Bol. Botânica, Univ. S. Paulo
7:43 - 59, 1979

HAIRS ON REPRODUCTIVE ORGANS OF SOME *ERIOCAULACEAE* AND THEIR TAXONOMIC SIGNIFICANCE.

PELOS NOS ÓRGÃOS REPRODUTIVOS DE ALGUMAS *ERIOCAULACEAE* E SEU SIGNIFICADO TAXONÔMICO.

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SUMMARY – Twenty species of Eriocaulaceae have been studied in terms of the types and distribution of hairs on involucral bracts of inflorescences as well as on floral bracts, sepals and petals of masculine and feminine flowers. The distribution of hairs on the parts show certain peculiarities and can be a useful diagnostic criterion. The species investigated were: *Blastocaulon rupestre* (Gardn.) Ruhl., *Eriocaulon aquatile* Koern., *E. cipoense* Alv. Silv., *E. elichrysoides* Bong., *Leiothrix crassifolia* (Bong.) Ruhl., *L. fluitans* (Mart.) Ruhl., *L. sclerophylla* Alv. Silv., *Paepalanthus bromelioides* Alv. Silv., *P. flaccidus* (Bong.) Kunth, *P. planifolius* (Bong.) Koern., *P. scleranthus* Ruhl., *Philodice hoffmannseggii* Mart., *Syngonanthus anthemidiflorus* (Bong.) Ruhl., *S. caulescens* (Poir.) Ruhl., *S. chrysolepis* Alv. Silv., *S. elegans* (Koern.) Ruhl. var. *canescens* Alv. Silv., *S. marginatus* Alv. Silv., *S. vernonioides* (Kunth) Ruhl., *S. verticillatus* (Bong.) Ruhl. and *Tonina fluviatilis* Aubl.

RESUMO – Foram estudadas vinte espécies de Eriocaulaceae quanto aos tipos e distribuição dos pelos existentes nas brácteas involucrais das inflorescências e também nas brácteas florais, sépalas e pétalas das flores masculinas e femininas. A distribuição dos pelos nas peças mostrou uma certa peculiaridade e poderá ser um critério taxonômico significante. As espécies pesquisadas foram: *Blastocaulon rupestre* (Gardn.) Ruhl., *Eriocaulon aquatile* Koern., *E. cipoense* Alv. Silv., *E. elichrysoides* Bong., *Leiothrix crassifolia* (Bong.) Ruhl., *L. fluitans* (Mart.) Ruhl., *L. sclerophylla* Alv. Silv., *Paepalanthus bromelioides Alv. Silv.*, P. flaccidus (Bong.) Kunth, *P. planifolius* (Bong.) Koern., *P. scleranthus* Ruhl., *Philodice hoffmannseggii* Mart., *Syngonanthus anthemidiflorus* (Bong.) Ruhl., *S. caulescens* (Poir.) Ruhl., *S. chrysolepis* Alv. Silv., *S. elegans* (Koern.) Ruhl. var. *canescens* Alv. Silv., *S. marginatus* Alv. Silv., *S. vernonioides* (Kunth) Ruhl., *S. verticillatus* (Bong.) Ruhl. e *Tonina fluviatilis* Aubl.

INTRODUCTION

Studies on morphology and anatomy of vegetative and reproductive organs of Eriocaulaceae are usually concerned with one species or a small group of species of different genera, and have usually examined a range of structures at a superficial level. None has taken into account a single anatomical character and checked its taxonomic significance in a range of species (Van Tieghem 1887a,b, Poulsen 1888, Holm 1901, Ruhland 1903, Smith 1910, Malmanche 1919, Palm 1920, Arber 1922, Solereder & Meyer 1929, Solomon 1931, Hare 1950, Tomlinson 1965, Begum 1968, Tomlinson 1969, Monteiro-Scanavacca & Mazzoni 1976a,b, Monteiro-Scanavacca et al. 1976, Monteiro-Scanavacca & Mazzoni 1978 and Giulietti 1978).

The epidermis and its appendages, especially the form and distribution of hairs provided useful characters for taxonomy in many families (Prat 1932, Heintzelman &

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Howard 1948, Davies 1959, Tateoka *et al.* 1959, Metcalfe 1960, Carlquist 1961, Stace & Khush 1961, Ahmad 1964 and Stace 1965).

In the Eriocaulaceae, studies on hairs have been few and limited (Poulsen 1888, Holm 1901, Ruhland 1903, Malmanche 1919, Solereder & Meyer 1929, Solomon 1931, Hare 1950 and Tomlinson 1965, 1969). Nevertheless the taxonomic value of certain hair characters has been frequently emphasized. Koernicke (1863) noted that in every species the hair on the involucral and floral bracts and on the perianth show a characteristic structure. He also observed that while *Paepalanthus* species with hairly capitula possess obtuse hairs that are subclavate, tuberculate and internally granular, those species with glabrescent capitula have acute, non-tuberculate hairs which are not internally granular. Ruhland (1903) regarded the shape of the distal cell of hair present on the floral organs as well as the ornamentation and the colour of wall, as valuable taxonomic characters. Using the two capitulum types proposed by Koernicke (1863) he removed the group with glabrescent capitula from *Paepalanthus* and created two new genera *Leiothrix* and *Syngonanthus.* The principal characters which he used to separate *Leiothrix* and *Paepalanthus* concerned the hairs of the perigonium and bracts. He characterized the first genus by its always having acute, non-tuberculate and internally smooth hairs, and the second by its obtuse, internally granular and tuberculate hairs. In *Paepalanthus,* Ruhland (1903) again used the presence or absence of hairs on the perigonium and bracts together with its distribution to separate the subgenera *Paepalocephalus* and *Thelxinoë,* which always possess hairy perigonia and bracts, with usually more or less granular and externally tuberculate hairs, from the subgenera *Bostrychophyllum* and *Psilandra* where the perigonia and the bracts are glabrous or possess smooth, subclavate hairs. The same author (Ruhland 1903) also used the structure of hairs to differentiate species or group of species in subsection *Eupaepalanthus.* Thus, for example, he separated *P. domingensis* Ruhl. from *P. suffruticans* Ruhl., *P. desperado* Ruhl. and *P. macaheensis* Koern., because it possesses perigonial hairs which are externally strongly tuberculate, while in the remaining species tubercles are absent. Using the same characters the separated *P. microcaulon* Ruhl. and *P. ruhlandii* Alv. Silv. with tuberculate hairs on the perigonia and bracts from other related species which possess externally smooth hairs. Malmanche (1919) studied the anatomy of vegetative organs of Eriocaulaceae and concluded that the size and form of the distal cell of glandular hairs on the scapes could be used to separate related species. Tomlinson (1969), analysing the hairs found on vegetative organs in various genera and species within the family recognized three basic types: a) filamentous hairs; b) three-celled glandular hairs; c) capitate multicellular glandular hairs (infrequent). All of these have two short basal cells, that is, one basal cell and one collar-cell; the characteristics of the distal part depend on the type of hair under consideration. He suggested that the differences presented by the hairs as to shape, distribution of the three-celled glandular hairs on leaf, and even as to size of apical cell might have a certain taxonomic value. As regards the reproductive organs Tomlinson (1969) took into account observation by Solereder and Meyer (1929) that the hairs found on the receptacle, bracts and other floral parts are "strikingly different from those on vegetative parts". The proximal two cells of all hairs and the three basic types of hairs as defined on characters of distal cells are similar to those on vegetative organs, but the intermediate types are more common. So, two basic types were considered: a) filamentous hairs; b) glandular hairs. Some characteristics presented by the cells of the filamentous hairs, such as thickness and aspect of the walls (warty, striated, irregular etc.), and shape of the apical cell (pointed, blunt, bluntly lobed, globular, etc.) were also taken into account; some species and genera were mentioned as examples. Even the number of distal filament cells was

considered as having a possible taxonomic significance in species of *Paepalanthus* and *Blastocaulon.* As to the glandular hairs that occur in a few species, these were said to correspond to the capitate glandular hairs of vegetative organs, and consist of 2 or 3-4 cells. Tomlinson (1969) also stressed the value of hairs when he asserted that the "diagnostic anatomical features in the Eriocaulaceae are most likely to be found in the structure of the hairs, especially those on the reproductive organs, which in some instances are critical for the separation of the genera".

This study was conceived with the aim of evaluating the taxonomic importance at the generic, subgeneric and specific level of characters of the hairs on bracts and floral organs, in the Eriocaulaceae. For this purpose species were selected to represent sections and subgenera of all the genera which occur in Brazil, and in two cases, in *Eriocaulon* and *Syngonanthus,* very closely related species normally considered difficult to separate were chosen to investigate the diagnostic value of such characters at the species level. Within each representative collection, the floral organs were analysed with respect to the existent hair types and their distribution.

