



## Onion Seed Production

Rebeca Unghiatti Rosales  
 Departamento de Ciencias Vegetales  
 Facultad de Agronomía e Ingeniería Forestal  
 Pontificia Universidad Católica de Chile  
 raunghia@uc.cl

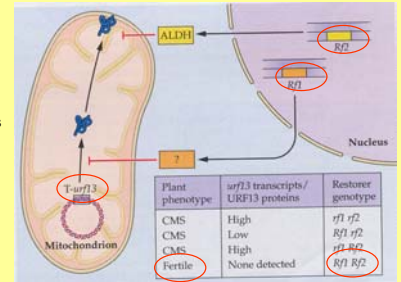
### Cytoplasmic male sterility (CMS)

- A condition under which a plant is unable to produce functional pollen.
- Extra nuclear genetic control
- Non-Mendelian inheritance
- The cytoplasm of a zygote comes primarily from egg cell
- The progeny of male sterile plants is always male sterile.
- CMS systems are a valuable tool in the production of hybrid seed in vegetable crops such as onions.

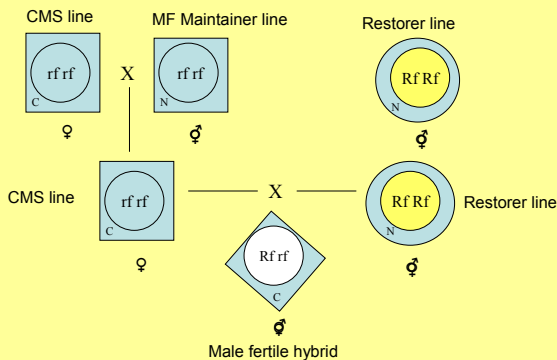
### Cytoplasmic male sterility (CMS)

Sterility results from mitochondrial genes causing cytoplasmic dysfunction

Fertility restoration relies on nuclear genes that suppress cytoplasmic dysfunction.



### Cytoplasmic male sterility (CMS)



### Cytoplasmic male sterility (CMS)

Cytoplasm	Nucleus		
	Rf Rf	Rf rf	rf rf
With URF 13 C	fertile	fertile	♂ sterile
Without URF 13 N	fertile	fertile	fertile

- Which line/s are fertile?
- Which line/s are sterile?
- Which line/s may be used by onion producers?
- Which line/s may be used by carrot producers?
- Which lines may be used by sunflower producers?

# Onion Seed Production

- 1. Climate
  - 1.1 Photoperiod
  - 1.2 Temperature
  - 1.3. Relative humidity
  - 1.4 Wind
- 2. Soil: pH 6 to 6.8
- 3. Weeds

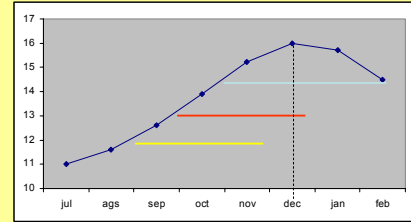


# Biology

## Bulb formation

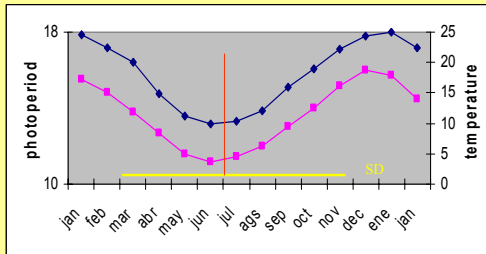
Minimum photoperiod to produce a 10 mm bulb

- Long day: >14.5 to 15 hr
- Intermediate day : >13.5 to 14 hr
- Short day: >12 to 13 hr



# Biology

Sowing:	Bulb harvest
SD: Febr-March	November-December
ID: April-May	December-January
LD: May-July	Febr-March



# Flower induction

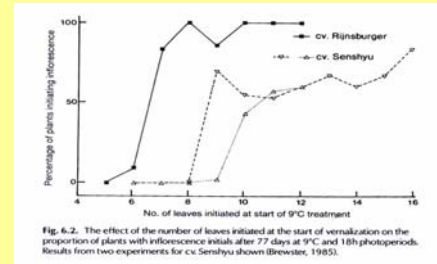
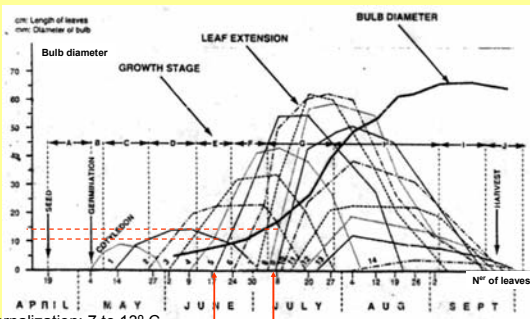


Fig. 6.2. The effect of the number of leaves initiated at the start of vernalization on the proportion of plants with inflorescence initials after 77 days at 9°C and 18h photoperiod. Results from two experiments for cv. Senshyu shown (Brewster, 1985).

