



NEW ADDITION OF GRASS SPECIES (POACEAE) TO FLORA OF SHIMOGGA DISTRICT KARNATAKA

Yogeesh Naik H.S. & Y.L. Krishnamurthy*

Department of PG Studies and Research in Applied Botany, Jnana Sahyadri, Kuvempu University, Shankaraghatta-577451, Karnataka, India.

Abstract

The present study reports addition of five grass species, which are reported for first time for Shivamogga region from different part of the Central Western Ghats of Shivamogga district to the flora of Karnataka. The herbarium specimens have been deposited in the herbarium of Department of PG Studies and Research in Applied Botany, Jnana Sahyadri, Kuvempu University, Shankaraghatta, Karnataka, India. A key to the identification of species along with detailed description and illustrations are provided to facilitate their easy identification.

Key words : *Cymbopogon martini*; *Leersia hexandra*; *Pennisetum hohoneckeri*; *Perotis indica*; *Saccharum spontanum*; Western Ghats.

Introduction

In current scenario, systematic biodiversity documentation is the main purpose in proper authentication of particular species (Rasheed *et al.*, 2016). Poaceae is one of the fourth largest family among Angiosperms comprises of 780 genera and nearly 12,500 species distributed all over the world except Antarctica (Rajkumar *et al.*, 2017). Grasses distributed nearly one-fourth of the Earth's land surface covering every terrestrial habitat (Shantz, 1954; Potdar *et al.*, 2012; Barbhuiya *et al.*, 2013). India is having nearly 240 genera and 1,200 species (Parmar *et al.*, 2012). Grasses serving mankind from ancient times as a main source of food (Rice, Wheat, Maize, Bajra etc.), fodder for the cattle, medicine, shelter fuel, furnishing *etc.* (Khude 2016). The grasses show high adoptability with respect to changing environment, ability to coexist with grazing animal and man with endless variation in distinct life forms Grasses grow, reproduce and die back in one short season. Great emphasis is per forced on reproduction. The plant body is just a few thin leaves; one or two stems but the inflorescence that weight as much the rest of the plant producing large no of seeds. Clearly, these are organism whose success lies in their ability to grow when condition are right. Since the proper condition for growth and reproduction may be limited to a few short weeks, the grasses are evolved to reproduce

quickly as possible and this makes them one of the most successful terrestrial life forms on the earth (Bor, 1960). Ecologically grasslands are important by way of food cradles for the wildlife, and as harbours for many ailing herbaceous plant forms (Slietty and Vivekananthan, 1991). Their ultimate role in ecological succession direct to the subject of grasslands over to the forefront of contemporary sustainable significance (Swarupanandan *et al.*, 1998). The studies of grassland is utmost significance and imperative for protection and management of wildlife (Panwar, 1986; Rodgers and Sawarkar, 1988).

The study site, Shivamogga is existing in the Central of Karnataka are scattered with numerous plantations with patronizing lush-green forest Western Ghats cover known as "thick ever green forests" (Sudarshan *et al.*, 1992). These forest areas are also known as sacred forests which are collectively protected, and which usually have a significant religious association for the protecting community. Hunting and logging are usually strictly prohibited within these patches, (Gokhale 2004). Shivamogga, a Malnad district of the Karnataka State with a geographical area of 8465 sq.km is situated in the mid-south-western part of the State at 13°27' and 14°39' N and 74°38' and 76°4' E at a mean altitude of 640 metres above sea level (Ramachandra, 2013). The study area has a rich and varied flora, the major contributing factors

*Author for correspondence : E-mail : murthyylk@yahoo.co.in

to this variety being differences in rainfall and topography within the district, has evergreen, semi-evergreen, moist and dry deciduous forests and is rich in diversity of grasses with ecological value. In this study area we have studied grass flora to know the present status of grass species.

Materials and Methods

Study sites

Shimogga district forms part of the Western Ghats and Malnad region, which includes the mountainous and forest areas lying to the western edge of the Ghats. The highest peak of the district named as Kodachadri measuring about an altitude of 1343m (Ramaswamy *et al.*, 2001). Remaining portion of the district falls under southern maidan area consisting of broad undulating plateau with elevations ranging from 600 to 1000 m. The area is partly tropical climate throughout the year. Generally, the weather prevails hot and humid in the eastern part and very pleasant in the remaining parts of the area.

Collection of grass specimens

During field explorations of Shivamogga region of Karnataka state, 05 interesting specimens belonging to Poaceae were collected from seven taluks. Close investigation with the help of literature and herbarium specimens revealed that they were not collected earlier from Shivamogga region, which proved to be new records for flora of Shivamogga district. The periodic field investigation was conducted here from 2016 to 2018. The stratified random sampling method was used to collect the grasses. Global positioning system (GPS) was used to plot the latitude, longitude and altitude of the study area.

Sample processing and herbarium preparation

Collected samples were brought to laboratory, processed and pressed under blotting paper until the specimen completely dries. Grass species were identified through morphological characters by using standard flora (Bor, 1960; Ramaswamy, 2001; Yadav *et al.*, 2012, Gamble, 1934). The herbarium specimens were deposited in the herbarium of the Department of Applied Botany, Kuvempu University.

