MINOR FRUIT PRODUCTION

HFS-513, 3 (2+1)

PRACTICAL MANUAL

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Course: Minor Fruit Production, HFS-513, 3 (2+1)

Practical: Visits to institutes located in the hot and cold arid regions of the country. Identification of minor fruits plants/cultivars. Collection of leaves and preparation of herbarium. Allelopathic studies. Generating know-how on reproductive biology of minor fruits. Fruit quality attributes and biochemical analysis. Project formulation for establishing commercial orchards in fragile ecosystems.

Name of Students: .....

Roll No..... Batch.....

Session ..... Semester.....

Course Name .....

Course No: ..... Credit: .....

Certificate

This is to certify that Shri./Km. ……...

ID No: …… has completed the practical of courses …… courses No …… as per the syllabus of M. Sc (Horticulture) Fruit Science …… semester in year ……..in the respective lab/field of college.

Date: **Course Teacher**

Contents

S. No	Name of Exercise	Signature
1.	To study the morphological characters of minor fruits: Bael and Jamun	
2.	To study the morphological characters of minor fruits: Karonda and Phalsa	
3.	To study the morphological characters of important minor varieties	
4.	To the collect of leaves and preparation of herbarium	
5.	To study the allelopathic effects on seed germination	
6.	To study the allelopathic effects on weed control	
7.	To study the floral biology of minor fruits	
8.	To study the pollination of minor fruits	
9.	To Identify and management of nutritional disorders in minor fruit crops	
10.	To study the analyses of quality attributes of TSS and Acidity	
11.	To study the analyses of Sugar content & Vitamin	
12.	To study the extraction of anthocyanin pigment and estimation of anthocyanin	
13.	To study the production economics for Bael	
14.	To visit to cold arid region	
15.	To visit to hot arid region	

Exercise No: 1

Objective: To study the morphological characters of minor fruits: Bael and Jamun

Materials required: ……..

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1. Bael

A. General parameters

i. Common name:

ii. Botanical name:

iii. Type of planting material (Seedling/grafted/layered):

iv. Name of the variety:

v. Name of the rootstock:

vi. Age of the plant:

vii. Parentage name:

Observation:

Parameters	**Remarks**
Growth habit	
Leaf characteristic	
Time of flowering	
Inflorescence type	
Fruit characteristic	
Maturity index	

2. Jamun

A. General parameters

i. Common name:

ii. Botanical name:

iii. Type of planting material (Seedling/grafted/layered):

iv. Name of the variety:

v. Age of the plant:

vi. Parentage name:

Observation:

Parameters	Remarks
Tree height (cm)	
Tree spread (cm)	
Tree habit	
Flowering time	
Flower characters	
Fruit characters	
Maturity index	

Exercise No: 2

Objective: To study the morphological characters of minor fruits: Karonda and Phalsa

Materials required: ……..…

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1. Karonda

A. General parameters

i. Common name:

ii. Botanical name:

iii. Type of planting material (Seedling/grafted/layered):

iv. Name of the variety:

v. Age of the plant:

vi. Parentage name:

Observation:

Parameters	**Remarks**
Plant height (cm)	
Plant girth (cm)	
Bearing habit	
Flowering time	
Physical parameters of Fruit	
Maturity period:	
Maturity index:	

2. Phalsa

A. General parameters

i. Common name:

ii. Botanical name:

iii. Type of planting material (Seedling/grafted/layered):

iv. Name of the variety:

v. Age of the plant:

vi. Parentage name:

Observation:

Parameters	**Remarks**
Plant height (cm)	
Plant girth (cm)	
Bearing habit	
Flowering time	
Physical parameters of Fruit	
Maturity period:	
Maturity index:	

Exercise No: 3

Objective: To study the morphological characters of important minor varieties

Materials required: ……...

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1. Bael:
Narendra Bael-5:
Goma Yashi:
CISHB-1:
CISHB-2:

2. Jamun:
Goma Priyanka:
CISH J-37:
CISH J-42:
Narendra Jamun-6:

3. Fig:
Poona:
Dinkar:
Diana:
Brown Turkey:
Black Mission:

4. Types of Dragons Fruit:
1. *Hylocereus undatus*:
2. *Hylocereus costaricencis:*
3. *Hylocereus megalanthus:*
4. *Hylocereus polyrhizus:*

Exercise No: 4

Objective: To collect of leaves and preparation of herbarium

Materials required: ……...

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Procedure of collection of leaves:

Assignment: Collection of leaves and preparation of herbarium file.

Exercise No: 5

Objective: To study the allelopathic effects on seed germination

Materials required: ……...

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Procedure: ……

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Observations:

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Problem: Practice in field and take observations

Exercise No: 6

Objective: To study the allelopathic effects on weed control

Materials required: ……...

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Procedure: ……

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Observations:

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Problem: Practice in field and take observations

Exercise No: 7

Objective: To study the floral biology of minor fruits

Materials required: ……...

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Observation of flower characters: ……..

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Flowering stage:

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Procedure:

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Observation: Time of anthesis (out of 10 selected flowers)

	Time							
	7.00 am		8.00 am		9.00 am		10.00 am	
No of flower								
Percentage of flowers opened								

Time of dehiscence (out of 10 selected flowers)

	Time							
	7.00 am		8.00 am		9.00 am		10.00 am	
No of flower								
Percentage of flowers opened								

Exercise No: 8

Objective: To study the pollination of minor fruits

Materials required: ……………………………………………………………………………………...

