

**DISCUSSION
AND CONCLUSIONS**

DISCUSSION AND CONCLUSIONS:

Danthonidium gammiei belongs to tribe Danthoneae of subfamily Pooideae. Danthoneae consists of genera viz *Centropodia*, *Danthonia*, *Danthonidium*, *Erichne*, *Schismus* and *Zenkaria*. *Danthonia gammiei* described by Bhide (1912) was separated into a new genus *Danthonidium* (Hubbard 1936) which differs from *Danthonia* in its 1 flowered spikelet, lemma -2 lobed at the tip with very stout awn between the lobes.

Leaf anatomy of *Danthonidium gammiei* shows similarities with genus *Danthonia* in having long cell with sinuous walls, Panicoid type of microhairs, absence of papillae, fan shaped bulliform cells, mesophyll non radiate form, mid rib conspicuous with single bundle and vascular bundle with sclerenchymatous girders.

Danthonia and *Danthonidium* differ anatomically in some characters. Leaves of *Danthonidium* possess stomata and vertical dumbbell shaped 'Oryza type' silica bodies while stomata are absent in *Danthonia* and leaves possess dumbbell shaped or nodular Panicoid type of silica bodies. This supports separation of *Danthonidium* from *Danthonia*.

Hubbardia heptaneuron belongs to tribe Hubbardiaceae of subfamily Pooideae. Bor 1951 described a new monotypic genus *Hubbardia* from India. The grass was collected in 1919 from Jog falls by Sedgwick. However, the grass remained undescribed till father Santapau handed over it to Bor. This grass was collected only on two occasions from clinging rocks near the famous Gersoppa falls on the Sharawati river. The species disappeared from the fall and was declared as possibly extinct from the region (Ahmedullah and M.P.Nayer, 1987) after construction of dam on the Sharawati river and probably drying of Jog falls during summer. It was collected after about 80 years from Tilarí Ghat of Kolhapur (Potdar *et al* 2000). In spite of intensive and extensive search for the species in other similar habitats in northern Western Ghats, it could not be collected (Potdar 2006).

It is one of the critically endangered species of Western Ghats. Presently there is species restoration programme on *Hubbardia heptaneuron* financed by Department of Biotechnology and more than 2500 individuals of the grass in about 10 localities have been established by research group working at Department of Botany, Shivaji University, Kolhapur.

This monotypic genus was separated into separate tribe for its unique spikelet which consists of two 7 nerved glumes enclosing two 7 nerved scales, the upper of which contains hermaphrodite flower. According to Bor (1950) the grass can not be placed in Panicoideae because of Festucoid type of chlorophyll tissue in the leaves and absence of two celled hairs. However, the anatomy of leaf does not seem of Festucoid type. The leaf consists of three layer of cells, upper layer somewhat palisade like below adaxial epidermis, loosely arranged spongy cells and two to four radial cells from vascular bundles.

Leaf characters show similarities with tribe Isachneae as also observed by Clifford (1964) except that he had wrongly treated abaxial epidermis for adaxial probably due to extremely thin leaves and use of herbarium material for his studies.

Anatomical characters of Isachneae agree with those of *Hubbardia* confirming its affinities but seven nerved glumes are unknown in Isachneae and therefore separation of genus into separate tribe is justified as already done by Bor (1960).

Indopoa papurcula belongs to tribe Eragrostideae of subfamily Pooideae. Eragrostideae consists of genera viz. *Arachne*, *Cleistogenes*, *Dactyloctenium*, *Dinebra*, *Diplachne*, *Eleusine*, *Elytrophorus*, *Eragrostiella*, *Eragrostis*, *Halopyrum*, *Leptochloa*, *Myristachya*, *Neyraudia*, *Orinus*, *Silentvalleya* and *Tripogon*.

Tripogon papurcula described by Stapf (1896) was separated by Bor (1958) into a new monotypic genus *Indopoa* which differs from other members of *Tripogon* in its perfect awn twisted at the base. According to Bor (1958) *Indopoa papurcula* is similar with *Tripogon* in its spikelet, inflorescence; in it lower glume of lateral spikelet being furnished with blunt tooth right nearest to rachis. Similarly the genus has unique caryopsis. Caryopsis is very long in comparison with its diameter, flunty in texture and extremely small anthers.

