DYNAMICS OF FRUIT GROWTH AND FRUIT MATURATION

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DYNAMICS OF FRUIT GROWTH AND FRUIT MATURATION

CONTENTS

- INTRODUCTION
- STRUCTURE OF FRUIT
- DEVELOPMENT OF FRUIT
- DYNAMICS OF FRUIT GROWTH
- BIOCHEMISTRY AND MOLECULAR BIOLOGY OF FRUIT MATURATION

INTRODUCTION

- In common language a fruit may be defined as an edible product of the entire gynoecium and any floral part which is sweet, juicy or fleshy, coloured, aromatic and encloses seeds.

- Botanist divide fruits into two main categories:
  - True fruit (eucarp) - The fruit derived from ovary of a flower not associated with any noncarpellary part is called a true fruit. Example - Mango, Brinjal, Tomato, Pea etc.

  - False fruit (pseudocarp)- The fruit derived from the ovary along with other accessory floral part is called false fruit. Example - in Apple and Fig.

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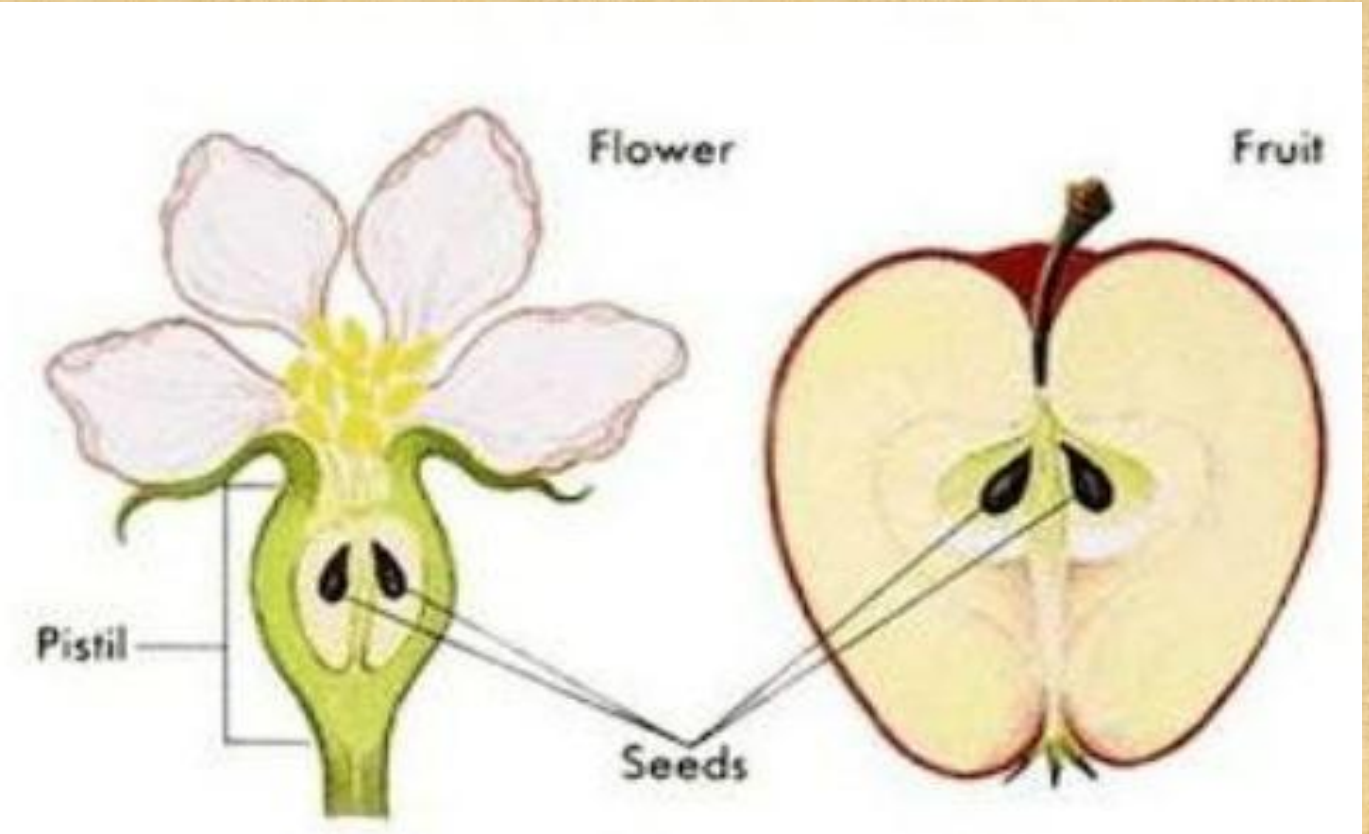
INTRODUCTION



