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Research Article

NUTLET MORPHOLOGY IN SPECIES OF ABILDGAARDIEAE LYE (CYPERACEAE) FROM TAMIL NADU AND ITS TAXONOMIC SIGNIFICANCE

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ABSTRACT
The nutlet morphology of 3 species of *Bulbostylis* Kunthand 12 species of *Fimbristylis* (L.) Vahl of the tribe Abildgaardieae Lye from Tamil Nadu were examined using light microscope. Nultlets of these two genera show a wide range of diversity in their shape, size, colour and surface ornamentation. In the genus *Fimbristylis*, the shape of the nutlets varies from trigonous-obovoid, biconvex-obovate, obovate-orbicular, biconvex-compressed and globular-obovoid and size from 0.5 to 1.3 mm long. In *Bulbostylis* nutlets shape varies from triquetrous-obovoid, obovate-orbicular-trigonous and size from 0.5 to 1 mm long. Surface ornamentation in the nutlets of *Fimbristylis* is warty, tuberculate, striate-reticulate and transverse-wavy ridged types and in *Bulbostylis* they are irregularly-puncticulate, striate-reticulate and transeverse-wavy ridged. The present study on the nutlet morphology of the tribe Abildgaardieae summarised that this can very well be used to distinguish the species coming under its genera, *Bulbostylis* & *Fimbristylis* in Tamil Nadu.

Keywords: *Abildgaardieae, Cyperaceae, Nutlet Morphology, Tamil Nadu*

INTRODUCTION
Abildgaardieae Lye is a taxonomicallycomplicated tribe under the third largest monocotyledonous family, Cyperaceae (Muasya *et al*., 1998; Govaerts *et al*., 2007). It is represented by two genera, *Fimbristylis*(L.) Vahland *Bulbostylis* Kunth (Goetghebeur, 1998; Simpson, 2003). The tribe *Abildgaardieae* characterised by having the glumes usually spiral, rarely in distichous, prominent joint between style base and ovary with a distinct border line, usually swollen and/or fimbriate, the style base often persistent like a button or beak (*Bulbostylis*) and caducous (*Fimbristylis*).
Fimbristylis is the 4th largest genus within the family Cyperaceae, having about 306 species and there are about 100 species of *Bulbostylis* distributed worldwide in tropical and temperate zones (Bruhl, 2006; Wilson, 2007). In India the tribe *Abildgaardieae* represented with 91 species in *Fimbristylis* and 7 species in *Bulbostylis* (Karthikeyan *et al*., 1989). Of which 51 species in *Fimbristylis* and 3 species in *Bulbostylis* reported from Tamil Nadu (Henry *et al*., 1989). The first basic study of fruit epidermal silica bodies was accomplished by Schuyler (1971), on two species of *Scirpus* L. and *Eriophorum* L., which leads to the development of a new set of conserved characters that could be re-evaluate the systematics of Cyperaceae. Microscopic studies of Indian *Fimbristylis* (Wujek *et al*., 1992: Wujek *et al*., 1994) revealed sufficient micromorphological achene character differences to suggest their use systematically at the sectional rank. In the tribe *Abildgaardieae* the characters of nutlets such as shape, size and surface ornamentation are effective in discrimination of species at the generic levelthus, taxonomically are reliable source. In this work morphology of nutlets of 15 species of tribe *Abildgaardieae* distributed in Tamil Nadu (Table: 1) were subjected to be studied to evaluate their taxonomic significance under its genera *Fimbristylis* and *Bulbostylis*.

MATERIALS AND METHODS
The nutlets were collected from fresh plants from different areas in Tamil Nadu and herbarium specimens housed at Madras Herbarium (MH). Collected specimens were identified using Fischer (1928), Clarke

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(1893), Koyama (1985), and Kern (1974). The herbarium specimens prepared based on the standard method (Fosberg and Sachet, 1965) was deposited in MH. Details of the collections used for the study are provided in Table 1.