According to Metcalf (1960) the microhairs of leaves strongly suggest those of Chlorideae while the silica bodies have markedly resemblance those of *Bouetolia* which is member of the same tribe. The leaf anatomy resembles that of *Eragrostiella*.

Leaf anatomy of *Indopoa papurcula* closely resembles with that of *Tripogon* species in having long rectangular cells with markedly sinuous wall, Chloridoid spherical type microhairs, absence of papillae, saddle shaped silica bodies, mesophyll with radiate chlorenchyma, association of bulliform cells with colourless

mesophyll cells to form deeply penetrating fans and all vascular bundles with abaxial and adaxial girder.

Anatomical features of leaf support close affinities of *Indopoa* with *Tripogon*, but have some significant differences as discussed above which delimit the genus.

Pseudodichanthium serrafalcoides belongs to tribe Andropogoneae of subfamily Panicoideae. Andropogoneae consists of genera such as *Andropogon*, *Apluda*, *Apocopsis*, *Arthraxon*, *Bhidea*, *Bothrichloa*, *Capillipedium*, *Chrysopogon*, *Cleistahne*, *Coelorachis*, *Cymbopogon*, *Dichanthium*, *Dietomis*, *Dimeria*, *Elyonurus*, *Eremochloa*, *Eremopogon*, *Erianthus*, *Eriochyris*, *Euclasta*, *Eulalia*, *Eulaliopsis*, *Germainia*, *Heteropholis*, *Hyparrhenia*, *Imparata*, *Ischamum*, *Iseilama*, *Lasirus*, *Lophopogon*, *Manisuris*, *Microstegium*, *Miscanthus*, *Mnesithea*, *Narenga*, *Ophiuros*, *Phacelurus*, *Pogonachne*, *Pogonatherum*, *Polytrias*, *Pseudanthristia*, *Pseudodichanthium*, *Pseudopogonatherum*, *Pseudosorghum*, *Ratzeburgia*, *Rottboellia*, *Saccharum*, *Schizachyrium*, *Sclerostachya*, *Sehima*, *Sorghum*, *Spodiopogon*, *Thaumasochloa*, *Thelepogon*, *Thyrsia*, *Triplopogon*, *Vetiveria* and *Vossia*.

Dichanthium serrafalcoides described by Blatter and Mc.Cann (1928) was separated into a new monotypic genus *Pseudodichanthium serrafalcoides* (Bor, 1940) which differs from *Dichanthium* in its curved spike like racemes and lower glume of sessile spikelet 2-toothed at apex.

Leaf anatomy of *Pseudodichanthium serrafalcoides* shows similarities with genus *Dichanthium* in having long rectangular cells with sinuous walls, Panicoid type microhairs, absence of papillae, dumbbell shaped silica bodies, radiate mesophyll, small vascular bundles without sclerenchyma, single bundle sheath, large vascular bundle with abaxial and adaxial girder and keel conspicuous with large median vascular bundle.

Anatomical feature of leaf indicate close affinities of *Pseudodichanthium serrafalcoides* with *Dichanthium*.

Pogonachne racemosa a monotypic genus described by Bor in 1949 belongs to Andropogoneae of subfamily Panicoideae. The genus *Pogonachne* (*P. racemosa*) is so far reported only from the state of Maharashtra. *Pogonachne racemosa* is structurally unique in the Andropogoneae in having a simple raceme with fragile rachis.

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Triplopogon ramosissimus also belong to the tribe Andropogoneae of subfamily Panicoideae. *Ischaemum ramosissimum* described by Hack (1889) was separated into a new monotypic genus *Triplopogon (T. ramosissimus)* Bor (1954) which differs from *Ischaemum* in its three tufts of hair on the glumes.