MATERIAL AND METHODS

Most of the material was collected from the region of the Serra do Cipó (approximately Lat. 19°29'W and Long. 43°30'W), located in Santana do Riacho (State of Minas Gerais, Brazil), along the Belo Horizonte-Conceição do Mato Dentro road. They form part of the Serra do Cipó Collection (CFSC), deposited in the herbarium of the Instituto de Botânica de São Paulo (SP). Two of the species studied do not belong to this Collection and of those remaining two are from Diamantina (State of Minas Gerais), one from the State of Amazonas and another from Porto Seguro (State of Bahia). The herbarium details are as follows: *Blastocaulon rupestre* (Gardn.) Ruhl., Diamantina, Minas Gerais, 22/04/1957; leg.: E. Pereira 2802 and Pabst 3638 (HB); *Eriocaulon aquatile* Koern., Km. 104, 15/07/1975; leg.: A. Giulietti, CFSC 5398 (SP); *E. cipoense* Alv. Silv., Km 107, 05/09/1973; leg.: A. Giulietti, M. Sazima and J. Semir, CFSC 4450 (SP); *E. elichrysoides* Bong., Km. 107, 05/09/1973; leg.: J. Semir CFSC 4449 (SP); *Leiothrix crassifolia* (Bong.) Ruhl. (Subgen. *Calycocephalus),* Km 114, 15/12/1974; leg.: J. Semir, M. Sazima, L.S. Kinoshita and S.C. Mazzoni, CFSC 5382 (SP); *L. fluitans* (Mart.) Ruhl. (Subgen. *Rheocaulon),* Km 104, 20/07/1973; leg.: J. Semir, CFSC 4262 (SP); *L. sclerophylla* Alv. Silv. (Subgen. *Eleutherandra),* Km 124, 15/12/1974; leg.: J. Semir, M. Sazima, L.S. Kinoshita and S.C. Mazzoni, CFSC 5387 (SP); *Paepalanthus bromelioides* Alv. Silv. (Subgen. *Platycaulon,* Sect. *Divisi*), Km 101, 15/12/1973; leg.: W.R. Monteiro, CFSC 4902 (SP); *P. flaccidus* (Bong.) Kunth (Subgen. *Paepalocephalus,* Sect. *Eriocaulopsis),* Diamantina, Minas Gerais, 02/04/1957; leg.: E. Pereira 2777 (HB); *P. planifolius* (Bong.) Koern. (Subgen. *Platycaulon,* Sect. *Indivisi*), Km 115, 15/12/1973; leg.: W.R. Monteiro, CFSC 4895 (SP); *P. scleranthus* Ruhl. (Subgen. *Thelxinoë*), Km 132, 30/03/1974; leg.: A. Giulietti CFSC 4967 (SP); *Philodice hoffmannseggii* Mart., Igarapé Amim, Rio Araricuena, Amazonas, 07/1927; leg.: Luetzelburg 20532 (R); *Syngonanthus anthemidiflorus* (Bong.) Ruhl. (Sect. *Dimorphocaulon*), Km 2, Estrada da Usina, 05/03/1972; leg.: A.B. Joly, A.M. Joly and N.L. Menezes, CFSC 1171 (SP); *S. caulescens* (Poir.) Ruhl. (Sect. *Carphocephalus*), Km 114, 26/02/1973; leg.: A. Giulietti and N.L. Menezes, CFSC 3974 (SP); *S. chrysolepis* Alv. Silv. (Sect. *Thysanocephalus*), Serra do Cipó, Minas Gerais, 08/1921; leg.: J. Michaeli (R); *S. elegans* (Koern.) Ruhl. var. *canescens* Alv. Silv. (Sect. *Eulepis*), Serra do Cipó, Minas Gerais, 04/1918; leg.: A. Silveira 650 (R); *S. marginatus* Alv. Silv. (Sect. *Dimorphocaulon*), Km 132, 10/02/1974; leg.: J. Semir and

M. Sazima, CFSC 4939 (SP); *S. vernonioides* (Kunth) Ruhl. (Sect. *Thysanocephalus*), Km 127, 26/07/1973; leg.: J. Semir CFSC 4314 (SP); *S. verticillatus* (Bong.) Ruhl., Km 128, 27/02/1973; leg.: A. Giulietti and N.L. Menezes, CFSC 4032 (SP); *Tonina fluviatilis* Aubl., Porto Seguro, Bahia, 27/08/1961; leg.: A.P. Duarte 6070 (RB).

Observations were made on bracts and flower parts from fresh and dried inflorescences. The latter were boiled in distilled water for some seconds and then treated with 2% KOH solution and washed several times in distilled water (Smith & Smith 1942). These inflorescences and the fresh ones were then dissected. The bracts and the flower parts were cleared following the steps 1-6 of the method described by Shobe and Lersten, 1967 (*in* Berlyn & Miksche 1976). The sequence 100% ethyl alcohol, 100% ethyl alcohol--xylene (1:1) and xylene was followed, and mounting in Harleco resin was carried out for half of each sample; the other half was stained with safranin (1% in 100% ethyl alcohol-xylene 1:1) after the second step of the sequence above; the excess of stain was removed by using 100% ethyl alcohol-xylene (1:1); then the bracts and flower parts were treated with xylene and mounted in Harleco resin. The transparent materials were not treated with NaOH solution and chlorine bleach (step # 2) while the latter was also avoided for the less resistant materials.

Drawings were obtained with the aid of a camera-lucida drawing apparatus.

RESULTS

The more frequent types of hairs as well as their descriptions are shown in the table 1. The results concerning the distribution and types of hairs found on bracts (involucral and floral), sepals and petals are seen in the tables 2, 3, 4, and 5.

The types of hairs found on the involucral bracts of the heads as well as on the floral bracts, sepals and petals of male and female flowers have been studied. The dense or hyaline aspects of cells, the appearance of the cell walls and shape of the apical cell have led to a classification of the hairs into thirteen types (Table 1, Figures 1-25).

Using these hair types, it is possible to characterize the seven genera as follows:

Eriocaulon: In the three species studied the invocucral bracts do not posses hairs. Type VI is found on the floral bracts and on sepals and petals of male and female flowers in *Eriocaulon cipoense* and *E. aquatile* as well as on the sepals of male and female flowers and petals of male flowers of *E. elichrysoides.* In the latter one, types V and VI are found on the floral bracts of male and female flowers and the petals of female flowers (Table 2, Figures 26-43).

Paepalanthus: The petals of male flowers do not possess hairs in the four species studied. A great variety of types is observed on the bracts, sepals and petals. Thus, three types occur on the internal involucral bracts (V, VII and XII) in *Paepalanthus planifolius,* and on the floral bracts (V, IX and X) of male and female flowers in *P. flaccidus.* Two types are found on the involucral bracts of *P. scleranthus* (II and V). Types V and VIII are present on involucral bracts, floral bracts of male and female flowers, petals of female flowers in *P. bromelioides,* floral bracts, sepals of male and female flowers, and petals of female flowers of *P. planifolius.* In *P. flaccidus,* types V and X occur on the involucral bracts, sepals of female flowers and petals of female flowers, and types IX and X on the sepals of male flowers. One type of hair (V) is found on the floral bracts, sepals of male and female flowers, and petals of female flowers in *P. scleranthus.* Type VIII is found on the sepals of male and female flowers in *P. bromelioides.* (Table 3, Figures 45-68).

Syngonanthus: The involucral bracts do not have hairs in *S. elegans* var. *canescens, S. vernonioides, S. chrysolepis* and *S. caulescens.* Floral bracts exist only in *S. marginatus*

and these possess hairs. The sepals of male and female flowers do not have hairs in *S. elegans* var. *canescens, S. vernonioides* and *S. chrysolepis.* Hairs are also absent on petals of male flowers in all the species studied; as to the petals of female flowers in *S. elegans* var. *canescens* and *S. anthemidiflorus* they not present hairs, either. Three types of hairs (II, III and V) are seen on the involucral bracts of *S. marginatus.* Two types (I and V) occur on the sepals of male and female flowers in *S. verticillatus.* One type (V) is the more frequent and is found on the petals of female flowers in *S. vernonioides* and *S. chrysolepis;* on sepals of male and female flowers and petals of female flowers in *S. caulescens;* on involucral bracts, sepals of male and female flowers and petals of female flowers in *S. verticillatus;* on involucral bracts and sepals of male and female flowers in *S. anthemidiflorus;* and on involucral bracts, floral bracts and sepals of male and female flowers, and petals of female flowers in *S. marginatus.* In the case of *S. anthemidiflorus,* hairs occur in regions A, B, C, D, and E of the external involucral bracts, while on the internal ones the hairs are found only in regions D, E and F. Hairs are absent on all the floral parts of *S. elegans* var. *canescens.* (Table 4, Figures 70-88).

Leiothrix: Hairs are absent in *L. fluitans,* on the petals of male and female flowers in *L. crassifolia,* and on the external involucral bracts and petals of male flowers in *L. sclerophylla.* One type (V) is found in *L. crassifolia,* and VII is seen in *L. sclerophylla* (Table 5, Figures 90-100).

Philodice, Tonina and *Blastocaulon:* in *P. hoffmannseggii* only the involucral bracts possess hairs, which are of type XIII (Table 5, Figure 101). In *T. fluviatilis* hairs are absent on the floral bracts of male and female flowers, and on the sepals and petals of male flowers; type IV is found on the petals of female flowers and type V is found on the involucral bracts and sepals of female flowers (Table 5, Figures 102-103). In *B. rupestre* hairs are absent on the petals of male flowers, while type XI is widely distributed on various floral organs (Table 5, Figures 104-109).

DISCUSSION

Analysis of the types and distribution of hairs on involucral and floral bracts and on perianths of Eriocaulaceae reveal a considerable amount of morphological diversity. With certain reservations this diversity can be utilized at all taxonomic levels within the family.

