



Saving Your Own Vegetable Seeds

Part I



AVRDC – The World Vegetable Center
Global Technology Dissemination
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Outline

- **Reproduction of plants**
- **How to produce and harvest seeds**
- **Hands-on practicum**

Modes of Reproduction in Plants

- **Sexual reproduction**

- Involves male (pollen) & female (egg) flowers
- Pollination produces seeds which grow into new plants
- Ex. tomato, pepper



- **Vegetative reproduction**

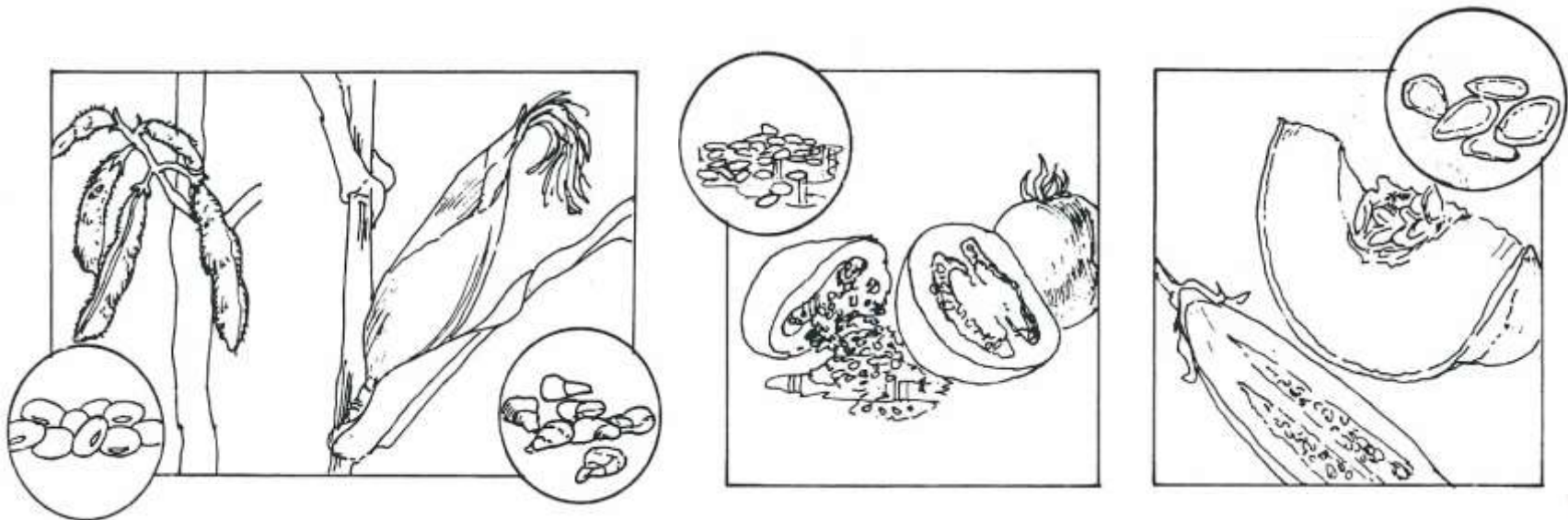
- Sex (flowers) is not involved
- New plants develop from a portion of plant body
- Ex. sweet potato, banana



Types of Planting Materials

- **Seeds**

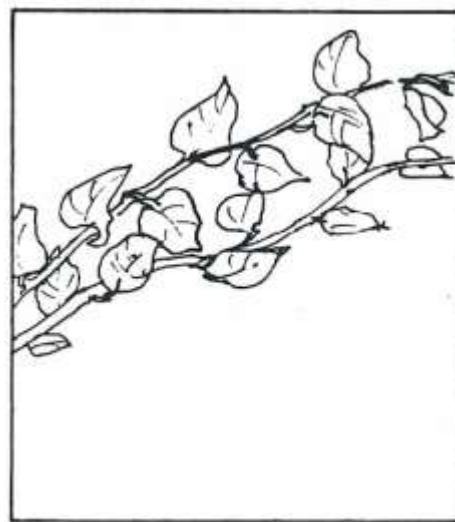
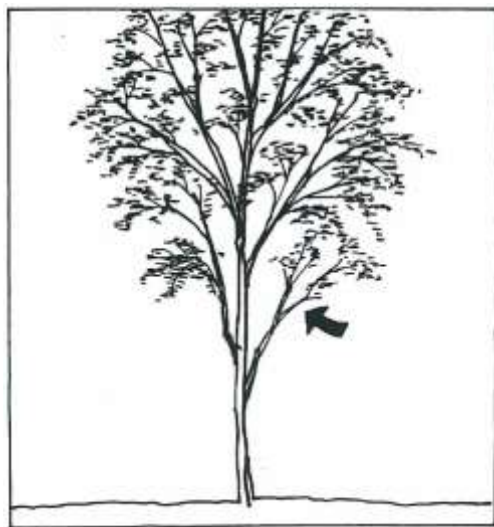
- Dry seeds
- Wet seeds with mucilaginous coating
- Wet seeds without mucilaginous coating



