

Plant Physiology

Topic 4: Reproductive and Vegetative Growth

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Topic outline

- Reproductive and Vegetative Growth
- Floral Induction
- Floral Initiation
- Flower Morphology

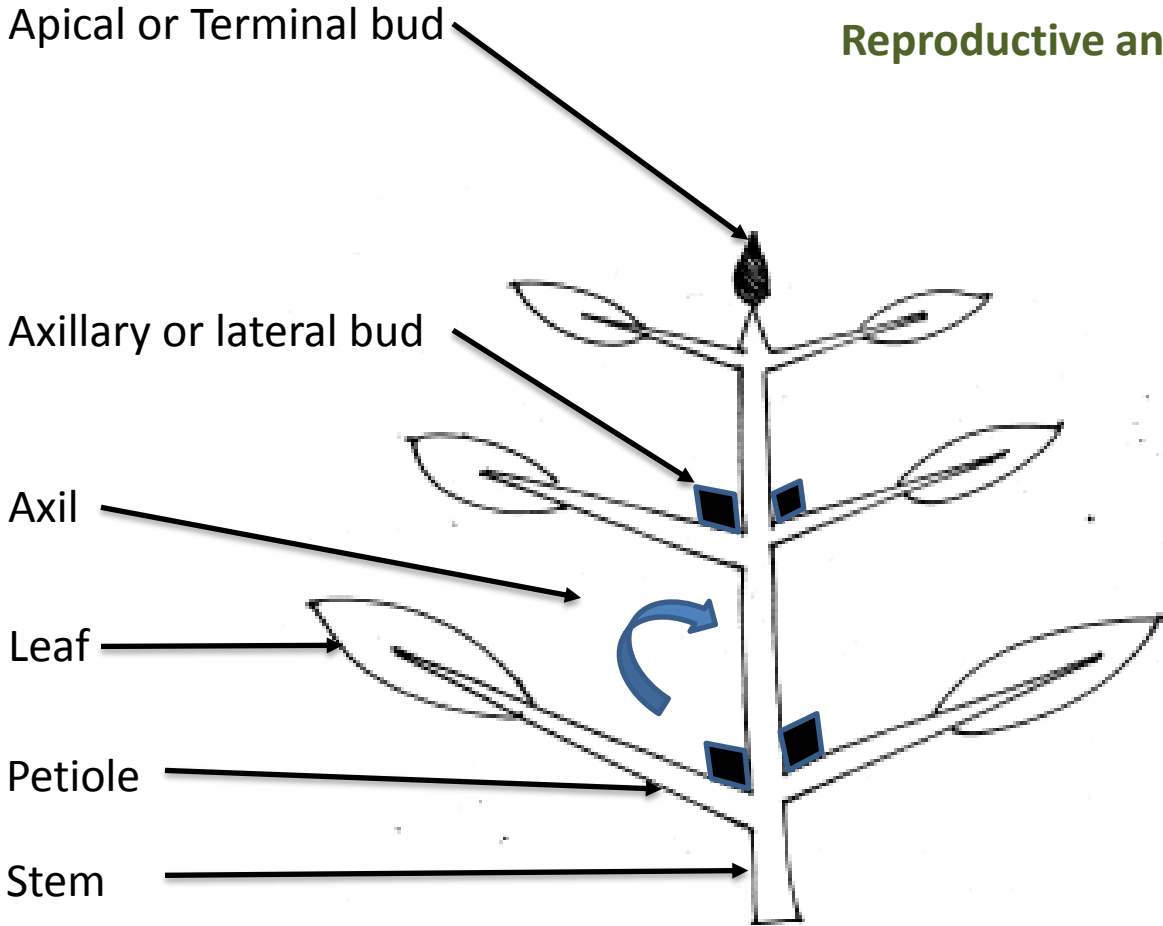


Reproductive and vegetative growth

- Plant growth originates within the buds in regions known as meristems (apical, axile and lateral)
- In these meristems, cell division and cell elongation occur;
 - eventually produce tissues that will develop into the root, stem, leaf, flower, fruit and seed



