



## Hybrid Cucumber Seed Production

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### 2.1. Introduction

#### a) Cucurbitaceae Family

Genus	Species	Common name
<i>Citrullus</i>	<i>lanatus</i>	Watermelon
<i>Cucumis</i>	<i>sativus</i>	Cucumber
	<i>melo</i>	Melon
<i>Cucurbita</i>	<i>pepo</i>	Summer squash
	<i>maxima</i>	Pumpkin or winter squash
	<i>mixta</i>	
	<i>moschata</i>	

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(pictures from: [http://www.nuc.cl/sw\\_educ/hortalizas/html/](http://www.nuc.cl/sw_educ/hortalizas/html/))

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## 2.1. Introduction

### b) Reproductive structures and natural pollination mechanisms

Species	Flowering type
<i>Cucumis sativus</i> (cucumber)	Monoecious (most common)
	Gynoecious
	Hermaphroditic
<i>Cucumis melo</i> (melon)	Andromonoecious
	Andromonoecious (most common)
<i>Cucurbita pepo</i> (summer squash)	Monoecious
<i>Citrullus lanatus</i> (watermelon)	Monoecious (most common)
	Andromonoecious

(from Wien, 1997)

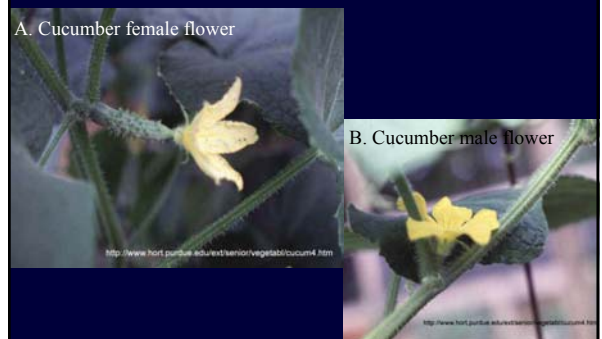
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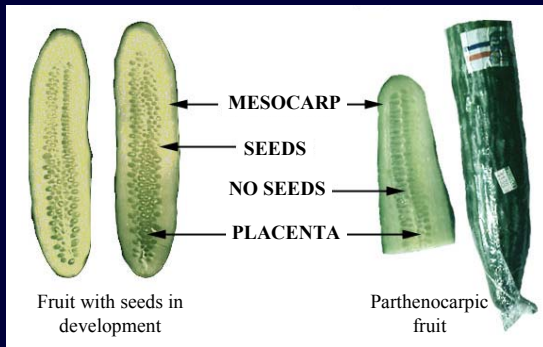
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### c) Fruits and Seed



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## 2.1. Introduction

### d) Use of hybrids in Cucurbitaceae family

- Some advantages: earliness, yield, fruit quality, disease resistance
- Hybrids are most common in summer squash, cucumber, melon, and watermelon
- Adoption of hybrid cultivars favored because:
  - high number of seeds per fruit
  - relatively low number of seed required for establishment
  - cost-efficient hybrid seed production

## 2.1. Introduction

### d) Use of hybrids in Cucurbitaceae family

Techniques used for hybridization:

- Hand emasculating and pollination
- Flower removal or manual removal of male flowers from the female parental line
- Gynoecy or the use of lines with only female flowers as female parent of hybrids
- Use of growth regulators to modify sex expression
- Genetic male sterility

## 2.2. Production of cucumber hybrid seed

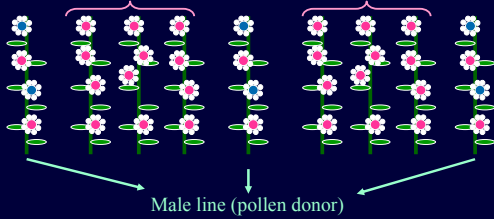
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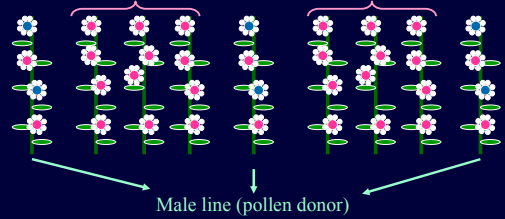
Gynoecious inbred lines used as female. Only female flowers



## 2.2. Production of cucumber hybrid seed

### a) Use of gynoecious lines in hybrid seed production

Gynoecious inbred lines used as female. Only female flowers



Types of hybrids according to male line:

- Gynoecious x monoecious
- Gynoecious x hermaphroditic
- Gynoecious x gynoecious
- Gynoecious x andromonoecious

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### a) Use of gynoecious lines in hybrid seed production

#### Gynoecious x Monoecious hybrids

- Hybrids have a tendency to produce mostly female flowers, however a variable amount of male flowers is still produced
- In non-parthenocarpic hybrids, blending with seed of monoecious cultivar (~10%) may be required

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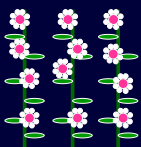
### a) Use of gynoecious lines in hybrid seed production

#### Gynoecious x Gynoecious hybrids

- Resulting F1 hybrid is homozygous for F, i.e. more stable for gynoecy.
- Relatively more important for parthenocarpic hybrids used for greenhouse production

## 2.2. Production of cucumber hybrid seed

### b) Flowering model in cucumber



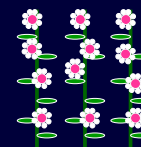
Gynoecious inbred line

Advantages:

- No pollen is produced
- Higher yield

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### b) Flowering model in cucumber



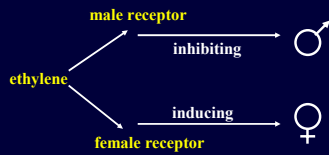
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Multiplication by self pollination

→ HOW???