Certain hair types occur exclusively in some genera. Thus types I and III only occur in *Syngonanthus,* type VI only in *Eriocaulon,* and type IV only in *Tonina.* Type XI occurs only in *Blastocaulon* and type XIII only in *Philodice.* The difficulty of characterizing these genera by hair type is that besides these characteristic, others occur which are common to two or more genera. For example, hair type V can be found in *Eriocaulon, Syngonanthus, Leiothrix, Paepalanthus* and *Tonina,* while type II can occur in *Syngonanthus* and *Paepalanthus* and type VII is common to *Leiothrix* and *Paepalanthus.* Encountering the same hair type for two genera as in the examples cited above makes it very difficult to accpet the view of Ruhland (1903) who used this characteristic to separate them.

The presence or absence of hairs can be used to reach certain conclusions at the generic level. The absence of hairs on the petals of male flowers is characteristic of all genera studied with the exception of *Eriocaulon.* In *Philodice* hairs occur on the involucral bracts but are absent on floral bracts and flowers.

At the subgeneric and sectional levels certain observations can be made. Species of *Syngonanthus* – Sect. *Dimorphocaulon* possess hairy involucral bracts, while in the other

sections of the genus these are glabrous. At the subgeneric level in *Paepalanthus,* hair type II was found only in subgenus *Thelxinoë,* while in the two sections of subgenus *Platycaulon,* types V and VIII occurred in association. Due to the high degree of morphological variation found in the hairs of the species of this genus, a more extensive survey would undoubtedly furnishes useful diagnostic characters which could be used not only at the subgeneric, sectional and subsectional levels but also at the species level.

The characters of the hairs on the bracts and flowers of Eriocaulaceae will probably prove of greatest diagnostic value at the species level. Here both hair type and specially its distribution on the various floral organs must be taken into account. One particularly striking example is found in the species pair *Eriocaulon cipoense* and *E. aquatile* which are difficult to differentiate using gross morphological characters. Using hair characters, however, the two species are immediately separable, on the basis of hair distribution on the floral parts. This is particularly striking when one observes the sepals and petals of both male and female flowers in the two species (Figures 34-37; 40-43; and Table 2). The differences are seen when one compares the distribution of hairs in the regions (A, B, C, D, E and F) as well as on the faces of the floral parts. While in *E. aquatile* hairs occur on both surfaces of the petals, in *E. cipoense* these are restricted to the ventral face only. Another interesting comparison can be made between *Syngonanthus vernonioides* and *S. chrysolepis* that belong to the same section *Thysanocephalus* and are quite similar. Both possess hairs of type V only on the ventral face of the petals of female flowers, but while in *S. vernonioides* hairs occur in regions B, C and E, in *S. chrysolepis* they occur only in the regions B and C (Figures 70-71, Table 4).

Acknowledgments – The authors are very grateful to Dr. Raymond M. Harley and Dr. David F. Cutler for their valuable suggestions and revision of the manuscript. S.C.M. thanks Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) for the award of a research training scholarship (grant 74/0793).

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TABLE 1. TYPES OF HAIRS.

TYPE	DESCRIPTION	FIGURES
I	globoid,unicellular with hyaline aspect.	1
II	T-shaped or "Malpighian" type;bi to tricellular,with 1 or 2 short basal cells;distal cell 2-armed,the arms extending parallel to the floral organ surface;arms of the T with denticulate walls and almost equally long;all the cells are hyaline.	2
III	T-shaped or "Malpighian" type;tricellular,with 2 short basal cells;distal cell 2-armed,the arms extending parallel to the floral organ surface;arms of the T with smooth walls and unequally long;all the cells are hyaline.	3
IV	filamentous,uniseriate,spirally twisted,acute apex;variable number of cells,with 2 short basal cells;all the cells are hyaline.	4
V	filamentous,uniseriate,apex ranging from acute(variable angles)to capitate;variable number of cells,with 1 to 4 short basal cells;all the cells are hyaline.	5-11
VI	filamentous,uniseriate,apex ranging from acute(variable angles)to capitate;variable number of cells,with 1 to 4 short basal,hyaline cells,the remaining ones presenting dense aspect.	12-14
VII	filamentous,uniseriate,apex ranging from acute(variable angles)to capitate;variable number of cells,with 1 to 4 short basal cells presenting dense aspect being the remaining ones hyaline.	15
VIII	filamentous,uniseriate,apex ranging from acute(variable angles)to capitate;variable number of cells,with 1 to 3 short basal cells; 1 or more distal cells have dense aspect being the remaining ones hyaline.	16-17
IX	filamentous,uniseriate,apex ranging from acute(variable angles)to capitate;variable number of cells,with 2 short basal cells;the distal cell is warty; all the cells are hyaline.	18-19
X	filamentous,uniseriate,apex ranging from acute(variable angles)to capitate;variable number of cells,with 1 or 2 short basal cells; 1 or more distal cells have dense aspect being the apical one warty; all the remaining cells are hyaline.	20-21
XI	filamentous,uniseriate,apex ranging from acute(variable angles)to capitate;variable number of cells,with 1 or 2 short basal cells; 1 or more distal cells have dense aspect, and the apical one is warty,being its external walls spirally striated; all the remaining cells are hyaline.	22
XII	filamentous,uniseriate,apex ranging from acute(variable angles)to capitate;variable number of cells,with 1 to 3 short basal cells,that have smooth walls,differing from the remaining ones that present crenulate walls;all the cells are hyaline.	23-24
XIII	filamentous,uniseriate,capitate apex;penta to hexacellular, with 1,somewhat dilated,bottle-shaped basal cell; all the cells are hyaline being this characteristic more pronounced in the apical cell.	25

TABLE 2. ERIOCAULON L.

SPECIES	INVOLUCRAL BRACT	FLORAL BRACT		SEPAL		PETAL	
		♂ FLOWER	♀ FLOWER	♂ FLOWER	♀ FLOWER	♂ FLOWER	♀ FLOWER
Eriocaulon elichrysoides Bong.	Hairs absent.	DISTRIBUTION:Dorsal face;regions D and E:MAR,LSMAR,L and MED;region F: MAR, LSMAR,L,MED,AP and MEDSAP(Fig. 26 and 44). TYPES:V and VI,acute apex(variable angles);tetra to hexacellular.	DISTRIBUTION:Dorsal face;regions D and E: MAR,LSMAR,L and MED; region F:MAR,LSMAR,L, MED,AP and MEDSAP (Fig.27 and 44). TYPES:V and VI,acute apex(variable angles); tetra to hexacellular;1 to 3 short basal cells.	DISTRIBUTION:Dorsal face;region E:MAR, LSMAR,L and MED;region F:MAR,LSMAR,L, MED,AP and MEDSAP (Fig.28 and 44). TYPE:VI,acute apex (variable angles); bi to heptacellular; 1 to 3 short basal cells.	DISTRIBUTION:Dorsal face;region E: MAR, LSMAR,L and MED;region F:MAR,LSMAR,L, MED,AP and MEDSAP (Fig.29 and 44). TYPE:VI,acute apex (variable angles); bi to pentacellular;1 to 3 short basal cells.	DISTRIBUTION:Dorsal face;regions C and D: MAR,LSMAR and L;region E:MAR,LSMAR,L and MED;region F:MAR, LSMAR,L,MED,AP and MEDSAP(Fig.30 and 44) TYPE:VI,acute apex (variable angles); tri to heptacellular; 1 to 3 short basal cells.	DISTRIBUTION:Dorsal face;region B: MAR, LSMAR and L;regions C,D and E:MAR,LSMAR, L and MED;region F: MAR,LSMAR,L,MED,AP and MEDSAP(Fig.31 and 44). TYPES:V and VI;tri to hexacellular; 1 short basal cell.
Eriocaulon cipoense Alv. Silv.	Hairs absent.	DISTRIBUTION:Dorsal face;regions C and D: MED;region E:MAR,L and MED;region F:MAR (Fig.32 and 44). TYPE:VI,acute apex (variable angles);bi to pentacellular;1 or 2 short basal cells.	DISTRIBUTION:Dorsal face;region D:MED;regions E and F:MAR,L and MED(Fig.33 and 44). TYPE:VI,acute apex (variable angles); tri or tetracellular; 1 or 2 short basal cells.	DISTRIBUTION:Dorsal face;region E:L and MED;region F:MAR,L, MED and AP(Fig.34 and 44). TYPE:VI,acute apex (variable angles); tri or tetracellular; 2 short basal cells.	DISTRIBUTION:Dorsal face;region E:L and MED;region F: MAR, LSMAR,L,MED,AP and MEDSAP(Fig.35 and 44). TYPE:VI,acute apex (variable angles); tri or tetracellular; 2 short basal cells.	DISTRIBUTION:Ventral face;region F: MAR, LSMAR,L,MED,AP and MEDSAP(Fig. 36 and 44). TYPE:VI,tri to hexacellular; 1 or 2 short basal cells.	DISTRIBUTION:Ventral face;region C: MED and scarce;region D: MAR and MED; region E:MAR,LSMAR,L and MED;region F: MAR, LSMAR,L,MED,AP and MEDSAP(Fig.37 and 44). TYPE:VI,tri or tetracellular;1 or 2 short basal cells.
Eriocaulon aquatile Koern.	Hairs absent.	DISTRIBUTION:Dorsal face;region C:MED; regions D and E:MAR, L and MED;region F: MAR(Fig.38 and 44). TYPE:VI,acute apex (variable angles);tri or tetracellular; 2 short basal cells.	DISTRIBUTION:Dorsal face;regions D and E: MAR,L and MED;region F:MAR(Fig.39 and 44). TYPE:VI,acute apex (variable angles);tri or tetracellular;1 or 2 short basal cells.	DISTRIBUTION:Dorsal face;region D:MED; region E:LSMAR,L and MED;region F:MAR,L, MED,AP and MEDSAP (Fig.40 and 44). TYPE:VI,acute apex (variable angles); tri to pentacellular;2 short basal cells.	DISTRIBUTION:Dorsal face;region D: MED; region E:MAR,LSMAR, L and MED;region F: MAR,LSMAR,L,MED,AP and MEDSAP(Fig. 41 and 44). TYPE:VI,acute apex (variable angles); tri to pentacellular; 2 short basal cells.	DISTRIBUTION:Dorsal and ventral faces;regions C,D and E:MAR, LSMAR,L and MED; region F:MAR,LSMAR,L, MED,AP and MEDSAP (Fig. 42 and 44). TYPE:VI,acute apex (variable angles); tetra or pentacellular;2 short basal cells.	DISTRIBUTION:Dorsal and ventral faces; regions C,D,E and F: MAR,LSMAR,L and MED (Fig. 43 and 44). TYPE:VI,acute apex (variable angles); tri to pentacellular;2 short basal cells.