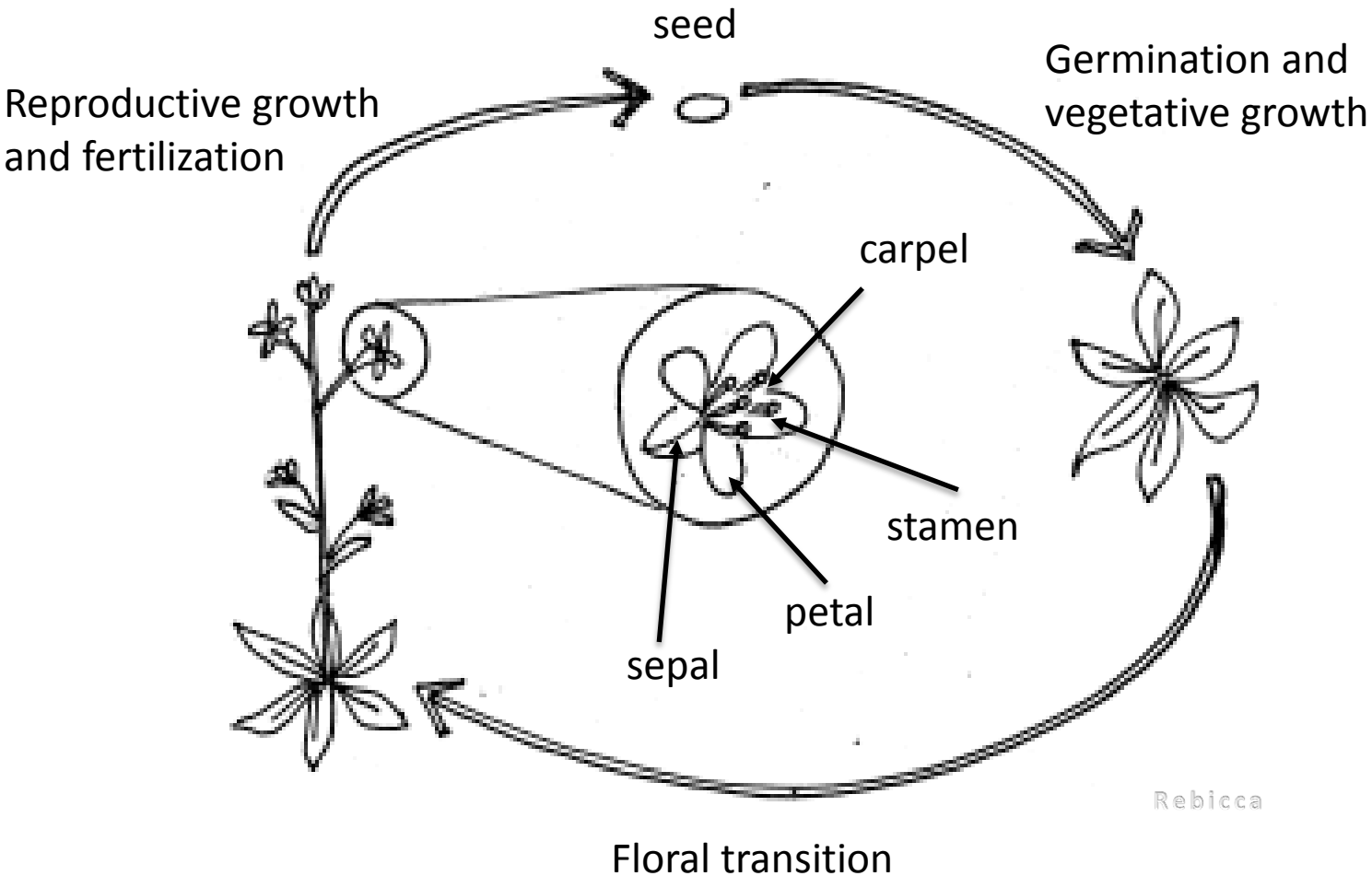
Reproductive and vegetative growth cont.



