Practical Manual

Breeding of Fruit and Plantation Crops

Course No. HFS 204, Credit Hrs. 3(2+1)

Dr. Anjana Kholia

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College of Horticulture & Forestry
Rani Lakshmi Bai Central Agricultural University
Jhansi – 284003

Syllabus:

Exercises on floral biology, pollen viability; emasculation and pollination procedures; hybrid seed germination; raising and evaluation of segregating populations; use of mutagens to induce mutations and polyploidy in major crops like Mango, Banana, Citrus, Grapes, Guava, Sapota, Papaya, Custard apple, Aonla, Ber, Litchi, Pomegranate, Jamun, Arecanut, Coconut, Pistachio nut, Apple, Pear, Plum, Peach, Apricot and Strawberry.

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Name of Student .....

Roll No. .....

Batch .....

Session .....

Semester .....

Course Name : .....

Course No. : .....

Credit .....

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Date: Course Teacher

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Practical No. 1

Objective: To study about different species of genus *Citrus.*

Material required:

S. No.	Name	Botanical name and Chromosome no. (2n)	General description
1.			…….. …….. …….. …….. ……..
2.			…….. …….. …….. …….. ……..
3.			…….. …….. …….. …….. ……..
4.			…….. …….. …….. …….. ……..
5.			…….. …….. …….. …….. ……..
6.			…….. …….. …….. …….. ……..

Qualitative observation:

S. No.	Name	Growth habit	Presence of thorn	Leaf size	Leaf shape	Leaf margin shape	Presence of petiolar wing
1.							
2.							
3.							
4.							
5.							
6.							

Draw the well labelled diagram

Leaf shape

Leaf margin shape

Presence and absence of petiolar wing

Practical No. 2

Objective: To study about floral biology of Sweet orange

Material required: ……

Floral biology, anthesis and pollination: ……

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	**Corolla colour**	
2.	**Calyx colour**	
3.	**Anther colour**	
4.	**Stigma colour**	
5.	**Position of ovary**	
6.	**Fusion of filaments**	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	**Number of petals**	
2.	**Number of sepals**	
3.	**Number of stamens**	
4.	**Length of petal**	
5.	**Length of stamen**	

Draw well labelled diagram of Sweet Orange flower and its parts

Practical No. 3

Objective: To study about floral biology of Mandarin

Material required: ……

Floral biology, anthesis and pollination: ……

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	**Corolla colour**	
2.	**Calyx colour**	
3.	**Anther colour**	
4.	**Stigma colour**	
5.	**Position of ovary**	
6.	**Fusion of filaments**	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	**Number of petals**	
2.	**Number of sepals**	
3.	**Number of stamens**	
4.	**Length of petal**	
5.	**Length of stamen**	

Draw well labelled diagram of Mandarin flower and its parts

Practical No. 4

Objective: To study about floral biology of Lemon

Material required: ……

Floral biology, anthesis and pollination: ……

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	**Corolla colour**	
2.	**Calyx colour**	
3.	**Anther colour**	
4.	**Stigma colour**	
5.	**Position of ovary**	
6.	**Fusion of filaments**	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	**Number of petals**	
2.	**Number of sepals**	
3.	**Number of stamens**	
4.	**Length of petal**	
5.	**Length of stamen**	

Draw well labelled diagram of Lemon flower and its parts

Practical No. 5

Objective: To study about floral biology of Acid Lime

Material required: ……

Floral biology, anthesis and pollination: ……

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	**Corolla colour**	
2.	**Calyx colour**	
3.	**Anther colour**	
4.	**Stigma colour**	
5.	**Position of ovary**	
6.	**Fusion of filaments**	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	**Number of petals**	
2.	**Number of sepals**	
3.	**Number of stamens**	
4.	**Length of petal**	
5.	**Length of stamen**	

Draw well labelled diagram of Acid Lime flower and its parts

Practical No. 6

Objective: To study about floral biology and different cultivars of Pomegranate

Material required: ……

Floral biology, anthesis and pollination:

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Cultivar Details:

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	Corolla colour	
2.	Calyx colour	
3.	Anther colour	
4.	Stigma colour	
5.	Position of ovary	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	Corolla type (Single/double)	
2.	Number of petals	
3.	Number of sepals	
4.	Number of stamens	
5.	Length of petal	
6.	Length of stamen	

Draw well-labelled diagram of Pomegranate flower and its parts

Practical No. 7

Objective: To study about floral biology and different cultivars of Guava

Material required: ……

Floral biology, anthesis and pollination:

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Cultivar Details:

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	Corolla colour	
2.	Calyx colour	
3.	Anther colour	
4.	Stigma colour	
5.	Position of ovary	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	Number of petals	
2.	Number of sepals	
3.	Number of stamens	
4.	Length of petal	
5.	Length of stamen	

Draw well labelled diagram of Guava flower and its parts

Practical No. 8

Objective: To study about floral biology and different cultivars of Banana

Material required: ……

Floral biology, anthesis and pollination:

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Cultivar Details:

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Draw well-labelled diagram

Practical No. 9

Objective: To study about floral biology of Mango

Material required: ……

Floral biology, anthesis and pollination:

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	Corolla colour	
2.	Calyx colour	
3.	Anther colour	
4.	Stigma colour	
5.	Position of ovary	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	**Length of panicle**	
2.	**Number of perfect flowers per panicle**	
3.	**Number of male flowers per panicle**	
4.	**Number of petals**	
5.	**Number of sepals**	
6.	**Number of stamens**	
7.	**Length of petal**	
8.	**Length of stamen**	

Draw well labelled diagram of Mango flower and its parts

Practical No. 10

Objective: To study about floral biology of Sapota

Material required: ……

Floral biology, anthesis and pollination:

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	**Corolla colour**	
2.	**Calyx colour**	
3.	**Anther colour**	
4.	**Stigma colour**	
5.	**Position of ovary**	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	**Number of petals**	
2.	**Number of sepals**	
3.	**Number of stamens**	
4.	**Length of pistil**	
5.	**Length of stamen**	

Draw well labelled diagram of Sapota flower and its parts

Practical No. 11

Objective: To study about floral biology of Ber

Material required: ……

Floral biology, anthesis and pollination:

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Qualitative Observations:

S. No.	Qualitative characters	Description
1.	Petal (Present / Absent)	
2.	Calyx colour	
3.	Anther colour	
4.	Stigma colour	
5.	Position of ovary	

Quantitative Observations:

S. No.	Quantitative characters	Average
1.	**Number of sepals**	
2.	**Number of stamens**	
3.	**Length of pistil**	
4.	**Length of stamen**	

Draw well labelled diagram of Ber flower and its parts

Practical No. 12

Objective: To study about floral biology of Custard Apple

Material required: ……

Floral biology, anthesis and pollination:

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Draw well labelled diagram of Custard Apple flower and its parts

Practical No. 13

Objective: To study about different sex forms of Papaya

Material required: ……

Floral biology, anthesis and pollination:

Draw well labelled diagram

Practical No. 14

Objective: To study about pollen fertility in major fruit crops

Material required: ……

Preparation of Acetocarmine 1% solution

1) Take 45 ml of glacial acetic acid
2) Add 55 ml of distilled water
3) Boil it and add 1g of carmine to it
4) Boil for few minutes and cool it
5) Filter in Whatman filter paper No: 1
6) The prepared solution will have a clear red colour.

Note: To get 2% acetocarmine instead of 1g carmine add 2g of carmine.

Procedure for staining of pollens:

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$$\text{Percentage of pollen viability} = \frac{\text{Number of pollen stained}}{\text{Total number of pollen grain}} \times 100$$

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Procedure for estimation of pollen germinability

$$\text{Percentage of pollen germination} = \frac{\text{Total germinated pollen}}{\text{Total number of pollen grain}} \times 100$$

Define the terms:

Pollen viability:

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Pollen germinability:

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Practical No. 15

Objective: To study and practice of crossing technique in major fruit crops

Material required: ……

Procedure:

Write in brief about following

Emasculation

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Bagging

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Labelling/ tagging

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Artificial pollination

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Practical No. 16

Objective: To study about polyembryony in Mango and Citrus

Material required: ……

Polyembryony: ……

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Polyembryony in Mango: ……

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Polyembryony in Citrus: ……..

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Practical No. 17

Objective: Visit to Biotechnology Lab and *in vitro* study of breeding techniques

Material required: ……

S. No.	Instrument name	Application

In vitro techniques used in fruit breeding and cultivation

In vitro mass multiplication

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Embryo rescue

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In vitro mutation breeding

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Genetic transformation

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Practical No. 18

Objective: Practices in mutation breeding

Material required: ……

Procedure to inducing mutation:

Selection of the Variety

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Plant part to be treated

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Mutagen treatment

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Handling of M1 and subsequent generations

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Precautions

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Achievements

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Practical No. 19

Objective: Botany, floral biology, selfing and crossing techniques for plantation crops

Material required: ……

Coconut:

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Arecanut:

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Oilpalm:

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Cocoa:

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