Squash—Neely-Kinyon Trial, 2005**

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## **Introduction**

Organic farming has increased to a \$13 billion industry in the U.S. and continues to expand approximately 20% annually (USDA-ERS, 2003). In Iowa alone, organic acreage has increased from 13,000 in 1995 to 100,000 in 2002 (IDALS, 2003). Farmers interested in transitioning some or all of their land to organic production require information on best management practices for these systems. Because the first year of transition to organic production is often considered the most challenging, methods to buffer the system against pests are needed to ensure yields similar to conventional production. Our research (Delate, 2002-2004) has demonstrated comparable yields to conventional crops, using certified organic practices. In 2001, we began an examination of one of the most important farmer-identified problem in organic squash production— insect pest management for the organic baby food market. Most pest problems in organic systems are managed through cultural and biological control techniques, but certain pests, such as the cucumber beetle transmitting bacterial wilt, may warrant additional controls in certain years.

In the first two years of the experiment (2001-2002) at Laura Krouse’s Abbe Hills Farm in Mt. Vernon, Iowa, management strategies for the cucumber beetle, squash bug (*Anasa tristis*), and squash vine borer in cucurbits included Surround™ (kaolin clay product) (Engelhard Corp., Iselin, NJ), applied on a bi-weekly basis from plant emergence until 1 month prior to harvest; interplanting buckwheat to assist in increased parasitization of the squash bug by the natural enemy, *Trichopoda pennipes*; and applying Reemay™ row covers to prevent colonization by squash bugs, squash vine borer, and cucumber beetle. Row covers were the most effective method of reducing pest injury (Delate, 2002), with the lowest squash yields occurring in the buckwheat-interplant treatment. Although pests were not significantly reduced with the kaolin clay, we speculated that a formulation with a longer residual cover could potentially lower pest load.

From 2003–2005, we evaluated the effect of two formulations of the kaolin clay product at the Neely-Kinyon Farm. Because squash was destined for the organic baby food market, emphasis was placed on a high-yielding organic cultivar with minimal pest problems.

## Materials and Methods

Organic 'Waltham Butternut' winter squash seeds (Johnny's Selected Seeds, Albion, ME) were planted on May 27, 2005, in plots measuring 6.5 x 18 ft. with two rows of 5 hills each and four replications of each treatment at the Neely-Kinyon Research Farm in Greenfield, Iowa. In 2005 we assigned the following treatments:

- Surround WP<sup>®</sup> applied on a weekly basis from plant establishment until plant leaf senescence (approximately 1 month prior to harvest);
- Surround XP<sup>®</sup> applied on the same schedule; and
- A control (no treatment).

The total treated area of squash plants was 22.5 x 72 ft. The application rate for both formulations of Surround<sup>®</sup> was 50 lb. of kaolin clay to 100 gallons of water for the first two applications, then 25 lb/100 gallons of water for the last six applications. Plants were sprayed on July 7, 13, 22, 28, and August 3, 9, 18, and 24, 2005. Insect data were collected on July 13, 22, 28, and August 3, 9, 18, and 24 by sampling ten random leaves in three different areas of each plot for insect pest and beneficial species. Squash were counted, weighed, and measured at harvest on September 20, 2005.

## Results and Discussion

Pest insect populations, including cucumber beetles and squash bugs, were moderate to high throughout the season and greater than in 2004. In 2005, the total pest population was greater than the total beneficial insect population (Fig. 1) contrasting with results from 2004. There were no significant differences in insect populations throughout the growing season except for cucumber beetle populations on August 24, where the Surround XP<sup>®</sup> plots had the fewest beetles (averaging 0 beetles per 10 leaves) compared with the other two treatments (averaging 1 beetle per 20 leaves) (Table 1).

No significant differences were observed between treatments in squash yield or fruit per acre (Table 2), with excellent yields at 9,700 to 12,000 lb/acre. There was a trend towards greater yields in the Surround WP<sup>®</sup> compared to the Surround XP<sup>®</sup>, but differences were not significant. There were also no significant differences between treatments in individual squash fruit weight or length. There was, however, a significantly greater fruit width (averaging 4.25 in.) in the Surround WP<sup>®</sup> treatment compared with the other two treatments (averaging 3.89 in.).

## References

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[USDA-AMS] U.S. Department of Agriculture -Agriculture Marketing Service. 2005. National Organic Program. Final Rule: 7 CFR Part 205, USDA, Washington, D.C.

**Table 1. Insect populations, Neely-Kinyon Farm, 2005.**

Treatment	Squash bugs per 10 leaves							
	July 13	July 22	July 28	Aug. 3	Aug. 9	Aug.18	Aug. 24	Mean
Control	0.08	0.00	1.17	8.42	6.33	9.08	5.92	4.28
SurroundWP <sup>®</sup>	0.08	0.08	1.67	2.67	0.00	3.92	5.08	1.93
Surround XP <sup>®</sup>	0.42	0.00	2.25	1.92	4.67	4.50	3.92	2.62
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS
Squash bug egg clusters per 10 leaves								
Control	0.75	0.67	0.33	0.92	1.67	3.25	4.42	1.68
SurroundWP <sup>®</sup>	0.33	0.67	0.75	0.92	0.92	3.25	4.08	1.56
Surround XP <sup>®</sup>	0.58	0.89	0.92	0.50	1.17	2.08	4.67	1.57
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS
Cucumber beetles per 10 plants								
Control	1.00	0.73	0.58	0.00	0.42	0.17	0.25ab	0.46
SurroundWP <sup>®</sup>	0.25	0.17	0.17	0.08	0.33	0.42	0.75b	0.32
Surround XP <sup>®</sup>	1.42	0.22	0.33	0.08	0.00	0.33	0.00a	0.35
LSD (0.05)	NS	NS	NS	NS	NS	NS	0.59	NS
Beneficial insects per 10 plants								
Control	0.00	0.00	0.00	0.08	0.08	0.17	0.00	0.05
SurroundWP <sup>®</sup>	0.00	0.00	0.33	0.00	0.00	0.17	0.50	0.14
Surround XP <sup>®</sup>	0.00	0.00	0.00	0.08	0.08	0.08	0.08	0.05
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS

**Table 2. Squash harvest, Neely-Kinyon Farm, 2005.**

Treatment	Squash weight (lb/acre)	Fruit/acre	Individual squash weight (lb)	Individual squash width (in)	Individual squash length (in)
Control	12,006.0	6,143.1	1.95	3.89b	7.96
SurroundWP <sup>®</sup>	10,487.9	5,398.5	1.94	4.25a	7.89
Surround XP <sup>®</sup>	9,726.9	5,305.4	1.83	3.88b	7.49
LSD (0.05)	NS	NS	NS	0.23	NS

Figure 1. Insect populations through the growing season, Neely-Kinyon Farm, 2005.

