

PRACTICAL MANUAL

SEED PRODUCTION OF

VEGETABLE, TUBER AND SPICE CROPS

Course No. HVS-303; Credit Hrs. 3(2+1)

For B.Sc. (Horticulture) III-year (2nd Semester)



Dr. Maneesh Pandey
Dr. Arjun Lal Ola

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Department of Vegetable Science
College of Horticulture and Forestry
Rani Lakshmi Bai Central Agricultural University
Jhansi-284003

Syllabus: Seed Production of Vegetable, Tuber and Spice Crops

Practical: Study of seed structure, colour size, shape and texture. Field inspection of seed crops. Practices in rouging. Harvesting and seed extraction. Germination and purity analysis. Methods of seed production, Seed certification in cole crop, root vegetable, bulb crop, solanaceous vegetable, cucurbits, okra, leafy vegetable, leguminous vegetable and exotic vegetables. Seed processing machines. Visit to seed production units.

Name of Student

Roll No.

Batch

Session

Semester

Course Name :

Course No. :

Credit

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CERTIFICATE

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Date:

Course Teacher

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18.	To Study about the Seed processing machines	

Experiment No. 1

Objective: To study the seed structure of vegetable crop.

Define Seed:.....
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.....

MORPHOLOGICAL FEATURES OF SEED

Seed Size.....
.....

Shape.....
.....

Seed

Weight.....
.....

Surface Texture.....
.....

EXTERNAL FEATURES

Seed Coat.....
.....

Pericarp.....
.....

Raphae.....
.....

Micropyle.....

Hilum.....

INTERNAL FEATURES

Embryo.....
.....

Endosperm.....
.....

Cyotyledon.....

Scutellum.....

Coleoptyle.....

Plumule.....

Radicle.....

Hypocotyl.....

Perisperm.....

Epicotyl.....

Draw Monocot and Diocot Seed Structure:

Monocot	Diocot

Experiment No. 2

Objective: To study the field inspection of Seed Crops

Objective of field Inspection.....

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General principles of field Inspection.....

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Various crop stages of Inspection

1. At time sowing.....

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2. During pre-flowering/ Vegetative stage.....

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3. During Flowering stage.....

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4. During post flowering and pre harvest stage.....

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5. At harvesting time.....

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Contaminants to be observed during field inspection

1. Off type.....

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2. Inseparable other crop plants.....

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3. Objectionable weed plants.....
.....
.....

.....
4. Diseased plants.....
.....
.....

FIELD INSPECTION REPORT

Field No..... Report no.....

Crop..... Variety.....

Date of sowing..... Date of inspection.....

Expected date of harvest..... Time: From.....To.....

1. Name of producer/ grower.....
2. Village.....
3. Location of farm.....
4. Source of seed.....
5. Total acreage under production of this seed crop.....
6. Acreage of the field no. inspected.....
7. Previous crop..... Isolation distance.....
8. Stage of seed crop at this inspection.....
9. Field counts: Take field counts as directed in the guidelines.....

No. of heads/ plant				
Count no.	Off types	Inseparable other crops	Objectionable weeds	Plants affected by seed borne diseases
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Total				
Percentage				

10. Name(s) of
(a) Seed borne diseases.....

- (b) Inseparable other crop plants.....
- (c) Objectionable weed plants.....
- 11. Name of non-seed borne diseases present.....
- 12. Condition of crop.....
- 13. Does this crop conform to the standards of certification.....
- 14. Quality of seed production work.....
- 15. Is this the final report?.....
- 16. Estimated seed yield.....
- 17. Was the grower or his representative present at inspection time?.....
- 18. Remarks.....
-
-

Signature of grower or his representative

Signature of Inspector:

Name:

Experiment No. 3

Objective: To study practices of roughing in seed production

Principal of

Roughing.....
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Practices of roughing

1. Rouging at vegetative stage.....
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2. Rouging at flowering stage

3. Rouging just before harvest.....
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Experiment No. 4

Objective: To study the method of Harvesting in seed production

Method of harvesting.....

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1. Hand picking.....

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2. Mechanical harvesting.....