Types of Planting Materials

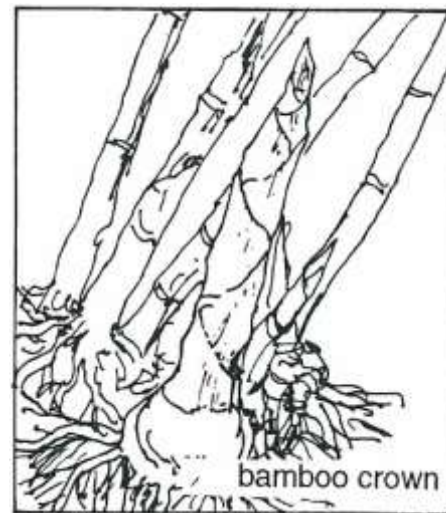
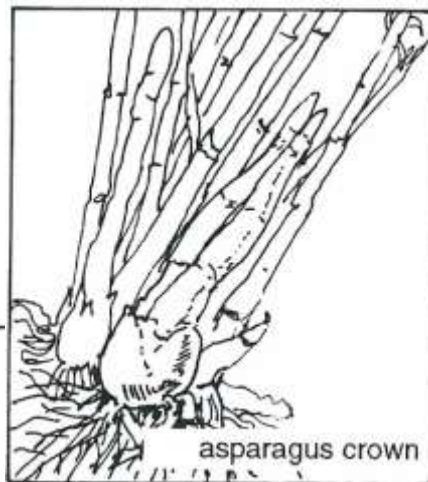
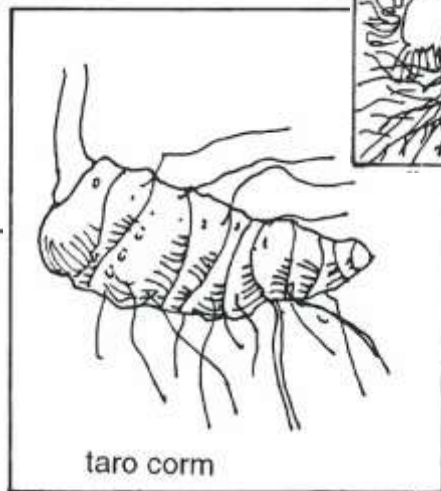
- **Cuttings**

- 50-100 cm stem
- Upper 20-30 cm terminals
- Survives better when older leaves are trimmed



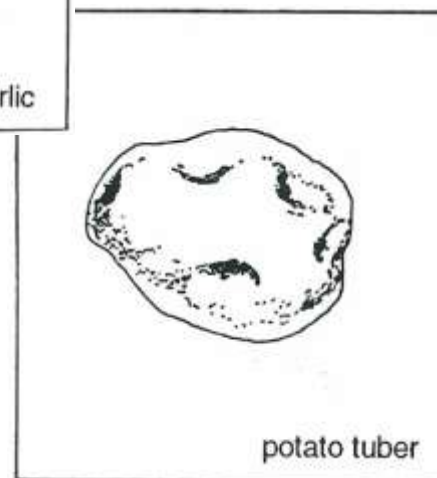
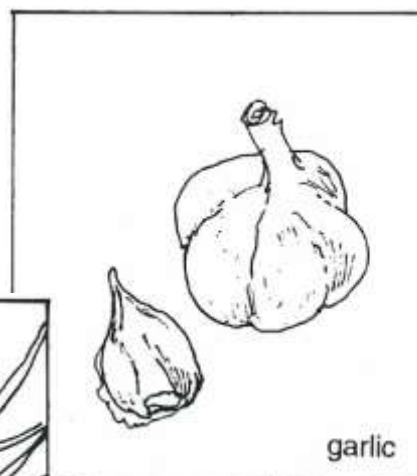
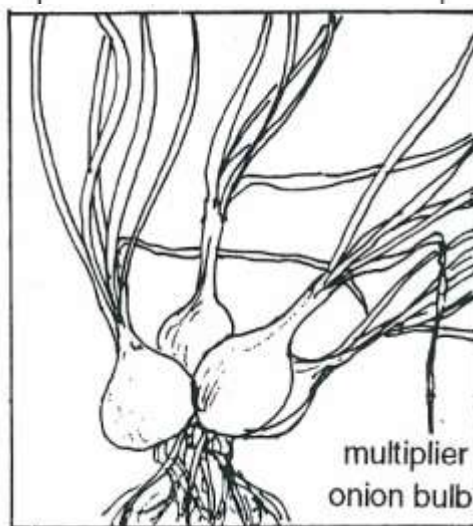
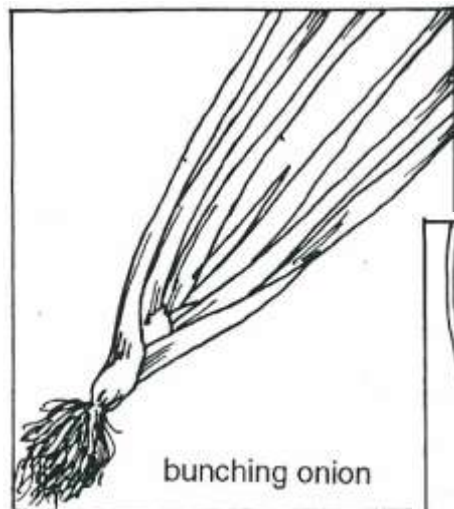
Types of Planting Materials