Rebicca



Reproductive and vegetative growth cont.



Reproductive and vegetative growth cont.

Two classes of meristems:

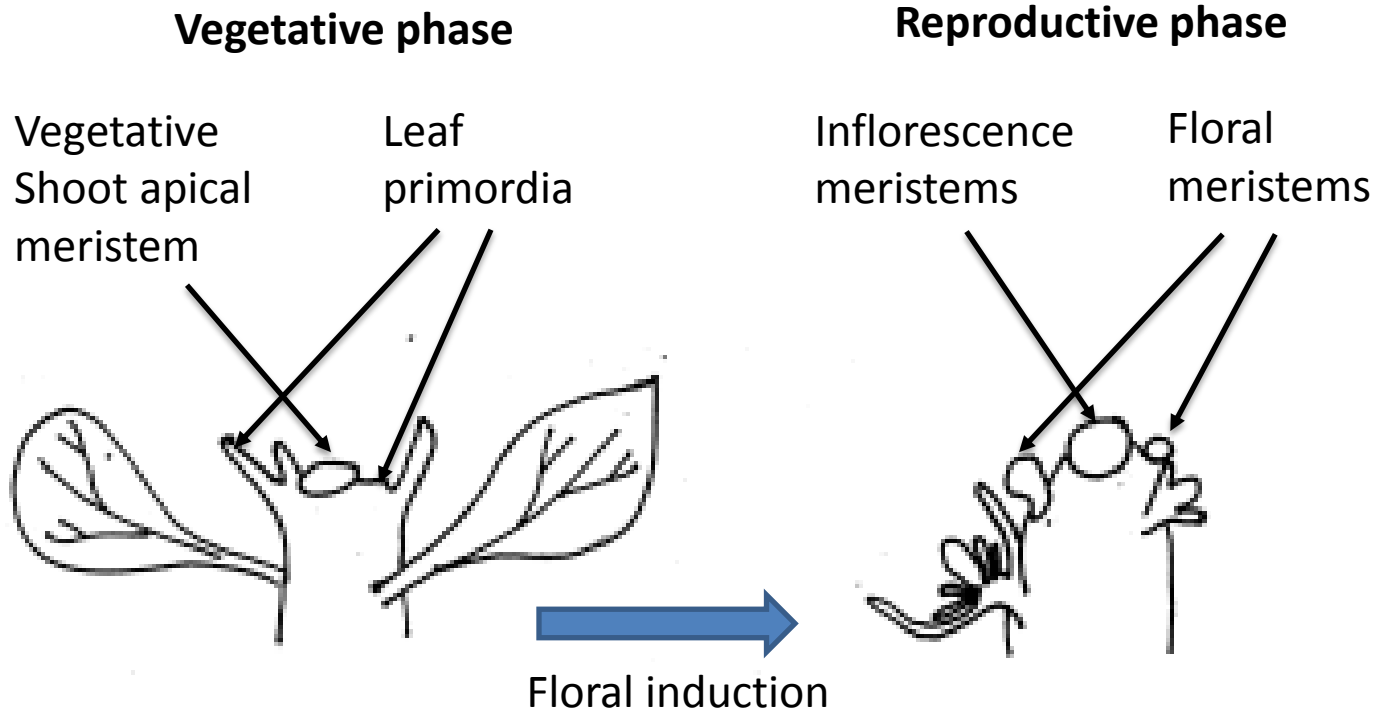
Vegetative
meristems

- Give rise to plant parts such as **stems, leaves** and **roots**

Reproductive
meristems

- Give rise to flowers that ultimately will develop into **fruits** and **seeds**





Floral Induction

- Vegetative growth of plant occurs until they are ready to flower
- At this stage, certain stimuli can trigger floral induction
- Floral induction is a physiological change that allows for the development of reproductive primordia



Floral Induction cont.