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Experiment No. 5

Objective: To study the method of Seed Extraction

Mechanical seed threshing/extraction.....

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A. Hand threshing for dry seed separation.....

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B. Beating.....

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C. Flailing.....

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D. Rolling.....

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E. Walked

on.....

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.....

Seed extraction from wet or flashy fruits: The seeds extraction from wet / flash fruits can be done by the following methods.

Manual Method

Manual Method	Crop
Maceration	watermelon
Crushing	brinjal
Scraping	cucumber
Separated	muskmelon
Scooping	pumpkins and
Extraction	squashes

Dry Extraction.....

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.....
Wet Extraction.....
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Fermentation Method.....
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Chemical method

Alkali method.....
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.....

Acid method.....
.....
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Experiment No. 7

Objective: To study seed germination

Materials Required:

Procedure:

The percent germination is calculated is given below:

$$\text{Germination percentage} = \frac{\text{No. of germinated seeds}}{\text{Total no. of seed taken}} \times 100$$

Substratum:

Germination counts:

Experiment No. 8

Objective: To study about the purity analysis of seed sample

Principle of purity analysis:

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Method

1. The working sample.....

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.....
.....

2. Weighing the working sample.....

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.....

Weight of the working Sample (g)	No. of decimal places Required	Example
< 1	4	0.7534
1- 9.999	3	7.534
10 - 99.99	2	75.34
100 - 999.9	1	753.4
1000 or more	0	753.4

3. Purity separation.....

.....
.....

Pure seed.....

.....
.....

Other crop seed.....

.....
.....

Weed seed.....

.....
Inert matter.....

.....
4. Method of purity separation.....

.....
5. Calculation All the four components must be weighed to the required no. of decimal places. The percentages of the components are determined as follows.

$$\% \text{ of component} = \frac{\text{Weight of individual component}}{\text{Total weight of all components}} \times 100$$

If there is a gain or loss between the weight of the original samples and the sum of all the four components is in excess of one percent, another analysis should be made.

6. Duplicate tests.....

.....
7. Determination of other crop seeds & weed seeds by number /kg.....

.....
Equipments used for purity analysis

1. Seed blower.....

.....
2. Purity work board.....

Experiment No. 9

Objective: To study the seed production in Solanceous vegetables

Family:

Botanical Description

	Tomato	Brinjal	Chilli
Botanical name			
Chromosome no.			

Land requirement.....
.....

Isolation Distance

Crop	Foundation (m)	Certified (m)
Brinjal		
Tomato		
Chilli		

Rouging.....
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.....

Harvesting and Seed extraction

Brinjal.....
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Tomato.....
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Comparison of different seed extraction method in tomato

	Fermentation	Acid	Alkali
Method	Mix fruit pulp with water - 24 - 48 h	HCl @10ml / Kg of pulp - 20-30 minutes	Washing soda @ 900mg/4 l of water- equal volume – overnight soak
Salient features	<ul style="list-style-type: none"> • Low cost. • Unskilled labour. • More time taken. • Low seed recovery (0.5 to 0.6 %) • Dull seed colour. • Seed borne pathogens 	<ul style="list-style-type: none"> • Cost is more. • Skilled labour. • Lesser time. High seed recovery (0.8 to 1 %). Bright colour market value higher. • Seed borne pathogen removed • Improper washing leads to injury to seeds 	<ul style="list-style-type: none"> • Recovery 0.7 to 0.8 per cent. • Luster of the seeds will be lost. • Improper washing leads to injury to seeds

Chilli.....

Seed cleaning and processing.....

Objective: To study the seed production in Gourd Family

Family :

Crop	Botanical Name	Chromosome No
Pumpkin		
Bottle Gourd		
Bitter Gourd		
Ash Gourd		
Ridge Gourd		
Song Gourd		

Land requirement.....

Isolation Requirements

Crop	Foundation (m)	Certified (m)
Pumpkin		
Bottle Gourd		
Bitter Gourd		
Ash Gourd		
Ridge Gourd		
Song Gourd		

Maturity of fruit.....