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Procedure: ……………………………………………………………………………………………

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Observation: Record the number fruit

Date	Female Parent	Male Parent	Date of pollination	Fruit set (yes/No)

Exercise No: 9

Objective: To Identify and management of nutritional disorders in minor fruit crops

Materials required: ………………………………………………………………………………………...

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Identify the disorder and record.

Disorder	Cause and Symptoms	Control

Exercise No: 10

Objective: To study the analyses of quality attributes of TSS and Acidity

Materials required for estimation of total soluble solids (TSS): ……..

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Procedure: ……

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Observations:

Samples	Name of crops:	TSS (^{0} Brix)

Conversion of the reading of the refractometer with scale indicating Sucrose for a temperature different from 20±0.5^{o}C

Temperature ^{0}C	Scale reading for soluble solids content (%)													
	5	10	15	20	25	30	35	40	45	50	55	60	65	70
	Subtract from actual reading													
15	0.29	0.31	0.33	0.34	0.34	0.35	0.36	0.37	0.37	0.38	0.38	0.39	0.39	0.40
16	0.24	0.25	0.26	0.27	0.28	0.28	0.29	0.30	0.30	0.30	0.31	0.31	0.32	0.32
17	0.18	0.19	0.20	0.21	0.21	0.21	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24
18	0.13	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16
19	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	Add to actual reading													
21	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22	0.13	0.14	0.14	0.15	0.15	0.15	0.15	0.14	0.16	0.16	0.16	0.16	0.16	0.16
23	0.20	0.21	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24
24	0.27	0.28	0.29	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32
25	0.35	0.36	0.37	0.38	0.38	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
26	0.42	0.43.	0.44	0.45	0.46	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
27	0.50	0.52	0.53	0.54	0.55	0.55	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
28	0.57	0.60	0.61	0.62	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
29	0.66	0.68	0.69	0.71	0.72	0.72	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
30	0.74	0.77	0.78	0.79	0.80	0.80	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81

Source: Proceeding of the ninth session of the International Commission for Uniform Methods of sugar analysis, London, 1936.

Materials required for estimation of titratable acidity: ……

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Procedure: ……

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Calculation:

$$\text{Titratable acidity } (\%) = \frac{titre \times Normality\ of\ NaOH \times volume\ made\ up \times equivalent\ weight\ of\ acid}{Volume\ of\ sample\ taken \times volume\ of\ aliquot\ taken \times 1000} \times 100$$

Milli equivalent weight of acid:

Malic acid - 0.0067g	Oxalic acid - 0.0045g	Citric acid monohydrate - 0.0070g	Tartaric acid - 0.0075g
Lactic acid – 0.0090g	Acetic acid – 0.0060g	Oleic acid – 0.00282g	

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Exercise No: 11

Objective: To study the analyses of Sugar content & Vitamin

Materials required for estimation of reducing sugar: ……

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Procedure: ……

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Calculation:

$$Reducing\ sugar\ (\%) = \frac{Factor\ \times\ Dilution}{titre\ value\ \times weight\ of\ sample\ taken} \times 100$$

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Materials required for estimation of sugar: ……

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Procedure: ……

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Calculation:

$$Total\ sugar\ as\ invert\ sugars\ (\%) = \frac{Factor\ \times\ Dilution}{titre\ \times weight\ of\ sample\ taken} \times 100$$

% Sucrose = (% total invert sugars - % reducing sugars) x 0.95

% Total sugars = (% reducing sugars + % sucrose)

Materials required for estimation of ascorbic acid: ……...

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Procedure: ……

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Calculation:

$$Ascorbic\ acid\ (mg/100\ g) = \frac{Titre\ \times\ Dye\ factor\ \times\ volume\ made\ up}{Aliquot\ of\ extract\ taken\ \times\ Weight\ of\ sample\ taken} \times 100$$

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Exercise No: 12

Objective: To study the extraction of anthocyanin pigment and estimation of anthocyanin

Materials required: ……...

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Extraction methods:

1. Hot water extraction: ……...

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2. Acidified aqueous extraction (0.5% citric acid): ……...

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3. Solvent extraction (20 % ethanol): ……

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4. Acidified solvent extraction (20% ethanol + 0.5% citric acid): ……...

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Anthocyanin estimation procedure:

Anthocyanin content estimation was done based on the method given by Iland et al., (1996). Malvidin-3-glucoside was used as the standard. Transferred 0.2 ml of the extract to a test tube, added 3.8 ml of 1.0 M HCl to it and incubated for 22 hours at room temperature by covering with parafilm. This step is critical in allowing full expression of the colour. Measured the absorbance of the acidified diluted extract at 520 nm using a 1.0 M HCl blank in a UV spectrophotometer.

$$Anthocyanin\ content = \frac{A520\ \times D.F\ \times final\ volume(ml)\ \times berry\ wt\ (g) \times 1000}{d\ \times 100\ \times homogenate\ wt\ (g)}$$

Where,
D.F = Dilution factor
d= absorbance of a one per cent w/v solution of malvidin-3-glucoside.

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Exercise No: 13

Objective: To study the production economics for Bael

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

Sl. No.	Component	Proposed Expenditure
1.	**Plantation Expenses**	
	Cost of field preparation	
	Cost of planting material	
	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 field preparation, planting, application of manures, fertilizers, 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 ……..

Sold @ ……..

Net income = gross income – expenditure

Net income growing one ha. will be …..

Benefit cost ratio: Net income / total cost

Conclusion:

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.

Exercise No: 14

Objective: To visit to cold arid region

A brief report on the visit

Exercise No: 15

Objective: To visit to hot arid region

A brief report on the visit