STRUCTURE AND DEVELOPMENT OF COLLECTERS IN AGANOSOMA CARYOPHYLLATA G. DON.

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Abstract

In Aganosome caryophyllata, collecters are present on the basal adaxial side of the petiole, trac and calyx. These finger shaped structures are clearly divisible into head and stalk. The collecters are developing from a group of epidermal and hypodermal initials. A mature collecter consists of a central core of parenchymatous cells surrounded by palisade like epithelial cells. Epithelial cells are externally coated with thick cuticle and contain a single nucleus with abundant cytoplasm. A characteristic feature of these collecters is the presence of vascular supply and unicellular unbranched hairs.

Introduction

Glandular secretory hairs have been reported in various angiosperm families such as Rubiaceae (Lersten, 1974a, b), Rhizophoraceae (Lersten & Curtis, 1974) and Apocynaceae (Ramayya & Bahadur, 1968). These structures have been called as glandular shaggy hairs (Metcalfe & Chalk, 1972), nectarthodes (Lewis, 1968), squamellae (Woodson, 1935) or collecters (Lersten, 1974a, b; Lersten & Curtis, 1974). Williams et. al., (1982) reported the presence of glandular trichomes on the adaxial side of the petiole base in Nerium. Most of the taxonomists (Cooke, 1958; Duthie, 1960; Gamble, 1957; Haines, 1961; Saldana & Nicolson, 1976) reported the collecters as glands borne within the calyx. Patel & Zaveri (1975) studied them in Coffea and called them as stipular glands. Study of collecters in Tabernaemontana and Allamanda has been made by Ramayya & Bahadur (1968). Mohan & Inamdar (1968) studied same structures from the petiole of Plumeria and called them nectaries. The present paper describes the structure and development of collecters found in Aganosome caryophyllata.

Material and Methods

Plant materials were collected from University Botanical Garden and fixed in F.A.A. Materials were dehydrated and embedded in “Tissue Prep” (Sass, 1958). Paraffin sections were cut and stained with Tannic acid-Ferric chloride and Safranin-Fast Green (Johansen, 1940). Observations and drawings were made using Nikon and Carl-Zeiss microscope. Histochemical tests for carbohydrates and proteins were carried out by PAS (Jensen, 1962) and Mercuric bromophenol blue (Mazia, et. al., 1953) respectively. Sugars and amino acids were separated by chromatography.
Results

*Aganosoma caryophyllata* is a climbing shrub having simple, opposite and extipulate leaves. Colleters are present on the adaxial side of the petiole (Figs. 1, 2), bract and calyx (Fig. 3). Each colleters is differentiated into a long head and a small stalk. On the petiole 14-16 colleters are present. They are intermingled with numerous hairs. Calyx bears 2-4 colleters in two separate groups.

Secretory material produced by the colleters is colourless, soluble in water and alcohol and insoluble in xylol. Thin layer chromatography shows Rhamnose but no amino acids. Histochemical study of colleters indicates the presence of starch and proteins.

The colleters head consists of a central core of parenchymatous cells surrounded by epithelial cells (Figs. 17, 18). In certain colleters development of epithelial cells is not uniform (Fig. 4). A characteristic feature is the presence of vascular supply and unicellular unbranched hairs (Figs. 4, 6, 7, 8). Colleters show different shapes in transection and longissections because of their lobed or branched nature (Figs. 9, 10). Colleters present in the sepals persist for a long time along with the fruit.

Development

Multicellular colleters of *Aganosoma* develops from a small group of 7-8 cell initials of epidermis and hypodermis (Fig. 13). These cells can be distinguished by their prominent nuclei and abundant cytoplasm. After a number of anticlinal and periclinal divisions a mount like structure (Figs. 14, 15), of which the outer layer of cells is modified into epithelial cells and its inner cells into central cells (Fig. 16). A fully mature colleters can be distinguished into a long head and a small stalk (Fig. 17). A thick cuticle is present. Certain multicellular globular structures are present on the stalk of the colleters (Figs. 11, 12). Most of the colleters are found overarching the developing shoot apical meristem and provide protection (Fig. 5). A mature colleters measures 1400 µm in length and 200 µm in diameter and epithelial cell measures 50 µm in length and 15 µm in breadth when observed in transection.

