

Practical Manual

TROPICAL AND SUBTROPICAL FRUITS

HFS 104 3(2+1)

For Undergraduate Horticulture students

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2019

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SYLLABUS

Practical: Description and identification of varieties based on flower and fruit morphology in above crops. Training and pruning of grapes, mango, guava and citrus. Selection of site and planting system, pre-treatment of banana suckers, desuckering in banana, sex forms in papaya. Use of plastics in fruit production. Visit to commercial orchards and diagnosis of maladies. Manure and fertilizer application including bio-fertilizer in fruit crops, preparation and application of growth regulators in banana, grapes and mango. Seed production in papaya, latex extraction and preparation of crude papain. Ripening of fruits, grading and packaging, production economics for tropical and sub-tropical fruits. Mapping of arid and semi-arid zones of India. Botanical description and identification of ber, fig, jamun, pomegranate, carissa, phalsa, wood apple, West Indian cherry, tamarind, aonla, bael and Annona.

Name of Student:

ID No.

Batch

Session

Semester

Course Name:

Course No:

Credit:

CERTIFICATE

This is to certify that Shri/Km

ID No has completed the practical course

..... Course No as per the syllabus of

B. Sc (Hons) Agriculture/Horticulture

semester in the year in the respective lab/field of college.

Date:

Course Teacher

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5		Selection of site and planting system, pre-treatment and intercultural operation in banana.		
6		Pretreatment of banana suckers		
7		Desuckering of Banana		
8		Preparation and Application of Growth Regulators		
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10		Methods of Biofertilizer application in fruit crops		
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Exercise No. 1

Objective: Description and identification of Tropical and subtropical Fruits

S. No	Fruit crops	Parameters	Remarks
1	Mango	Inflorescence shape (Conical, Pyramidal, broadly pyramidal)	
		Inflorescence colour	
		Position of flower/bearing habit	
		Time of flowering	
		Fruit Shape	
		Fruit colour at maturity	
		Fruit length	
		Fruit breadth	
		Time of fruit maturity	
2	Banana	Inflorescence shape (Conical, Pyramidal, Broadly pyramidal)	
		Inflorescence colour	
		Position of flower/bearing habit	
		Time of flowering	
		Fruit Shape	
		Fruit colour at maturity	
		Fruit length	
		Fruit breadth	
		Time of fruit maturity	
3	Grapes	Inflorescence shape (Conical, Pyramidal, Broadly pyramidal)	
		Inflorescence colour	
		Position of flower/bearing habit	
		Time of flowering	
		Fruit Shape	
		Fruit colour at maturity	
		Fruit length	
		Fruit breadth	

		Time of fruit maturity	
4	Guava	Inflorescence shape (Conical, Pyramidal, Broadly pyramidal)	
		Inflorescence colour	
		Position of flower/bearing habit	
		Time of flowering	
		Fruit Shape	
		Fruit colour at maturity	
		Fruit length	
		Fruit breadth	
		Time of fruit maturity	
5	Ber	Inflorescence shape (Conical, Pyramidal, Broadly pyramidal)	
		Inflorescence colour	
		Position of flower/bearing habit	
		Time of flowering	
		Fruit Shape	
		Fruit colour at maturity	
		Fruit length	
		Fruit breadth	
		Time of fruit maturity	
6	Citrus	Inflorescence shape (Conical, Pyramidal, Broadly pyramidal)	
		Inflorescence colour	
		Position of flower/bearing habit	
		Time of flowering	
		Fruit Shape	
		Fruit colour at maturity	
		Fruit length	
		Fruit breadth	
		Time of fruit maturity	

Exercise No. 2

Objective: Training and Pruning of Tropical and Sub-tropical fruits

Materials required:.....

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Methods of training:

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Procedures:.....

