

MORPHOLOGY AND HISTOLOGY OF STIGMA AND STYLE OF *BAUHINIA PURPUREA* L.

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Bauhinia purpurea (Caesalpinaceae) is fairly well represented all over the Western Himalayas, upto a height of 2,000m. The protoderm of stigma differentiates into a glandular epidermis. Epidermis is totally papillate and covered with a cuticle and secretes stigmatic fluid. The style is cylindrical and solid at the apex and hollow in the middle and basal regions with several canals. Between the stigma and ovary, there is a specialized several layers thick transmitting tissue covered by a discernible layer of cuticle and it covers the placenta. The transmitting tissue is brought close to the micropyle by the development of funiculus and placenta which initiate the ovule formation.

Key Words: *Bauhinia*, Stigma, Transmitting Tissue, Metabolites.

Stigma forms an important object, since it helps in controlling interspecific hybridization as well as regulates the compatibility relationships within the species (Heslop-Harrison & Shivanna, 1977). By studying the characters of stigma, it is easy to assess the importance of features that relate to the capture, recognition, selection and the germination of the pollen on its surface. The long and narrow style serves as a sieve where incompatible pollen tubes are screened from compatible ones through inhibition, finally leading to the various stages related to the fertilization. The present paper deals with the structure of style and stigma in *B. purpurea*. Since it has been considered desirable from the point of view of further and detailed investigations on these appendages which play a pivotal role in the reproductive process.

MATERIALS AND METHODS

The mature flowers were collected from in around Srinagar Garhwal and fixed in FAA (formalin acetic acid and alcohol) and AA (absolute alcohol and acetic acid) for localization of the reserve metabolites. After fixation, material was transferred to a graded ascending series of alcohol followed by transfer to alcohol and xylene mixture. Following infiltration in various grades of the wax, the material was sectioned at 15 µm with the help of a Rotary Microtome. The slides were stained with safranin-fast green and safranin-oil blue.

RESULTS

B. purpurea bears conspicuous and fragrant

flowers on its leafless branches. Their four petals are white or purplish but the fifth one is comparatively dark with purple or red veins. The superior ovary stalk is coherent with the calyx tube. The pods are 15-45cm long, linear and flat and usually bear 10-15 seeds. The fruits attain full size by June and ripe between July to August when maximum temperature reaches 35-32°C and minimum 27-25°C but the rain-fall occurs in the level of 102-402 mm and total day length of 12.48 to 12.34h. Some fruits and flowers may be seen upto September on the solitary branches of tree. Again leaf-fall is initiated from November onwards and continues up to January.

Protoderm of *B. purpurea* differentiated into a glandular epidermis with rich protoplast. The epidermis is totally papillate and covered with a cuticle and secretes a stigmatic fluid. In the stigmatic exudate, a high proportion of tannin, proteins, insoluble polysaccharides and nucleic acids have been found.

Between the tissue of stigma and the ovary, there is a specialized group of cells termed as the 'transmitting tissue' through which the germinating pollen tube penetrates. This provides a nutrient substrate and helps the pollen tube to grow through the style into the ovary. The style is solid at the apex and hollow in the middle and basal regions. the hollow portion of style contains several canals lined by specialized cells through which pollen tubes grow ectotropically towards their destination.

