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## NUPTIAL NECTARIES IN SOME SPECIES OF BIGNONIACEAE

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### ABSTRACT

The floral and extra floral nectaries are characteristic feature of the family Bignoniaceae. The floral nectaries in *Millingtonia hortensis* (L.), *Stenolobium stans* (L.), *Tabebuia pallida* (Lindl.) and *Tabebuia argentea* (Britt.) observed as disk surrounding the base of the ovary. The time of secretion and positioning of anther in the opened flowers are conducive for cross pollination.

**Key words:** Nuptial nectary, *Millingtonia hortensis* (L), *Stenolobium stans* (L), *Tabebuia pallida* (Lindl.), *Tabebuia argentea* (Britt.), Starch, Phloem.

### INTRODUCTION

Nectaries are specialized secretory glands which secrete sweet watery fluid rich in amino acids, minerals and small amount of organic compounds known as nectar. Nectaries are involved in plant animal interactions and therefore it bears great ecological significance [10]. The floral and extrafloral nectaries are characteristic features of the family Bignoniaceae. It has been reported that nuptial nectaries play a key role in pollination biology of Bignoniaceae (1 & 8).

According to Rivera [11] there are two types of nuptial nectaries found in Bignoniaceae.

a) Nonsecretory or vestigial nectaries: These are non functional nectaries, though they resemble functional nectaries in their external morphology. Vestigial type of nuptial nectaries are found in *Cyclostoma callistegioides*, *C. binatum* and [11] in *Lundia* sp. [8]. In case of *Lundia* sp the process of nectar secretion is performed by secretory trichomes which are found on the inner side of the corolla tube.

b) Secretory nectaries: These are also of two types (I) Annular nectaries: It is an enlarged ring surrounding the base of the ovary and generally five lobed structures. In longitudinal sections a groove or a furrow is clearly observed dividing nectariferous tissues from the base of the ovary. These types of nectaries are reported in *Kigelia pinnata*, *Bignonia illicium* and *Tecomaria capensis* [13, 14 & 15], while in some cases, the ovary is raised from the secretory tissue on a long axis. It is found in *Arrabidaea corallina* and *Dolichandra cynanchoides* [11]. (II) Tubular: It is an enlargement of floral axis. In longitudinal section it appears to be a cylindrical structure without any grooves or furrow [11]. This type of nectaries are observed in *Cuspidaria convolute*; *Monsoa diffcilis*; *Jacaranda micrantha* [11].

In the present paper the histological and histochemical characteristics of nuptial nectaries in *Millingtonia hortensis*, *Stenolobium stans*, *Tabebuia pallida* and *Tabebuia argentea* of Bignoniaceae are reported.

### MATERIALS AND METHODS

Flowers of *Millingtonia hortensis*, *Stenolobium stans*, *Tabebuia pallida* and *T. argentea* were collected fresh from Sardar Patel University campus and fixed on the spot in FAA [70% ethanol/acetic acid/formaldehyde, 18: 1: 1 (v/v)], [7] these fixed materials were dehydrated in a graded ethanol series and embedded in paraffin wax. Serial longitudinal

sections of 12µm thickness were cut using a rotary microtome (Sipcon India SP-1120/Sp-1120 A) and stained with PAS (Periodic Acid Schiff's) reagent [9] and observed and photographed under Nikon microscope (Nikon, Japan 113615) fitted with Donpish CCD camera.