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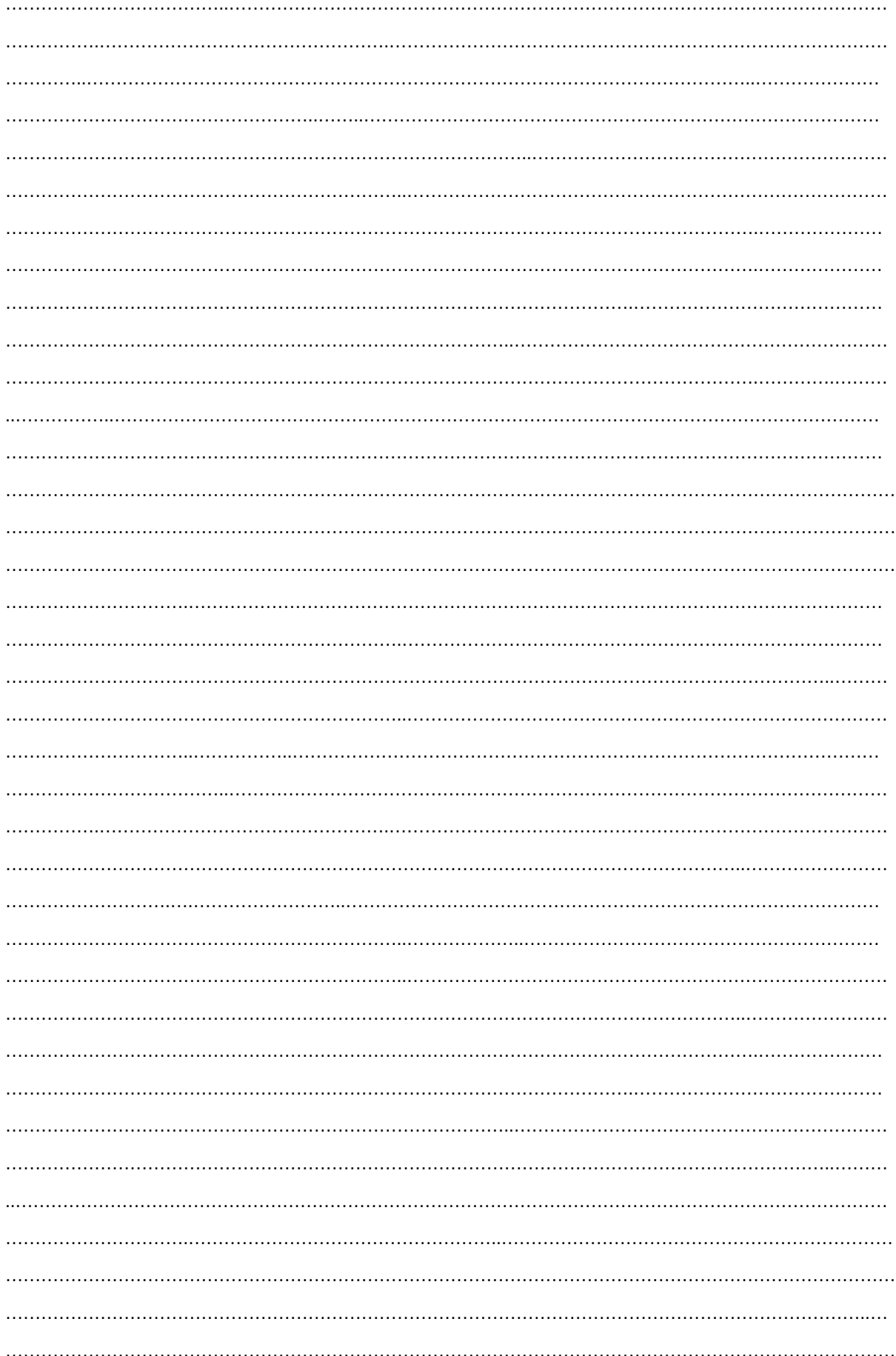
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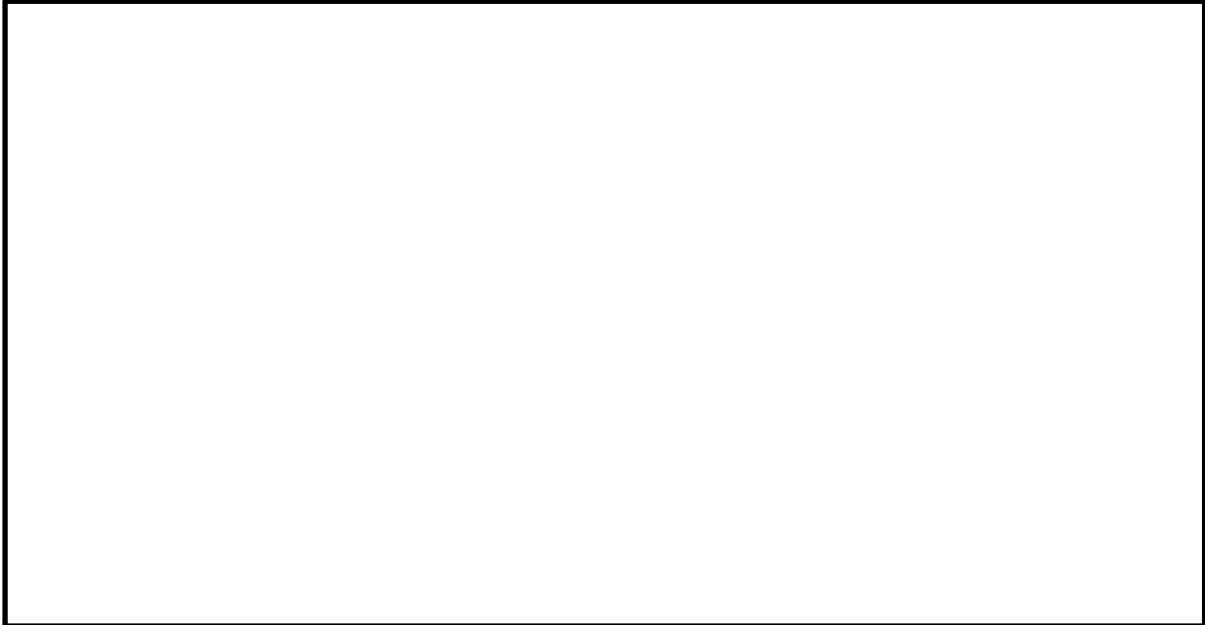
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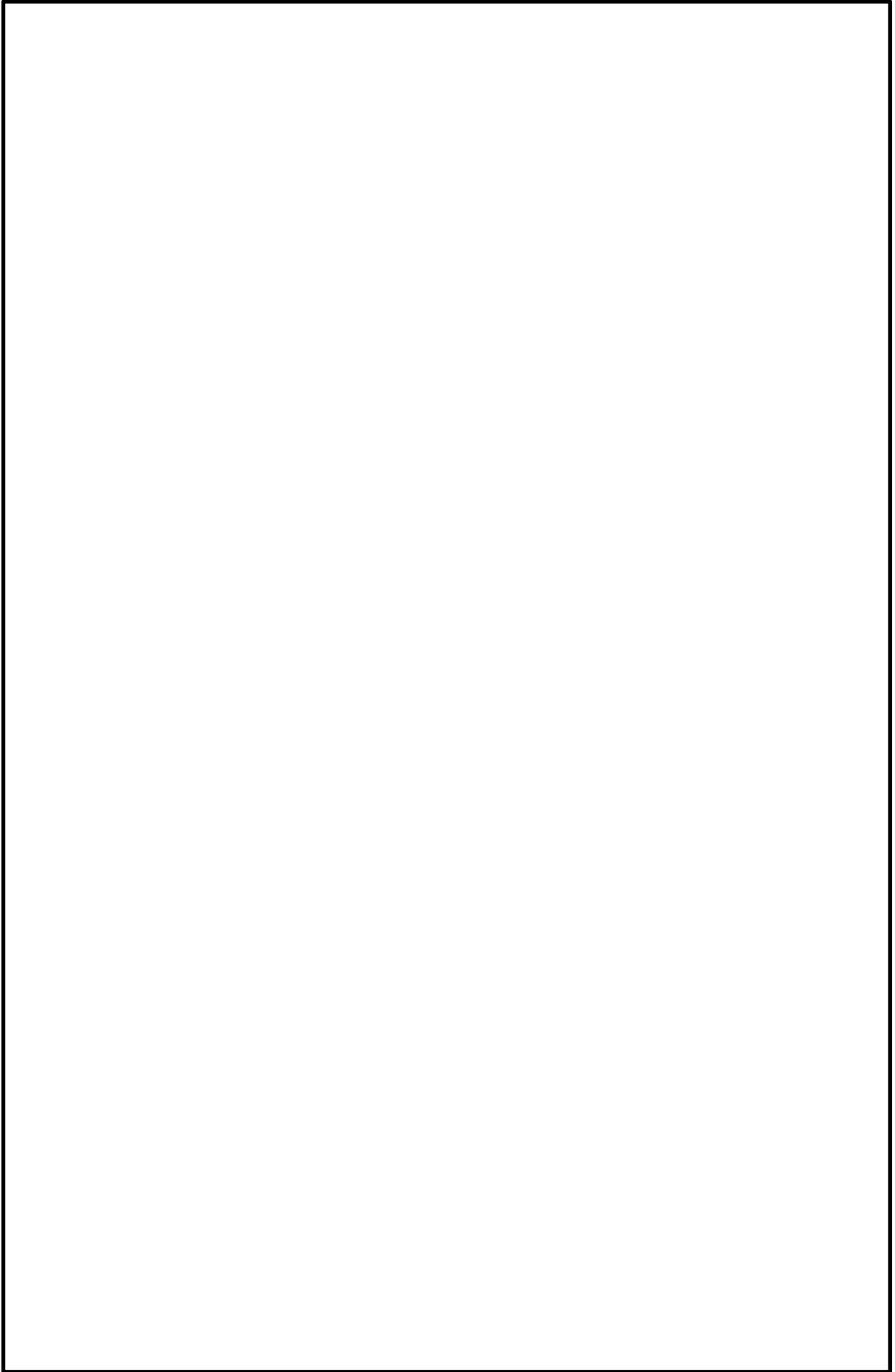
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Assignment: Practice the procedures and draw sketches.





