

STRUCTURE AND DEVELOPMENT OF COLLETTERS IN *AGANOSOMA CARYOPHYLLATA* G. DON.

YASH DAVE, VINOTH THOMAS AND P.M. KURIACHEN

*Department of Biosciences,
Sardar Patel Universtiy, Vallabh Vidyanagar – 388 120, Gujrat, India.*

Abstract

In *Aganosoma caryophyllata*, collectors are present on the basal adaxial side of the petiole, bract and calyx. These finger shaped structures are clearly divisible into head and stalk. The collectors are developing from a group of epidermal and hypodermal initials. A mature collector 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 collectors 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 (Metcalf & Chalk, 1972), nectarthode (Lewis, 1968), squamellae (Woodson, 1935) or collectors (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; Saldanha & Nicolson, 1976) reported the collectors as glands borne within the calyx. Patel & Zaveri (1975) studied them in *Coffea* and called them as stipular glands. Study of collectors 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 collectors found in *Aganosoma 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 exstipulate leaves. Colleters are present on the adaxial side of the petiole (Figs. 1, 2), bract and calyx (Fig. 3). Each colleter 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.

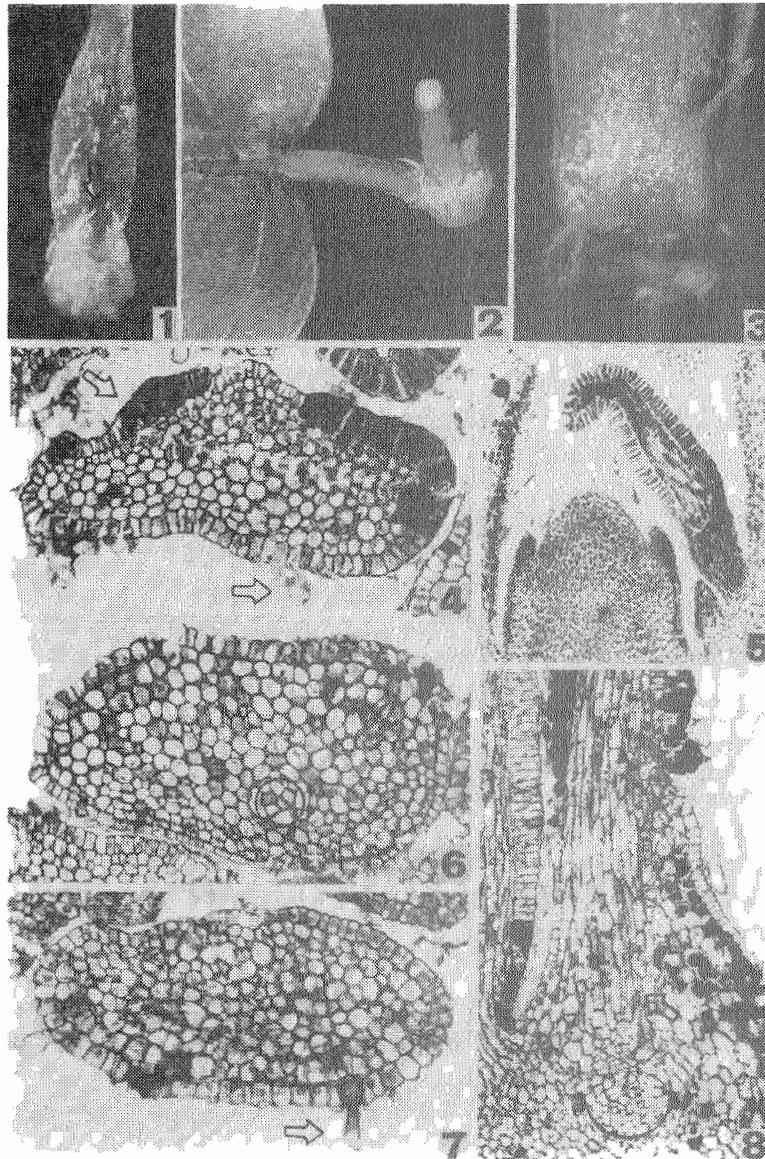
The colleter head consists of a central core of parenchymatous cells surrounded by epithelial cells (Figs. 17, 18). In certain colleters development of epithelial cells is not uniform (Fig. 4). A characteristic feature is the presence of vascular supply and unicellular unbranched hairs (Figs. 4, 6, 7, 8). Colleters show different shapes in transection and longisections 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

