



Parthenocarpic Zucchini: For Fruit Set Under Difficult Conditions

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What is Parthenocarpy?

- Ability to set fruit without fertilization of the ovule
 - No pollination
 - Ineffective pollination
 - Ineffective fertilization

Cucurbit Sex

- Male and female reproductive structures are produced on the same plant but in different flowers
- Occasionally both types will appear in one flower.

Female flower



Male flower



Squash Flower Anatomy

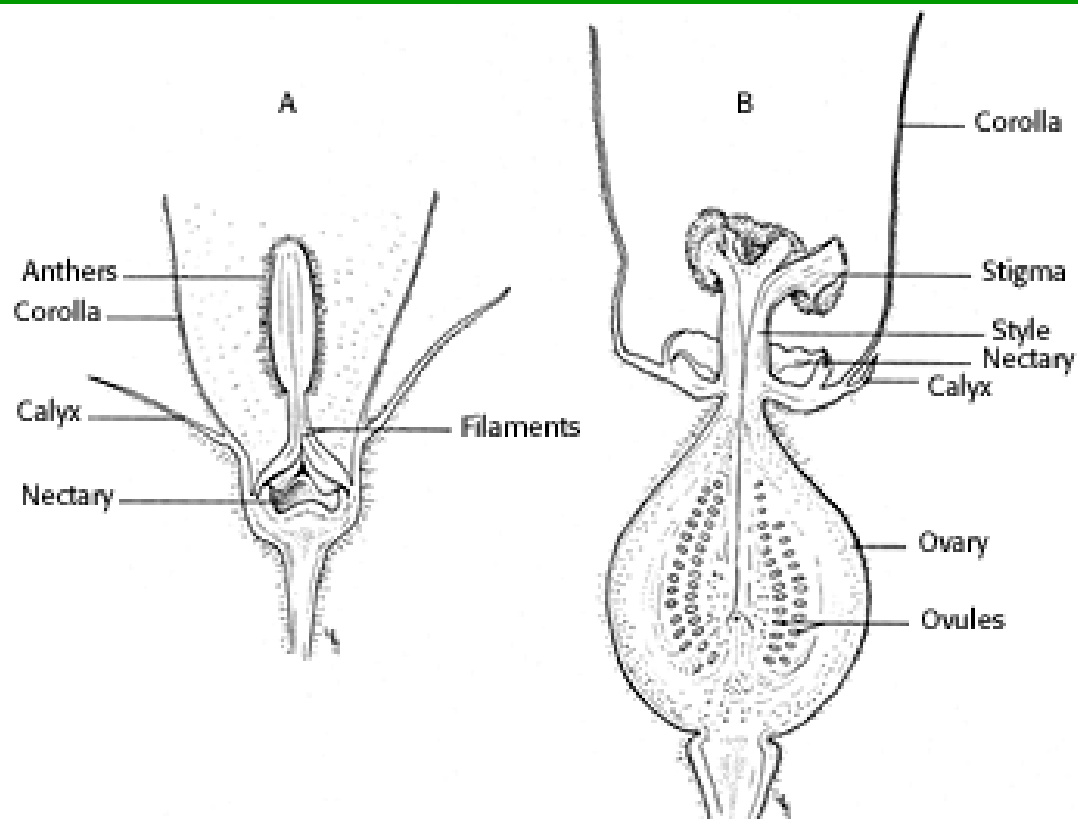


Figure 162. - Longitudinal section of reproductive portions of acorn squash flowers, x2.
A, Staminate, or male flower; B, pistillate, or female flower.

Why Worry?