- Rhizomes/Corms



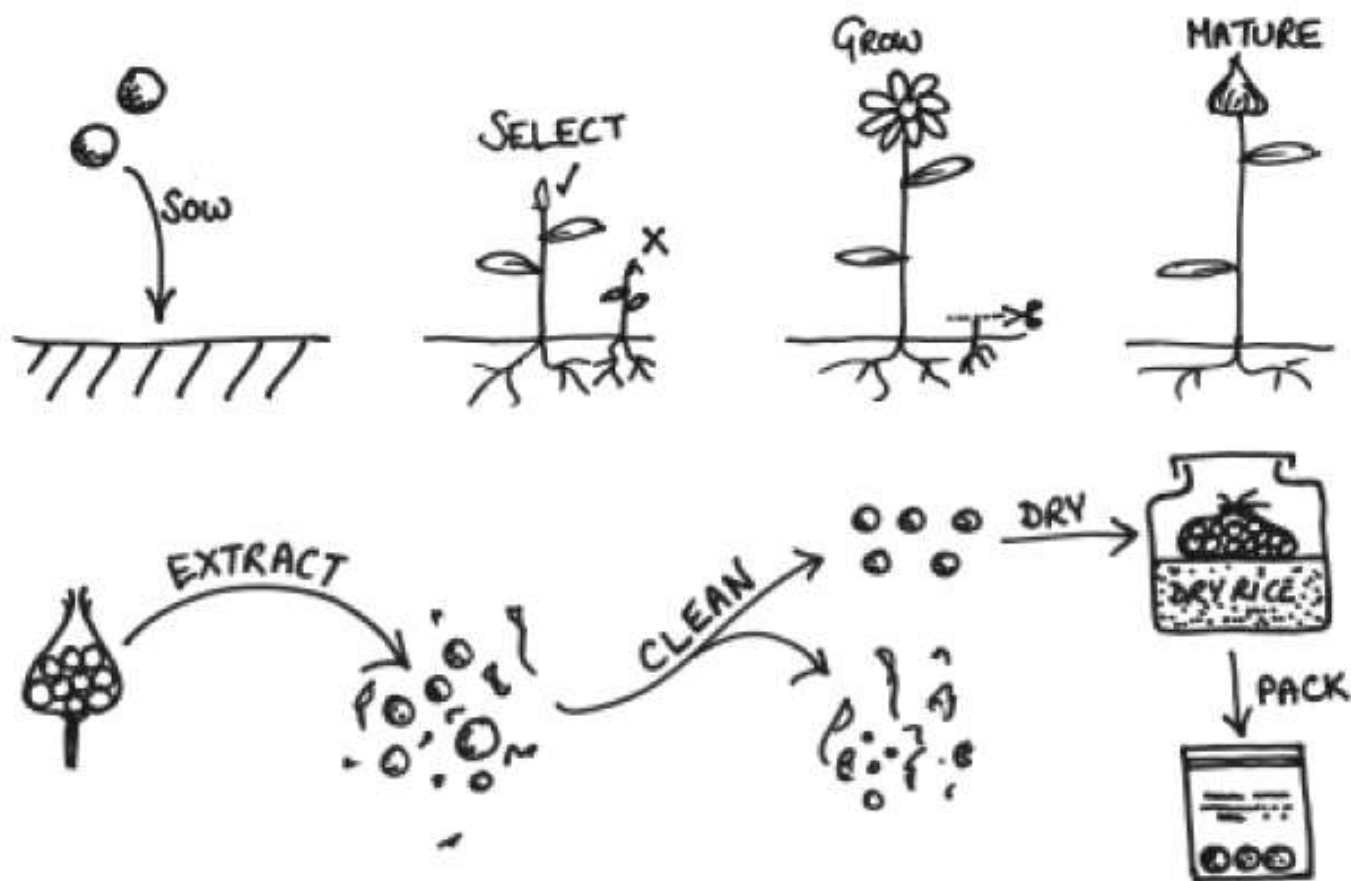
Types of Planting Materials

- Bulbs/Tubers**





How to Save Vegetable Seeds





Selection Criteria

- Traits subject to selection
 - Seedling color
 - Leaf shape, size
 - Disease susceptibility
 - Insect pest tolerance
 - Flowering time
 - Pollen fertility
 - Plant habit
 - Fruit shape, color, size
 - Earliness of fruit maturity
 - Taste, texture
 - Yield



Selection Strategies

- **Negative selection (remove off-types due to mutation, out crossing, segregation)**
 - Roguing
- **Positive selection**
 - Bulk (mass) selection (bulk at least 30 plants)
 - Half sib selection:
 - Select individual plants, save seed separately
 - Grow out in rows
 - Bulk seed only from rows with acceptable overall performance