Abbreviations: AP - apical; L - lateral; LSMAR - lateral-submarginal; MAR - marginal; MED - median; MEDSAP - median-subapical.

Obs.: The types of hairs mentioned above are described in the Table 1.

TABLE 3. PAEPALANTHUS MART.

SPECIES	INVOLUCRAL BRACT	FLORAL BRACT		SEPAL		PETAL	
		♂ FLOWER	♀ FLOWER	♂ FLOWER	♀ FLOWER	♂ FLOWER	♀ FLOWER
Paepalanthus scleranthus Ruhl. subgenus Thelxinoë	DISTRIBUTION: Dorsal and ventral faces, regions B,C,D and F: MAR and LSMAR (Fig. 45 and 69). TYPES:II,bicellular with 1 short basal cell and tricellular with 2 short basal cells(dorsal and ventral faces, on the regions C,D,E and F). V,acute apex; tri to hexacellular; 2 short basal cells(dorsal face, on the regions B and C).	DISTRIBUTION:Dorsal face: region D:MAR (Fig.46 and 69). TYPE:V,acute apex; bi to pentacellular,1 or 2 short basal cells. Obs.:Some bracts are glabrous.	DISTRIBUTION:Dorsal face;region C:MAR and MED;region D: MAR (Fig. 47 and 69). TYPE:V,acute apex;bi to tetracellular;1 or 2 short basal cells. Obs.:Some bracts are glabrous.	DISTRIBUTION:region F: MAR and AP (Fig. 48 and 69). TYPES:V,acute apex; bi to pentacellular;1 or 2 short basal cells.	DISTRIBUTION:regions A,B,C,D, E and F:MAR (Fig.49 and 69). TYPE:V,acute apex;bi to tetracellular; 1 or 2 short basal cells.	Hairs absent.	DISTRIBUTION:regions D,E and F: MAR (Fig.50 and 69). TYPE:V,acute apex;bi to tetracellular;1 or 2 short basal cells.
Paepalanthus bromelioides Atv. Stlv. subgenus Platycaulon	DISTRIBUTION:Dorsal and ventral faces; region B:MAR,L and MED;regions C,D and E:MAR,LSMAR,L and MED;region F: MAR, LSMAR,L,MED,AP and MEDSAP(Fig.51 and 69). TYPES:V,acute apex;penta to heptacellular; 2 short basal cells. VIII,penta to heptacellular;1 or 2 short basal cells.	DISTRIBUTION:Dorsal face; regions B,C and D:MAR;region E:MAR,LSMAR,L and MED; region F:MAR,LSMAR,L,MED, AP and MEDSAP(Fig.52 and 69). TYPES:V,acute apex;hexa to octacellular; 1 or 2 short basal cells. VIII,acute apex(variable angles);hexa to octacellular;1 or 2 short basal cells.	DISTRIBUTION:Dorsal face;regions B,C and D:MAR;region E: MAR,LSMAR,L and MED;region F: MAR,LSMAR,L,MED,AP and MEDSAP (Fig. 53 and 69). TYPES:V,acute apex;heptacellular; 2 short basal cells. VIII,tri to octacellular;1 or 2 short basal cells.	DISTRIBUTION:Dorsal face; region E:MAR,LSMAR,L and MED;region F:MAR,LSMAR,L, MED,AP and MEDSAP (Fig.54 and 69). TYPE:VIII,hexacellular; 2 short basal cells.	DISTRIBUTION:Dorsal face;region E:L and MED;region F:MAR, LSMAR,L,MED,AP and MEDSAP(Fig. 55 and 69). TYPE:VIII,penta to heptacellular; 2 short basal cells.	Hairs absent.	DISTRIBUTION:Ventral face;regions B,C and D:MAR;region E: MAR,L and MED;region F:MAR,L, MED,AP and MEDSAP(Fig.56 and 69). TYPES:V,acute apex; tri to heptacellular; 1 or 2 short basal cells. VIII,tetra to hexacellular;1 or 2 short basal cells.
Paepalanthus planifolius (Bong.) Ruhl. subgenus Platycaulon	External Hairs absent. Internal DISTRIBUTION: regions D and E:MAR;region F:MAR and AP (Fig.57 and 69). TYPES:V,acute apex;bi to tetracellular;1 or 2 short basal cells. VII,acute apex; tri to pentacellular;2 or 3 short basal cells. XII,acute apex(variable angles);tri to pentacellular.	DISTRIBUTION: Dorsal face; regions D and E:MAR,LSMAR, L and MED;region F: MAR, LSMAR,L,MED,AP and MEDSAP (Fig. 58 and 69). TYPES:V,acute apex(variable angles);pentacellular; 1 or 2 short basal cells (regions D and E). VIII,penta or hexacellular;1 or 2 short basal cells(present on all region F and MED on the region E).	DISTRIBUTION:Dorsal and ventral faces;region E:MAR,LSMAR, L and MED;region F:MAR,LSMAR, L,MED,AP and MEDSAP(Fig.59 and 69). TYPES:V,acute apex(variable angles);penta or hexacellular; 2 short basal cells(region E). VIII,hexacellular; 1 or 2 short basal cells(present on all the region F; MED on the region E).	DISTRIBUTION: Dorsal and ventral faces;region E:MAR, L and MED;region F: MAR, LSMAR,L,MED,AP and MEDSAP (Fig. 60 and 69). TYPES:V,acute apex(variable angles);pentacellular; 2 short basal cells (region E). VIII,penta to heptacellular;2 short basal cells (present on all the region E:MED on the region E).	DISTRIBUTION:Dorsal and ventral faces;region E:MAR,LSMAR, L and MED;region F:MAR,LSMAR, L,MED,AP and MEDSAP (Fig. 61 and 69). TYPES:V,acute apex(variable angles);penta or hexacellular;2 short basal cells(region E). VIII,penta to heptacellular;2 short basal cells (present on all the region E).	Hairs absent.	DISTRIBUTION:Ventral face;region E:MAR,L and MED;region F: MAR,LSMAR,L,MED,AP and MEDSAP (Fig. 62 and 69). TYPES:V,acute apex (variable angles);tri or tetracellular: 1 or 2 short basal cells (region E, MAR and AP on the region F). VIII,penta or hexacellular; 2 short basal cells(present on all the region F,MED on the region E).
Paepalanthus flaccidus (Bong.) Kunth subgenus Paepalocephalus	DISTRIBUTION:Dorsal and ventral faces; regions B,C and D:MAR;region E:MAR, LSMAR and MED;region F:MAR,LSMAR,L,MED, AP and MEDSAP (Fig.63 and 69). TYPES:V,acute apex;tri to hexacellular; 2 short basal cells(regions B,C,D and E). X,tetra to heptacellular;2 short basal cells(regions E and F).	DISTRIBUTION: Dorsal face; regions C and D:MAR;region F:MAR,LSMAR,L,MED,AP and MEDSAP (Fig. 64 and 69). TYPES:V,acute apex;penta or hexacellular;2 short basal cells(regions C and D). IX,acute apex;penta or hexacellular(regions C and D). X,capitate apex;tetra or pentacellular; 1 short basal cell; 1 dense distal cell(present on all the region F).	DISTRIBUTION: Dorsal face;region D:MAR;region F:MAR,LSMAR, L,MED,AP and MEDSAP(Fig. 65 and 69). TYPES:V,acute apex;tetracellular;2 short basal cells (region D). IX,acute apex;penta or hexacellular (region D). X,capitate apex;penta or hexacellular;2 short basal cells; 1 dense distal cell (present on all the region F).	DISTRIBUTION: Dorsal and ventral faces;region E:MAR, LSMAR,L and MED;region F: MAR,LSMAR,L,MED and AP(Fig. 66 and 69). TYPES:IX,tetra to hexacellular. X,tetra to heptacellular;2 short basal cells (acute apex in variable angles-region E;capitate apex -region F).	DISTRIBUTION:Dorsal and ventral faces;region E:L and MED; region F:MAR,LSMAR,L,MED,AP and MEDSAP (Fig.67 and 69). TYPES:V,acute apex;tetracellular; 2 short basal cells. X,tetra to heptacellular;2 short basal cells(acute apex in variable angles - region E;capitate apex-region F).	Hairs absent.	DISTRIBUTION:Ventral face;regions E and F: MAR LSMAR and L (Fig. 68 and 69). TYPES:V,acute apex;tetra or pentacellular; 2 short basal cells. X,tetra to hexacellular; 2 short basal cells; 1 dense distal cell(acute apex in variable angles - MAR and LSMAR-regions E and F;capitate apex -L-regions E and F).