Harvesting and seed extraction.....

Experiment No. 11

Objective: To study the seed production in Leguminous Family

Leguminous vegetable: These are self-pollinated crops and hence no appreciable contamination is expected. Isolation distance of 50 m and 20 m is followed for beans and peas respectively. Agronomic practices for crop to be raised for seed production are more or less the same as for vegetable production. Dry pods are collected and threshed carefully without injuring the seed.

Family:

Crop	Botanical Name	Chromosome No
Cowpea		
French Bean		
Cluster Bean		
Vegetable Pea		

Land requirement.....

Isolation distance

Crop	Foundation seed (m)	Certified seed (m)
Cowpea		
French Bean		
Cluster Bean		
Vegetable Pea		

Rouging.....

Harvesting.....

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Threshing and winnowing.....

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Drying.....
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Experiment No. 12

Objective: To study the seed production in Root vegetables

Botanical Description

Crop	Botanical Name	Chromosome No	Family
Carrot			
Radish			
Turnip			
Beet root			

Land requirement.....
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.....
.....

Isolation

Crop	Foundation Seed (m)	Certified Seed (m)
Carrot		
Radish		
Turnip		
Beet root		

Rouging.....
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Pre-uprooting stage.....
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Uprooting and replanting stage.....
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Methods of seed production:

Seed-to-seed.....
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Root-to-seed.....

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Harvesting.....

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Curing, threshing and seed grading.....

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Experiment No. 13

Objective: To study the seed production in coal crops

Botanical Description

Crop	Botanical Name	Chromosome No	Family
Cabbage			
Cauliflower			

Land requirement.....
.....
.....

Isolation

Crop	Foundation seed (m)	Certified seed (m)
Cabbage		
Cauliflower		

Rouging.....
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Methods of seed production:

Head to seed method.....
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Seed to seed method.....
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Stump method.....
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Stump with central core-intact method.....

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Harvesting and Threshing.....

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Experiment No. 14

Objective: To Study the seed production in bulb crops

Botanical Description

Crop	Botanical Name	Chromosome No	Family
Onion			

Land requirement.....
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Isolation

Crop	Foundation seed (m)	Certified seed (m)
Onion		

Rouging.....
.....
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Method of seed production:

Seed to seed method.....
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Bulb to seed method.....
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Umbel harvesting & drying.....

Objective: To Study the seed production in Okra

Botanical Description

Crop	Botanical Name	Chromosome No	Family
Okra			

Land requirement.....
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Isolation

Crop	Foundation seed (m)	Certified seed (m)
Okra		

Rouging.....
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Harvesting.....
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.....

Threshing drying and processing.....
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Experiment No. 16

Objective: To Study the seed production in Leafy vegetables

Botanical Description

Crop	Botanical Name	Chromosome No	Family
Amaranthus			
Spinach			

Land requirement.....
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Isolation

Crop	Foundation seed (m)	Certified seed (m)
Amaranthus		
Spinach		

Rouging.....
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.....

Harvesting.....
.....
.....

Threshing drying and processing.....
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Experiment No. 17