Table 1: List of taxa of the tribe Abildgaardieae studied

Taxon	Voucher details
Fimbristylis acuminata Vahl	Pudukottai district, Narthamalai, 120m, 8.9.1985, *C. Arulappan*492
F. argentea(Rottb.)Vahl	Madurai, Thidiyan, Thirumangalam, 250m, 3.9.1985, *K. Ravikaumar* 2490
F.bisumbellata(Forssk.) Bubani	Perambalur district, Karaivetti WLS, 150 m, 19.11.2013, *G.V.S. Murthy & K. Yarrayya*129898
F. cymosa R.Br.	Pudukottai district, Poovarasankudi, 70m, 24.2.1985, *C. Arulappan* 375
F. dichotoma(L.)Vahlsub.sp. *dichotoma*	Nilgiris district, Anaikatty, 850m, 21.8.1970, *G.V. Subbarao*36143
F. eragrostis (Nees) Hance	Kanniyakumari district, way to Balamore, 1450m, 16.3.1979, *A.N. Henry* 60728
F. ferruginea(L.)Vahl	Thanjavur district, Pattukkottai, 5m, 31.1.1978, *K. Ramamurthy* 53672
F. kingie Gamble ex Boeckeler	Nilgirisdistrict, Mukurthi, 2100m, 22.7.1970, *J.L. Ellis* 34796.
*F. littoralis*Gaudich.	Thanjavur district, Thiruvarur, 30m, 28.5.1978, *V.J. Nair* 57149
F. ovata (Burm.f.)J.Kern	Perambalur district, Karaivetti WLS,150m, 19.11.2013, *G.V.S. Murthy& K. Yarrayya* 129819
*F. rugosa*Govind.	Kanniyakumari district, Vellachithodi, 13.7.1969, *Thaya Singh* 9549
F. schoenoides (Retz.)Vahl	Cuddalore district, way to Marakkanam, 10m, 17.2.1979,*K. Ramamurthy*60256
Bulbostylisbarbata(Rottb.)C.B.Clarke	Ramanathapuram district, Sirumalai, 250m, 22.2. 1979, *N.C. Nair* 61075
B.densa(Wall.)Hand.-Mazz.	Nilgiris district, Ebanad, 1725m, 10.9.1970. *G.V. Subbarao* 36626
*B. puberula*Kunth	Ramanathapuram district, Valantharavai, 47m, 23.2.1988, *V. Balasubramaniam* 1646

In order to investigate the nutlets, first the mature nutlets were soaked in ethanol (50%) for 48 hours. Then air driednutlets were examined using Nikon SMZ 1500stereomicroscope attached with Nikon Digital sight DS-Fi1 camera.

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RESULTS AND DISCUSSION

Different types of shapes in nutlets have been observed in the present study.