 - Progeny testing



Selection Strategies

- Negative selection (remove **off-types** due to mutation, out crossing, segregation)





Measure Moisture Content

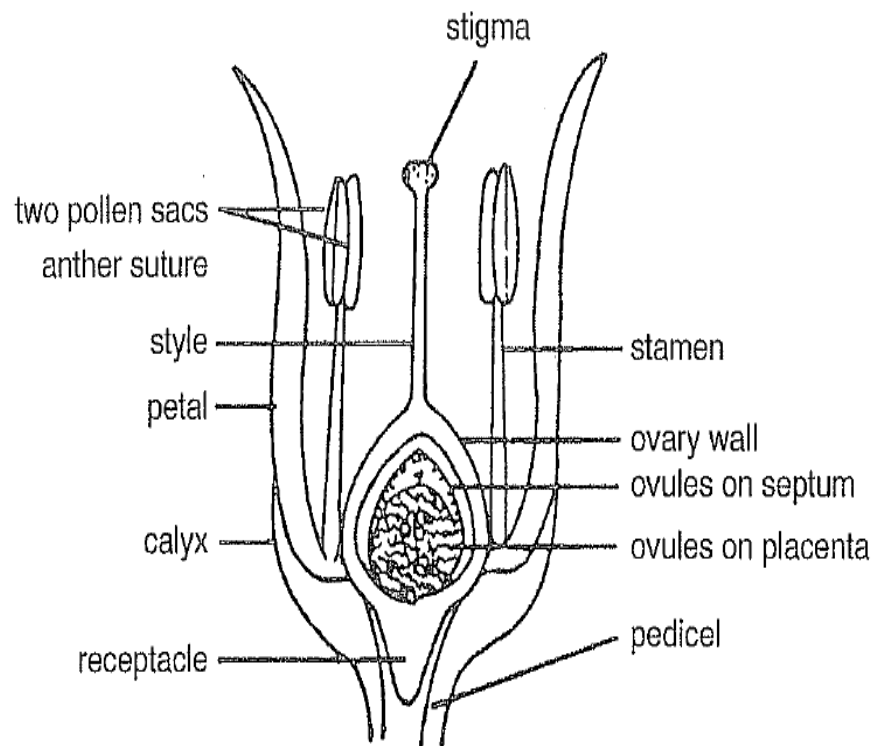
- Carefully weigh a sample of seed (W_b)
- Dry at 100-120°C for several hours
- Weigh sample again (W_a): weight lost is moisture

- % moisture = $\frac{W_b - W_a}{W_b} \times 100\%$



Parts of a Perfect Flower

Male reproductive organ:
stamen
(anther, filament)



Female reproductive organ:
pistil
(stigma, style, ovary)



Producing New Seeds Through Pollination: Basic Steps

- **Anther releases pollen**
- **Pollen lands on stigma**
- **Pollen grows down the style to the ovary**
- **Pollen fertilizes an ovule to form a zygote (new individual)**
- **Seed maturation**



