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Summer Squash Variety Evaluation for Early-season Production in High Tunnels

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High tunnel is an effective tool to extend early-season production of warm-season vegetables. In the spring, high tunnels that are planted with warm-season vegetables are often closed to maintain heat inside the structure. As a result, pollination by natural pollinators are limited. Introducing bee hives to high tunnels increases production cost and may raise concerns of worker safety. Crops that can set fruit without pollination (parthenocarpic) have an advantage for early-season high tunnel production.

With a diverse fruit shape and color, summer squash is a valuable crop providing diversity especially for early farmers market. Previous studies indicated parthenocarpic character exists in some summer squash cultivars. But such information is not always clearly indicated in seed catalogs. Without knowing the information, farmers may miss the opportunity of growing summer squash and targeting for early harvest in high tunnels. In the present study, we evaluated six summer squash cultivars for their early-season yield potential. The selected cultivars are either indicated as parthenocarpic cultivars in seed catalogs or showed high capability to set fruit without pollination based on a previous publication (Steve, 2014).

Materials and methods

Cultivar name, fruit character and seed source are presented in Table 1. The trial was conducted in spring 2018 in an unheated, gothic-style high tunnel at the Southwest Purdue Agricultural Center (SWPAC) in Vincennes, IN. Transplants were produced in a greenhouse at SWPAC. Seeds were sown in 50-cell trays using peat-based growing mixes on March 8. Seedlings were transplanted in high tunnels on April 2 into raised beds with 4-ft center-to-center bed spacing. The beds were covered with black plastic mulch with one drip tape having 8-inch emitter spacing in the middle of each bed. The in-row plant spacing was 2 ft apart. Plants were fertigated three times per day, beginning 2 weeks after transplanting with potassium nitrate and urea ammonium nitrate solution.

Plants were checked daily for blooming in April. Blooming dates of female and male flowers of each plant were recorded. The number of aborted female flowers were checked four times on Apr. 22, Apr. 26, Apr. 29 and May 4. The high tunnel was closed entirely until around middle May. Harvest was conducted twice a week from Apr. 29 to June 11. Completely randomized block design with three blocks and three plants per experimental unite was used in the experiment.

Analysis of variance was performed using JMP Pro 14. Fisher's least significant difference test ($\alpha = 0.05$) was conducted for multiple comparisons of different measurements among treatments.

Results and discussion

Cultivar Multipik developed female flowers around Apr. 9, which was the earliest among the evaluated cultivars (Table 2). Male flowers of 'Multipik' bloomed about 10 days later compared

to the female flowers. Female flowers of cultivar Golden Glory bloomed the latest compared to the other cultivars, which was around Apr. 23. Male flowers of 'Golden Glory' bloomed about 5 days earlier than the female flowers. Cultivars Cavili, Dunja, Noche and Partenon developed male and female flowers about the same time around Apr. 17.

Cultivar Multipik had the greatest number of aborted female flowers while cultivar Golden Glory had the least number of aborted female flowers (Table 3). This agreed with the observations made by Steve (2014) that 'Golden Glory' had 100% fruit set and 'Multipik' had only 39% fruit set of bagged female flowers. The cultivars Dunja, Noche, Partenon were ranked in the middle, with 83%, 73%, and 69% fruit set of bagged female flowers, respectively.

Cultivar Cavili and Partenon were harvested the earliest with the first harvest on Apr. 29. The first harvest of all the other cultivars was on May 4. Within the harvest period, all cultivars had yield above 6 lb/plant (Table 4). Cavili had the highest yield (8.58 lb/plant) although it was not significantly different from other cultivars. Multipik produced the greatest number of straighneck fruit with smaller sizes compared to the other zucchini cultivars.

This trial showed that with careful cultivar selection, summer squash is a valuable crop grown in high tunnels without insect pollination for early-season production. Cultivars evaluated in this study are all suitable for this purpose.

Reference

Reiners, S. 2014. Producing summer squash without pollination-ranking varieties. 2014 Conference Proceedings. Cornell University. Jan 28 2020 < http://www.hort.cornell.edu/expo/proceedings/2014/Vine%20crops/Seedless%20squash%20Reiners.pdf>

Table 1. Cultivar, fruit character and seed source of summer squash cultivars evaluated at the Southwest Purdue Agricultural Center in Vincennes, IN in 2018.

Cultivar	**Fruit character**	**Seed source**
Cavili	Light green zucchini	Territorial Seed Company
Dunja	Dark-green zucchini	Johnny's Selected Seeds
Golden Glory	Bright yellow zucchini	Johnny's Selected Seeds
Multipik	Yellow straightneck	Johnny's Selected Seeds
Noche	Dark-green zucchini	Johnny's Selected Seeds
Partenon	Medium-green zucchini	Johnny's Selected Seeds

Table 2. Dates of blooming of female and male flowers of summer squash cultivars evaluated at the Southwest Purdue Agricultural Center in Vincennes, IN in 2018.

Cultivar	**Female flowers**	**Male flowers**
Cavili	Apr. 15[z]	Apr. 16
Dunja	Apr. 18	Apr. 21
Golden Glory	Apr. 23	Apr. 18
Multipik	Apr. 9	Apr. 19
Noche	Apr. 17	Apr. 17
Partenon	Apr. 16	Apr. 17

[z]The recorded blooming dates were averages of 9 plants.

Table 3. Number of aborted female flowers of summer squash cultivars evaluated at the Southwest Purdue Agricultural Center in Vincennes, IN in 2018.

Cultivar	**No. of aborted female flowers per plant[z]**
Cavili	0.78 bc[y]
Dunja	0.55 bc
Golden Glory	0 c
Multipik	2.22 a
Noche	0.89 b
Partenon	0.83 bc

[z]Total number of aborted female flowers observed on the four date were added for statistical analysis.

[y]Means within a column followed by the same letter were not significantly different by Fisher's least significant difference test ($\alpha = 0.05$).

Table 4. Marketable yield of summer squash cultivars evaluated at the Southwest Purdue Agricultural Center in Vincennes, IN in 2018.

Cultivar	**Weight (lb) per plant**	**Fruit no. per plant**
Cavili	8.58 a[z]	23.39 b
Dunja	6.00 a	15.78 b
Golden Glory	6.06 a	16.38 b
Multipik	6.90 a	44.55 a
Noche	8.21 a	18.5 b
Partenon	7.57 a	20.33 b

[z]Means within a column followed by the same letter were not significantly different by Fisher's least significant difference test ($\alpha = 0.05$).