Table 2: Morphological characters of nutlets of tribe Abildgaardieae

	Taxa	Shape	Length(in mm)	Width (in mm)	Colourof Nutlet	Texture
1	*Fimbristylis acuminata* Vahl	Obovate, orbicular	1.0-1.5	1.2-1.3	Whitish/cream colour	Transverse ridges, finely striate
2	*F.argentea* (Rottb.)Vahl	Obovate biconvex	0.4-0.6	0.3-0.4	Yellow	Smooth
3	*F.bisumbellata*(Forssk.) Bubani	Obovate, biconvex	0.5-0.6	0.4-0.5	Golden yellow	Smooth
4	*F. cymosa* R.Br.	Obovate, biconvex	0.8-1.0	0.5-0.7	Dark brown	Warty
5	*F. dichotoma* (L.)Vahlsub.sp. dichotoma	biconvex, obovate	0.7-1.1	0.7-0.8	Light yellow-creamish	Trabeculate, striped
6	*F.eragrostis* (Nees) Hance	Obovate, Trigonous	0.75-1.0	0.7-0.9	Whitish-brown	Verruculose
7	*F. ferruginea* (L.)Vahl	Obovate, unequal biconvex	1.4-1.6	0.9-1.0	Orange-brown	Smooth
8	*F. kingii* Gamble ex Boeckeler	Trigonou, obovoid	1.2-1.3	0.8-1.0	Greyish	Striped
9	*F. littoralis* Gaudich.	Trigonou, obovoid	0.6-0.7	0.3-0.4	Yellow	Warty
10	*F. ovata* (Burm.f.)J.Kern	Trigonou, obovate	2.0-2.2	1.4-1.5	Cream-white	Warty
11	*F. rugosa* Govind.	Trigonou, obovoid	0.8-1.0	0.6-0.7	Yellow	Warty
12	*F. schoenoides* (Retz.)Vahl	Obovate, orbicular	1.6-1.7	1-1.2	Yellow-white	Smooth
13	*Bulbostylis barbata*(Rottb.)C.B.Clarke	Obovate, orbicular, trigonous	0.6-0.7	0.4-0.5	Cream-white	Smooth
14	*B. densa* (Wall.)Hand.-Mazz.	Obovate, trigonous	0.7-0.9	0.5-0.6	Cream-white Yellow	Irregularly Puncticulate
15	*B. puberula* Kunth	Obovoid, triquetros	0.7-0.8	0.5-0.6	Light yellow	Transversely wavy wrinkled

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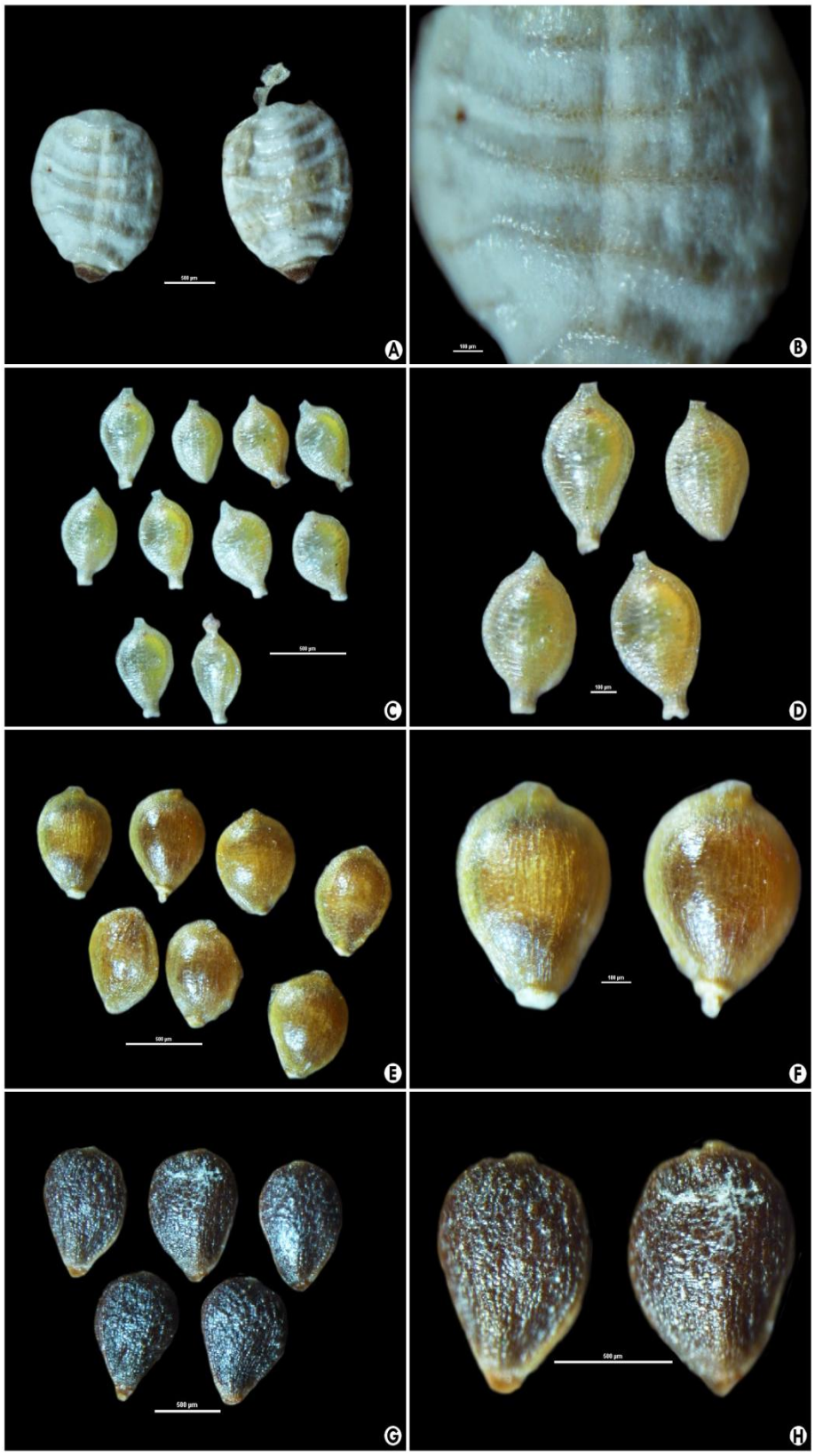