Discussion

Colleters develop on the basal adaxial side of the petiole, bract and in calyx in *Aganosoma caryophyllata* as in other members of Apocynaceae (*Nerium, Roupelia, Allamanda* and *Tabernaemontana*) (unpublished data). According to our observations other 10 genera of Indian Apocynaceae (*Alstonia, Carissa, Catharanthus, Ichnocarpus, Rauwolfia, Plumeria, Vallaris, Thevetia, Holarrhena* and *Wrightia*) have colleters on the petiole or on petiole and calyx. Ramayya & Bahadur (1968) reported the presence of colleters only on the petiole and calyx of *Tabernaemontana* and *Allamanda*.
Figs. 1-8. 1) Colleters on young petiole base (at arrow) x 8. 2) Colletor on mature petiole x 1.
3) Sepal showing colleters x 10. 4) Incomplete epithelial cells and hairs (at arrows). x 95. 5) Over
arching colletor on the shoot apex. x 42. 6) Vascularized colletor. x 136. 7) Presence of unicellular
hair on colletor. x 68. 8) L.S. of colletor showing vascular trace. x 75.
Figs. 9-12. 9) Lobed colletor in L.S. x 68. 10) T.S. lobed colletors, x 54. 11) T.S. of globular structure present on the stalk, x 138. 12) L.S. of colletor showing globular structure on the stalk, x 85.

In *Roupelia* and *Nerium* petiolar colletors are arranged in different rows, but in *Aganosoma* they are arranged in one row. The colletors in *Aganosoma* are intermingled with numerous unicellular, unbranched hairs as in *Nerium*. Analysis of the secretion of *Nerium* indicates presence of rhamnose, glucose and arabinose while *Roupelia* and *Aganosoma* show only rhamnose. The amino acids are absent in *Aganosoma*, *Nerium* and *Roupelia*.

Vascularized colletors are present in *Holarrhena*, *Wrightia* and *Vallaris*, which receive their supply from the main trace of the petiole (Rao & Arati, 1963). In *Aganosoma* certain colletors are vascularized and have connection with the petiolar trace. The vascular supply is not extending up to the head portion of the colletor. Rao & Arati (1963) reported that *Aganosoma* have non-vascularized squamellae. Members of the same family such as *Cerbera* and *Nerium* have irregularly arranged calycine colletors while in *Aganosoma* colletors are arranged in a single row as in *Roupelia*.

Colletors are devoid of stomata but are characterized by unicellular hairs on them. Histochemistry of colletors indicates the presence of starch and proteins. Recently Mohan & Inamdar (1986) analysed the extrafloral nectaries of *Plumeria* in which starch, proteins and lipids were detected.
Figs. 13-18. 13) Developmental stages of colletor in longitudinal sections. Epidermal and hypodermal colletor initials (CI). 14) Initials showing periclinal divisions. 15) Colletor meristem (CM). 16) Longitudinal section of colletor showing differentiation of the tissue into outer elongated epithelial cells (EP) and central cells (CC). 17) Mature colletor showing head (H) and stalk (ST). 18) Transverse section of colletor showing epithelial cells (EP) and central cells (CC). x 90.

According to Mueller (1985) petiolar colletors of Alstonia secrete a latex like substance that covers the apical meristem and gives protection to the shoot apex. Williams et. al. (1982) also observed the over arching colletors in Nerium which are supposed to protect the developing shoot as in Aganosoma.

Lersten (1974a) regarded the finger shaped colletors with a central core of elongated cells surrounded by palisade like epithelial cells as “standard” type. Collectors of Aganosoma have a thick cuticle and are regarded as “standard” type.

References


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