Objective: Propagation, Planting and Planting Density of Pineapple

Materials required:.....
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Time of planting:

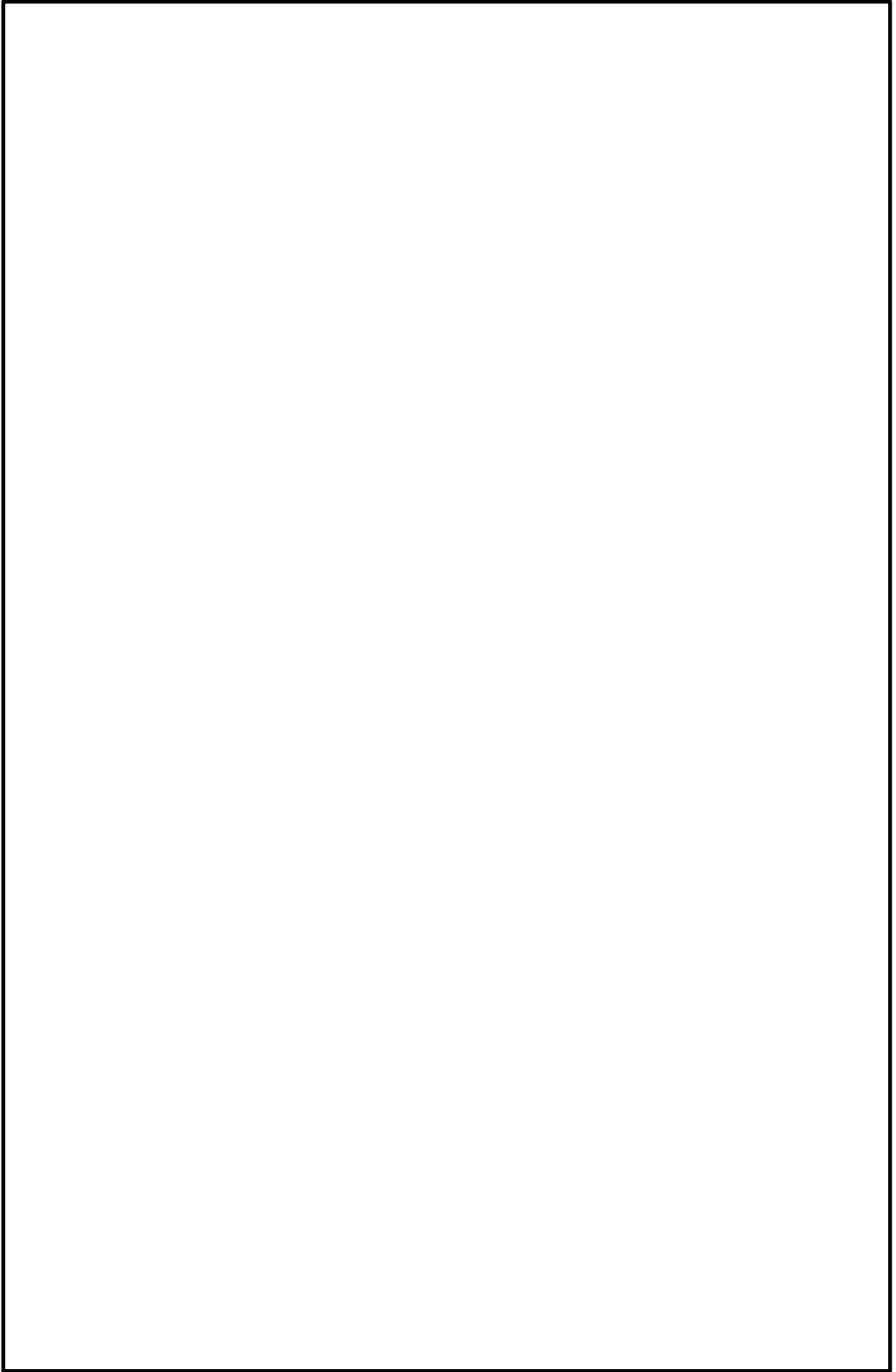
Pre-treatment of Planting Material:
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Planting System:
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Procedure:
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Assignment:

- 1. Draw the different types of planting materials used in propagation of pineapple



2. Calculate the planting density (Per hectare) as details below:

Plant to plant	Row to Row	Between double row	Planting density
30	60	90	
25	60	90	
25	60	75	
25	35	90	

Double Row System:

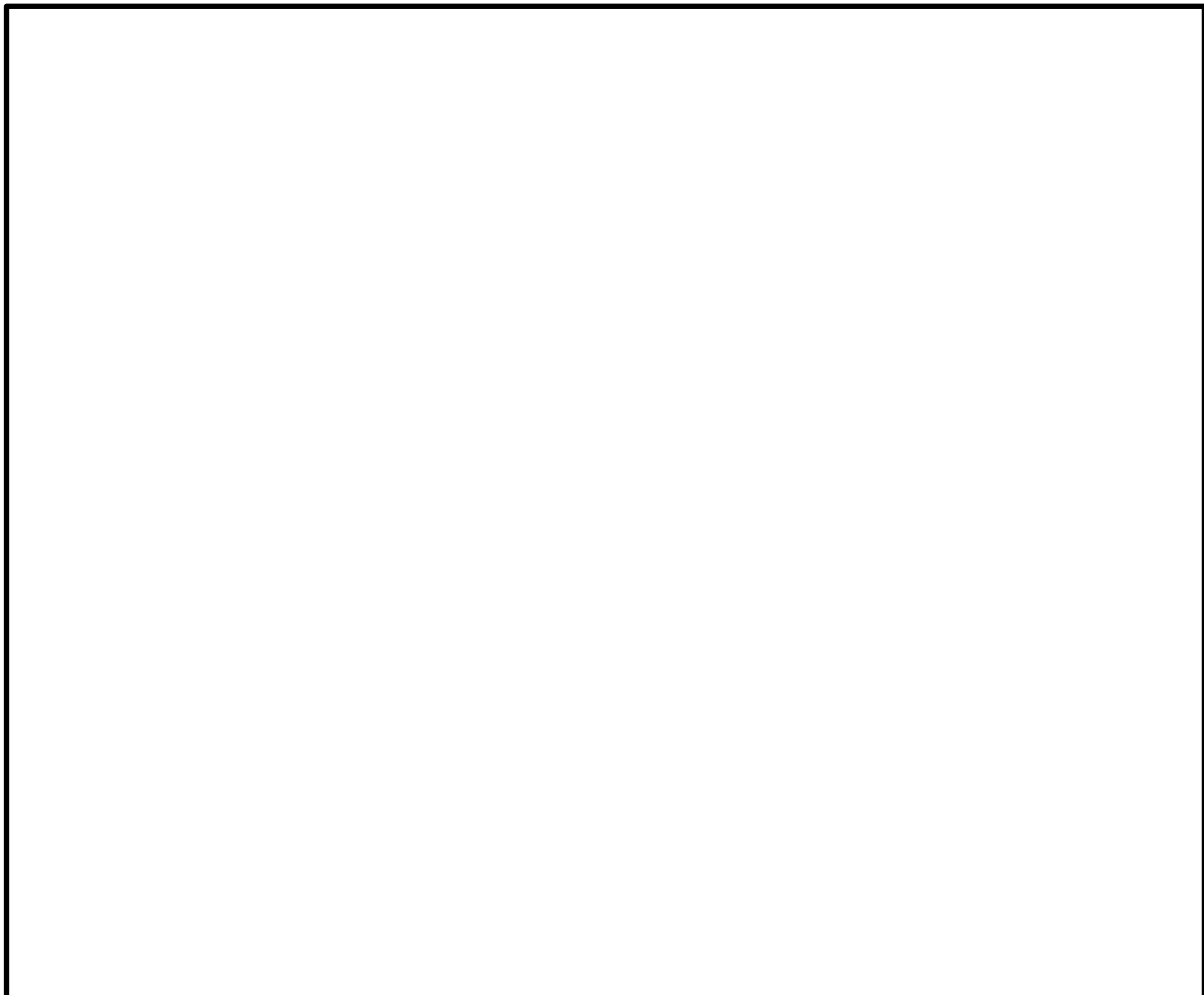
$$\text{No of plants / ha} = \frac{\text{Number of the Rows} \times \text{Total area cropped}}{(\text{Plant to plant distance}) \times (\text{Row to Row}) + (\text{Bed to Bed distance})}$$