Producing New Seeds Through Pollination

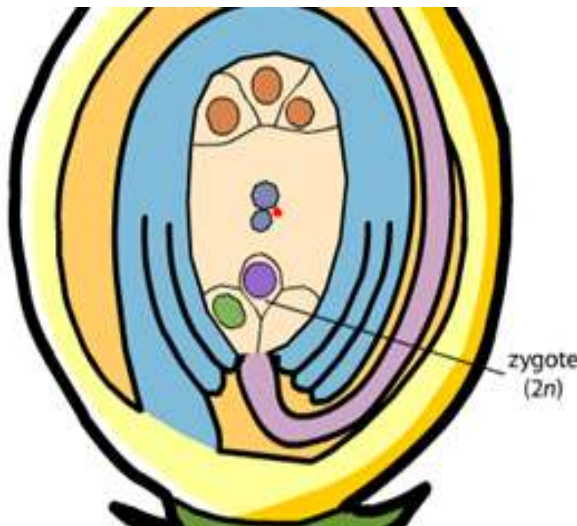
1 Anther releases pollen

2 Pollen lands on stigma

3 Pollen tube grows

5 Seeds develop over time

4 Sperm fertilizes egg





Modes of Pollination

Self-pollination

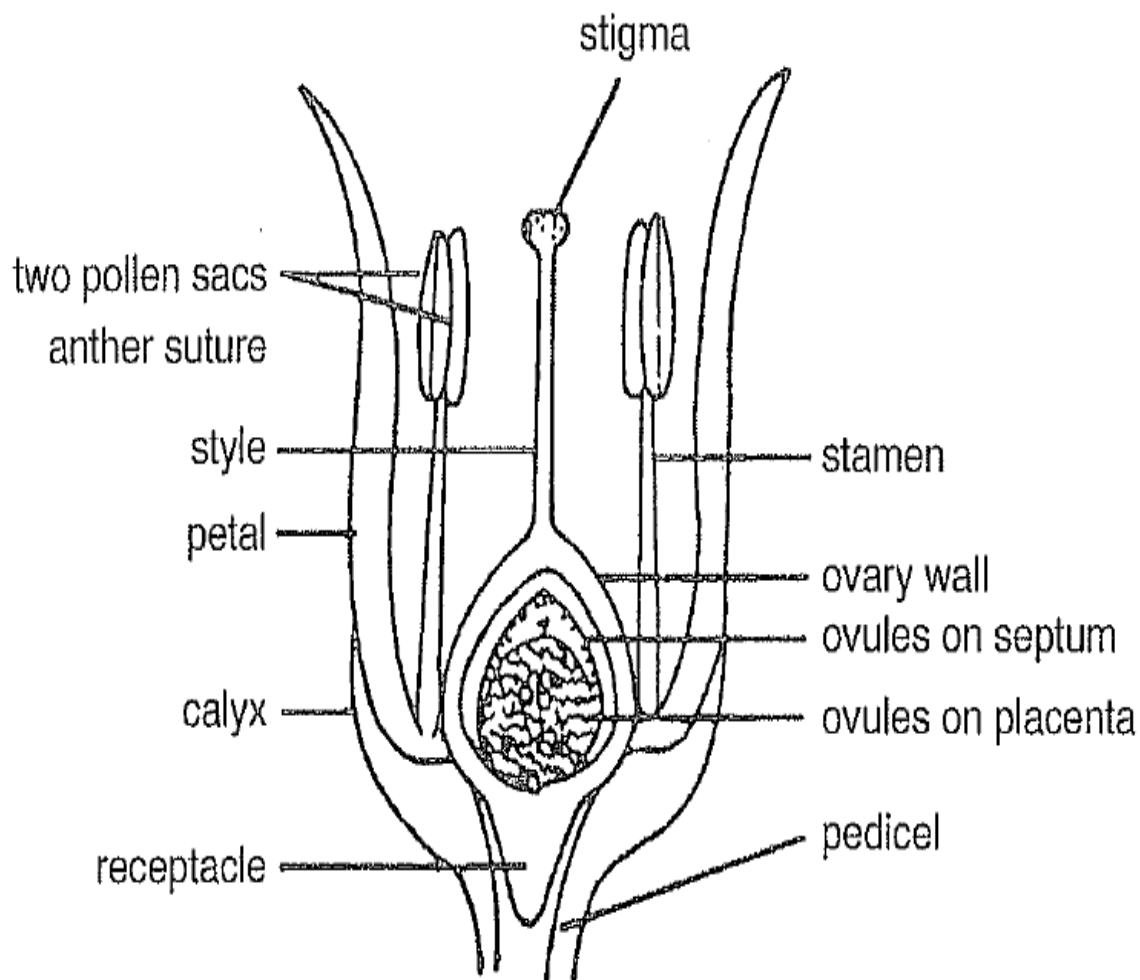
- Pollen grains from anther of a given plant fall on the stigma of the same flower (perfect flower)
- Pollen grains from a flower of one plant fall on the stigmas of other flowers of the same plant