Abbreviation: AP - apical; L - lateral; LSMAR - lateral-submarginal; MAR - marginal; MED - median; MEDSAP - median-subapical.

Obs.: The types of hairs mentioned above are described in the Table 1.

TABLE 4. SYNGONANTHUS RUHL.

SPECIES	INVOLUCRAL BRACT	FLORAL BRACT		SEPAL		PETAL	
		♂ FLOWER	♀ FLOWER	♂ FLOWER	♀ FLOWER	♂ FLOWER	♀ FLOWER
Syngonanthus elegans (Koern.) Ruhl. var. canescens Alv. Sitv. section Eulepsis Bong.	Hairs absent.			Hairs absent.	Hairs absent.	Hairs absent.	Hairs absent.
Syngonanthus vernonioides (Kunth) Ruhl. section Thysanocephalus Koern.	Hairs absent.			Hairs absent.	Hairs absent.	Hairs absent.	DISTRIBUTION:Ventral face;regions B,C and E:MAR,LSMAR,L and MED(Fig. 70 and 89). TYPE:V,acute apex;tri or tetracellular; 2 short basal cells.
Syngonanthus chrysolepis Alv. Sitv. section Thysanocephalus Koern.	Hairs absent.			Hairs absent.	Hairs absent.	Hairs absent.	DISTRIBUTION:Ventral face;regions B and C:MAR,LSMAR,L and MED(Fig. 71 and 89). TYPE:V,acute apex;tricellular with 1 or 2 short basal cells;tetracellular with 2 short basal cells.
Syngonanthus caulescens (Poir.) Ruhl. section Carphocephalus Koern.	Hairs absent.			DISTRIBUTION:Ventral face;regions B,C and D: L and MED(Fig. 72 and 89). TYPE:V,acute apex;bi or tricellular;1 or 2 short basal cells.	DISTRIBUTION:Ventral face;region C: MED (Fig.73 and 89). TYPE:V,acute apex;bi or tricellular; 1 or 2 short basal cells.	Hairs absent.	DISTRIBUTION:Ventral face;region C:LSMAR,L and MED;region D:LSMAR and L (Fig.74 and 89). TYPE:V,acute apex;bicellular; 1 short basal cell.
Syngonanthus verticillatus (Bong.) Ruhl. section Dimorphocaulon Ruhl.	DISTRIBUTION:Dorsal face;regions A,B,C,D and E:MAR,LSMAR,L and MED;region F: MAR, LSMAR,L,MED,AP and MEDSAP(Fig. 75 and 89). TYPE:V,acute apex;bicellular with 1 short basal cell(MAR and L on the regions A,B and C;and capitate apex,tri or tetracellular with 1 short basal cell(present on all the involucral bract).			DISTRIBUTION:Dorsal and ventral faces;regions B,C,D,E and F: scarce(Fig.76 and 89). TYPES:I(present on all the sepal,especially on the regions E and F). V,capitate apex; bi or tricellular;1 or 2 short basal cells (present on all the sepal's dorsal face).	DISTRIBUTION:Dorsal and ventral faces;regions B,C and D:MAR,LSMAR, L and MED;region E:MAR,LSMAR and L; region F:MAR and AP(Fig.77 and 89). TYPES: I(present on all the sepal, especially on the regions E and F). V,acute apex;bi or tricellular,with 1 or 2 short basal cells (MAR,and LSMAR,L,MED on the dorsal face,of the regions B,C,D and E); and capitate apex; bi or tricellular,with 1 or 2 short basal cells (MAR on the region E and MAR,AP on the region F).	Hairs absent.	DISTRIBUTION:Dorsal face;regions B,C and D:MAR,LSMAR.L and MED (Fig.78 and 89). TYPE:V,acute apex;tricellular; 1 short basal cell.
Syngonanthus anthemidiflorus (Bong.) Ruhl. section Dimorphocaulon Ruhl.	External DISTRIBUTION:Dorsal and ventral faces;regions A,B and C:L;region D and E: L and MED(Fig.79 and 89). TYPE:V,acute apex;bi or tricellular; 1 or 2 short basal cells. / Internal DISTRIBUTION:Dorsal and ventral faces;regions D and E: LSMAR, L and MED;region F:L and MED(Fig.80 and 89). TYPE:V,acute apex;bi or tricellular; 1 or 2 short basal cells.			DISTRIBUTION:Ventral face;regions C,D and E: L and MED(Fig. 81 and 89). TYPE:V,acute apex;tricellular;2 short basal cells.	DISTRIBUTION:Ventral face;region C: L and MED;regions D and E:MAR,LSMAR, L and MED (Fig. 82 and 89). TYPE:V,acute apex;tricellular; 2 short basal cells.	Hairs absent.	Hairs absent.
Syngonanthus marginatus Alv. Sitv. section Dimorphocaulon Ruhl.	DISTRIBUTION:Dorsal face;regions B,C and D: MAR,LSMAR,L and MED;region E: L and MED;region F: L,MED,AP and MEDSAP(Fig. 83 and 89). TYPES:II and III,tricellular;2 short basal cells (especially L and MED). V,acute apex;tri or tetracellular; 2 short basal cells(especially MAR and LSMAR).	DISTRIBUTION:Dorsal and ventral faces;regions C and D: MAR, LSMAR and L (Fig.84 and 89). TYPE:V,acute apex;tri or tetracellular; 2 short basal cells.	DISTRIBUTION:Dorsal and ventral faces;regions C and D: MAR, LSMAR,L and MED(Fig. 85 and 89). TYPE:V,acute apex;tri or tetracellular; 2 short basal cells.	DISTRIBUTION:Dorsal and ventral faces;regions C and D: L and MED (Fig. 86 and 89). TYPE:V,acute apex; tri or tetracellular; 2 short basal cells.	DISTRIBUTION: Dorsal and ventral faces;regions B,C and D:MAR,LSMAR, L and MED (Fig.87 and 89). TYPE:V,acute apex;tri or tetracellular; 2 short basal cells.	Hairs absent.	DISTRIBUTION: Dorsal and ventral faces;regions B and C:MAR,LSMAR, L and MED;region D:L(Fig.88 and 89). TYPE:V,acute apex;tri or tetracellular; 2 short basal cells.

Abbreviations : AP - apical; L - lateral; LSMAR - lateral-submarginal; MAR - marginal; MED - median; MEDSAP - median-subapical.

Obs. : The types of hairs mentioned above are described in the Table 1.
The blanks mean absence of floral bracts.

TABLE 5. LEIOTHIX RUHL., PHILODICE MART., TONINA AUBL. AND BLASTOCAULON RUHL..