If, the plant to plant distance is 25 cm, row to row distance is 35 cm and bed to bed distance is 90 cm.)

$$\text{No of plants / ha} = \frac{2 \times 10000}{0.25 \times (0.35 + 0.90)}$$

$$\text{No of plants / ha} = 64000$$

3. Draw a layout plan for planting of pineapple at density of 64000/ha



Procedure of intercultural operation:

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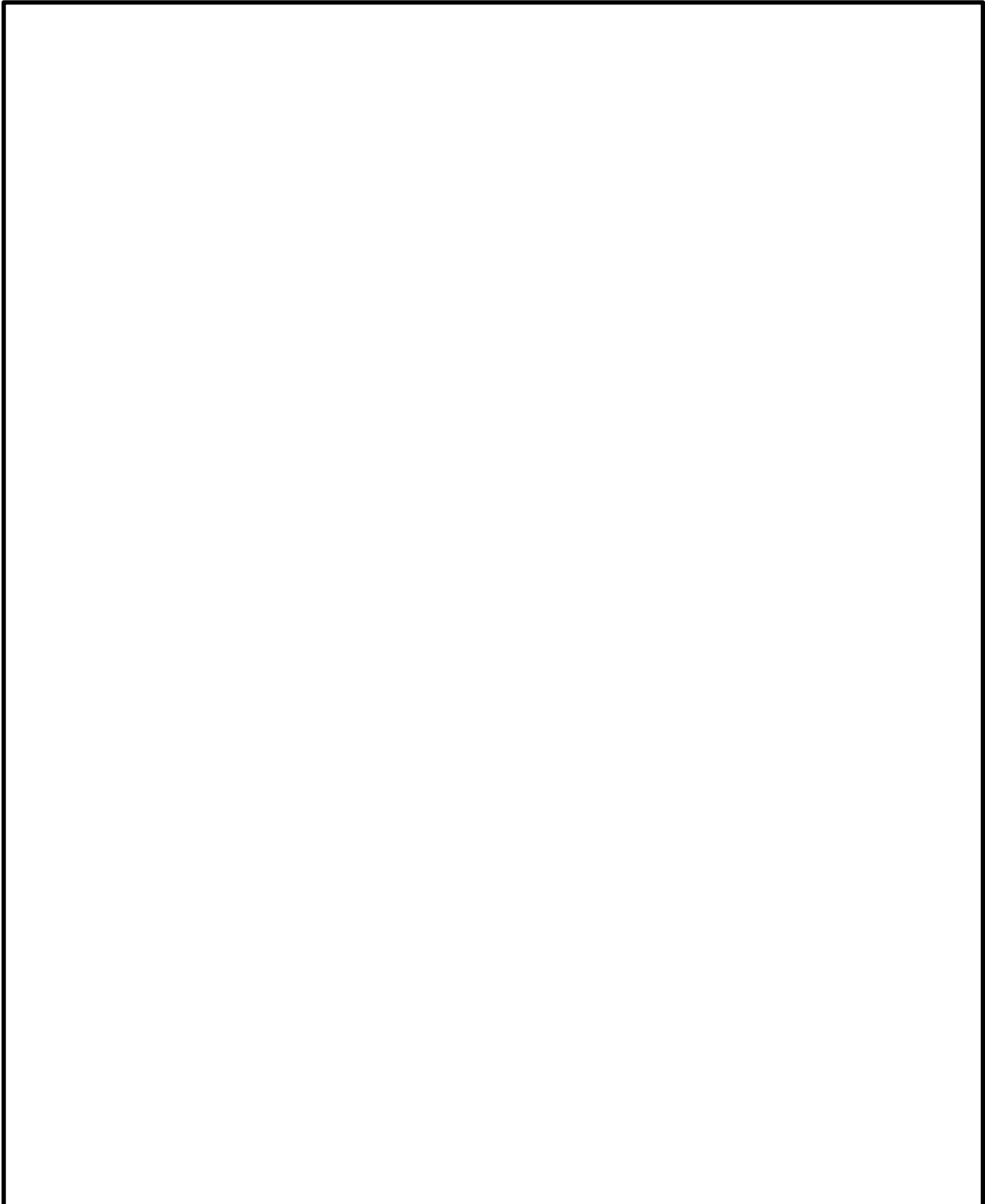
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Assignment: Follow the procedure and present with a neat sketch.



Exercise No. 6

Objective: Pretreatment of banana suckers.

Materials required:

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Procedure:

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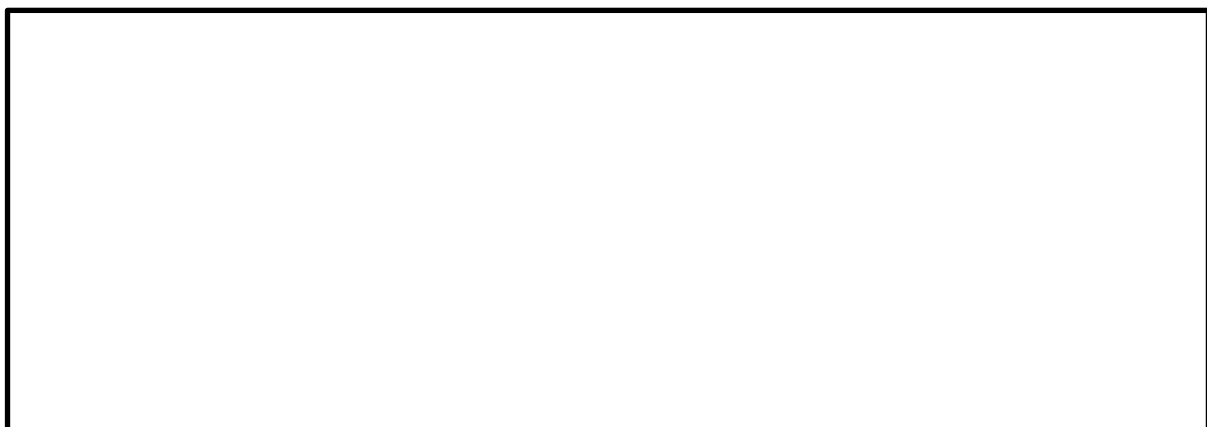
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Assignment: Follow the procedure and present with a neat sketch.