Bor (1949) placed the *Pogonachne* genus into subtribe Ischaeminae on the basis of its morphological characters. *Pogonachne racemosa*, *Triplopogon ramosissimum* and *Ischaemum* of tribe Andropogoneae show significant difference in their morphology of spikelet. Leaf anatomy of *Pogonachne racemosa*, *Triplopogon ramosissimus* and *Ischaemum* show close similarities with each other. All the 3 genera show some anatomical features viz. long cells markedly different in shape with sinuous wall, stomata with triangular subsidiary cells, Panicoid type microhairs, papillae present, intercostal papillae per cell, dumbbell shaped or nodular silica bodies, bulliform cells irregularly grouped mesophyll, radiate chlorenchyma and keel conspicuous with single large bundle.

Moulik (1997) divided the sub tribe Ischaeminae into Ischaemastrae and Apludastrae on the basis of raceme character; spathate racemes are in Apludastrae while Ischaemastrae has non spathate racemes.

Ischaemum, *Pogonachne*, *Sehima*, *Thelepogon* and *Triplopogon* are included into separate subtribe Ischaemastrae by Moulik (1997), Anatomy of leaf of these genera as discussed above shows similarities and supports the placement of these genera into a single sub tribe Ischaemastrae.

Trilobachne cookei belongs to tribe Maydeae of subfamily Panicoideae. Maydeae consists of eight genera viz, *Chionachne*, *Coix*, *Euchlaena*, *Euchlaeza*, *Polytoca*, *Trilobachne*, *Tripsacum* and *Zea*. Of the 4 genera of Maydeae; *Chionachne*, *Coix* and *Polytoca* are widely distributed while monotypic genus *Trilobachne* is restricted to Northern Western Ghats of Maharashtra and Karanataka. (Salunkhe, 2000). *Polytoca cookei* described by Stapf (1894) was separated into a new genus *Trilobachne* (Bor, 1960) which differs from *Polytoca* in its lower glume of female spikelet which is 3-lobed, the central lobe larger than the others.

Leaf anatomy of *Trilobachne cookei* shows closely resemblance with *Polytoca cookei* (Watson and Dalwithz, 1992) in having long rectangular cells with, Panicoid type of microhairs, absence of papillae, paired intercostal short cells, cross shaped silica bodies, mesophyll with non radiate chlorenchyma, bulliform cells in irregular shapes, small vascular bundle without sclerenchymatous girders.

Anatomical features of leaf of *Trilobachne cookei* shows close affinities with *Polytoca*, but have significant differences in its exomorphology.

Present studies indicate need for further studies on endemic grasses of India to understand there affinities and interrelationships.

CONCLUSIONS

- 1) About 225 species and 21 varieties are endemic to Peninsular India. Of the 225 endemic species, 124 occur in Maharashtra. Of the 14 genera endemic to Peninsular India, 11 are monotypic. These endemic genera are 1) *Bhidea* (3), 2) *Chandrasekharania* (1), 3) *Indopoa* (1), 4) *Danthonidium* (1), 5) *Glyphochloa* (10), 6) *Hubbardia* (1), 7) *Lophopogon* (2), 8) *Pogonachne* (1), 9) *Limnopoa* (1), 10) *Manisuris* (1), 11) *Pseudodichanthium* (1), 12) *Silentvalleya* (1), 13) *Trilobachne* (1) and 14) *Triplopogon* (1).
- 2) Anatomical features of leaf support the separation of *Danthonia gammiei* into a monotypic genus *Danthonidium*.
- 3) Anatomical character of Isachneae agree with those of *Hubbardia* but seven nerved glumes unknown in Isachneae supports separation of genus into separate tribe as already done by Bor (1960).
- 4) Anatomical features of leaf show close affinities of *Indopoa* with *Tripogon*, but have some significant differences.
- 5) Anatomical feature of leaf indicate close affinities of *Pseudodichanthium serrafalcoides* with *Dichanthium*.
- 6) Anatomy of *Pogonachne racem^oosa* and *Triplopogon ramosissimus* leaf show similarities and supports the placement of these genera into a single sub tribe Ischaemastrae.
- 7) Anatomical features of leaf *Trilobachne cookei* shows close affinities with *Polytoca*, but have significant differences in its exomorphology.