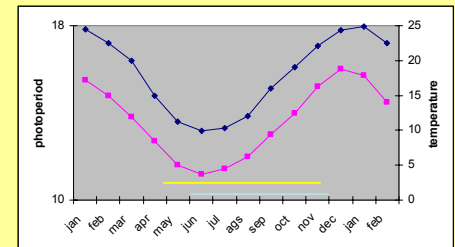
Vernalization: 7 to 13° C  
 Plant stage:  
 Leaves: 5 to 9

# Flower induction



Vernalization: 7 to 13° C  
 Plant stage:  
 Leaves: 5 to 9  
 Bulb: 10-15 mm

# Flower induction: Seed-bulb-seed method

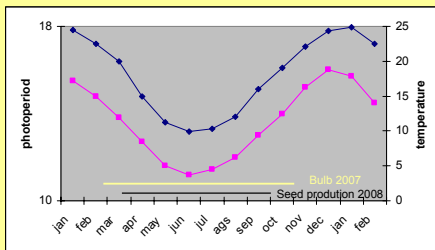


Vernalization: 7 to 13° C  
 Plant stage:  
 Leaves: 5 to 9  
 Bulb: 15 mm

Sowing:	Bulb harvest
SD: Febr-March	Nov-December
ID: April-May	December-January
LD: May-July	February-March

No flower induction

## Flower induction: Seed-bulb-seed method



Sowing: (2007)	Bulb harvest	Bulb planting (2008)
SD: Febr-March	November-December	March-April
ID: April-May	December-January	April-May
LD: May-July	February-March	May-June

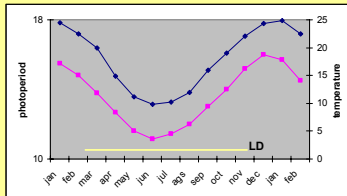
## Storage



## Flower induction: Seed to seed

### Flower induction

Vernalization: 7 to 13° C  
 Plant stage:  
 Leaves: 5 to 9  
 Bulb: 10 -15 mm



No bulb formation

Sowing: (2008)	Seed Harvest (08)
SD: December	September-October
ID: January	October-November
LD: February	November-December

## Methods of seed production

### Seed-bulb-seed

Sowing:(2007)	Bulb harvest	Bulb planting (08)	Seed harvest (08)
SD: Febr-March	Novem-Decem	April-May	October
ID: April-May	Decem-January	May-June	November
LD: May-July	February-March	June-July	December

### Seed-seed

Sowing: (2008)	Seed harvest (08)
SD: December	September-October
ID: January	October-November
LD: January-Febr	November-December

## Methods of seed production

- Seed-bulb-seed:
- First year: bulbing
- Storage of mother bulb
- Roguing
- Mother bulb planting
- Flower induction



- Seed to seed:
- Modification of the sowing date
- No bulb formation
- Roguing
- Yields

## Production

4. Isolation: 1000-1500 m

Cytoplasmic male sterility  
 Insect pollinated



5. Roguing

Seed to seed: Plant morphology  
 Seed-bulb-seed: Plant morphology  
 Bulb morphology

## Production

6. Downy mildew  
(*Peronospora destructor*)  
Chemical control  
Weed control



## Producción

7. Pollination  
• Honey bees  
• Unattractive



## Harvest

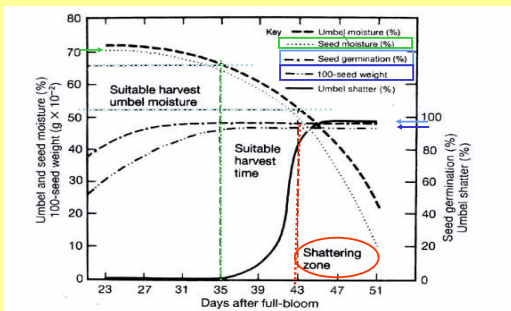


Fig. 6.8. The growth, drying and development of germinability of onion seeds on ripening umbels in relation to umbel shattering, harvesting time and seed quality. (Steiner and Akinin, 1986. Courtesy of HortScience.)



## Carrot Seed Production

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## Carrot Seed Production

Biennial

### Flower induction

Vernalization:  
Plant stage:  
Leaves: 6 to 8  
Root: 5-10 mm

Temperature and vernalization:  
Cultivars: 50 days 15°C  
15 to 60 days  
temperature of 4 – 15°C

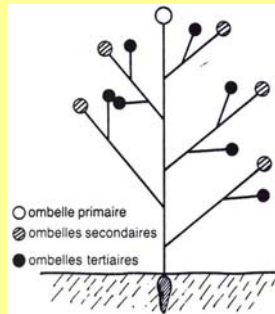


## Botany



## Botany

- 90% of the seed is located in the first four orders.
- The first three umbel orders are economically important.



## Seed Production

### 1. Production Methods:

- Seed to seed  
 Direct Planting: Late summer  
 Vernalization: Winter  
 Blooming: Spring  
 Harvest: Summer
- Seed – root – seed  
 Bed planting: Mid summer  
 Root selection and disinfection  
 Replanting stecklings: late autumn  
 Winter vernalization  
 Harvest: mid-summer



## Seed Production

- Open-pollinated lines: protandry
- Hybrid seed: Cytoplasmic male sterility (CMS)
- Split: 2 ♂ : 4 - 6 ♀
- Male steckling planting: 15-30 days before female.



## Seed Production

### Genetic purity:

Wild carrot  
 Volunteer

### Isolation:

Hybrids: 2000 m  
 Open-pollinated: 1500 m



Pollination: honey bees 5 hives/ha  
 sometimes alkali bees

## Seed Production



## Seed Production

### Density and yields

Distance spacing effect on carrot seed production  
 (Jacobsohn and Globerson, 1980)

Row spacing cm	Yields		Seeds in the Primary umbel
	Per plant (g)	Per ha (kg)	%
80 x 40	5.7	178	25
80 x 7	8.8	1577	37
40 x 7	3.5	1253	50
20 x 7	3.4	2408	51

## Seed Production

### Harvest

The primary or king umbel matures first



## Seed Production

### Harvest



## Seed Production

### Drying



## Seed Production

### Threshing



## Seed Production

### Seed Conditioning

Debearders  
Air-screen cleaner  
Gravity table  
Indent cylinder

Some use size graders



## Seed Quality

- Germination is low in some years
- Is accompanied by increased number of abnormal seedlings.
- Early harvest may contribute to this problem