Structure of Fruit

- A true fruit consists of two main part -
  - The seeds(developed from ovules)
  - The pericarp or fruit wall (developed from ovary).
- The structure and thickness of pericarp varies greatly in different kinds of fruit.
- The pericarp consists of three layer:
  - Epicarp - the outer thin skin
  - Mesocarp - the sweet juicy and edible fleshy portion
  - Endocarp - the inner most hard covering of the seeds
- These three layer are not easily distinguishable in dry fruits.

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STRUCTURE OF FRUIT

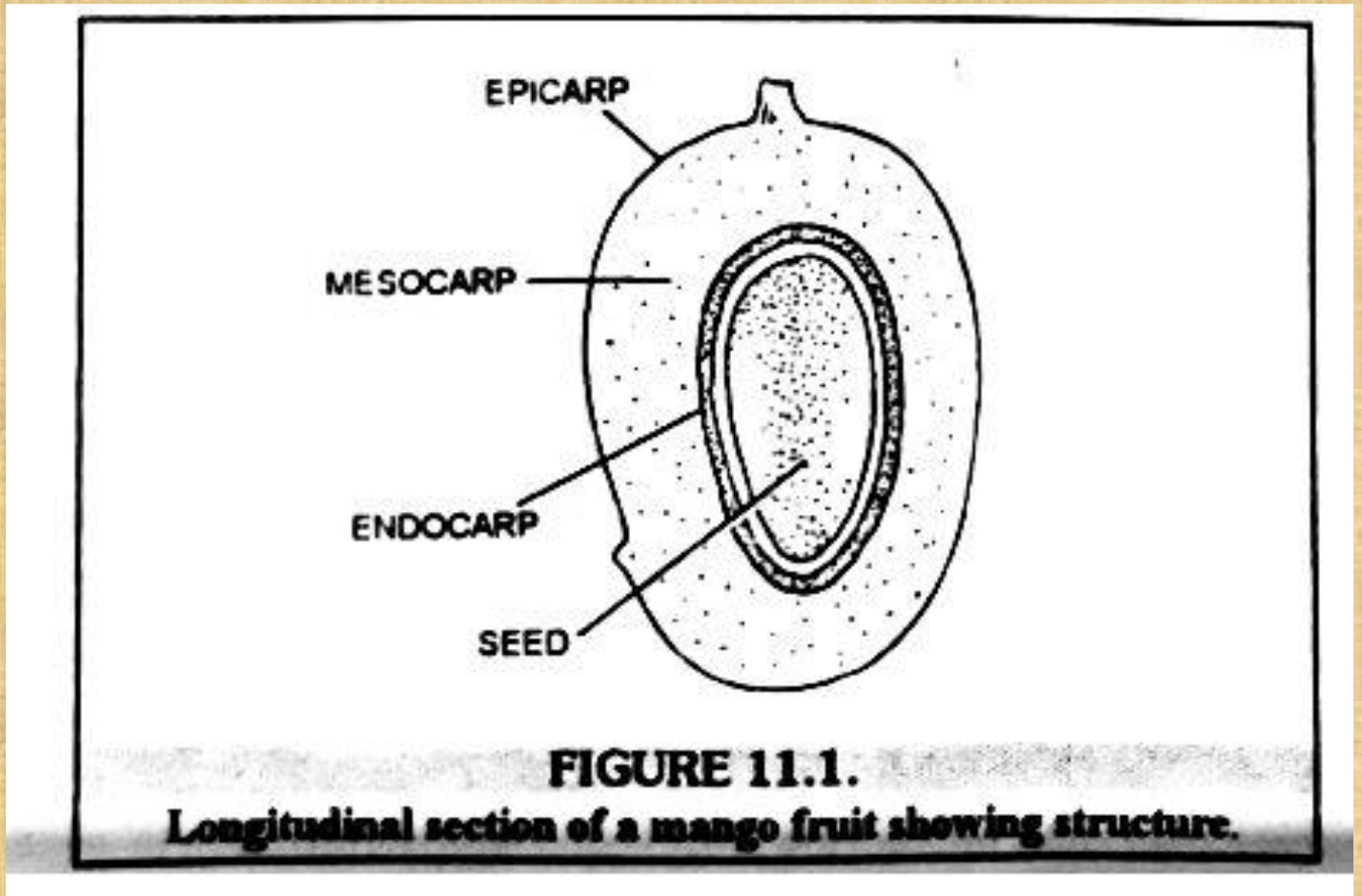

FIGURE 11.1.
Longitudinal section of a mango fruit showing structure.

