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Structure and Dehiscene Mechanism of Pericarp in *Brassica oleracea* var. *botrytis* Linn.

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The structure, development and dehiscence mechanism of pericarp in *Brassica oleracea* var. *botrytis* are dealt with. The ovary wall undergoes significant changes after fertilization leading to the formation of pericarp. The layer immediately adjacent to inner epidermis develops into the fibrous zone. Fibers are smooth-walled and without dents. Commissural framework sclrenchyma and valve-end sclrenchyma are formed due to respective sclerification of the tissue surrounding the double bundles as also the parenchyma lying between the septum-fruit wall junctions and corresponding fruit wall notches. A semicircular thin-walled stomial tissue' gets established which lays down the lines of dehiscence of fruit. Mosogenous trilabrate type of stomata are present on upper epidermis of pericarp.

Key Words : Dehiscence mechanism, Pericarp, *Brassica oleracea* var. *botrytis*

Introduction

Considerable work has been done on different aspects of this important plant by various workers from time to time. While the floral morphology has been worked out (Pearson 1933, Sidki & Ozbun 1967), no published work is on record regarding the dehiscence mechanism of fruit wall. A relationship between seed dispersal and histological structure of pericarp has been emphasized (Fahn & Zohary 1955, Guttenberg 1971, Fahn & Werker 1972). The present study comprises our observations on structure, development and dehiscence mechanism in *Brassica oleracea* var. *botrytis*.

The material was collected locally from plants raised in Botanical Garden of Kurukshetra University and fixed in formalin-acetic-alcohol. Sun-dried field ripe fruits were stored in screw-capped bottles. To study developmental changes in pericarp, sequential transections were cut and stained with safranin-light green combination after

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the usual process of dehydration and embedding. Fruit wall was macerated using Jeffrey's technique (1928).

