Evaluation of Organic Cucumber, and Summer and Winter Squash Varieties for Certified Organic Production—Neely-Kinyon Trial, 2005

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Introduction

The requirement for organic seed in certified organic operations has prompted many seed companies to increase their organically-grown germplasm stock and selections. Seeds of Change, Inc., approached Iowa State University to conduct trials of organic cucurbit varieties in 2004 to determine performance under Midwestern conditions. The 2005 Organic Cucurbit Variety Trial was an extension of the 2004 experiment.

Materials and Methods

On May 26, 2005, 12 varieties of organic summer and winter squash, cucumbers, and zucchinis were planted at the Neely-Kinyon Farm in Greenfield, IA. Plots measuring 7.5 × 15 feet were laid out in a completely randomized block design with three feet between plots and four replications of each variety. Three seeds were planted in each of nine hills per plot. Weed control was established through the following procedures: tilling with a walk-behind tiller on July 6, hand-hoeing on June 22, July 6, July 7 and August 18, and applying mulch on June 24. Germination data were taken on June 23 by counting the number of emerged plants per plot. Plant production data on random 3 plants per plot included plant length (the longest shoot of each plant) and number of leaves on June 27. Insect data on June 27 and on August 18 included an enumeration of all insects on the longest shoot. Plant disease data on June 27 included the number of plants that had died due to disease in each plot. Because of high populations of cucumber beetles, Surround WP™ (Engelhard Corp., Iselin, NJ) was applied at 25 lb/100 gal water to all plants on June 28 and cucumber plants only on July 7. Cucumber harvests occurred on July 27, August 3, 8, and 16. Summer squash plots were harvested on July 11, 14, 20 and 27, and August 3, 8, 16, and 23. Winter squash harvests occurred on September 6, 8, and 16, 2005.

Results and Discussion

Cucumber

Cucumber plant performance statistics are enumerated in Table 1. There was a trend towards greater cucumber seed germination in the SOC 'Northern Pickling' variety, followed by 'Mideast Prolific' and 'Sweet Marketmore', although differences were not significant among varieties. No significant difference was observed in plant length between the three varieties; however, there was a trend toward greater plant length in the 'Mideast Prolific' and 'Northern Pickling' (averaging 22.5 cm) compared with the 'Sweet Marketmore' cucumbers with an average of 19.4 cm (Table 1). 'Mideast Prolific' tended to have the most number of leaves per plant, followed by 'Northern Pickling', and 'Sweet Marketmore', but no significant differences among varieties were found. There was a trend

toward a higher number of diseased plants per plot in the 'Mideast Prolific' and 'Northern Pickling' (averaging 2.75/plot) compared with the 'Sweet Marketmore' variety (0.75/plot). Cucumber beetles and squash bugs were observed on all varieties, but there were no significant differences in insect populations on June 27 or August 18, 2005 (Table 2).

The 'Sweet Marketmore' variety had a significantly higher number of fruit per acre compared with the 'Mideast Prolific' variety, but due to high variability, was not significantly different from 'Northern Pickling' (Table 3). Subsequently, the 'Sweet Marketmore' variety produced a significantly higher yield (3,466 lb/acre) than the other two varieties. The 'Sweet Marketmore' variety also had a significantly greater fruit length compared with the two other varieties. No significant differences were found in individual fruit width or fruit weight among varieties.

Summer Squash

Summer squash plant performance statistics are enumerated in Table 4. There was no significant difference in plant germination among varieties; however, there was a trend toward greater germination in the 'Black Beauty' variety compared with the other varieties. There were also no significant differences in plant length (Table 4). A significantly higher number of leaves per plant were found in the 'Cocozelle Bush' variety compared with the other two varieties. There were no significant differences in diseased plants between varieties, but there was a trend toward fewer diseased plants in the 'Golden Scallopini' and 'Black Beauty' varieties. Cucumber beetles and squash bugs were greatest in summer squash compared to cucumbers and winter squash, reaching as high as 9 squash bugs per shoot (Table 5). There were no significant differences among varieties in insect populations on June 27 or August 18, 2005, however (Table 5).