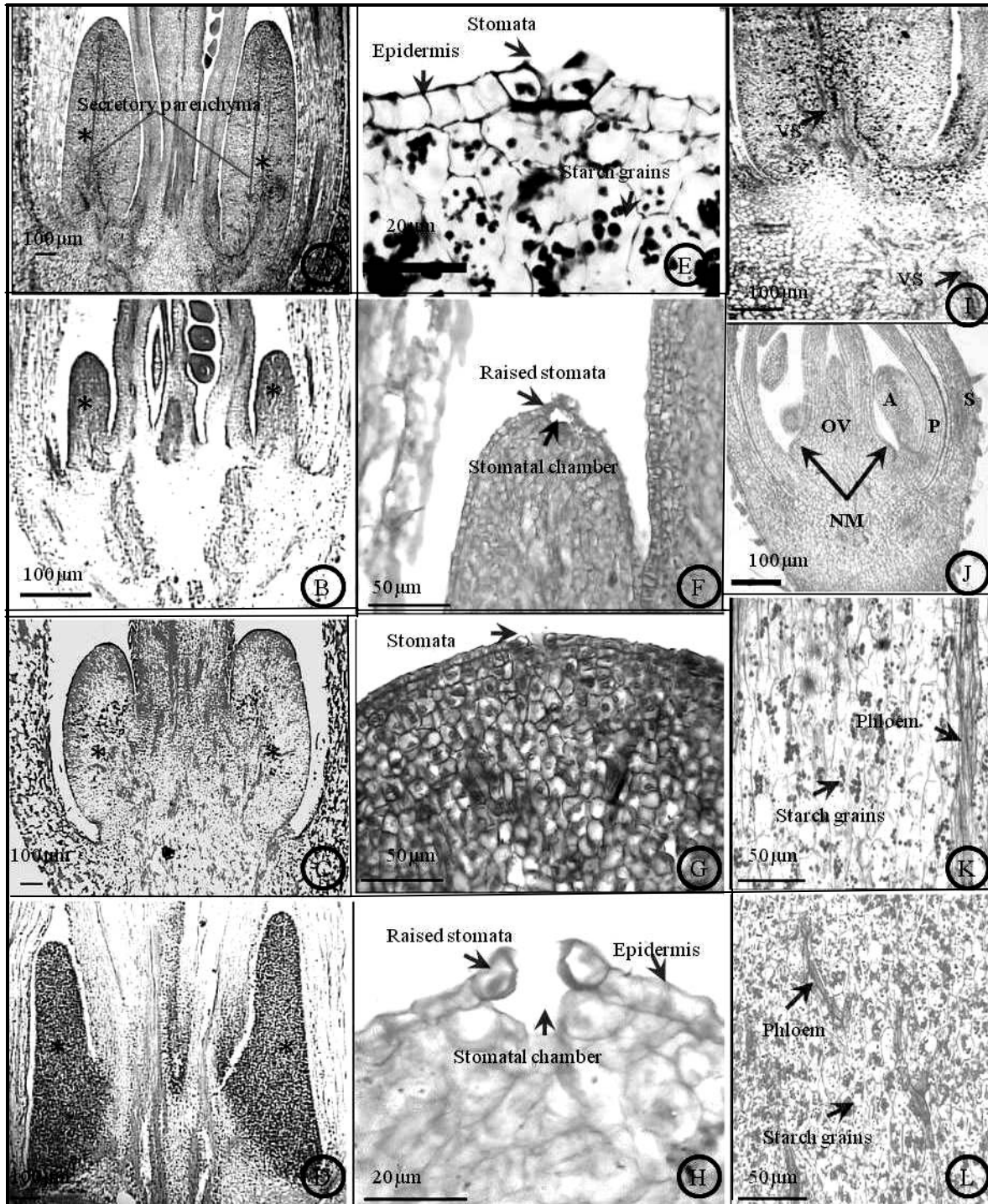
### RESULTS AND DISCUSSION

Nuptial nectaries at the maturity observed as annular ring around the ovary in all the four species studied. In *S. stans*, *M. hortensis* and *T. argentea* nectary and ovary are at the same level (Fig. A, B & D) while in *T. pallida* ovary is raised above the nectary.(Fig. C). A group of parenchymatous cells on the rim of the torus by continuous cell divisions give rise to nuptial nectary. In early stages it appears as a protuberance around the base of the ovary (Fig. J). Nuptial nectaries showed two distinct regions viz. epidermis and secretory parenchyma with vascular connection.