In the canal, the cells of transmitting tissue are

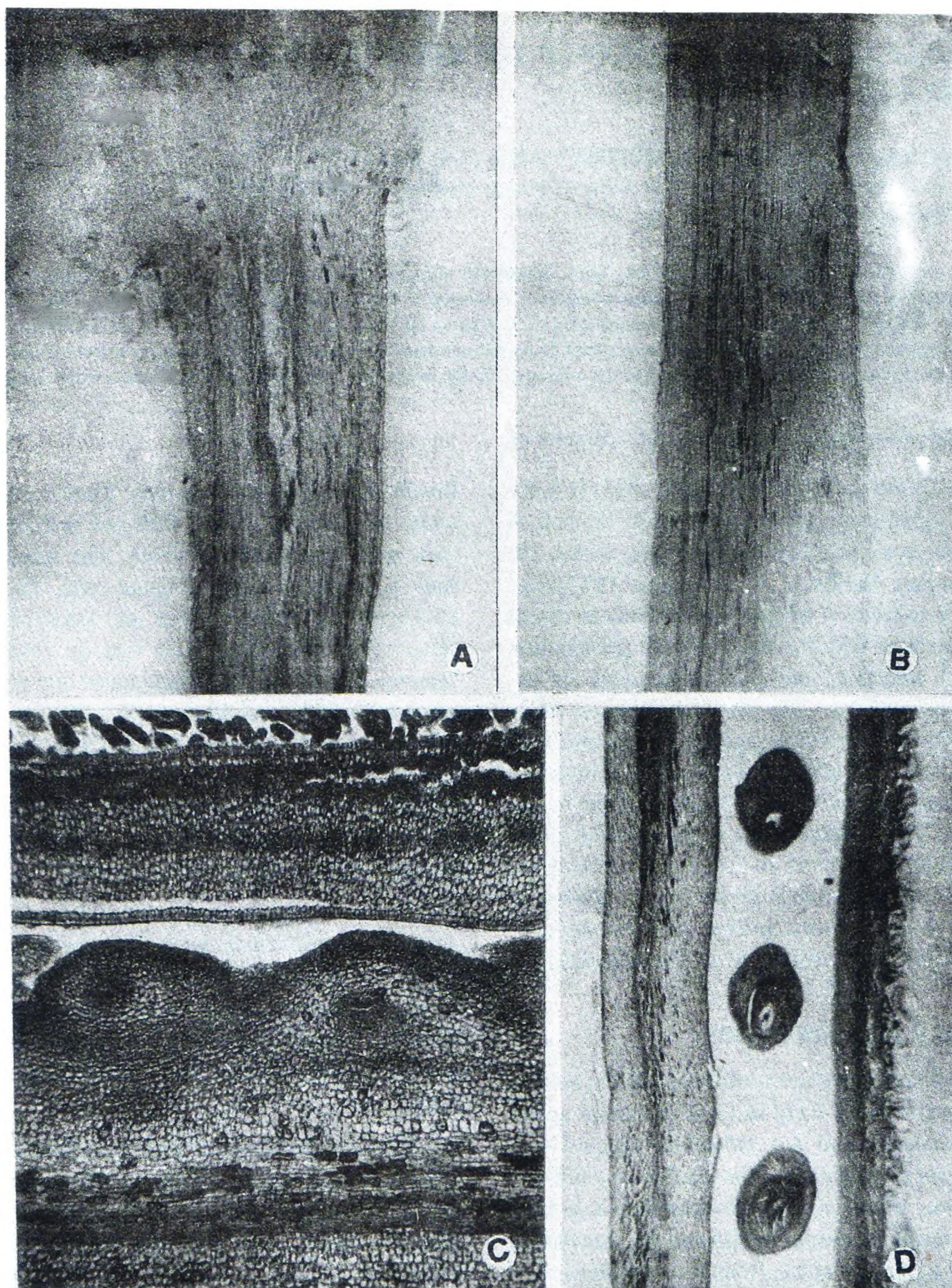


Figure 1. A-D. *Bauhinia purpurea*. Pollination sub-system with ovule initiation and subsequent development. (A) L.S. of stigma differentiated into a glandular epidermis, papillae and the Tannin cells X 100 (B) Detailed view of style showing the tissue arrangement X 100 (C) L.S. of ovary to show the ovule formation X 400 (D) L.S. of a young ovary with a few functional ovules X 100.

covered by cuticle. On the inner side of wall facing the canal there is a thick layer of elaborate wall protuberance. The transmitting tissue is several cell

layers thick and covers the placenta. These tissues are brought close to the micropyle by the development of funiculus and placenta.

DISCUSSION

The morphologically distinctive marks such as the profoundness of the stigma, presence or absence of papillae and trichomes, length of stigma, ornamentation on its surface etc. may influence the compatibility in the plants. The morphological and anatomical investigation of style and stigma have shown interesting features. The stigma is papillate and at maturity it starts shining owing to the presence of a moist exudate. Once pollination has set in, they loose their turgidly and undergo necrosis within the mucilaginous secretion, a feature similar to what has been observed by Considine & Knox (1979) in *Vitis vinifera*.

At the time of anthesis i.e. close to the maturation of anthers and ovule, only limited histological differentiation has been observed in the ovary wall. It mainly consists of parenchyma and vascular tissue covered by a cuticle-bearing epidermis. The specialized zone between the tissue of stigma and ovary termed as the 'transmitting tissue' provides the nutrient substrate which aids the pollen tube to grow through style into the ovary. However, this tissue have been refered by a variety of other terms (see among others, Tilton & Horner, 1980). The style consists of small canals the number of which are equal to that of carpels, a situation comparable to what has been seen by Sassen (1964). The canal are lined completely by the transmitting tissue, whose cells are papillose and covered with cuticle, a situation similar to that recorded by Bell & Hicks (1976) in their studies covering the fine structure of the secretory cells which line the canals of *Lilium longiflorum* styles. It is revealed that these are rich in organelles and possess abundant multivesicular bodies. The tissue is brought close to the micropyle by the

development of outgrowth of funiculus, the obturator and placenta of the stylar canal.

CONCLUSION

Present study has shown that this species has a highly elaborate stigma and style with suitable transmitting tissue covered by distinct cuticle. Such organization undoubtedly has a direct bearing on the fertilization followed by seed formation. Since it helps in bringing the transmitting tissue closer to the micropyle as a result of development of funiculus and placenta. Obviously, such an information will serve a highly useful morphological base for critical analysis of the various physiological events as well as genetical parameters that are called for to recognize the compatibility system and the related response. Therefore, it is highly desirable that more and more species are brought under the gamut of such a survey.

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