- The floral induction or physiological change may occurs before the actual flowering takes place by several days, weeks or even months
- Four common stimulus involved in floral induction are:
 - 1) Temperature
 - 2) Day-length
 - 3) Chemical
 - 4) Nutrient status



1. Temperature Stimuli

- **Vernalization:** phenomenon of exposure to low temperature to promote flowering in some plant species, whether annual, biennial or perennial
- Many plants require exposure to low temperature before floral induction can occur
- In many plant species, floral induction occurs in response to day-length (photoperiodism)



2. Day-Length Stimuli

- Plant species have been categorized according to their day-length requirements:
 - short-day, long-day, intermediate-day or day-neutral
- The length of night or dark period influences flowering



3. Chemical Stimuli

- Certain hormones (natural or synthetic) can cause floral induction
- Chemical examples:
 - Auxin (indoleacetic acid, naphthaleneacetic acid and 2,4-dichlorophenoxyacetic acid i.e. 2,4-D)
 - Gibberellic acid
 - Cytokinin
 - Ethylene



4. Nutrient Status Stimuli

- In some plants, the Carbon-Nitrogen ratio influences floral induction
- This is because the development of flower parts depend on food availability and translocation
- For examples, in tomato, carbohydrate deficiencies cause the microspores degeneration, leading to pollen sterility



4. Nutrient Status Stimuli cont.

- Nitrogen deficiency has no such effect;
 - In some species, such as those that bear male and female flowers on separate plants separate plants (dioecious)
 - High nitrogen to carbon ratio favours pistillate rather than staminate flowers



Floral Initiation

- Floral initiation is the morphological expression (a physical process)
 - which follows after floral induction and occurs within the meristems of the plant
- Floral initiation can be expressed a few days or up to several months after floral induction has occurred



Floral Initiation cont.

- In monocot, (flowering plants in which a single embryonic seed leaf appears in germination);
 - floral induction begins in specialized meristems called the dermatogens
 - this gives rise to the epidermis



