Quadrant II – Transcript and Related Materials

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Notes

STRUCTURE OF MATURE SEED

A mature seed may be differentiated into three distinct parts

(i) The embryonic plant,
(ii) cotyledons-one or two in number and
(iii) The covering seed-coat.

The typical structure of a seed is illustrated by the garden pea (Pisum sativum). The mature fruit or pod contains a number of seeds attached to the fruit wall by a short stalk, the funiculus. The funiculus abscisses on maturity, leaving a scar on the seed-coat, known as hilum. Lying beneath the hilum is a small pore, the micropyle, through which water is absorbed during germination. The hilum is continuous with a slightly elevated ridge on the seed-coat, known as raphe. The seed is enclosed by a smooth seed-coat, commonly referred to as seed testa. On removing the seed-coat, the embryo is exposed. It consists of two large, green and hemispherical cotyledons enclosing the embryonic axis. One end of the embryonic axis is seen to project out between the two cotyledons like a curved structure and is termed as radicle (embryonic root), whereas the other end of the axis lies protected between the two cotyledons and is known as plumule (embryonic shoot). The radicle develops to form the root, whereas the plumule develops to form the shoot. The part of the embryonic axis lying between the radicle and the point of attachment of the axis to the cotyledons is called hypocotyl, and the portion of the axis between the plumule and the cotyledons is termed as the epicotyl. In pea, the reserve food material is stored in the cotyledons. The special nutritive tissue, endosperm, is lacking, hence it is a non endospermic or ex-albuminous seed.

Classification of Seeds

Seeds are classified into two groups, based on the number of cotyledons present.

1. Dicotyledonous seed-Seeds possess two (di-two) cotyledons, enclosing the embryonic plant. Dictoyledonous seeds may be further subdivided into two types, based on the presence or absence of endosperm.

(i) Albuminous or Endospermic seeds-in which the endosperm is present, e.g. Castor, custard-apple, four o'clock plant etc:

(ii) Ex-albuminous or non-endospermic seeds-in which the endosperm is absent, e.g. pea, gram, country bean, Capsella, mango, sunflower etc.

2. Monocotyledonous seeds Seeds possess one (mono-one) cotyledon only. Monocotyledonous seeds may be of two types depending upon the presence or absence of endosperm.

(i) Albuminous or endospermic seeds-in which the endosperm is present, e.g. rice, maize, onion, wheat, coconut palms etc.

(ii) Ex-albuminous or non-endospermic seeds-in which the endosperm is absent, e.g. orchids, water plantain, arrowhead etc.

(a) Albuminous or endospermic dicot seed. An endospermic dicot seed may be studied by examining the castor-seed. The castor seed is differentiated into three distinct parts.

Structure of a dicot seed

1. Seed-coat. The castor-seed has a highly characteristic outer, hard, black and white designed seed-coat known as testa. At one end of the seed, towards the micropylar end, is present a knob-like, whitish outgrowth, known as caruncle Beneath the caruncle and hidden by it, is present the hilum which marks the point of attachment of the seed to the stalk. At the base of the caruncle is present the micropyle. From the hilum runs a ridge, downwards along the length of the seed, known as raphe. Beneath the hard, outer testa is present a thin and membranous covering known as tegmen, which represents the inner seed-coat

2. Endosperm. The seed-coat encloses a white, fleshy mass-the endosperm, which is visible only after removing the seed-coat. The endosperm is a storehouse of reserve food material and is specially rich in oil (castor oil).

3. Embryo. The endosperm encloses and completely surrounds the young embryo. The embryo consists of two, thin and papery cotyledons and the embryonic axis. The axis is divisible into the radicle, facing the micropylar end and the plumule, lying in between the cotyledons. The radicle germinates to form the root, whereas the plumule develops to form the shoot.

(b) Exalbuminous or non-endospermic dicot seed. Seeds lacking an endosperm are known as non-endospermic or exalbuminous seeds, e.g. pea, gram, Capsella (fig. 13.5), bean etc. They possess the structure of a typical dicot pea seed.

Structure monocot seed or Albuminous or endospermic seed

The maize grain represents a typical endospermous monocot seed. It is a one seeded fruit, in which the fruit wall is adherant to the seed wall and cannot be separated. On one side of the grain a whitish, suppressed area is distinct, which marks the position of the embryo within. A longitudinal section of the grain through this region reveals the following structures

1. Seed-coat. The seed-coat is thin, single-layered and inseparably fused with the fruit wall, the pericarp.

2. Endosperm. Internally, the grain distinctly divisible into two unequal portions, separated by a layer known as epithelium. The region lying above the epithelium represents the endosperm. It functions as a food storage tissue and is rich in starch, which may be tested by staining with iodine solution, whence the endosperm turns blue.

3. Embryo. The portion lying on the lower side of the epithelium represents the embryo. It is differentiated into
(i) One single cotyledon-which is shield-shaped, lying above and known as scutellum

(ii) Embryonic axis-which is differentiated into an upper, leaf-bearing plumule and a lower radicle. The plumule is further capped by a protective sheath known as coleoptile, whereas the radicle is enclosed by the radicle-sheath known as coleorrhiza.

The separating sheath, i.e. epithelium, performs the important function of digesting and absorbing the food material, present in the endosperm and transferring it to the young baby plant. Seeds of dicotyledons and monocotyledons are similar in their basic structures, but exhibit some significant differences.