Plate 1: (A-B) *F. acuminate* Vahl, (C-D) *F.argentea* (Rottb.) Vahl, (E-F) *F.bisumbellata* (Forssk.) Bubani, (G-H) *F.cymosa* R.Br.

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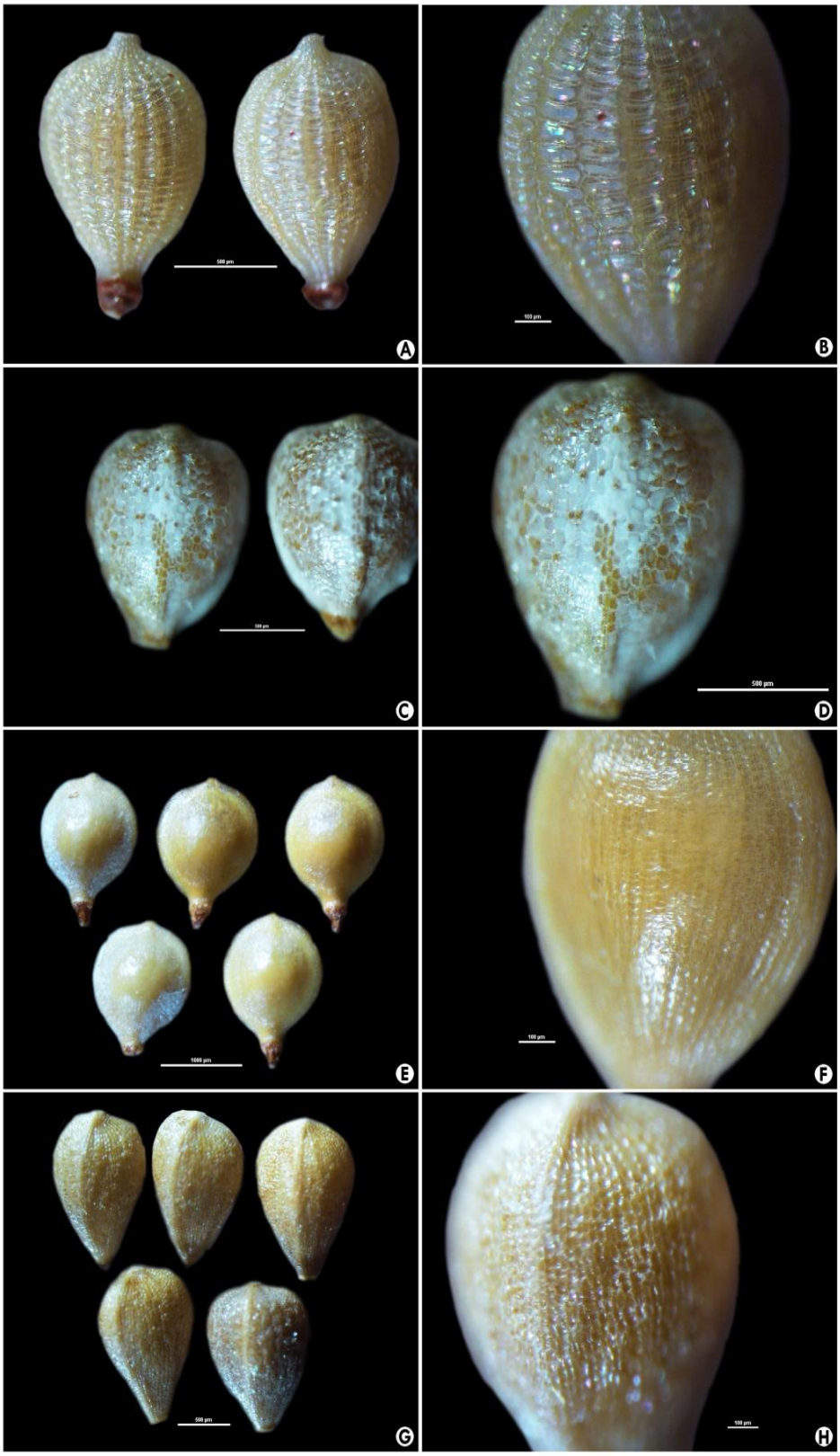