Objective: To Study the seed production of Exotic vegetable

Botanical Description

Crop	Botanical Name	Chromosome No	Family
Lettuce			

Land requirement.....
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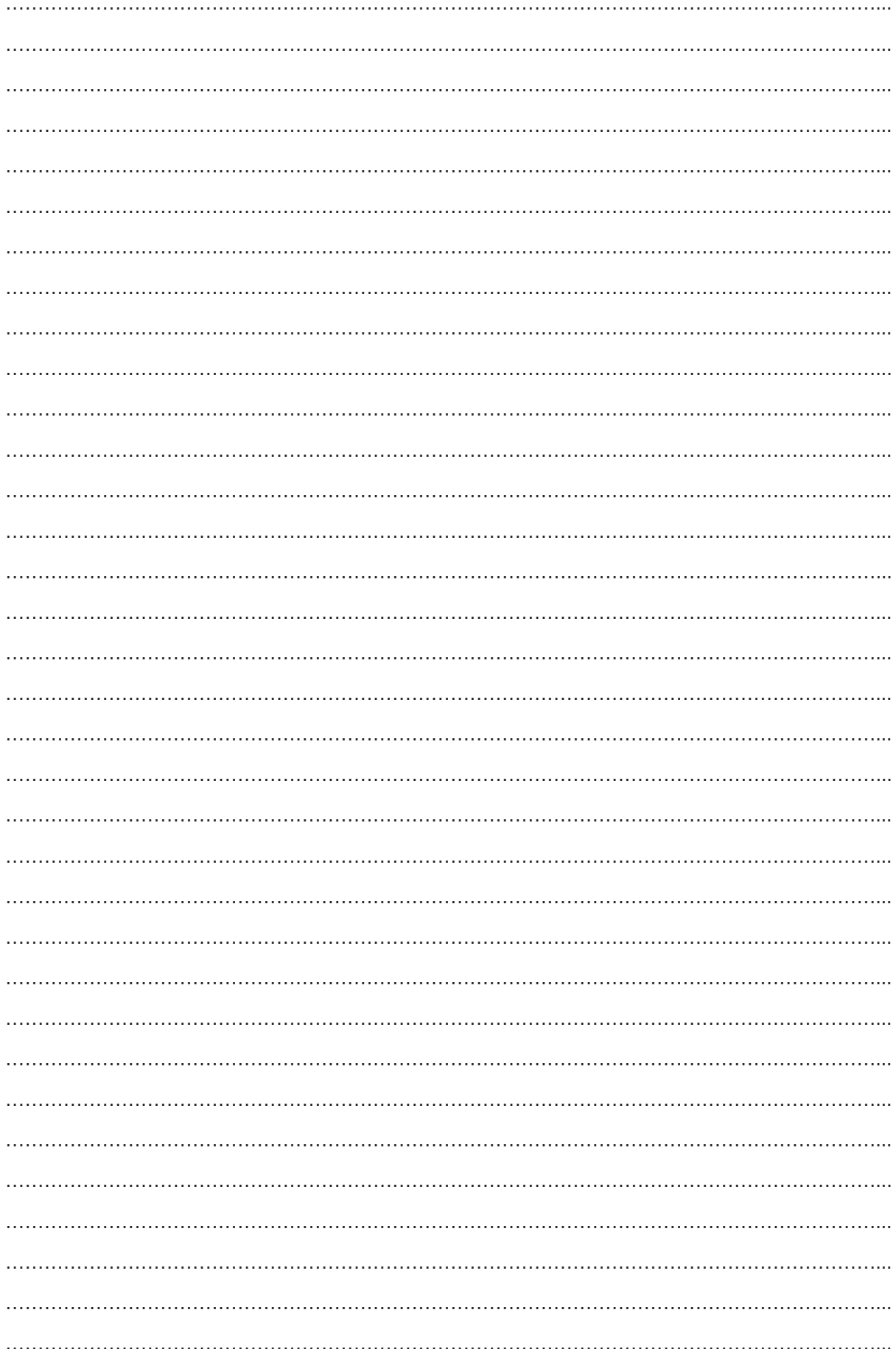
Isolation

Crop	Foundation seed (m)	Certified seed (m)
Lettuce		

Rouging.....
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.....

Harvesting.....
.....
.....

Threshing.....
.....
.....