The 'Golden Scallopini' fruit was significantly wider and shorter than the other varieties, which was due to the variety's different shape (Table 6). There were no significant differences among varieties in number of fruit or yield. However, there was a trend toward greater numbers of fruit and yield (39,758 lb/acre) in the 'Black Beauty' variety. There were significant differences among the three varieties in fruit weight, with the greatest fruit weight in the 'Cocozelle Bush' variety and lowest fruit weight in the 'Golden Scallopini' variety (Table 6).

Winter Squash

Winter squash plant performance statistics are enumerated in Table 7. There was a significantly higher winter squash germination percentage observed in the 'Butternut' and 'Sweet Dumpling' varieties compared with the other four varieties (Table 7). No significant differences occurred among the remaining varieties. The 'Spaghetti' leaves were significantly longer and had significantly more leaves than all other varieties. The 'Butternut' variety plants were significantly shorter and had significantly fewer leaves than the other varieties. There were no significant differences observed in diseased plants. There was a significantly greater population of squash bug egg clusters in the 'Royal Acorn' variety compared with all other varieties (Table 8). There were no other significant differences found in insect populations on June 27 or August 18, 2005.

There were significantly more fruit per acre in 'Delicata' (12,487 fruit/acre), 'Butternut' (9,293 fruit/acre) and 'Sweet Dumpling' (8,422 fruit/acre) compared with the 'Hokkaido' variety (Table 9). The 'Spaghetti' and 'Hokkaido' fruit were significantly wider than the other varieties while the 'Butternut' variety was significantly longer than all other varieties. The 'Spaghetti' and "Hokkaido'

varieties had significantly greater individual fruit weight compared with the ‘Delicata’, ‘Royal Acorn’ and ‘Sweet Dumpling’ varieties. Yield was significantly greater in the ‘Spaghetti’ (21,808 lb/acre) and ‘Butternut’ varieties (22,317 lb/acre) compared with the other varieties.

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Table 1. Cucumber plant data, Neely-Kinyon Farm, 2005.

Variety	Germination [z] (%)	Plant length [y] (cm)	Number of leaves per plant [y]	Diseased plants per plot
Mideast Prolific	36.11	22.67	9.00	2.75
Northern Pickling	39.81	22.33	8.42	2.75
Sweet Marketmore	22.22	19.42	6.92	0.75
LSD $_{(0.05)}$	NS	NS	NS	NS

[z] Data collected on June 28.
[y] Data collected on July 21, 28, August 2, 3, and 4 (one data point only from 3 plants per plot).

Table 2. Insect populations in cucumber plots, Neely-Kinyon Farm, 2005.

Variety	Number of cucumber beetles per plant		Number of squash bugs per plant	Number of squash bug egg clusters per plant
	June 27, 2005	August 18, 2005	August 18, 2005	August 18, 2005
Mideast Prolific	1.33	0	5.00	0
Northern Pickling	0.25	-[z]	-[z]	-[z]
Sweet Marketmore	0.67	1.40	2.60	0
LSD $_{(0.05)}$	NS	NS	NS	NS

[z] Data was not collected in this variety.

Table 3. Cucumber harvest, Neely-Kinyon Farm, 2005.

Variety	Number of fruit per acre	Average fruit width (inches)	Average fruit length (inches)	Average fruit weight (lbs)	Total weight per acre (lbs)
Mideast Prolific	871.20b	2.44	6.44b	0.36	312.0b
Northern Pickling	2,807.2ab	2.61	6.39b	0.39	1,085.5b
Sweet Marketmore	7,066.4a	2.82	9.89a	0.49	3,465.5a
LSD $_{(0.05)}$	4,886.7	NS	1.56	NS	1,919.5

Table 4. Summer squash plant data, Neely-Kinyon Farm, 2005.