SPECIES	INVOLUCRAL BRACT		FLORAL BRACT		SEPAL		PETAL	
			♂ FLOWER	♀ FLOWER	♂ FLOWER	♀ FLOWER	♂ FLOWER	♀ FLOWER
Leiothrix fluitans (Mart.) Ruhl. subgenus Rheocaulon Ruhl.	Hairs absent.		Hairs absent.	Hairs absent.	Hairs absent.	Hairs absent.	Hairs absent.	Hairs absent.
Leiothrix crassifolia (Bong.) Ruhl. subgenus Calycocephalus Ruhl.	DISTRIBUTION:Ventral face; regions D and E:LSMAR,L and MED (Fig. 90 and 110). TYPE:V,acute apex;bicellular with 1 short basal cell,and tricellular with 2 short basal cells.		DISTRIBUTION:Ventral face;regions D and E: LSMAR,L and MED (Fig. 91 and 110). TYPE:V,acute apex;tricellular;2 short basal cells.	DISTRIBUTION:Ventral face;regions D and E: LSMAR,L and MED (Fig. 92 and 110). TYPE:V,acute apex;tricellular; 2 short basal cells.	DISTRIBUTION:Ventral face;regions D and E: LSMAR,L and MED (Fig. 93 and 110). TYPE:V,acute apex; bi or tricellular;1 or 2 short basal cells.	DISTRIBUTION:Ventral face;regions C,D and E:LSMAR,L and MED(Fig. 94 and 110). TYPE:V,acute apex;bi, tri or tetracellular; 1 or 2 short basal cells.	Hairs absent.	Hairs absent.
Leiothrix sclerophylla Alv.Silv. subgenus Eleutherandra Ruhl.	External Hairs absent.	Internal DISTRIBUTION:Ventral face;regions C and D: scarce,MAR and L(Fig. 95 and 110). TYPE:VII ,acute apex (variable angles);bi, tri or tetracellular; 1,2 or 3 short basal cells.	DISTRIBUTION:Ventral face;regions D and E: MAR,L and MED (Fig.96 and 110). TYPE:VII,acute apex (variable angles);bi, tri or tetracellular; 1,2 or 3 short basal cells.	DISTRIBUTION:Ventral face;region C: L and MED;regions D and E: MAR,L and MED (Fig. 97 and 110). TYPE:VII, acute apex (variable angles); tri or tetracellular; 2 or 3 short basal cells.	DISTRIBUTION:Ventral face;region C:L and MED;region D: MAR,L and MED (Fig. 98 and 110). TYPE:VII,acute apex (variable angles);bi, tri or tetracellular; 1 or 2 short basal cells.	DISTRIBUTION:Dorsal and ventral faces;regions A,B,C,D and E: MAR,L and MED;region F:MED(Fig.99 and 110). TYPE:VII,acute apex (variable angles);bi to hexacellular.	Hairs absent.	DISTRIBUTION:Dorsal face;regions B and C: MAR and scarce L and MED;region D:scarce L and MED (Fig. 100 and 110). TYPE:VII,acute apex (variable angles); bi to pentacellular; 1,2 or 3 short basal cells.
Philodice hoffmannseggii Mart.	DISTRIBUTION:Dorsal face;regions A,B,C and D:L and MED (Fig.101 and 110);there is no uniformity considering all the bracts observed. TYPE:XIII.		Hairs absent.	Hairs absent.	Hairs absent.	Hairs absent.	Hairs absent.	Hairs absent.
Tonina fluviatilis Aubl.	DISTRIBUTION:regions E and F: MAR (Fig. 102 and 110). TYPE:V,acute apex;tetra to hepta cellular;2 or 3 short basal cells.		Hairs absent.	Hairs absent.	Hairs absent.	DISTRIBUTION:regions D and E:MAR(Fig.103 and 110). TYPE:V,acute apex; tetra to hexacellular; 2 or 3 short basal cells.	Hairs absent.	DISTRIBUTION:petal reduced to hairs. TYPE:IV,penta to heptacellular.
Blastocaulon rupestre (Gardn.) Ruhl.	DISTRIBUTION:regions B and C: MAR (Fig. 104 and 110);some external bracts are glabrous. TYPE:XI,acute apex(variable angles);bi,tri or pentacellular; 1 or 2 short basal cells.		DISTRIBUTION:regions C,D,E and F:MAR(Fig. 105 and 110). TYPE:XI, acute apex (variable angles) ; tetra to hexacellular; 2 short basal cells.	DISTRIBUTION:regions B,C,D and E:MAR (Fig. 106 and 110). TYPE:XI, acute apex (variable angles); pentacellular; 2 short basal cells.	DISTRIBUTION:regions C,D,E and F:MAR (Fig. 107 and 110). TYPE:XI,acute apex (variable angles); pentacellular; 2 short basal cells.	DISTRIBUTION:regions D,E and F:MAR (Fig. 108 and 110). TYPE:XI,acute apex (variable angles);bi, tri or tetracellular; 1 or 2 short basal cells.	Hairs absent.	DISTRIBUTION:regions C,D,E and F: MAR(Fig.109 and 110). TYPE:XI,acute apex (variable angles); tetra or pentacellular;2 short basal cells.

Abbreviations: AP - apical; L - lateral; LSMAR - lateral-submarginal; MAR - marginal; MED - median; MEDSAP - median-subapical.

Obs.: The types of hairs mentioned above are described in the Table 1.

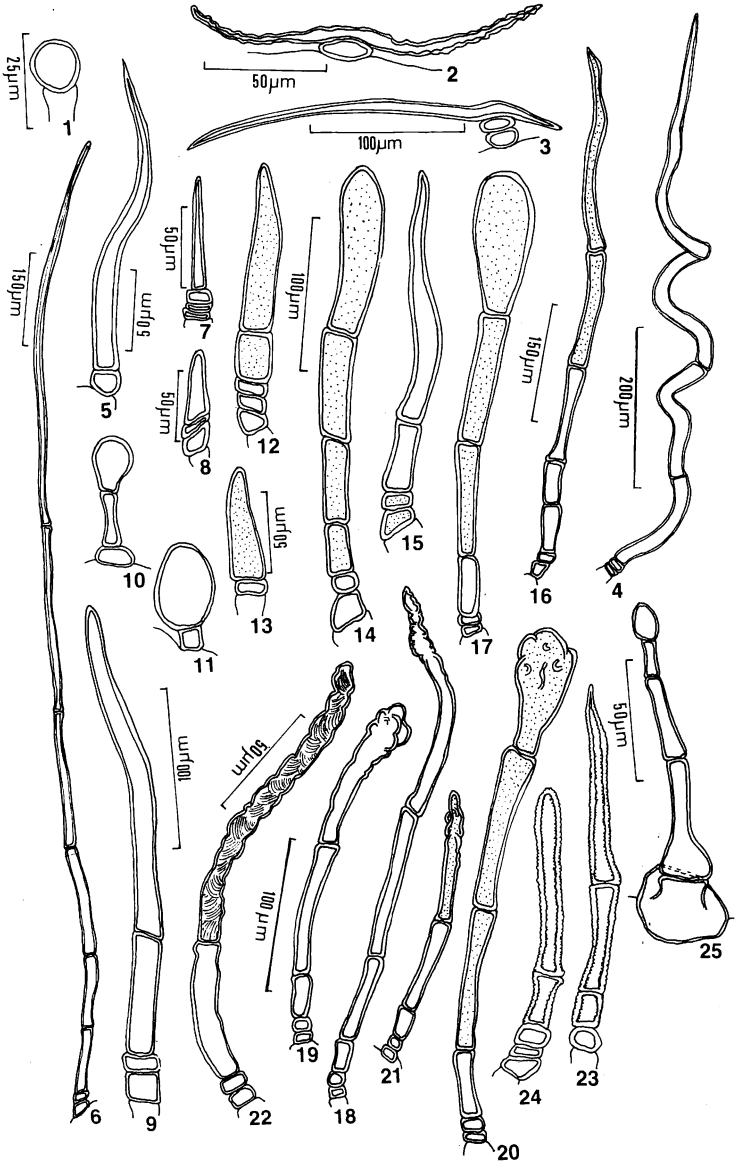

Fig. 1-25 – Hairs. Fig. 1 – type I. Fig. 2 – type II. Fig. 3 – type III. Fig. 4 – type IV. Fig. 5-11 – type V. Fig. 12-14 – type VI. Fig. 15 – type VII. Fig. 16-17 – type VIII. Fig. 18-19 – type IX. Fig. 20-21 – type X. Fig. 22 – type XI. Fig. 23-24 – type XII. Fig. 25 – type XIII.

Figs. 1-25 – Pelos. Fig. 1 – tipo I. Fig. 2 – tipo II. Fig. 3 – tipo III. Fig. 4 – tipo IV. Figs. 5-11 – tipo V. Figs. 12-14 – tipo VI. Fig. 15 – tipo VII. Figs. 16-17 – tipo VIII. Figs. 18-19 – tipo IX. Figs. 20-21 – tipo X. Fig. 22 – tipo XI. Figs. 23-24 – tipos XII. Fig. 25 – tipo XIII.