Plate 2: (A-B) *F.dichotoma* (L.) Vahl subsp. *dichotoma* (C-D) *F.eragrostis* (Nees) Hence, (E-F) *F.ferruginea* (L.) Vahl, (G-H) *F.kingii* Gamble ex Boeckeler

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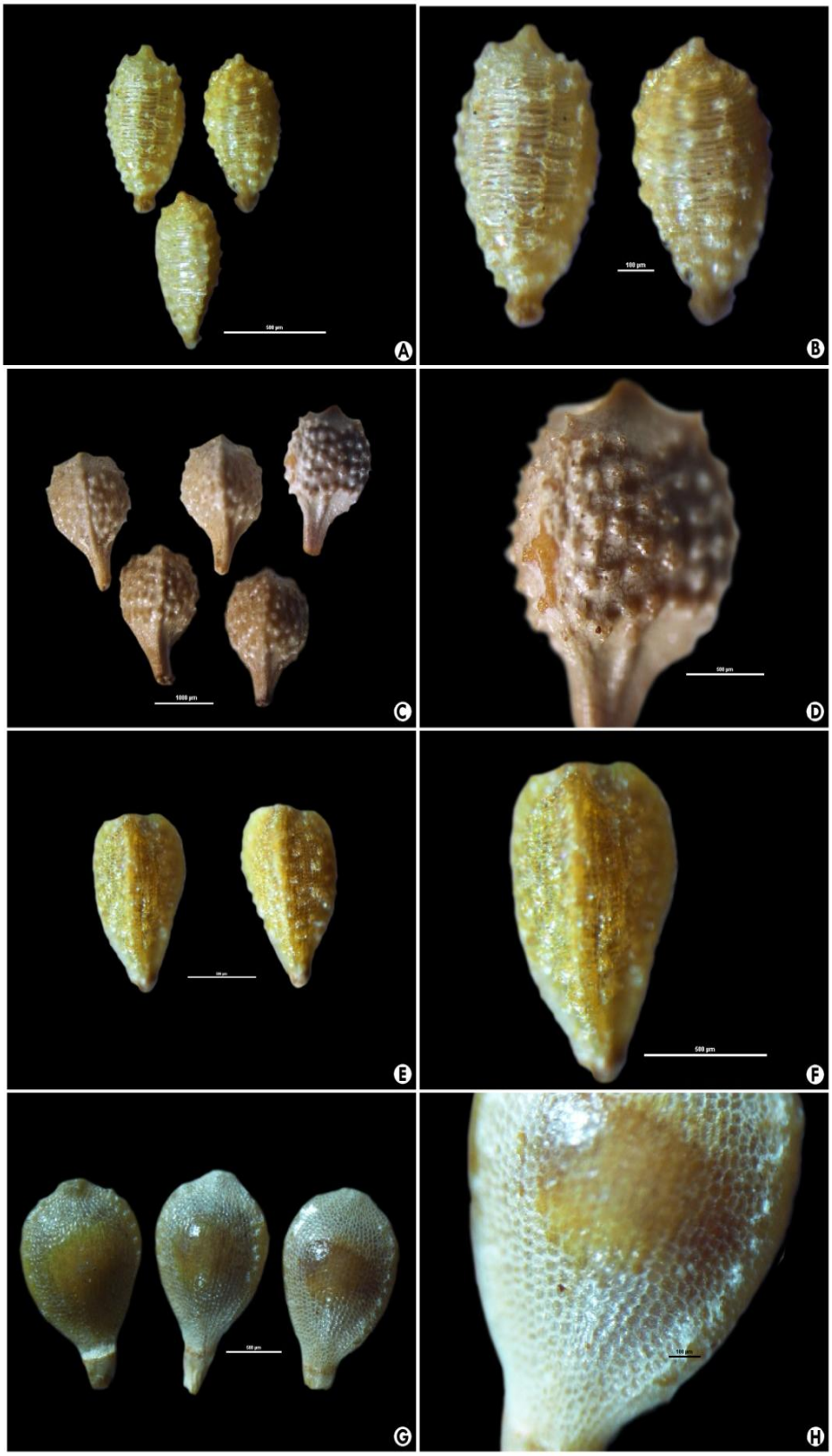

Plate 3: (A-B) *F.littoralis* Gaudich., (C-D) *F.ovata* (Burm.f.) J.Kern, (E-F) *F.rugosa* Govind., (G-H) *F.schoenoides* (Retz.) Vahl