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STRUCTURE OF FRUIT

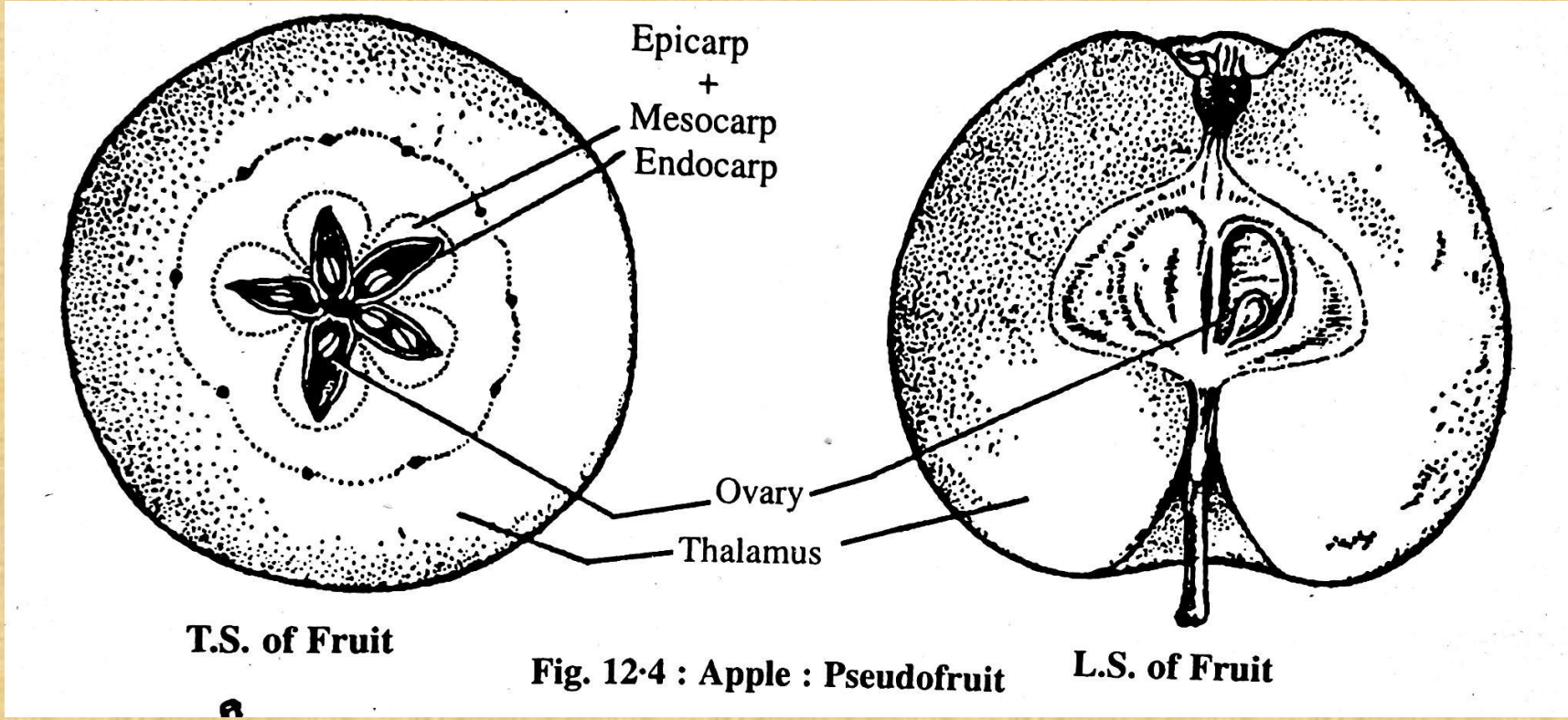

Fig. 12·4 : Apple : Pseudofruit

DEVELOPMENT OF FRUIT

- The mature ovary after fertilization is called fruit.
- After fertilization many changes occur in ovary and finally ovule and ovary produce seed and fruit respectively.
- Due to the effect of some growth hormones after pollination.

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DEVELOPMENT OF FRUIT

- **Role of pollination in fruit maturation**:
  - Pollination is an important process essential for fertilization, seed development, the Pollen grain release the wall held protein and other component.
  - It is now well established that Pollen grain release some specific hormones (particularly auxin) which together with the auxin of carpellary origin stimulate the initial growth of the ovary.

DYNAMICS OF FRUIT GROWTH

A) FRUIT GROWTH RATES

- Two important step of fruit growth are the growth of pericarp and the growth of embryo and endosperm.
- Growth process is completed in three phases namely: Cell formation phase, Cell elongation phase, Cell Maturation phase
- Cell elongation is slow at the starting, after some time it increases rapidly and than it is constant at the maturation phase.
- Growth increasing period is called "Grand period of growth

