

Nebraska  
Lincoln EXTENSION

## Parthenocarpic Zucchini: For Fruit Set Under Difficult Conditions

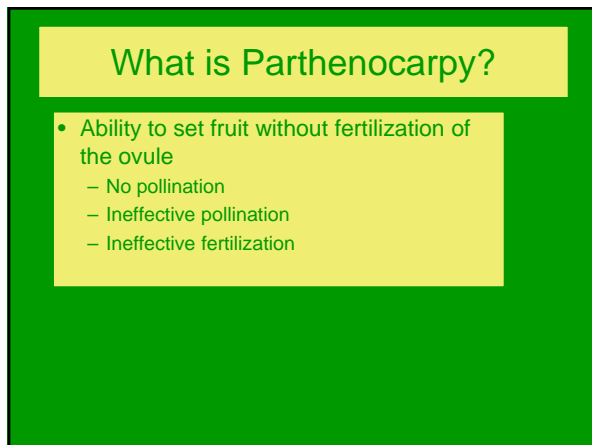
Laurie Hodges, Ph.D.  
LHodges@unl.edu



Nebraska  
Lincoln EXTENSION

Extension is a Division of the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln cooperating with the Counties and the United States Department of Agriculture

Extension is a Division of the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln cooperating with the Counties and the United States Department of Agriculture

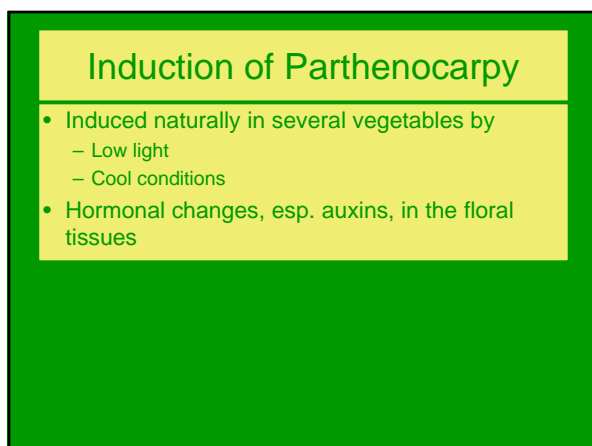


## What is Parthenocarpy?

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

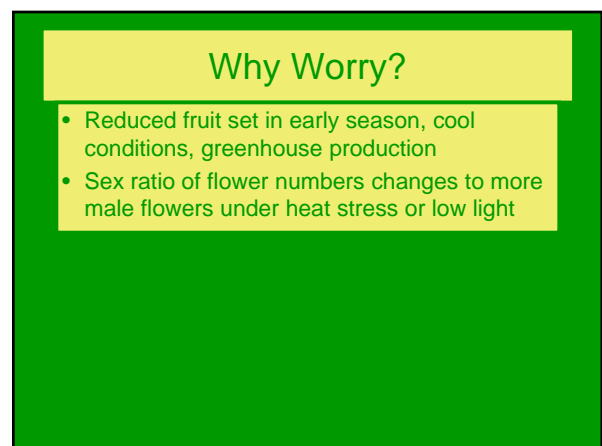


## Embryonic seeds are soft & insignificant even in large fruit



## Induction of Parthenocarpy

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



## Why Worry?

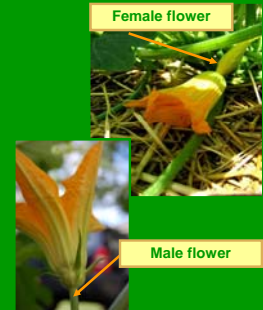
- Reduced fruit set in early season, cool conditions, greenhouse production
- Sex ratio of flower numbers changes to more male flowers under heat stress or low light

### 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

### 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.

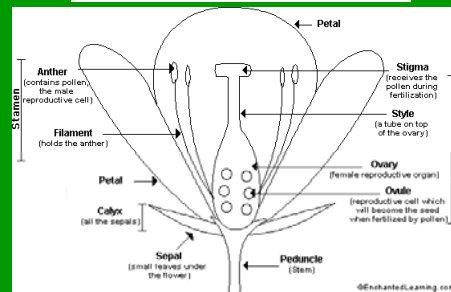


### Pollination

- Pollen is heavy & sticky and does not transfer without outside intervention – bees, beetles, wasps, people.
- It is NOT moved by wind



### Flower Anatomy



### The Parts Simplified

Human	Flower	Function	
Skin	Petals & Sepals	Attract & Protect	
Testicles	Anthers	Produce male sperm cells/pollen	
	Stigma	Receive male sperm cells	Pollen germinates here and sperm cells in germination tubes grow down through the style
Vagina	Style	Corridor for sperm	
Uterus	Ovary & ovules	Fertilized embryo develops – composed of MOTHER tissue	Forms fruit we eat
Baby	Seeds	Combine genes of parents to produce new generations	

### Objectives

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

### Spineless Beauty



Spineless Beauty F1

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


### Cavilli



Cavilli

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

### Defender



Defender

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

### Dundoo



Dundoo

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


### Parthenon



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

- 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 for cucumber beetles once. Knocked back impending population boom of squash bugs.

### Field Plan

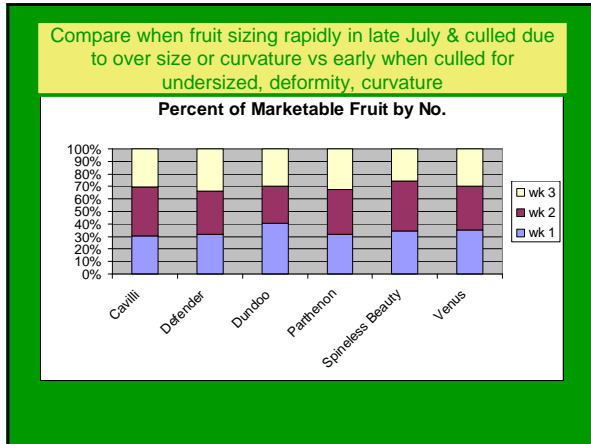
#### Parthenocarpic Zucchini Trial Harvested July 2 - 16 2008

Cultivar	Date	% of full yield	% Marketable	Per Plant			
				Average Wt per Fruit (lbs)	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%	69%	1.23	2.43	1.04	2.14
Parthenon	wk 2	41%	86%	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%	89%	0.48	0.8	0.35	0.7
Spineless Beauty	full season	100%	66%	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



**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 Pounds	
Venus	5.6	6	6	6	4
Cavilli	4.4	5	5	5	2
Parthenon	4.2	3	4	4	6
Dundoo	3.6	4	3	3	5
Spineless Beauty*	2.2	2	2	2	3
Defender	1.0	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



Developed and Produced By

Laurie Hodges, Ph.D., CPH 402-472-1639  
LHodges1@unl.edu

**\*\* Copyright 2008. This material is the property of the University of Nebraska-Lincoln; all rights reserved. Duplication of material is allowed on an individual basis for educational purposes only. As a courtesy, contact Dr. Hodges to acknowledge use in public educational formats. Resale of material is strictly prohibited without express written consent of the owner. \*\***