Cross-pollination

- Pollen grains from a flower of one plant fall on the stigmas of flowers of another plant

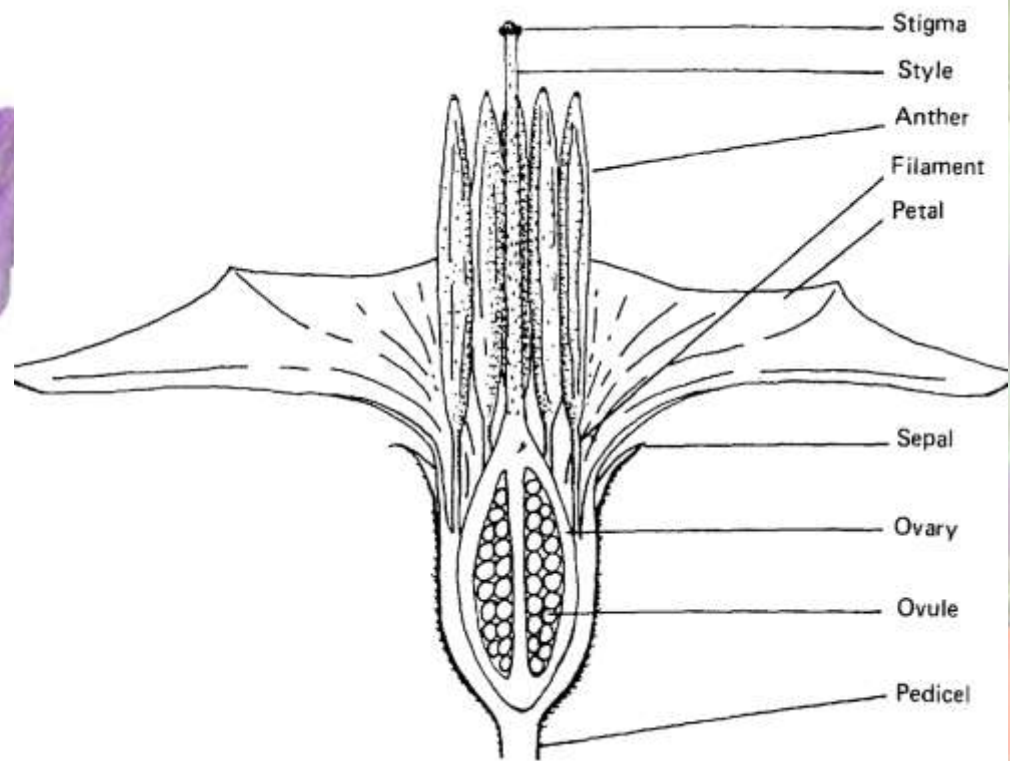


Can you identify the Capsicum flower parts on the left using the diagram on the right?





Can you identify the eggplant flower parts on the left using the diagram on the right?





Some Vegetable Crops Have Separate Female and Male Flowers – example, squash

Female



Male



Induced pollination





What are Open-Pollinated Varieties?

- Crop can be self-pollinated or cross-pollinated.
- Plants are allowed to pollinate freely, and seed can be harvested from all plants.
- Farmers can keep the seeds for next cropping season.

Can you keep seeds of hybrids for next cropping season?