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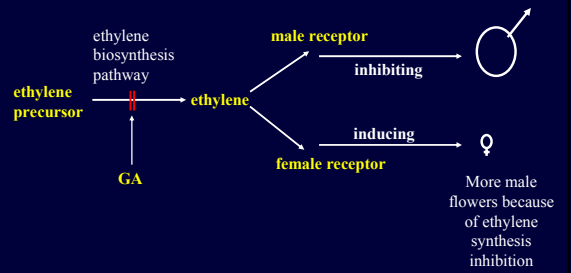
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(Yin and Quinn, 1995. American Journal of Botany 82: 1537-1546)

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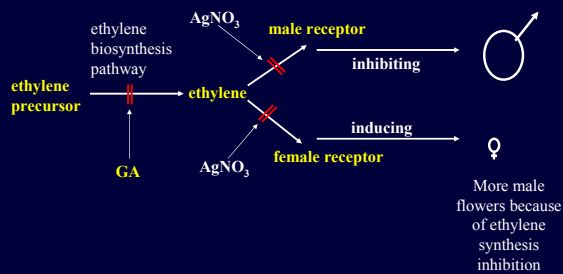
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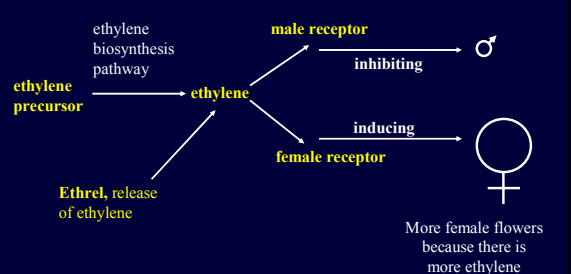
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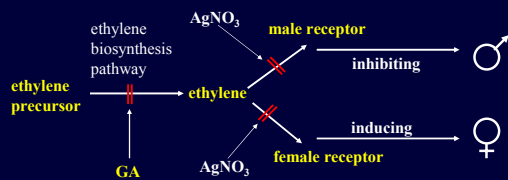
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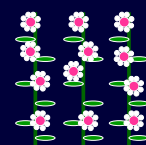


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## 2.2. Production of cucumber hybrid seed

### c) Use of growth regulators to modify flower sex expression

#### Use of growth regulators to promote maleness

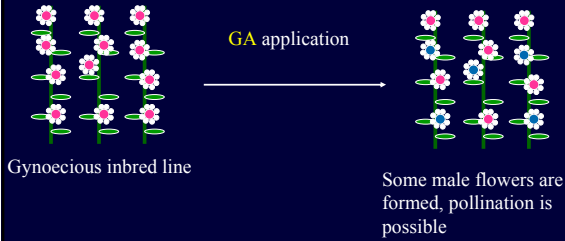


Gynoecious inbred line

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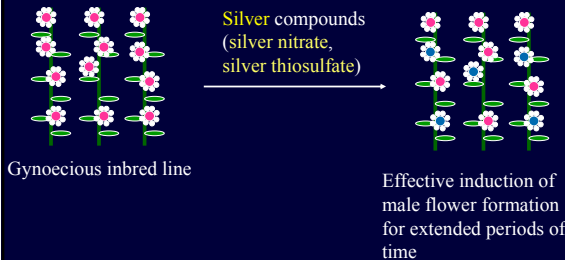
Problems in using GA:

- Effectiveness varies among cultivars
- Excessive stem elongation and malformed male flowers

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c) Use of growth regulators to modify flower sex expression

Use of growth regulators to promote maleness



## 2.2. Production of cucumber hybrid seed

c) Use of growth regulators to modify flower sex expression

Use of growth regulators to promote femaleness

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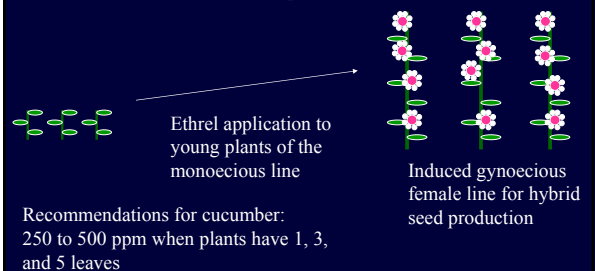
Use of growth regulators to promote femaleness

- Ethephon (etheal, trade name)
- It has a persistent and effective effect in some species
- In monoecious lines of summer squash and cucumber, it can induce formation **only** of female flowers
- Its most important use is in summer squash seed production, followed by monoecious cucumbers.

## 2.2. Production of cucumber hybrid seed

c) Use of growth regulators to modify flower sex expression

Use of growth regulators to promote femaleness



...practical implications, great plant uniformity is required.



## 2.2. Production of cucumber hybrid seed

d) Isolation



## 2.2. Production of cucumber hybrid seed

e) Harvesting