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DYNAMICS OF FRUIT GROWTH

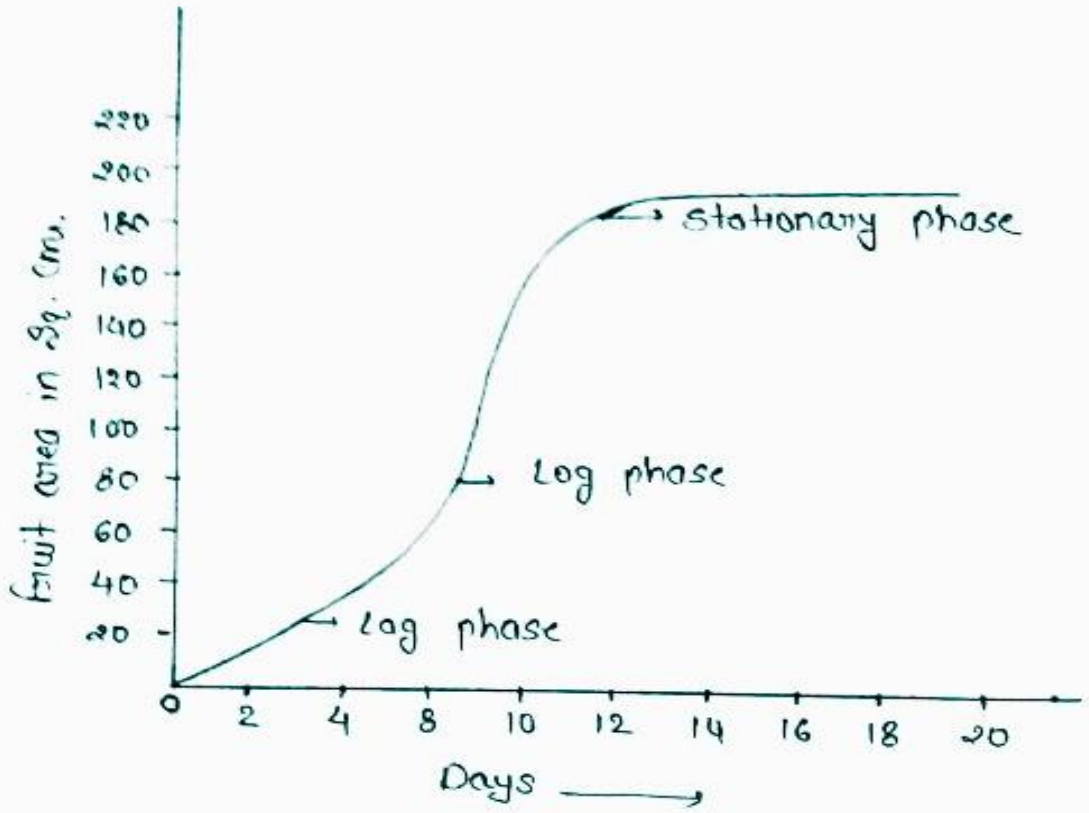

Fig – Fruit Growth Curve

Stationary phase:
Maturity stage

Log phase:
Grand period of growth

Lag phase:
Initial growth stage

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DYNAMICS OF FRUIT GROWTH

B) MOBILIZATION

- In large size fruit, food is translocate by various part of the material plant which has more important leaves.
- 10% of the food material in small grain comes from photosynthetic unit and 30% from flower spikes.

C) FRUIT SIZE

- Fruit size depends on the cell size.
- Example - Cherry, apple's large size fruits are due to the formation of intercellular space in the cells during enlargement.

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DYNAMICS OF FRUIT GROWTH

D) ROLE OF SEEDS

The regulatory role of seeds in fruit development has three supporting types of evidence:

- Fruit growth terminates with the removal of fertilized ovules
- Seeds give a definite geometrical shape to the distribution fruit.
- Shape of the seedless fruit becomes oval.

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DYNAMICS OF FRUIT GROWTH

E) GROWTH SUBSTANCES

- First growth curve in grapes is controlled by auxin
- Second growth curve is controlled by corbohydrate osmotic occumulation.
- Growth control in seedless Grapes is by Gibbereline.
- Other growth regulatory substances:
  - ethylens feric acid (tomato fruit),
  - abscissic acid (fraxinus) cytokinins.

BIOCHEMISTRY AND MOLECULAR BIOLOGY OF FRUIT MATURATION

1) RESPIRATORY CLIMACTERIC

According to Rhodes (1970):

- In the climacteric species it has been known that ripening fruits exhibit characteristic changes in respiration rate for a longer period of time.
- In majority of fruit crop (such as mango, peach, pear, and palm) the changes from growth to senescence and ripening are due to the rapid rise in respiration rate to a peak or climacteric

According to Belile (1960) and Rhodes (1970):