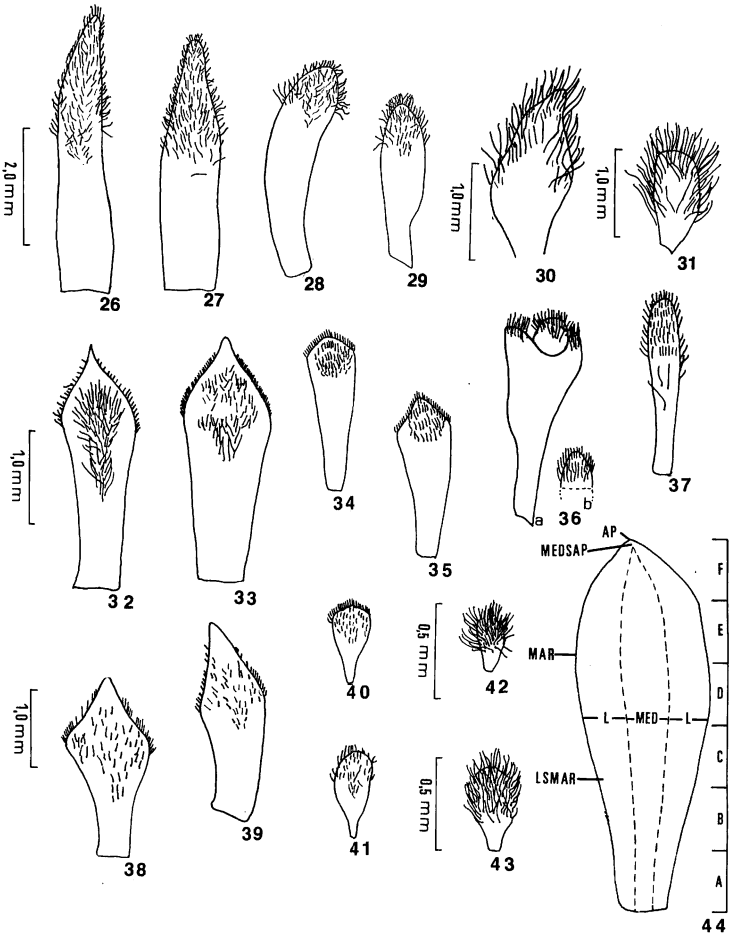

Fig. 26-31 – *Eriocaulon elichrysoides* Bong. Fig. 26 – Floral bract, ♂ flower. Fig. 27 – Floral bract, ♀ flower. Fig. 28 – Sepal, ♂ flower. Fig. 29 – Sepal, ♀ flower. Fig. 30 – Petal, ♂ flower. Fig. 31 – Petal, ♀ flower. Fig. 32-37 – *Eriocaulon cipoense* Alv. Silv. Fig. 32 – Floral bract, ♂ flower. Fig. 33 – Floral bract, ♀ flower. Fig. 34 – Sepal, ♂ flower. Fig. 35 – Sepal, ♀ flower. Fig. 36a, b – Petal, ♂ flower; a – general view b – apical portion. Fig. 37 – Petal, ♀ flower. Fig. 38-43 – Eriocaulon aquatile Koern. Fig. 38 – Floral bract, ♂ flower. Fig. 39 – Floral bract, ♀ flower. Fig. 40 – Sepal, ♂ flower. Fig. 41 – Sepal, ♀ flower. Fig. 42 – Petal, ♂ flower. Fig. 43 – Petal, ♀flower. Fig. 44 – General diagram (AP – apical; L – lateral; LSMAR – lateral-submarginal; MAR – marginal; MED – median; MEDSAP – median-subapical; A, B, C, D, E. F – transverse subdivisions).

Figs. 26-31 – Eriocaulon elichrysoides *Bong. Fig. 26 – Bráctea floral, flor ♂ . Fig. 27 – Bráctea floral, flor ♀ . Fig. 28 – Sépala, flor ♂ . Fig. 29 – Sépala, flor ♀ . Fig. 30 – Pétala, flor ♂ . Fig. 31 – Pétala, flor ♀ . Figs. 32-37* – Eriocaulon cipoense *Alv. Silv. Fig. 32 – Bráctea floral, flor ♂ . Fig. 33 – Bráctea floral, flor ♀ . Fig. 34 – Sépala, flor ♂ . Fig. 35 – Sépala, flor ♀ . Fig. 36 a, b – Pétala, flor ♂; a – vista geral; b – porção apical. Figs. 38-43* – Eriocaulon aquatile *Koern. Fig. 38 – Bráctea floral, flor ♂ . Fig. 39 – Bráctea floral, flor ♀ . Fig. 40 – Sépala, flor ♂ . Fig. 41 – Sépala, flor ♀ . Fig. 42 – Pétala, flor ♂ . Fig. 43 – Pétala, flor ♀ . Fig. 44 – Diagrama geral (AP – apical; L – lateral; LSMAR – lateral-submarginal; MAR – marginal; MED – mediano; MEDSAP – mediano-subapical; A,B,C,D,E,F – subdivisões transversais).

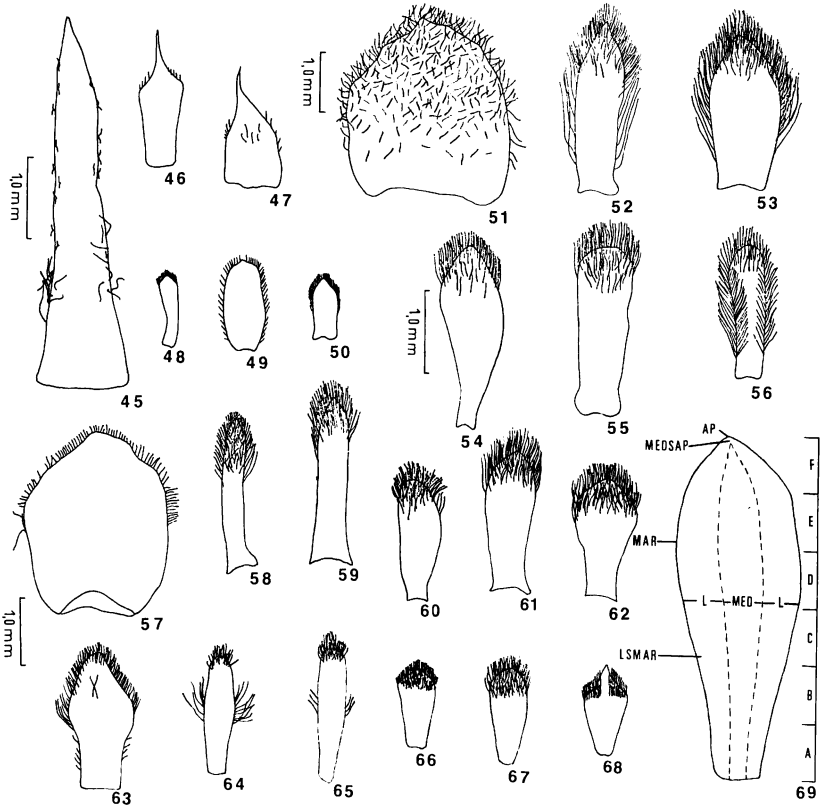

Fig. 45-50 – *Paepalanthus scleranthus* Ruhl. Fig. 45 – Involucral bract. Fig. 46 – Floral bract, ♂ flower. Fig. 47 – Floral bract, ♀ flower. Fig. 48 – Sepal, ♂ flower. Fig. 49 – Sepal, ♀flower. Fig. 50 – Petal, ♀ flower. Fig. 51-56 – *Paepalanthus bromelioides* Alv. Silv. Fig. 51 – Involucral bract. Fig. 52 – Floral bract, ♂ flower. Fig. 53 – Floral bract, ♀ flower. Fig. 54 – Sepal, ♂ flower. Fig. 55 – Sepal, ♀ flower. Fig. 56 – Petal, ♀ flower. Fig. 57-62 – *Paepalanthus planifolius* (Bong.) Koern. Fig. 57 – Internal involucral bract. Fig. 58 – Floral bract, ♂ flower. Fig. 59 – Floral bract, ♀ flower. Fig. 60 – Sepal, ♂ flower. Fig. 61 – Sepal, ♀ flower. Fig. 62 – Petal, ♀ flower. Fig. 63-68 – *Paepalanthus flaccidus* (Bong.) Kunth. Fig. 63 – Involucral bract. Fig. 64 – Floral bract, ♂ flower. Fig. 65 – Floral bract, ♀ flower. Fig. 66 – Sepal, ♂ flower. Fig. 67 – Sepal, ♀ flower. Fig. 68 – Petal, ♀ flower. Fig. 69 – General diagram (AP – apical; L – lateral; LSMAR – lateral-submarginal; MAR – marginal; MED – median; MEDSAP – median -subapical; A, B, C, D, E, F – transverse subdivisions).

Figs. 45-50 – Paepalanthus scleranthus *Ruhl.. Fig. 45 – Bráctea involucral. Fig. 46 – Bráctea floral, flor ♂. Fig. 47 – Bráctea floral, flor ♀. Fig. 48 – Sépala, flor ♂. Fig. 49 – Sépala, flor ♀. Fig. 50 – Pétala, flor ♀. Figs. 51-56* – Paepalanthus bromelioides *Alv. Silv.. Fig. 51 – Bráctea involucral. Fig. 52 – Bráctea floral,flor ♂. Fig. 53 – Bráctea floral,flor ♀. Fig. 54 – Sépala, flor ♂. Fig. 55 – Sépala, flor ♀. Fig. 56 -- Pétala, flor ♀. Figs. 57-62* - Paepalanthus planifolius *(Bong.) Koern.. Fig. 57 – Bráctea involucral interna. Fig. 58 – Bráctea floral, flor ♂. Fig. 59 – Bráctea floral, flor ♀. Fig. 60 – Sépala, flor ♂. Fig. 61 – Sépala, flor ♀. Fig. 62 – Pétala, flor ♀. Figs. 63-68* – Paepalanthus flaccidus *(Bong.) Kunth. Fig. 63 – Bráctea involucral. Fig. 64 – Bráctea floral, flor ♂. Fig. 65 – Bráctea floral, flor ♀. Fig. 66 – Sépala, flor ♂. Fig. 67 – Sépala, flor ♀. Fig. 68 – Pétala, flor ♀. Fig. 69 – Diagrama geral (AP – apical; L – lateral; LSMAR – lateral-submarginal; MAR – marginal; MED – mediano; MEDSAP – mediano-subapical; A, B, C, D, E, F – subdivisões transversais).*