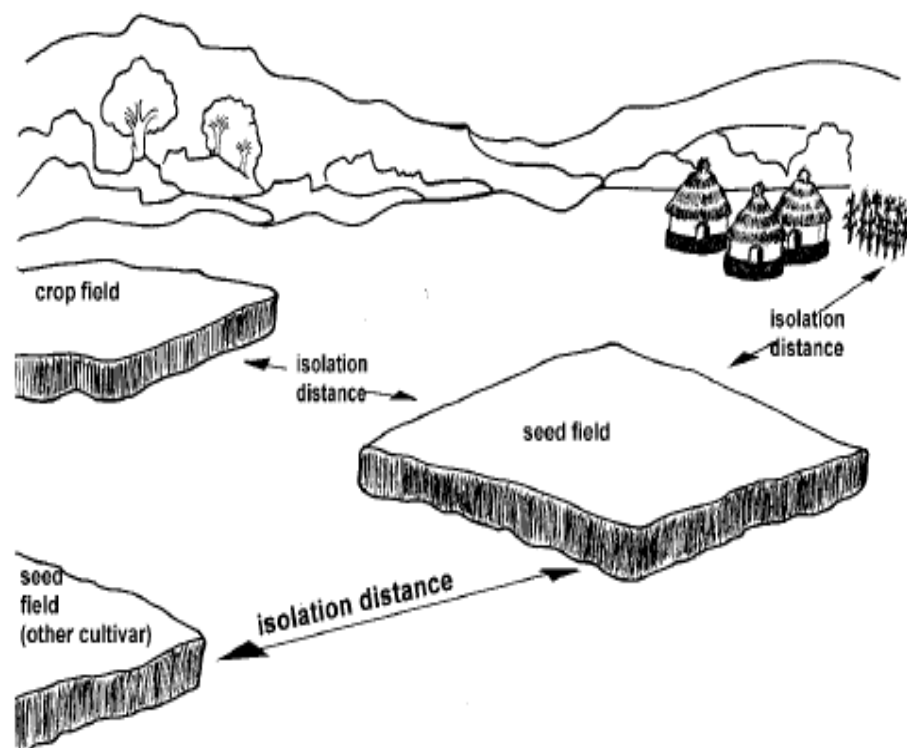
How to Keep Seed Pure

- Isolation in distance
- Bagging
- Caging



Isolation Distance

- Separation from similar crops minimizes
 - Cross pollination by airborne pollen, insects
 - Risk of physical admixture
 - Recommended distance varies with crop, surrounding vegetation, wind patterns,
 - Time isolation may also be possible





Avoid Admixture

- Keep all containers thoroughly clean
- Keep work area and tools cleanded, swept
- Label or mark all containers with cultivar name and harvest date, etc.
- Store different varieties separately



Recommended Isolation Distances for Seed Production

- **50 meters (self pollinated; avoid physical mixing)**
 - Bean, chicory, endive, Lettuce, Pea, Tomato
- **200 + meters (insect borne pollen):**
 - Asparagus, Cabbage and brassicas, Carrot, Celery, cucumber, Eggplant, Melons, Onion Parsley, Pepper , Squash
- **2 km or more (airborne pollen)**
 - Beet, Corn, Spinach, Swiss Chard



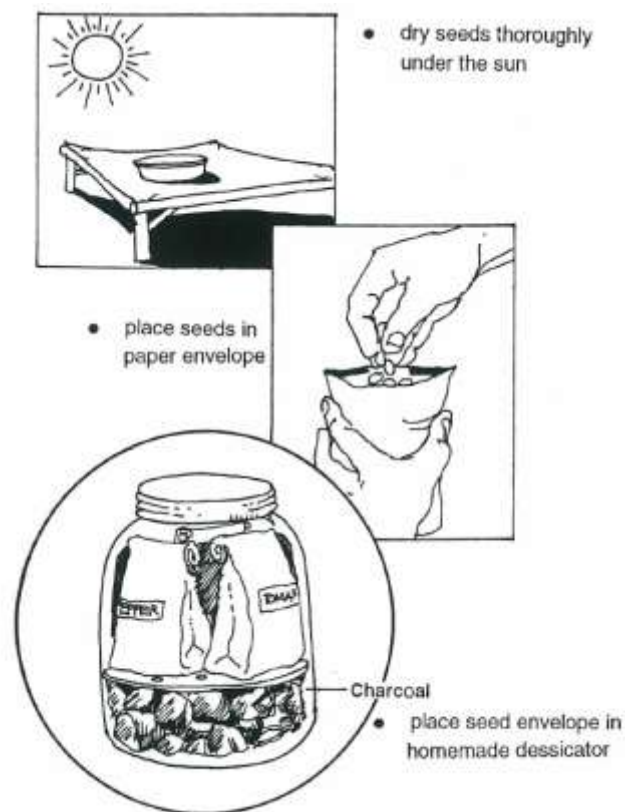
Vegetables Needing Vernalization to Produce Seed Stalks

- Beet
- Brussels Sprouts
- Cabbage
- Carrot
- Celery
- Chard, swiss
- Collard
- Florence Fennel
- Kale
- Leek
- Onion
- Parsley
- Parsnip
- Radish (winter type)
- Rutabega
- Turnip



Seed Drying

- Reduce moisture gently, by air flow under sun
- Low heat dryer (max. 45-50°C)
- Dessicant in air-tite container (e.g. calcium chloride in glass jar)-keep physically separated from seed
- Seed will reach equilibrium with atmosphere in a few weeks