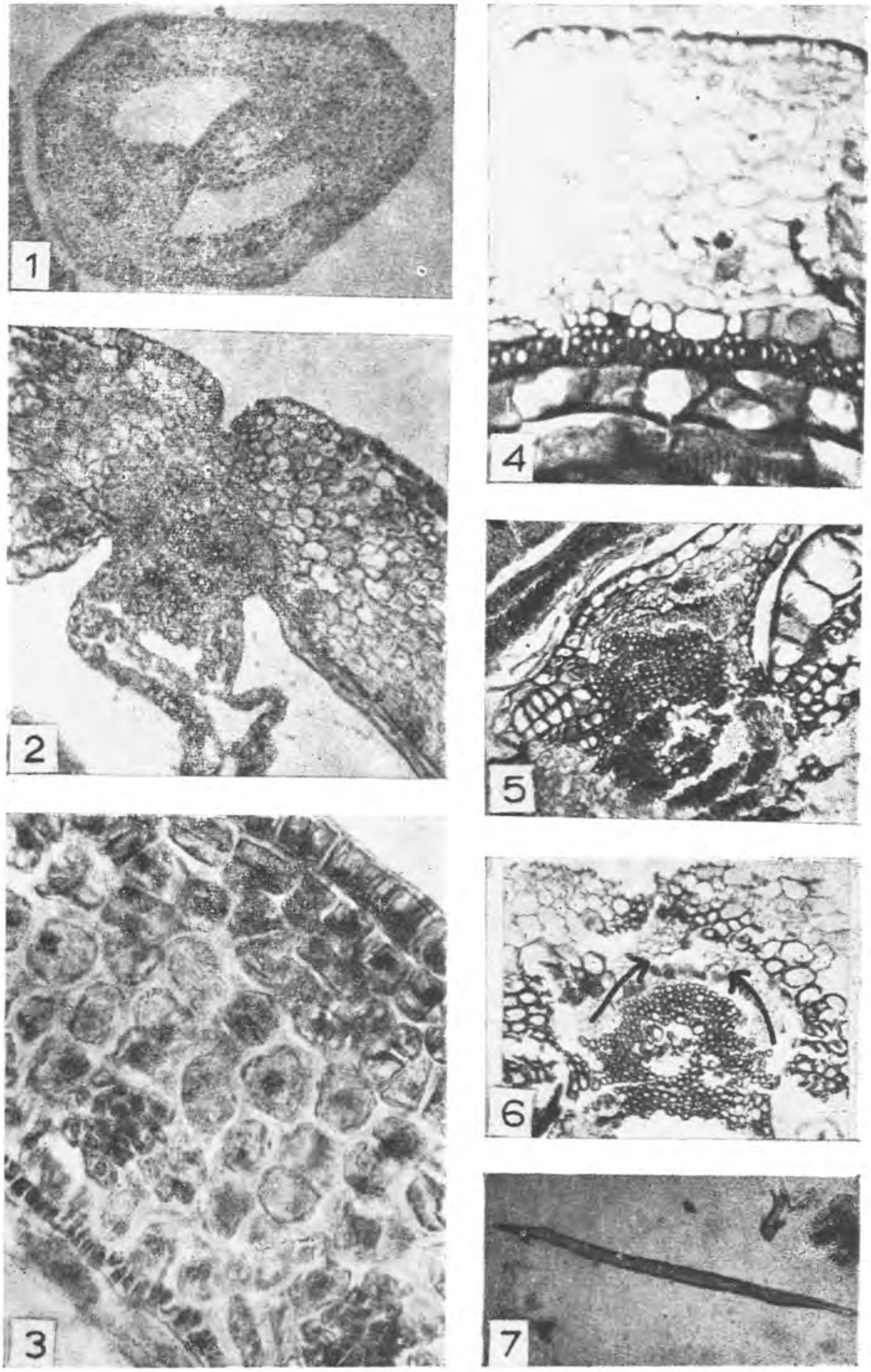
Observations

The siliquose fruit which develops from a single bicarpellary superior ovary bears several seeds borne on parietal placentae. The ovary wall undergoes significant changes after fertilization. The ovarian outline at embryo sac stage is more or less ovate with slight dents along the commissural plane indicating the future position of the notches (figure 1). Its wall is 60 to 75 microns thick and comprises 6 to 10 parenchymatous layeis. The cells of upper epidermis are broader than long with medium density cytoplasm, large vacuoles and distinct nuclei (figures 1–3). While the cells of inner epidermis are universally longer than broad, those comprising the intermediate layers are polygonal. Protruding into the ovarian cavity are two bulging masses of parenchymatous cells, one opposite each of the two commissural procambial strands which tend to meet in the centre, resulting in the formation of a septum that partitions the ovary into two chambers (figure 1).

Cuticle, though present on upper and inner epidermis shows a complete absence at both the notches and angular junctions formed by meeting the inner epidermis with septum (figures 2,5). Meanwhile, the layer of cells immediately adjacent to the inner epidermis undergoes numerous anticlinal divisions to form the "prosenchymatous-layer" having thin-walled, uninucleate, sparsely cytoplasmic and vacuolate cells. In transections, these tiny cells or fiber initials appear to be vertically oriented and broader than long (figures 2, 3) being 5 to 8μ broad and 4 to 6μ long.

In semimature fruit, a set of unique anatomical features is noticed. The outer as well as inner epidermal layers show intense cutinization, the heaviest being visible on the outer epidermis. Each of the initials comprising the prosenchymatous layer metamorphoses into a fiber, consequent to deposition of wall materials. Concomitantly, initiation of wall thickening starts in the entire tissue surrounding the two inverted double vascular bundles located in the commissural plane as also in the parenchyma cells lying between each of the four septum fruit-wall junctions and the respective 'fruit-wall notches' just opposite to them. This results in the formation of 'commissural frame-work sclrenchyma' and 'valve-end sclren-chyma'. In the mature fruit a type of 'sclren-chymatous stratum' is formed (figure 5,6) adjacent to inner epidermis consisting fibers. Fibers are smooth-walled and without dents. They are narrow, elongated measuring 0.6–0.8 mm and pointed at both the ends (figure 7). Formation of 'commissural frame-work sclrenchyma' along with highly cutinized epidermal layers of fruit wall as also the fibrous 'sclrenchymatous-stratum' or 'fibrous-zone' join in transforming both the valves into two strong indehiscent units. Small patches of sclrenchyma are also formed near major vascular bundles in both the valves. The replum consisting of two commissural frame works and the septum pets dried up to form a semitransparent partition. A more or less semicircular papery stomial-tissue 'gets' clearly marked of (figure 6).

As the fruit dries up under field conditions, its various tissues' contract differently due to highly differential wall thickenings, thus setting a force of tension that tends to pull apart the two valves. As a result tender and thin-walled tissue delimiting the two valves from the replum breaks down. Simultaneously, the two notches, and the septum-fruit wall junctions, all of which provide potential .weak points—split open. The septicidal split extends from the bottom of the valves up to the base of the beak.



Figures 1-7 *1* T.S. young ovary; *2*, T.S. young fruit showing notch, septum and commissural region; *3*, A part of pericarp in transection showing the development of prosenchymatous layer near inner epidermis; *4*, Transection of mature pericarp with Fibrous zone; *5*, T.S. mature pericarp in commissural region; *6*, A part of figure 5 showing stomial tissue (double arrow); *7*, A fiber

The two valves separate from the replum to which the seeds are attached along parietal placentae. The mode of dehiscence is further aided by absence of 'fibrous zone' in the region of replum.

Mesogenous trilabrate type of stomata are present on upper epidermis of pericarp. However, they are absent on inner epidermis. They are noticed in all the three regions of the fruit—the pedicel, middle zone and the beak. The size of stomata ranges between 24.8 to 30.1μ. They are located amongst the upper epidermal cells with clear sub-stomatal cavities.

Conclusions

The aforesaid investigations have revealed that the early ovary wall shows very little differentiation. However, during the course of development, the ovarian tissue gets better differentiated. Notable at the early stage are the cutinization of the outer and inner epidermal layers as also the laying down of the 'prosenchymatous layer' which finally develops into 'fibrous belt' (Lamba 1973) or 'sclrenchymatous stratum' (Fahn 1974) strategically oriented all along the inner face of the valves constituting the fruit.

In the notch region, inverted placental bundles have been recorded confirming thereby the views put forth by Puri (1941) and Lamba (1973) regarding the constitution of the cruciferous gynoecium. The present study has pinpointed the anatomical features that are collectively reponsible for the characteristic mode of dehiscence of the siliquose fruit. Moreover, the histological structure of pericarp and dehiscence mechanism have been correlated in conformity with the views expressed by Fahn and Zohry (1955) and Guttenberg (1971).

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