The epidermis is single layered composed of compactly arranged tubular cells, interrupted often by wide open stomata in the apical portion. In *S. stans* and *M. hortensis* a prominent stomatal chamber was found (Fig. F & H), while in *T. pallida* and *T. argentea* such chambers were absent. The stomata were either raised as in *M. hortensis* and *S. stans*.(Fig. F & H), or at the level of epidermis as in *T. pallida* and *T. argentea* (Fig. G & E) Secretory parenchyma tissue were made of several layers of compactly arranged isodiametric cells. These cells were stained densely with PAS reagent indicating all parenchymatous cells are secretory without any ground parenchyma tissue. In all the presently studied four plant species the secretory cells were compact with out any inter cellular spaces with starch grains before the secretion. But during the process of nectar secretion the density of starch grains is decreased (Fig. K). In the vasculature, only phloem strands were found in the secretory tissue (Fig. K & L). The vasculature is connected to the ovarian vascular bundles (Fig. B & D). The secretion of nectar which was observed prior to flowering got accumulated in corolla tube.

Flowering phenology in *M. hortensis*, *S. stans*, *T. pallida* and *T. argentea* is annual and similar to the cornucopia type proposed by Gentry [5 & 6] in which flowering occurs for several weeks and produce large number of flowers each day. According to a topographical classification explained by Fahn [3], annular secretory nectaries found in Bignoniaceae would fall under type 4 in which nectary have formed as a disk surrounding the base of the ovary. Anatomical characteristics

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\* - Nectary lobe, VS - Vascular strands, NM - Nectary meristem, OV- Ovary, A - Anther, P - Petal, S – Sepal .

Figure - A, E, I and K *Tabebuia argentea* ., Figure- B, F and J *Stenolobium stans*., Figure - C and G *Tabebuia pallida*., Figure- D, H and L *Millingtonia hortensis*

of nectary found in *M. hortensis* and *T. pallida* are similar to those of *Kigelia pinnata* [13] and *T. serratifolia* [16]. In some species of Bignoniaceae having vestigial nectary, the process of nectar secretion is performed by glandular trichomes present on the petal base [8]. However all the four species presently studied are found to have functional nectaries.

The presence of wide open stomata and prominent intercellular spaces in secretory parenchymatous tissue is the characteristic feature of floral nectaries [3]. In all the four species studied here, the presence of ground parenchyma region was not observed but it is a characteristic feature of *Eccremocarpus scaber* [1] of Bignoniaceae. The stomata found on the epidermis of nectary are either raised above the epidermal layer or are in the same level. The raised stomata, which is a characteristic feature in *Tecomaria capensis* [15], *Tabebuia aurea*, *T. chrysotricha*, *T. nodosa* and *T. ochracea* [11], was also observed in *M. hortensis* and *S. stans*, but in *T. pallida* and *T. argentea* the stomata is present at the level of epidermal cells. Stomata have been always found on the apical portion of the nectary, which corresponds to the region of secretory activity in the nectary. The apical location of stomata has been noted in Bignoniaceae and other families [2 & 4]. The stomata in the nectaries are nonfunctional as in *Vicia faba* [2]. In the present study, all are the four species showed completely opened stomata. Initially when the nectary is immature, no intercellular space is observed in secretory parenchyma, but loosely arranged cells with prominent intercellular space were found on its maturity. This indicates that during secretory stage, the breaking down of stored starch grains leads to the production of nectar atleast partially and cells becoming less compact resulting in the formation of the intercellular spaces. Starch stored in secretory parenchyma at the pre-secretory stage can be utilized both as a source of energy for highly metabolic processes and as a source of sugars for nectar synthesis [10 & 12]. The nectar is accumulated in these spaces before exuding through stomata. Similar observations have been made in floral nectaries of other Bignoniaceae members [13, 14 & 15]. The tubular corolla present in these which stores the nectar and the position of anthers at the mid way of corolla are well suited for promoting cross pollination [15].

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