- Reduced fruit set in early season, cool conditions, greenhouse production, low light
- Sex ratio of flower numbers changes to more male flowers under heat stress or low light
- Numbers and effectiveness of pollinators

Pollination

- Pollen is heavy & sticky and does not transfer without outside intervention – bees, beetles, wasps, people.
- It is NOT moved by wind
- Pollen germination is reduced at high temps (> 70° F cukes)



Induction of Parthenocarpy

- Induced naturally in several vegetables by
 - Low light
 - Cool conditions
- Hormonal changes, esp. auxins, in the floral tissues

Advantages of Parthenocarpic Fruit

- Fruit size, flavor comparable or better than of seeded fruits:
- Novelty for consumer – easier to eat, with less waste
- Seedless fruits have often higher total soluble contents
- Shelf life longer due to reduced ethylene generated by seeds.
- More reliable yields under varying climatic conditions
- Labor efficiency in food processing industry
 - Longer usable processing time and consumer shelf life.
 - Elimination of seed removal stage for some crops
- Parthenocarpic zucchini are selected for low levels of cucurbitacin (bitterness) with lessens the attraction of cucumber beetles

Embryonic seeds are soft & insignificant even in large fruit



Objectives

- Compare field production of parthenocarpic zucchini with a standard zucchini for
 - Total and Marketable Yield
 - Ease of Harvest
 - Quality

Spineless Beauty



- Spineless Beauty
- Rupp Seeds
- Standard F1 market zucchini, medium green, glossy,
- Spineless petioles
- 20 cents per seed in packets

Cavilli



- Cavilli
- Thompson & Morgan
- Early, pale skin, ridges, mild, sweet
- 20 cents per seed in pkt

Defender



- Defender
- Thompson & Morgan
- 55-75 day (early) mid-green, open habit
- 21 cents per seed In pkt

Dundoo



- Dundoo
- Thompson & Morgan
- Organic seed, open plant type, good mildew resistance
- 49 cents per seed in pkt

Parthenon



- Parthenon
- Thompson & Morgan
- 72 day, dark green, glossy, can be quite long quickly but stays attractive
- 20 cents per seed in pkt

Venus



- Venus
- Thompson & Morgan
- Dark green, glossy, high production, very attractive fruit
- 30 cents per seed in pkt

Cultivars

Cultivar	Source	Type	Cost/seed in pkt w/o shipping
Cavilli	T&M	Early pale skin,	20 cents
Defender	T&M	55-75 day (early) mid-green, open habit	21 cents
Dundoo	T&M	Organic, open, PM resistant	49 cents
Parthenon	T&M	72 day, dark green, glossy	20 cents
Venus	T&M	Dark green, glossy, long season	30 cents
Spineless Beauty	Rupp	Standard, medium green, glossy, spineless petioles	20 cents

Procedures

- Seeded 22 May. Transplanted 4 June, 2008
- 24" x 24" spacing in 3 rows, 15 plants/plot (usually). Number of plants and plots in each rep varied based on seed supply.
- Replicated twice, Drip irrigation,
- No preplant fertilizer. (201 lb/a residual nitrate, very high P, extremely high K, clay soil amended with alfalfa hay)
- Organic pest control
- Harvest 3X/week usually M, W, F.
- Harvest: 2 July to 16 July (7 harvests).

Insect and Disease Management

- Mildew control was good through end of crop under adverse conditions (Bacillus subtilis QST 713, Serenade™ or Rhapsody™, weekly with mist blower)
- Pyrethrum (Pyganic™) was used once for effective cucumber beetles control. Also used to knock back impending population boom of squash bugs.

Field Plan

WEST		PRAIRIE GOLD COMPOST AMENDED		SOUTH		EAST
		zucchini trial rep1		zucchini trial rep 2		
100 Guard	1	Spineless Beauty	Spineless Beauty	200 Guard	1	Spineless Beauty
	2				2	
	3				3	
101-A, B	4	#1= Cavili	#1= Cavili	201 ,b,c	4	#3 = Dundoo
	5				5	
	6				6	
	7				7	
	8				8	
	9				9	
	10				10	
	11				11	
	12				12	
	13				13	
102-A, B,	14	Spineless Beauty	#2 = Defender	202 ,b,c	14	#1= Cavili
	15				15	
	16				16	
	17				17	
	18				18	
	19				19	
	20				20	
	21				21	
	22				22	
	23				23	
103-a, b,	24	Spineless Beauty	#3 = Dundoo	203-,b,c	24	#5 - Venus
	25				25	
	26				26	
	27				27	
	28				28	
	29				29	
	30				30	
	31				31	
	32				32	
	33				33	
104, a,b,	34	#4 = Parthenon	#4 = Parthenon	204 ,b, c	34	Spineless Beauty
	35				35	
	36				36	
	37				37	
	38				38	
	39				39	
	40				40	
	41				41	
	42				42	
	43				43	
105, ab,b	44	Spineless Beauty	#5 - Venus	205, b,c,	44	#4 = Parthenon
	45				45	
	46				46	
	47				47	
	48				48	
	49				49	
	50				50	
	51				51	
	52				52	
	53				53	
100 Guard	54	Spineless Beauty	Spineless Beauty	200 Guard	54	Spineless Beauty
	55				55	
	56				56	