Exercise No. 6

Objective: De-suckering of Banana

Materials required:

Procedure:

Assignment: Follow the procedure through manual process in field condition.

Assignment: Practice the job and record the calculation

Exercise No: 9

Objective: Preparation of Fertilizer Mixtures and Field Application

Materials required:

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Method of Application:

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Problems: Practice the job on the field.

Exercise No. 10

Objective: Methods of Biofertilizer application in fruit crops

Materials required:

Application method:

Precaution:

Assignment: Write in brief the method of biofertilizer application you have practiced in field.

Exercise No. 11

Objective: Use of plastic mulches in fruit orchard

Materials required:

Procedure:

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Objective: Sex forms of Papaya

Materials required:

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Procedure:

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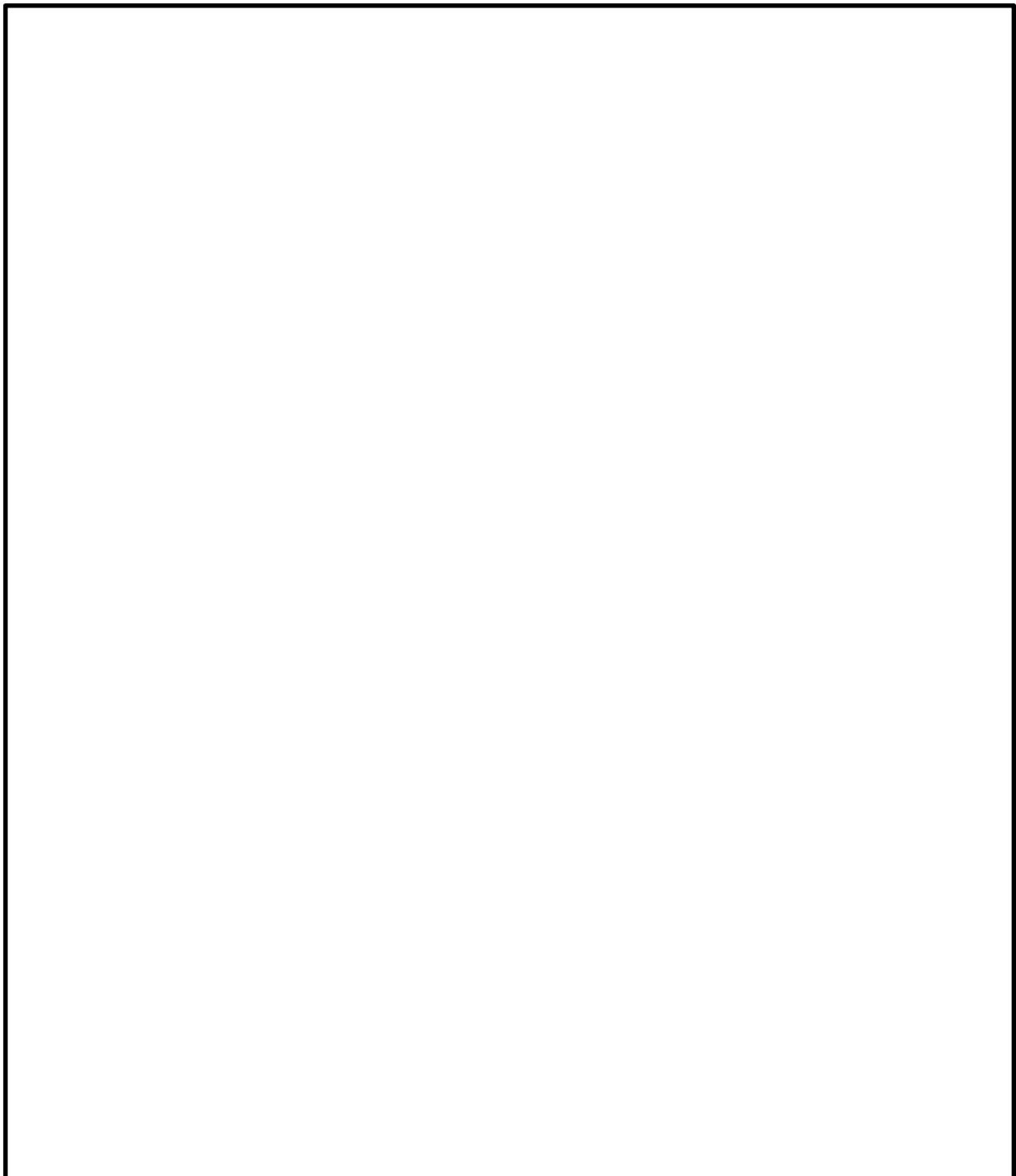
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Different sex expression

S. No	Type	Characters
1	Pistillate	
2	Staminate	
3	Hermaphrodite	
4	Reduced elongate (Unisexual)	
5	Elongate	
6	Pentandria	
7	Carpelloid	

Assignment: Study the different flower types of papaya and draw the neat sketches.



