SQUASH (*Cucurbita pepo* 'Honey Bear')
Powdery mildew; *Podosphaera xanthii*

M. T. McGrath and Z. F. Sexton
Plant Pathology & Plant-Microbe Biology Section
SIPS, Cornell University, LIHREC
3059 Sound Avenue, Riverhead, NY 11901

Efficacy of organic fungicides for managing powdery mildew on acorn squash, 2018.

An experiment with field-grown squash was conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY, in a field with Haven loam soil. The objective of this experiment was to assess the efficacy of LifeGard, a biological plant activator, used alone or in a program with other OMRI-listed fungicides for powdery mildew and bacterial leaf spot in cucurbits. Products selected are labeled for both diseases. The cultivar selected has intermediate resistance to powdery mildew. The field was plowed on 29 May. On 1 Jun controlled-release fertilizer (N-P-K, 15-5-15) at 675 lb/A (101 lb/A N) was broadcast over the bed area and incorporated, then beds were formed with drip tape and covered with black plastic mulch. A waterwheel transplanter was used to make planting holes in the beds and apply starter fertilizer. Two seeds were placed in each opening in the plastic mulch by hand on 27 Jun, and emerging seedlings were then thinned to one plant per hole on 3 Jul. Weeds were managed between the mulched beds by applying Strategy 3 pt/A, Sandea 0.5 oz/A, and Roundup PowerMax 22 oz/A prior to seedling emergence on 29 Jun using a tractor mounted sprayer. During the season, weeds were managed by cultivating and hand weeding as needed. The following fungicides were applied throughout the season to manage Phytophthora blight: Presidio 4 fl oz/A on 25 Jul, Ranman 2.75 fl oz/A on 30 Jul, Orondis Ultra 7 fl oz/A on 4 Aug, Revus 8 fl oz/A on 7 Aug, Omega 1.5 pt/A on 13 Aug, Orondis Ultra 7 fl oz/A on 23 Aug, Orondis Ultra 7 fl oz/A on 30 Aug, Omega 1.5 pt/A on 6 Sep, and Ranman 2.75 fl oz/A on 15 Sep. The primary source of initial inoculum of *Podosphaera xanthii* in this area is considered to be long-distance wind-dispersed spores from affected plants. Plots were three 15-ft rows spaced 68 in. apart, 12 plants per plot. A randomized complete block design with four replications was used. Treatments were applied on a 7-day schedule using a tractor-mounted boom sprayer equipped with twinjet (TJ60-11004VS) nozzles spaced 17 in. apart that delivered 72 gal/A at 50 psi and 2.3 mph. Applications of LifeGard were begun on 19 Jul, at least two weeks before fruit production was anticipated to begin, which is the growth stage when powdery mildew typically starts to develop. Plots were inspected for powdery mildew symptoms on upper and lower leaf surfaces on 24 Jul; and 1, 7, 16, 24 and 31 Aug. For each assessment 5 old to middle age leaves and 5 young leaves were evaluated per plot. Powdery mildew colonies were counted; severity was assessed by visual estimation of percent leaf area affected when colonies could not be counted accurately because they had coalesced and/or were too numerous. Colony counts were converted to severity values using the conversion factor of 30 colonies/leaf = 1% severity. Average severity for the entire canopy was calculated from the individual leaf assessments. Area Under Disease Progress Curve (AUDPC) values were calculated from 1 Aug through 17 Sep using the formula: $\sum n_{i=1}[(R_{i+1} + R_i)/2]\,[t_{i+1} - t_i]$, where R = disease severity rating (% of leaf surface affected) at the ith observation, t_i = time (days) since the previous rating at the ith observation, and n = total number of observations. Plots were also evaluated for canopy health using a hand-held GreenSeeker crop sensor, which measured canopy greenness using the Normalized Difference Vegetation Index (NDVI) spectral reflectance index. Plots were measured for canopy greenness on the same day as powdery mildew disease ratings when light conditions were appropriate (full sunlight). Two measurements were taken per plot and averaged. Data was analyzed with one-way ANOVA and Tukey's HSD to separate means using JMP statistical software. Average monthly high and low temperatures (°F) were 85/70 in Jul and 84/72 in Aug. Rainfall (in.) was 3.76 and 6.04 for these months, respectively.

Powdery mildew was first observed in this experiment on 1 Aug at very low levels, not in all plots. On 7 Aug, the three plots with the numerically highest severity were ones treated with LifeGard alone. No phytotoxicity was observed. NDVI values did not differ significantly among the treatments on any assessment date (data not shown). No symptoms of bacterial leaf spot were observed although this disease was widespread in a cucurbit experiment in the field in 2017. This report includes work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, Hatch under NYC-153409.

	Powdery mildew severity (%) [y,z]							
	Upper leaf surface				Lower leaf surface			
Treatment and rate (application dates) [x]	16 Aug	24 Aug	31 Aug	AUDPC	16 Aug	24 Aug	31 Aug	AUDPC
Untreated control	2.41 a	4.53	12.72 a	107.8 a	1.86	9.12	9.8	129.1
LifeGard 4.5 oz/100 gal (1-7)	4.66 a	3.37	4.12 b	103.6 a	1.94	13.05	12.0	163.3
Cueva 2 qt/A (3,5,7) Double Nickel 2 lb/A (3,5,7) Timorex Gold 0.6 fl oz/gal (4,6)	0.53 a	1.94	2.11 b	32.5 ab	4.71	8.79	10.0	177.3
LifeGard 4.5 oz/100 gal (1-7) Cueva 2 qt/A (3,5,7) Double Nickel 2 lb/A (3,5,7) Timorex Gold 0.6 fl oz/gal (4,6)	0.73 a	1.26	2.84 b	28.3 b	0.71	2.57	5.1	49.4
P-value (treatment)	0.0431	0.165	0.0016	0.0109	0.8007	0.1438	0.5526	0.3109

[z] Values in each column with a letter in common or with no letter are not significantly different from each other (Tukey's HSD, *P*=0.05).
[y] When data were not distributed normally, values were square root transformed before analysis. Table contains back-transformed values.
[x] Rate of formulated product. LifeGard rate was 3.25 oz/A. Application dates were 1=19 Jul, 2=27 Jul, 3=3 Aug, 4=10 Aug, 5=17 Aug, 6=24 Aug, and 7=31 Aug.