Parthenocarpic Zucchini Trial Harvested July 2 - 16,2008

Cultivar	Date	% of full yield	% Marketable	Per Plant			
				Average Wt per Fruit (lbs) per Plant	Total No. of Fruit per plant	Average Wt (lb) of Marketable Fruit	Average No. of Marketable Fruit
Cavilli	wk 1	22%	57%	0.99	2.00	0.40	1.81
Defender	wk 1	22%	67%	0.44	0.80	0.20	0.53
Dundoo	wk 1	26%	80%	0.92	1.43	0.58	1.14
Parthenon	wk 1	24%	77%	0.68	1.40	0.44	1.08
Spineless Beauty	wk 1	24%	71%	0.53	1.18	0.36	0.84
Venus	wk 1	23%	80%	1.46	6.38	2.56	5.13
Cavilli	wk 2	41%	74%	2.06	3.25	4.84	3.62
Defender	wk 2	46%	74%	0.96	1.67	0.52	1.00
Dundoo	wk 2	45%	60%	1.23	2.43	1.04	2.14
Parthenon	wk 2	41%	88%	1.22	2.36	1.02	1.96
Spineless Beauty	wk 2	38%	83%	1.18	1.82	0.81	1.48
Venus	wk 2	48%	81%	1.92	13.13	5.07	8.75
Cavilli	wk 3	37%	57%	3.26	3.87	1.34	2.20
Defender	wk 3	31%	71%	0.88	1.13	0.41	0.80
Dundoo	wk 3	29%	58%	2.57	1.57	0.30	0.91
Parthenon	wk 3	35%	78%	1.49	2.00	1.02	1.56
Spineless Beauty	wk 3	38%	54%	1.35	1.84	0.54	0.98
Venus	wk 3	29%	69%	3.13	8.00	2.28	5.25
Cavilli	full season	100%	66%	0.75	1.2	1.01	1.1
Defender	full season	100%	65%	0.32	0.5	0.16	0.3
Dundoo	full season	100%	77%	0.68	0.8	0.27	0.6
Parthenon	full season	100%	80%	0.48	0.8	0.35	0.7
Spineless Beauty	full season	100%	68%	0.44	0.7	0.24	0.5
Venus	full season	100%	70%	0.93	3.9	1.42	2.7