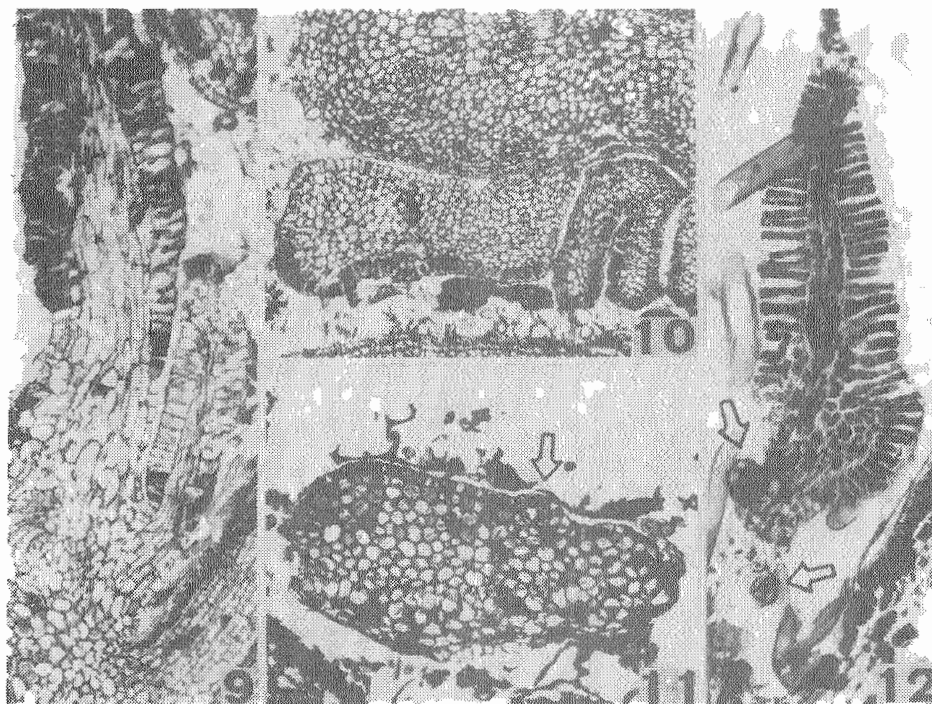
Multicellular colleter of *Aganosoma* develops from a small group of 7-8 cell initials of epidermis and hypodermis (Fig. 13). These cells can be distinguished by their prominent nuclei and abundant cytoplasm. After a number of anticlinal and periclinal divisions a mount like structure (Figs. 14, 15), of which the outer layer of cells is modified into epithelial cells and its inner cells into central cells (Fig. 16). A fully mature colleter 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 colleter (Figs. 11, 12). Most of the colleters are found overarching the developing shoot apical meristem and provide protection (Fig. 5). A mature colleter 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 Apocyanaceae (*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) Colletres on young petiole base (at arrow) x 8. 2) Colleter on mature petiole x 1. 3) Sepal showing colleters x 20. 4) Incomplete epithelial cells and hairs (at arrows). x 95. 5) Over arching colleter on the shoot apex. x 42. 6) Vascularized colleter. x 136. 7) Presence of unicellular hair on colleter. x 68. 8) L.S. of colleter showing vascular trace. x 75.

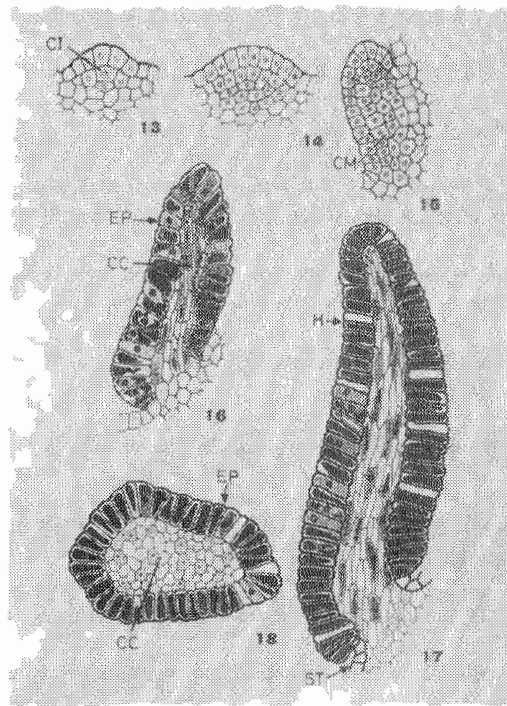


Figs. 9-12. 9) Lobed colleter in L.S. x 68. 10) T.S. lobed colleters. x 54. 11) T.S. of globular structure present on the stalk. x 138. 12) L.S. of colleter showing globular structure on the stalk. x 85.

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

Colleters are devoid of stomata but are characterized by unicellular hairs on them. Histochemistry of colleters 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 colleter in longitudinal sections. Epidermal and hypodermal colleter initials (CI). 14) Initials showing periclinal divisions. 15) Colleter meristem (CM). 16) Longitudinal section of colleter showing differentiation of the tissue into outer elongated epithelial cells (EP) and central cells (CC). 17) Mature colleter showing head (H) and stalk (ST). 18) Transverse section of colleter showing epithelial cells (EP) and central cells (CC). x 90.

According to Mueller (1985) petiolar colleters 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 colleters in *Nerium* which are supposed to protect the developing shoot as in *Aganosoma*.

Lersten (1974a) regarded the finger shaped colleters with a central core of elongated cells surrounded by palisade like epithelial cells as "standard" type. Collecters of *Aganosoma* have a thick cuticle and are regarded as "standard" type.

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