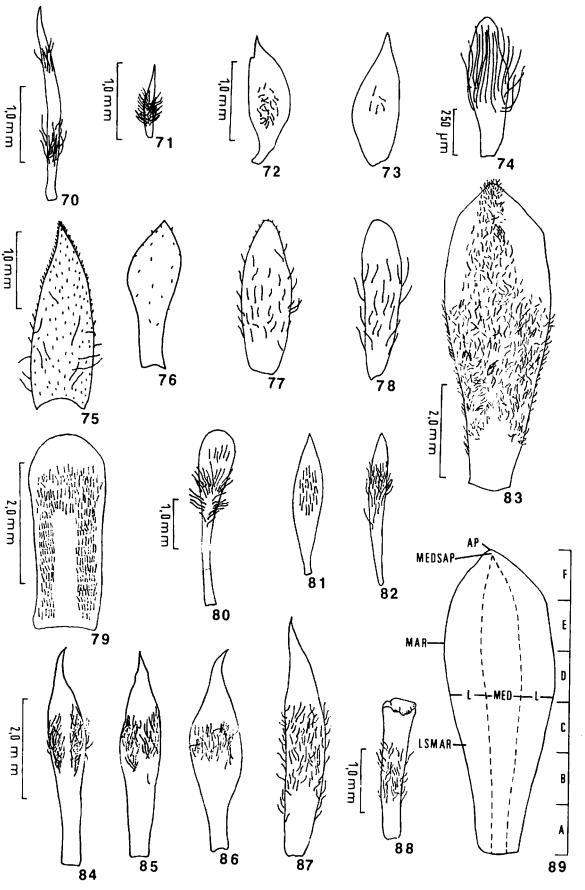

Fig. 70 – *Syngonanthus vernonioides* (Kunth) Ruhl. Petal, ♀ flower. Fig. 71 – *Syngonanthus chrysolepis* Alv. Silv.. Petal ♀ flower. Fig. 72-74 – *Syngonanthus caulescens* (Poir.) Ruhl.. Fig. 72 – Sepal, ♂ flower. Fig. 73 – Sepal, ♀ flower. Fig. 74 – Petal, ♀ flower. Fig. 75-78 – *Syngonanthus verticillatus* (Bong.) Ruhl. Fig. 75 – Involucral bract. Fig. 76 – Sepal, ♂ flower. Fig. 77 – Sepal, ♀ flower. Fig. 78 – Petal, ♀ flower. Fig. 79-82 – *Syngonanthus anthemidiflorus* (Bong.) Ruhl.. Fig. 79 – External involucral bract. Fig. 80 – Internal involucral bract. Fig. 81 – Sepal, ♂ flower. Fig. 82 – Sepal, ♀ flower. Fig. 83-88 – *Syngonanthus marginatus* Alv. Silv.. Fig. 83 – Involucral bract. Fig. 84 – Floral bract, ♂ flower. Fig. 85 – Floral bract, ♀ flower. Fig. 86 – Sepal, ♂ flower. Fig. 87 – Sepal, ♀ flower. Fig. 88 – Petal, ♀ flower. Fig. 89 – General diagram (AP – apical; L – lateral; LSMAR – lateral-submarginal; MAR – marginal; MED – median; MEDSAP – median-subapical; A, B, C, D, E, F – transverse subdivisions).

Fig. 70 – Syngonanthus vernonioides (Kunth) Ruhl.. Pétala, flor ♀. Fig. 71 – Syngonanthus chrysolepis *Alv. Silv.. Pétala, flor ♀. Figs. 72-74* – Syngonanthus caulescens *(Poir.) Ruhl.. Fig. 72 – Sépala, flor ♂. Fig. 73 – Sépala, flor ♀. Fig. 74 – Pétala, flor ♀. Figs. 75-78* – Syngonanthus verticillatus *(Bong.) Ruhl.. Fig. 75 – Bráctea involucral. Fig. 76 – Sépala, flor ♂. Fig. 77 – Sépala, flor ♀. Fig. 78 – Pétala, flor ♀. Figs. 79-82* – Syngonanthus anthemidiflorus *(Bong.) Ruhl.. Fig. 79 – Bráctea involucral externa. Fig. 80 – Bráctea involucral interna. Fig. 81 – Sépala, flor ♂. Fig. 82 – Sépala, flor ♀. Figs. 83-88* – Syngonanthus marginatus *Alv. Silv.. Fig. 83 – Bráctea involucral. Fig. 84 – Bráctea floral, flor ♂. Fig. 85 – Bráctea floral, flor ♀. Fig. 86 – Sépala, flor ♂. Fig. 87 – Sépala, flor ♀. Fig. 88 – Pétala, flor ♀. Fig. 89 – Diagrama geral (AP – apical; L – lateral; LSMAR – lateral-submarginal; MAR – marginal; MED – mediano; MEDSAP – mediano-subapical; A, B, C, D, E, F – subdivisões transversais).*

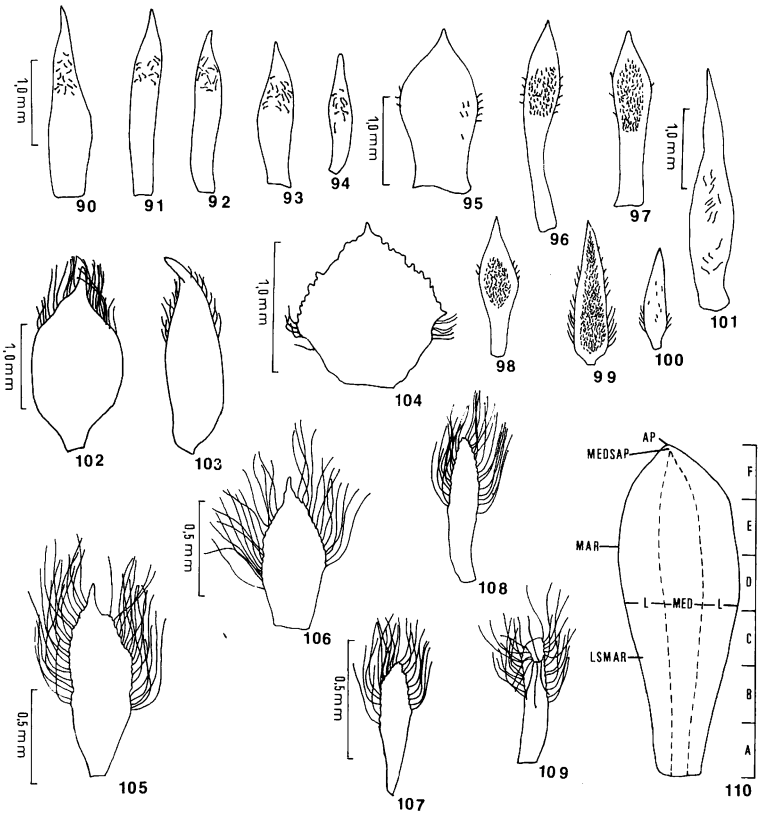

Fig. 90-94 – *Leiothrix crassifolia* (Bong.) Ruhl. Fig. 90 – Involucral bract. Fig. 91 – Floral bract, ♂ flower. Fig. 92 – Floral bract, ♀ flower. Fig. 93 – Sepal, ♂ flower. Fig. 94 – Sepal, ♀ flower. Fig. 95-100 – *Leiothrix sclerophylla* Alv. Silv.. Fig. 95 – Internal involucral bract. Fig. 96 – Floral bract, ♂ flower. Fig. 97 – Floral bract, ♀ flower – Fig. 98 – Sepal, ♂ flower. Fig. 99 – Sepal, ♀ flower. Fig. 100 – Petal, ♀ flower. Fig. 101 – *Philodice hoffmannseggii* Mart.. Involucral bract. Fig. 102-103 – *Tonina fluviatilis* Aubl.. Fig. 102 – Involucral bract. Fig. 103 – Sepal, ♀ flower. Fig. 104-109 – *Blastocaulon rupestre* (Gardn.) Ruhl. Fig. 104 – Involucral bract. Fig. 105 – Floral bract, ♂ flower. Fig. 106 – Floral bract, ♀ flower. Fig. 107 – Sepal, ♂ flower. Fig. 108 – Sepal, ♀ flower. Fig. 109 – Petal, ♀ flower. Fig. 110 – General diagram (AP – apical; L – lateral; LSMAR – lateral-submarginal; MAR – marginal; MED – median; MEDSAP – median-subapical; A, B, C, D, E, F – transverse subdivisions).

Figs. 90-94 – Leiothrix crassifolia *(Bong.) Ruhl.. Fig. 90 – Bráctea involucral. Fig. 91 – Bráctea floral, flor ♂. Fig. 92 – Bráctea floral, flor ♀. Fig. 93 – Sépala, flor ♂. Fig. 94 – Sépala, flor ♀. Figs. 95-100* – Leiothrix sclerophylla *Alv. Silv.. Fig. 95 – Bráctea involucral interna. Fig. 96 – Bráctea floral, flor ♂. Fig. 97 – Bráctea floral, flor ♀. Fig. 98 – Sépala, flor ♂. Fig. 99 – Sépala, flor ♀. Fig. 100 – Pétala, flor ♀. Fig. 101* – Philodice hoffmannseggii *Mart.. Bráctea involucral. Figs. 102-103* – Tonina fluviatilis *Aubl.. Fig. 102 – Bráctea Involucral. Fig. 103 – Sépala, flor ♀. Figs. 104-109* – Blastocaulon rupestre *(Gardn.) Ruhl.. Fig. 104 – Bráctea involucral. Fig. 105 – Bráctea floral, flor ♂, Fig. 106 – Bráctea floral, flor ♀. Fig. 107 – Sépala, flor ♂. Fig. 108 – Sépala, flor ♀. Fig. 109 – Pétala, flor ♀. Fig. 110 – Diagrama geral (AP – apical; L – lateral; LSMAR – lateral-submarginal; MAR – marginal; MED – mediano; MEDSAP – mediano-subapical; A, B, C, D, E, F – subdivisões transversais).*