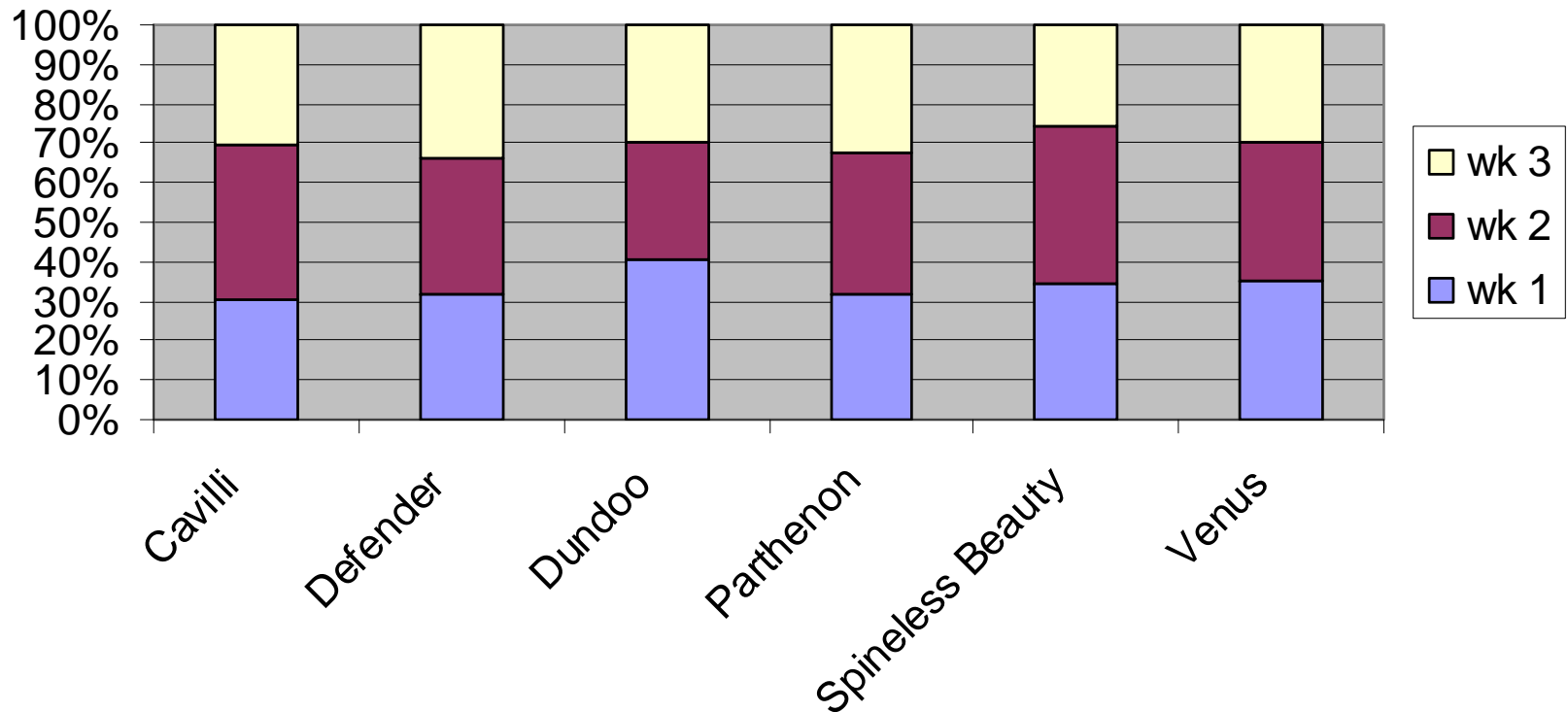
*Spineless Beauty is not parthenocarpic. It is a standard type.

Summary

Total Plants Harvested	228
Total Weight of Harvested Fruit	439 lbs
Total Number of Fruit Harvested, graded, counted, weighed, cleaned, packed, cooled, invoiced, delivered	688
Total wholesale @ 40 cents/lb	41 lbs
Donation to Food Bank or Composted	547 lbs
Average Total Fruit Weight per Plant	1.93 lbs
Average # of Fruit/plant	3.02

Compare when fruit sizing rapidly in late July & culled due to over size or curvature vs early when culled for undersized, deformity, curvature

Percent of Marketable Fruit by No.



Ranking of Results of 3 Weeks Harvest (6=best)

Cultivar	Overall Rank	Per Plant Average				Percent of Total Yield Marketable by Number
		Pounds	Number	Marketable Number	Marketable Pounds	
Venus	5.6	6	6	6	6	4
Cavilli	4.4	5	5	5	5	2
Parthenon	4.2	3	4	4	4	6
Dundoo	3.6	4	3	3	3	5
Spineless Beauty*	2.2	2	2	2	2	3
Defender	1.0	1	1	1	1	1

*control

What We Learned

- Spineless petioles are nice!
- Plants were open, fairly easy to harvest
- All but one parthenocarpic type yielded more than the standard type control and ranked higher overall.
- Venus maintains good linear shape (length:diameter) for great length without oversizing; good flavor and texture; would be great for fresh-cut market
- Seeds are very insignificant, increasing edible part and attractive serving

What We Learned

- Get the crop in and out fast. Move into a new planting for harvest efficiency and yields
- Must harvest **AT LEAST** every 2-3 days.
Weekends off don't cut it for quality.
- Squash bugs arrived at the end of July
- Our total yields per plant were comparable to commercial production but marketable yields were less – grading? harvest frequency?
- Local, pesticide-free had good market
(40¢ per lb wholesale)



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