Flower Morphology

Spermatophyta / flowering plants

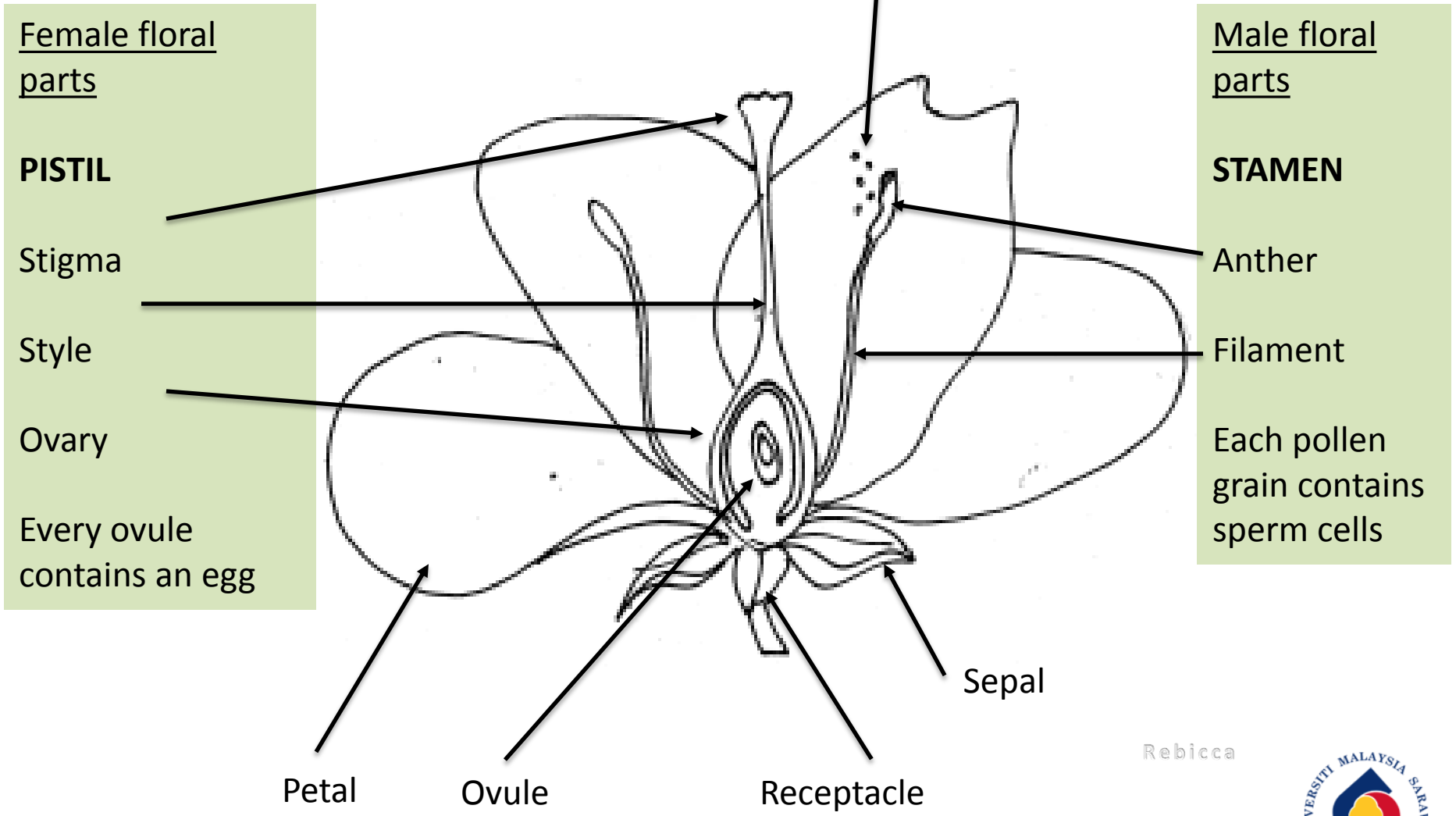
Gymnosperm

seeds uncovered
or naked

Angiosperm

seeds protected
in seeds coats

Flower Morphology cont.



Rebicca



Flower Morphology cont.

- A typical flower of an angiosperm is composed of:
 - **petals, sepals, stamens and a pistil**
- **Corolla:** a collective of petals, often the most conspicuous
- **Calyx:** a collective of sepals, usually less conspicuous
- **Stamens** (androecium): male pollen-bearing organs, and each of the stamen consists of an anther and a filament



Flower Morphology cont.

- **Pistil** (gynoecium): female part of the flower and it consists of a stigma, style and ovary
- The stigma receives the pollens from the anthers when pollination takes place or during pollination
- **Ovary**: made up of one or more carpels, contained in one or more locules (cavities)
- **Complete flower**: a flower which is made up of a pistil, stamens, petals and sepals



Flower Morphology cont.

- **Incomplete flower:** a flower lacks any one of the pistil, stamens, petals or sepals
- **Perfect flower:** a flower containing both the stamens and pistil
- **Imperfect flower:** a unisexual flower, can either be a pistillate or a staminate flower



Flower Morphology cont.

- **Monoecious:** a plant which have both stamens and pistil flowers on the same individual plant
 - i.e. oil palm, coconut, rubber, cocoa, pepper
- **Dioecious:** a plant that have unisexual flowers (either staminate/pistillate) on different individual plant
 - i.e. beteh, dabai, salak



What have you learned today?



Further reading

- Taiz, L. and Zeiger, E. (2010) Plant physiology 5th ed. Sunderland, MA : Sinauer Associates.



End of Topic 4

Thank you