APPENDICES

HARVESTING OF DIFFERENT CROP AT THEIR MATURITY INDICES

Crop	Maturity indices	Remarks
Dried Seeds		
Amaranth	Yellowish browning of inflorescence	Prone to shattering
Onion	Seeds become black on ripening in silver colored capsules. 10% heads exposed black seeds.	Prone to shattering
Carrot	Second and 3rd order head turn brown	Shattering on delayed harvest
Radish	Pods become brown and parchment like	Do not shatter easily
Turnip	Plants turn to brown parchment colour	Prone to shattering
Coriander	Plants turn to light yellow or brown in colour	Prone to shattering
Peas	Pods become parchment like	Do not shatter easily
Beans	Earliest pods dry & parchment like and remaining have turned yellow	Over maturity leads to shattering and cotyledon cracking
Wet fleshy fruits		
Brinjal	Fruit turn to straw yellow colour	Wet seed extraction (fermentation, acid, alkali)
Tomato	Skin colour turn to red and the fruits are softened	Wet seed extraction (fermentation)
Cucumber	Fruit become yellowish brown in colour, and stalk adjacent to the fruit withers for confirming actual seed maturity.	Seed extraction -scooping, (acid, alkali, fermentation))
Watermelon	Tendrils wither on fruit bearing shoot. Skin colour of the fruit resting on the soil is pale yellow and gives dull sound on thumping.	
Squash, Pumpkin	Rind becomes hard & its colour changes from green to yellow/orange or golden yellow to straw colour	
True potato seed (TPS)	Berries of potato becomes green to straw coloured and soft	
Bitter gourd	Fruit pulp and seed becomes red and light brown respectively	Seeds are separated manually and washed
Fruits dried before extraction		
Chilli	Green colour changes to red or yellow	Dry method of seed extraction
Bottle and Sponge gourd	Rind becomes hard and colour changes to light brown or yellow	
Vegetatively propagated materials		
Colocasia	Drying and dieing of petiole and leaves	Skin becomes tough, uproot
Zinger	Drying and falling down of pseudo-stem turning brown	Select healthy, disease free rhizomes
Turmeric	Drying and falling down of stem turning brown	Select healthy, disease free rhizomes
Garlic	The stem get dry and change in colour from green to brown	
Seed potato	Haulms get dry, droop down turn dark brown in colour	Delay leads to spoilage of seed tubes.

DIFFERENT SEX FORMS IN CUCURBITS

Sex form	Crop spp.
Hermaphrodite	Satputia cultivar of Ridge gourd and rare: Pumpkin and Summer squash
Monoecious	Cucumber, Musk and Watermelon, Round and Snap gourd, Pumpkin, Squash, Ash gourd, Bitter, Bottle, Ridge, Sponge and Snake gourd.
Andromonoecious	Muskmelon, Cucumber (var. Lemon) also reported in some breeding line of Watermelon
Gynoecious	Bitter gourd, Muskmelon and Cucumber
Gynomonoecious	Cucumber, Ridge gourd
Androecious	Ridge gourd, Cucumber and Muskmelon
Dioecious	Pointed gourd, Ivy gourd and Spine gourd
Trimonoecious /	Reported in some species of <i>Momordica</i> and <i>Cucumis melo</i> rarely cucumber

PROCESSING EQUIPMENTS



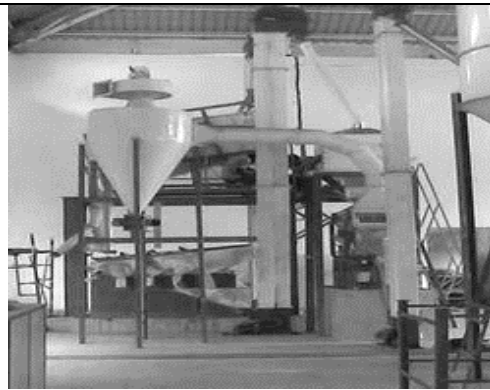
Grain Separator Cleaning Machine



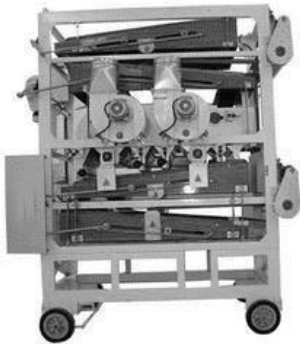
Grain Cleaner



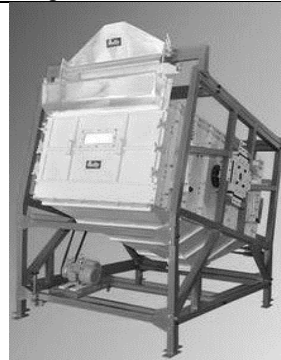
Cardamom Shelling



Seeds Cleaning and Classification Machinery



Screen Grader



Spices Cleaning Machine