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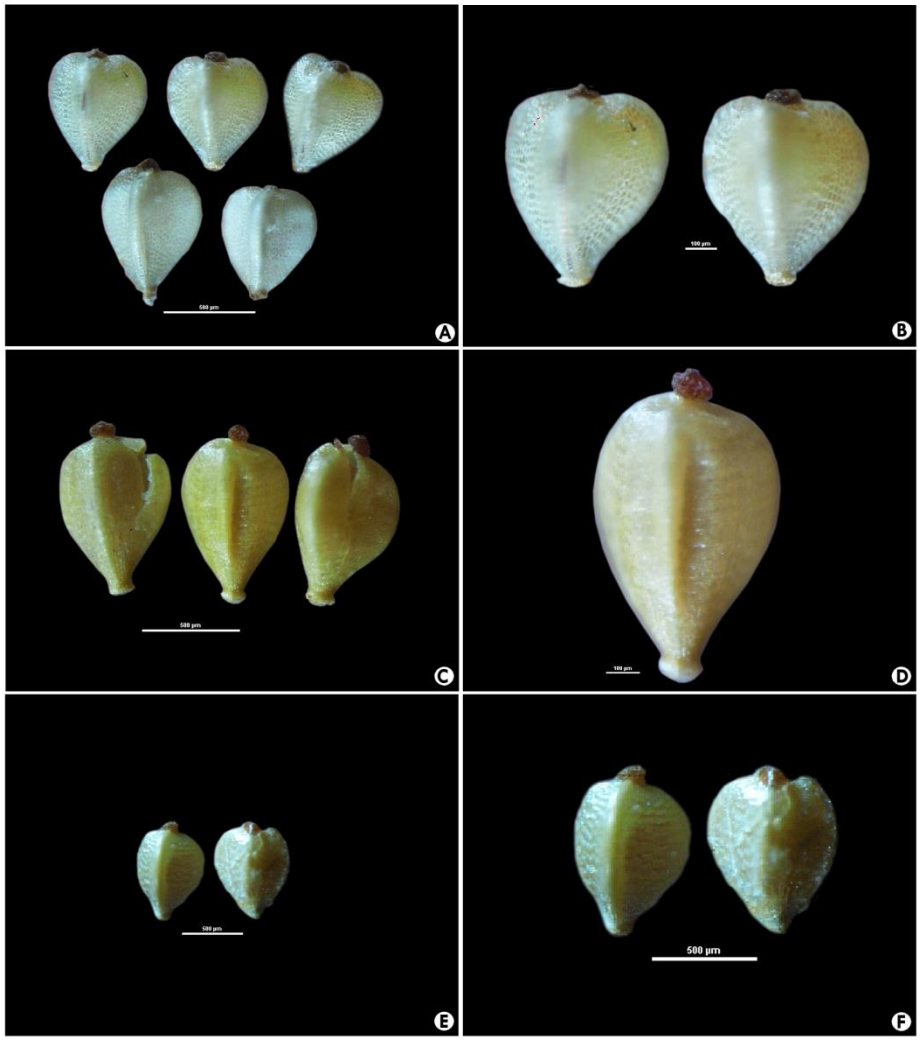

Plate 4: (A-B) *B.barbata* (Rottb.) C.B.Clarke, (C-D) *B.densa* (Wall.) Hand.-Mazz., (E-F) *B.purberula* Kunth

Nutletsare trigonous (*Fimbristylis eragrostis, F. kingii, F. littoralis, F. ovata, F. rugosa, Bulbostylis barbata* and *B. densa*), biconvex (*F. argentea, F.bisumbellata, F. Cymosa* and *F. dichotoma*), orbicular (*F. acuminate* and *F. schoenoides*), unequal biconvex (*F. ferruginea*) and triquetrous (*Bulbostylis puberula*). The colour of nutlets also different from white and yellow to dark brown. The size of nutlets is a characteristic trait, in which the largest is in *F. schoenoides* (1.6 – 1.7 mm long) and the smallest belongs to *F. argentea* (0.4 – 0.6 mm long). In *Bulbostylis*, the longeststyle base is of *B. Puberula* (0.1 mm long) and the shortest is of *B. barbata* (0.06 mm long) were noticed (Table 2).

The surface ornamentation of the nutlets varies from smooth, striate, warty, verruculose, striped and puncticulate, obscurely reticulate with longitudinally oblong cells and convex cells. Epidermal cell walls in most of the species are isodiametrical hexagonal, rectangular, longitudinally oblong and transversely oblong. In the species of *Bulbostylis*, persistent style base shows depressed bulbous (*B. densa*), depressed globular (*B. barbata*) and conical globular (*B.puberula*), (Table 2 & Plates 1-4).

In the present study nutlets of both the genera in *Ablidgaardieae* found to have enormous variations in its surface ornamentation. These characteristics are valuable tools in generic circumscription. In recent decade an approach towards the micromorphological studies including Scanning Electron Microscopy has been applied to confirm taxonomic significance of fruit epidermal characters as a criterion for differentiating the families, genera and species by various workers (Wujek *et al*., 1992; Wujek *et al*.,

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1994). The species examined in this tribe provided many characters which have been well used to recognise them. In *Bulbostylis*, the nutlets have the persistent style base with trigonous, biconvexed, orbicular shapes but in *Fimbristylis*, the nutlets have without persistent style base with trigonous, biconvexed, orbicular shapes. The nutlets are distinct in their surface ornamentation such as verruculose, trabeculate, striate, striped, warty, and minute and irregularly puncticulate, obscurely reticulate with longitudinally oblong cells and convex cells. Therefore the nutlet morphology isa prominent trait for the infrageneric level separation.