Observations:

- Cultivars of papaya:
- Time of collection:
- Season of collection:
- Quantity of fresh latex / fruit (g):
- Fruit size – length and breadth (cm):
- Maturity during lancing (days old):
- Shape of the fruit – oval/oblong/round:

Assignment: Draw sketches of the lancing operation.



Preparation of crude papain

Materials required:

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Procedure:

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Observation

- Time taken for sun drying:

- Time required for oven drying:

- Colour of dried papain:

- Quality of dry papain/fruit:

- Texture of papain (crisp and thick):

Assignment: Dry the latex in sun / oven

EXERCISE 14

Objective: Papaya seed production: Seed extraction and drying

Materials required:

Procedure:

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Observation

Parameters	Remarks
Numbers of seeds per fruit	
No. of seeds per 100 gm	
Colour of seed	

Assignment: Follow the steps involved in seed extraction and drying

Exercise No. 15

Objective: Production economics for commercial cultivation of Mango, and Banana

Items for calculating the cost of cultivation of Banana for 1 ha. area

S. No.	Component	Proposed Expenditure
1.	Plantation Expenses	
	Cost of planting material (Suckers and tissue culture plants)	
	Cost of Manures & fertilizers	
	FYM	
	Nitrogen	
	Phosphorus	
	Potassium	
	FeSO ₄	
	CuSO ₄	
	FeSO ₄	
	Cost of any others nutrients and plant growth regulators	
	Cost of Insecticides & pesticides	
	Cost of labour for application of manures, fertilizers and pesticides. Weeding and harvesting	
	Others, if any, (Power)	
2.	Irrigation	
	Tube-well/submersible pump	
	Cost of Pipeline	
	Others, if any, please specify	
3.	Cost of Drip/Sprinkler	
4.	Infrastructure	
	Store	
	Labour shed & Pump house	
	Farm Equipment	
5.	Land Development	
	Soil Leveling	
	Digging	
	Fencing	
	Others, if any, please specify	
Grand Total		

Total expenditure

Total yield of Banana

Sold @

Net income = gross income – expenditure

Net income growing one ha. Banana will be

Benefit cost ratio: Net income / total cost

Items for calculating the cost of cultivation of Mango for 1 ha. area

Sl. No.	Component	Proposed Expenditure
1.	Plantation Expenses	
	Cost of planting material (Based on planting density)	
	Cost of Manures & fertilizers	
	FYM	
	Nitrogen	
	Phosphorus	
	Potassium	
	Cost of any others nutrients and plant growth regulators	
	Cost of Insecticides & pesticides	
	Cost of labour for application of manures, fertilizers and pesticides.	
	Others, if any, (like Training, pruning and weeding and harvesting)	
2.	Irrigation	
	Tube-well/submersible pump	
	Cost of Pipeline	
	Others, if any, please specify	
3.	Cost of Drip/Sprinkler	
4.	Infrastructure	
	Store	
	Labour shed & Pump house	
	Farm Equipment	
5.	Land Development	
	Soil Leveling (Hiring tractor for plowing and leveling)	
	Digging (Hiring JCB for pit digging)	
	Fencing (permanent/temporary)	
	Others, if any, please specify	
Grand Total		

Total expenditure

Total yield of Mango

Sold @

Net income = gross income – expenditure

Net income growing one ha. Mango will be

Benefit cost ratio: Net income / total cost

Conclusion:

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The major components of the model are:

- **Land Development:** This is the labour cost of shaping and dressing the land site.
- **Fencing:** It is necessary to safeguard the orchard by a barbed wire fencing.
- **Irrigation Infra-structure:** For effective working with drip irrigation system, it is necessary to install a bore well with diesel/electric pumpset and motor. This is post cost of tube-well.
- **Drip Irrigation:** This is average cost of one acre drip system for apple inclusive of the cost of fertigation equipment. The actual cost will vary depending on location, plant population and plot geometry.
- **Implements:** For investment on improved manually operated essential implements a provision of another Rs.15 thousand is included.
- **Building and Storage:** A one acre orchard would require minimally a labour shed and a store-cum grading/packing room & pump house.