- In the non climacteric species (such as Cherry, Fig and Lemon), respiratory pattern shows a slow drift downwards after the fruit are detached
- Generally the non climacteric fruits ripe on tree only.

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BIOCHEMISTRY AND MOLECULAR BIOLOGY OF FRUIT MATURATION

2) ROLE OF ETHYLENS:

According to Mc murchie et al:

- Two different systems of ethylene production are there to distinguish between climacteric and non climacteric.
  - Both types have a common ethylene production system until the fruits ripen
  - Climacteric species have an additional auto-catalytic system which when dissolved in ethylene induces a large increase in ethylene levels in the tissues followed by ripening and senescence

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BIOCHEMISTRY AND MOLECULAR BIOLOGY OF FRUIT MATURATION

3) PIGMENTATION:

According to Goodwin and Goad (1970):

- The chloroplast in green immature fruit generally lose chlorophyll on ripening and change into chromoplast which contain carotenoides pigment

- Anthocyanin is usually present in the epidermal layer of fruit of Apple, Palm, Pear and Cherry

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BIOCHEMISTRY AND MOLECULAR BIOLOGY OF FRUIT MATURATION

4) SOFTENING:

According to Goodwin and Brady:

- In fruit softening mainly takes place by polygalacturonase, pectin methyl easterase and cellulases.
- Change occur in middle lamella of fruit which is rich in pectic polysaccharides which are degraded and solubilized during ripening.
- Some non enzymatic processes are also involve.
- The structural characters of pectic polysaccharides are affected by removal of calcium ion.

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BIOCHEMISTRY AND MOLECULAR BIOLOGY OF FRUIT MATURATION

5) OTHER GROWTH REGULATORS

- The ripening can be done rapidly by applying ABA (abscissic acid).

- IAA (indole acetic acid) inhibits ripening but its oxidation product Initiate the ethylene synthesis and ripening in Pears


Thank you!