Seed Quality Factors

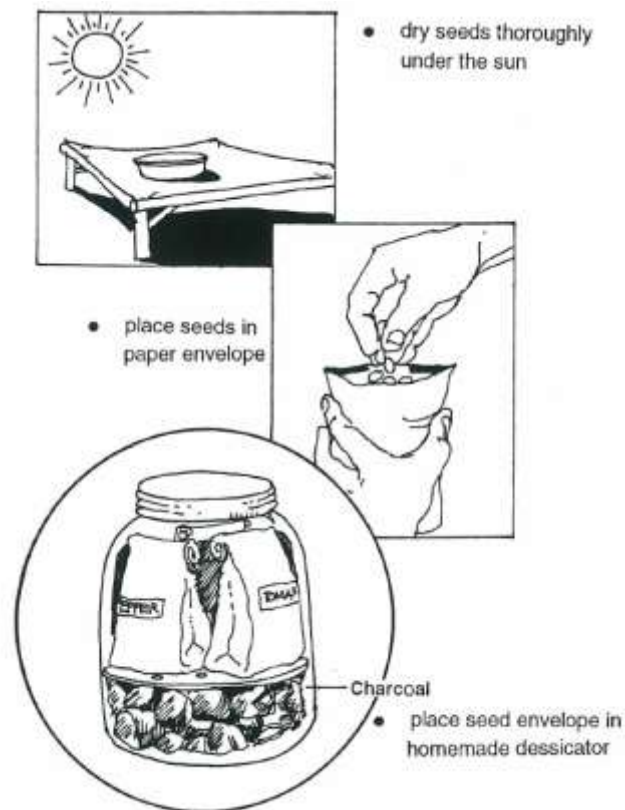
- **Moisture content**
- **Cleanliness (purity)**
 - Dirt, debris
 - Weed Seed
- **Viability and Vigor**
- **Seed Health**
 - Seed borne pathogens

Seed Quality



Storing Seeds

- Humidity
- Darkness
- Temperature





Seed Storage Environment

“the sum of the percentage relative humidity plus the temperature in degrees Fahrenheit should not exceed 100.”(Harrington, 1972)

$$RH(\%) + T(^{\circ}F) \leq 100$$



Vapor Proof Packaging

- Cans, glass, foil packs can maintain moisture equilibrium at varying temperatures
- Seeds need to be dried to lower moisture content before sealing





Seed Storage Room or Cabinets

- **Heavily insulated**
- **Good temperature and humidity control**
 - Target maintaining seed at < 8% moisture content
 - Temperature (°F) + Relative Humidity (%RH) ≤100
 - Seed life doubled for each 1% reduction in moisture content (between 6 and 16%)
 - Seed life halved for each 5°C increase in temperature (between 0 and 50°C)
 - Cooling, dehumidification, monitoring circuits
- **Volume capacity needed will grow over time.**
- **Moisture-proof containers will help, if seed is initially dried to low moisture contents**

Evaluation of Germination Test

- If you are saving seed to grow next year, it is important to know that they will sprout when you want them to.
- Whether it is seed you saved, or those received from a gardening friend, make sure to do a germination test sometime before planting.





Germination

- **Germination is defined as:**
 - "the emergence and development from the seed embryo of those essential structures which are indicative of the ability to produce a normal plant under favorable conditions."
- **The purpose of laboratory testing of seed germination are:**
 - to assess seed quality or viability
 - to predict performance of the seed and seedling in the field

Top of Pepper Method

- **Procedure:**

1. Place water absorbent material inside the waterproof tray
2. Wet the water absorbent material and allow free water to drip off for a minute.
3. Count out 20 seeds from each sample and place them on absorbent material inside the tray
4. Record the number of germinated seeds
5. Compute germination test for **5 days** and for **10 days**

- **Note:**

- The size sample depends on the size of the seed lot but usually **20 to 100 seeds** are germinated.
- Each day check that absorbent material remains moist.

Germination Rate Test

- Cabbage as an example



1 day



2 day



3 day



4 day



5 day



6 day



Calculating the Germination Rate

- **Germination rate is the average number of seeds that germinate over the five and ten day periods.**

$$\text{Germination (\%)} = \frac{\text{Number of seeds germinated}}{\text{Number of seeds on tray}} \times 100$$



Tomato

- **Production:**
 - Grow best in dry season
 - Day 21-25°C, night 15-20°C
 - Avoid field where the previous crop was tomato; this prevents the new seed crop from being contaminated with seeds from volunteer tomato plants
 - Growing tomato after paddy rice reduces the incidence of diseases and nematodes



Tomato

- **Isolation:**
 - Usually not needed
 - Perfect, self-pollinating flowers
- **Selection:**
 - Look for early maturing and attractive plants
 - Resistance to disease
- **Harvesting:**
 - Allow tomatoes to completely ripen on the plant before harvesting for seed



Tomato

- Processing: (Video)



Fermentation
25-30°C
for 2-3 days



Hands-on Practicum

- Germination test



Hands-on Practicum

- Tomato seeds extraction (I)





THANK YOU!