Conclusion

The nutlet morphological study of 15 species of the tribe *Ablidga ardieae* from Tamil Nadu, provided a number of characters such as shape, size, colour and surface ornamentation todistinguish the species coming under the genera *Fimbristylis* and *Bulbostylis.*

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REFERENCES

Clarke CB (1893). Cyperaceae. In: *The Flora of British India,* edited by Hooker JD (L. Reeve & Co.) London **6** 453-663.

Fischer CEC (1928). Cyperaceae. In: *The Flora the Presidency of Madras,* edited by Gamble JS (Adlard & Sons) London **3** 1662-1667.

Fosberg FR and Sachet H (1965). Manual of tropical Herbaria. *Regnum Vegetabile,* The Netherlands **39**.

Goetghebeur P (1998). Cyperaceae. In: *The Families and Genera of Vascular Plants,* edited by Kubitzki K (Springer-Verlag) Berlin, Germany **4** 141-190.

Govaerts R, Simpson DA, Goetghebeur P, Wilson KL, Egorova T and Brul JJ (2007). *World checklist of Cyperaceae*. The Board of Trustees of the Royal Botanic Gardens, Kew.

Henry AN, Chitra V and Balakrishnan NP (1989). *Flora of Tamil Nadu, India*. BSI (Ser 1) Coimbatore **3**.

Karthikeyan S, Jain SK, Nayar MP and Sanjappa M (1989). *Florae Indicae Enumeratio: Monocotyledonae*, BSI, Kolkata 32-73.

Kern JH (1974). Cyperaceae 1. In: *Flora Malesiana,* edited by Van Steenis CGGJ, ser. 1 (Noordhooff International Publishing) Leyden, The Netherlands 7(3) 435-753.

Koyama T (1985). Cyperaceae. In: *Revised Hand Book to the Flora of Ceylone* 5, edited by Dassanayake MD and Fosberg FR (Oxford & IBH) New Delhi 126-127, 153-166, 253-254.

Menapace FJ, Wujek DE and Reznicek AA (1986). A systematic revision of the genus Carex (Cyperaceae) with respect to the section *Lupulinae. Canadian Journal of Botany* **64** 2785-2788.

Muasya AM, Simpson DA, Chase MW and Culham A (1998). An assessment of suprageneric phylogeny in Cyperaceae using rcbL DNA sequences. *Plant Systematics and Evolution* **211** 257-271.

Schuyler AE (1971). Scanning Electron Microscopy of achene epidermis in species of Scirpus (Cyperaceae) and related genera. *Proceedings of the Academy of Natural Sciences of Philadelphia* **123**(2) 29-52.

Simpson DA, Furness Carol A, Hodkinson Trevor R, Muasya AM and Chase MW (2003). Phylogenetic relationships in Cyperaceae subfamily Mapanioideae inferred from pollen and plastid DNA sequence data. *American Journal of Botany* **90** 1071-1086.

World Checklist of Monocotyledons (2006). *The Board of Trusrees of the Royal Botanic Gardens, Kew.* Available: http://www.kew.org/wcsp/monocots/.

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Wujek DE (1994). Achene micromorphology of some indianCyperaceae II, *Fimbristylis. Asian Journal of Plant Sciences* **6** 1-17.
Wujek DE and Menapace FJ (1986). Taxonomy of *Carex* section Folliculatae using achene morphology. *Rhodora* **88** 399-403.
Wujek DE, Verma SK and Ruhlman RA (1992). Achene micromorphology of some Indian Cyperaceae (*Cyperus*, *Fimbristylis*, *Pycreus*, *Scirpus* and *Scleria*). *Asian Journal of Plant Science* **4** 1-19.

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