Variety	Germination [z] (%)	Plant length [y] (cm)	Number of leaves per plant [y]	Diseased plants per plot
Black Beauty	63.89	42.08	12.08b	0.75
Cocozelle Bush	54.63	46.67	18.00a	2.00
Golden Scallopini	58.33	43.17	9.67b	0.25
LSD $_{(0.05)}$	NS	NS	3.46	NS

[z] Data collected on June 28.
[y] Data collected on July 21, 28, August 2, 3, and 4 (one data point only from 3 plants per plot).

Table 5. Insect populations in summer squash plots, Neely-Kinyon Farm, 2005.

Variety	Number of cucumber beetles per plant		Number of caterpillars per plant	Number of squash beetles per plant	Number of squash beetle egg clusters per plant
	June 27, 2005	August 18, 2005	June 27, 2005	August 18, 2005	August 18, 2005
Black Beauty	0.00	6.38	0.00	8.63	3.63
Cocozelle Bush	0.42	3.50	0.08	9.33	1.67
Golden Scallopini	0.00	3.00	0.00	6.86	2.29
LSD $_{(0.05)}$	NS	NS	NS	NS	NS

Table 6. Summer squash harvest, Neely-Kinyon Farm, 2005.

Variety	Number of fruit per acre	Average fruit width (inches)	Average fruit length (inches)	Average fruit weight (lbs)	Total weight per acre (lbs)
Black Beauty	31,750.4	3.86b	11.91b	1.25b	39,757.9
Cocozelle Bush	22,264.0	3.59b	13.22a	1.58a	35,184.7
Golden Scallopini	22,360.8	5.93a	5.93c	0.98c	21,938.7
$LSD_{(0.05)}$	NS	0.29	0.89	0.16	NS

Table 7. Winter squash plant data, Neely-Kinyon Farm, 2005.

Variety	Germination [z] (%)	Plant length [y] (cm)	Number of leaves per plant [y]	Diseased plants per plot
Butternut	60.19a	26.33c	8.92c	0.25
Delicata	34.26b	34.67b	10.83bc	0.25
Hokkaido	36.11b	29.25c	11.92b	1.25
Royal Acorn	22.22b	35.00b	13.00b	0.25
Spaghetti	31.48b	48.33a	20.00a	1.75
Sweet Dumpling	58.33a	36.58b	12.42b	1.00
LSD (0.05)	0.17	4.68	2.44	NS

[z] Data collected on June 28.
[y] Data collected on July 21, 28, August 2, 3, and 4 (one data point only from 3 plants per plot).

Table 8. Insect populations in winter squash plots, Neely-Kinyon Farm, 2005.

Variety	Number of cucumber beetles per plant		Number of squash beetles per plant	Number of squash beetle egg clusters per plant
	June 27, 2005	August 18, 2005	August 18, 2005	August 18, 2005
Butternut	0.00	1.50	1.88	1.50a
Delicata	1.83	1.00	1.67	1.17a
Hokkaido	0.25	1.13	6.63	1.38a
Royal Acorn	0.00	1.04	3.25	3.75b
Spaghetti	0.17	0.92	4.38	1.00a
Sweet Dumpling	0.00	1.84	4.17	1.33a
LSD (0.05)	NS	NS	NS	1.73

Table 9. Winter squash harvest, Neely-Kinyon Farm, 2005.

Variety	Number of fruit per acre	Average fruit width (inches)	Average fruit length (inches)	Average fruit weight (lbs)	Total weight per acre (lbs)
Butternut	9,292.8ab	3.64c	8.31a	2.41b	22,316.5a
Delicata	12,487.2a	2.54d	6.37c	0.94d	11,667.9ab
Hokkaido	387.2d	5.00ab	4.00d	2.33ab	901.7b
Royal Acorn	4,840.0c	3.92b	6.42c	1.48c	7,141.0b
Spaghetti	7,453.6bc	4.22a	7.81b	2.93a	21,808.0a
Sweet Dumpling	8,421.6abc	3.98ab	3.45d	0.87d	7,328.2b
LSD (0.05)	4,220.97	0.24	0.48	0.19	11,020.7