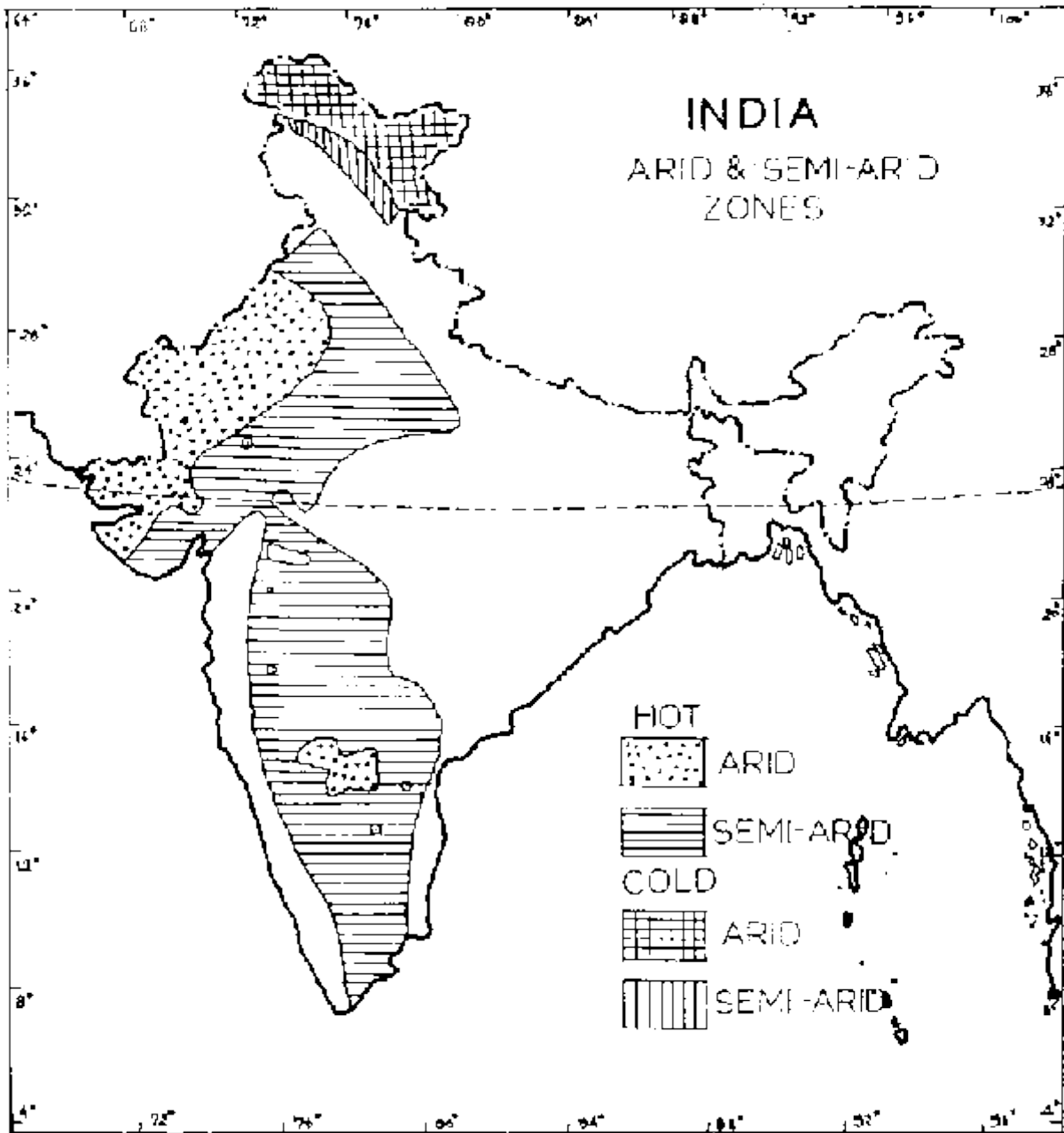
A. Fruit maturity standard

Study the development stages of seasonal fruits and record your observation in the following table.

Observe the stage of fruit maturity and record

S. No	Fruit's name	Stage of development	Fruit size weight/volume	Colour			Taste / Flavour	TSS
				Fruit	Flesh	Seed		
1.		Underdeveloped						
		Fully developed						
		Harvest maturity						
2		Underdeveloped						
		Fully developed						
		Harvest maturity						
3		Underdeveloped						
		Fully developed						
		Harvest maturity						
4		Underdeveloped						
		Fully developed						
		Harvest maturity						
5		Underdeveloped						
		Fully developed						
		Harvest maturity						
6		Underdeveloped						
		Fully developed						
		Harvest maturity						
7		Underdeveloped						
		Fully developed						
		Harvest maturity						
8		Underdeveloped						
		Fully developed						
		Harvest maturity						
9		Underdeveloped						
		Fully developed						
		Harvest maturity						
10		Underdeveloped						
		Fully developed						
		Harvest maturity						

Assignment: Draw sketches of Indian political map and mansion arid and semi-arid regions. Point out major fruits producing areas and production.



APPENDICES

NUTRIENT CONTENT OF ORGANIC MANURES

Organic Manure	N %	P ₂ O ₅ %	K ₂ O %
Farmyard manure	0.50	0.25	0.50
Cattle dung	0.40	0.20	0.17
Poultry manure	3.03	0.63	1.40
Vermicompost	3.00	1.00	1.50
Rural compost	0.75	0.20	0.50
Urban compost	1.75	1.00	1.50
Castor cake	4.37	1.85	1.39
Coconut cake	3.00	1.80	1.90
Neem cake	5.22	1.08	1.48
Blood meal	12.00	2.00	1.00
Groundnut cake	7.30	1.50	1.30
Pressmud	2.10	4.40	0.80
Safflower cake	4.8	1.4	1.2
Sesamum cake	6.2	2.0	1.2
Fish mean, fish manuring and fish guano	4.0	3.0	0.3
Bono mean (Raw)	3.0	20.0	-
Bone mean (Steamed)	1.0	25.0	-
Settled sludge (Dry)	2.0	1.0	0.4
Night soil	1.2	0.8	0.4
Human urine	1.0	0.1	0.2
Cattle dung and urine mixed	0.60	0.15	0.45
Horse dung and urine mixed	0.70	0.25	0.55
Sheep dung and urine mixed	0.95	0.35	1.00

COMPOSITION OF INORGANIC FERTILIZERS

Fertilizers	N %	P ₂ O ₅ %	K ₂ O %	Sulphur	Calcium
Ammonium nitrate	35				
Calcium ammonium nitrate	26				
Ammonium sulphate nitrate	26			12.1	
Sodium nitrate	15.6	-	-		
Calcium nitrate	15.5	-	-		19.5
Potassium nitrate	13.0	-	-		
Ammonium sulphate	20.6			24	
Ammonium chloride	26.0				
Anhydrous ammonia	82.0	-	36.4		
Urea	46	-	-		
Calcium cyanamide	20.6				
SSP	-	16	-		
Double SP	-	32	-		
Triple SP	-	46-48	-		
Diammonium Phosphate (DAP)	18	46	-		
Potassium chloride			60		
Potassium sulphate			48		
Calcium Chloride					15