Microscopic observation

In order to detect the variation in the flowers, differences in ligule, glume, lemma, palea, awn, lodicules the samples were observed under Carlzeiss Stemi 200°C Stereo microscope and Carl zeiss primo star microscopes, photographs were taken by using Axio cam ERc 5s camera, images were processed in Axio Vision LE

(AxioVs40V4.8.20) software.

Results and Discussion

Key Characters

Cymbopogon martini (Roxb.) S. Watson in Atkins. Gaz. N.W. Prov. India 10:392.1882; Blatt. & McCann, Bombay Grass.104.1935; Bor, Grass. Burma Ceylon India Pakistan 129. 1960.

Perennial, Culms tufted up to 250 cm tall, erect, nodes glabrous, leaf sheath terete 3-9.5 cm long, glabrous ligule, membranous. Leaf blade flat, linear 30 cm long 0.5 cm width, glabrous, apex acuminate. Panicles narrowly long up to 20 cm long contracted, raceme binate 4-3cm long, spatheate, spathe up to 2.5 -3.0 cm long. Sessile flower, ovate, 4.0 mm, awned callus short, glabrous. Lower glume chartaceous thin 0.4 mm grove in lower half, inflexed, apex muticous. Upper glume sub-coriaceous, boat (concave) shaped, narrowly ovate 3.5-4.5 mm, glabrous, apex acute. Lower lemma membranous ovate 3 mm, acute. Palea absent. Upper lemma hyaline to base of own, linear 0.2 mm, cleft at apex into two lobes, awned between cleft, on geniculate 2.5 cm. Palea hyaline, apex sub-acute, lodicules 2, stamens 3, anthers 2 mm (villous) on both side. Pedicelled spikelet- narrowly ovate, 4.00 mm. Lower glume membranous, ovate, 3.0 mm, glabrous, margin inflexed, apex acute. Upper glume membranous, ovate 4.0 mm, margin inflexed, hairy. Lower lemma hyaline, ovate 3.0 mm margin ciliate, apex acute. Palea absent, stamens 3, anthers 2 mm.

Fls. & Frts: September to December.

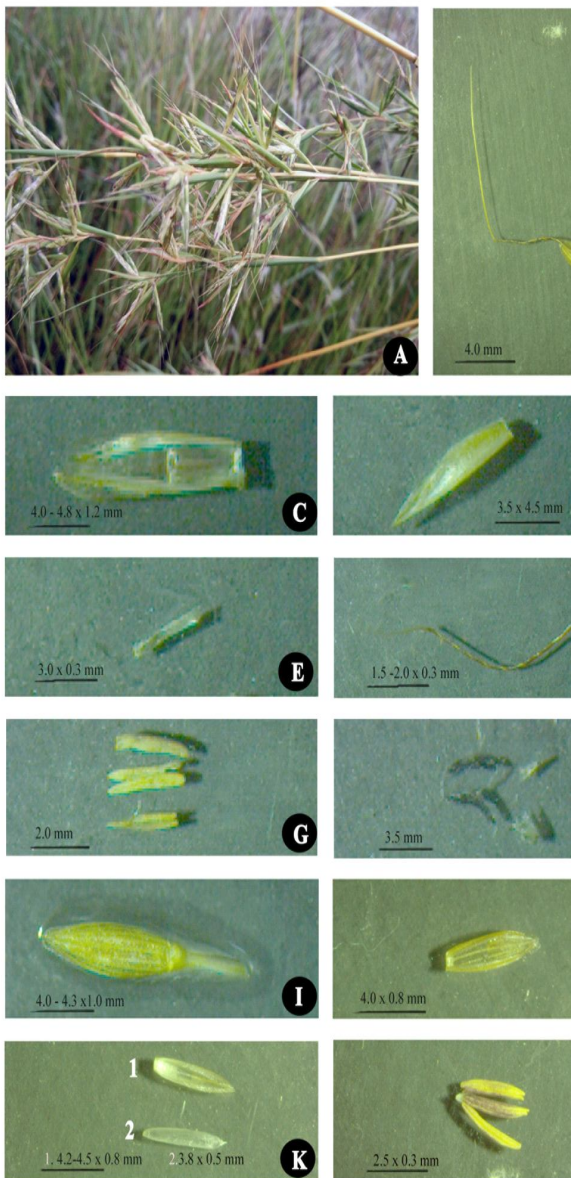
Distribution: Shikaripura taluk.

Habitat: Common at grasslands.

Specimens examined: India, Karnataka, Near Shikaripura, and Bhadravathi of Shivamogga 14° 37' 88" N - 75° 25' 81" E 625m. Yogeesh Naik & Y.L. Krishnamurthy, KUYLK4484.

Leersia hexandra Sw., Prodr. Veg. Ind. Occ. 21. 1788; Hook.f., Fl. Brit. India 7:94.1896; Cooke, Fl. Presi. Bombay 3: 564. 1958 (Repr.ed.); Bor, Grass. Burma Ceylon India Pakistan 599.1960.

Perennial, Culms terete, aquatic grass, erect: 50-130 cm (1.3m) long, slender, geniculate and ascending rooting at nodes; nodes hairy. Leaf sheath 8-13 cm, ligule membranous. Leaf blade 7-20×0.2-0.7 cm, glabrous, apex acuminate. Inflorescence panicle contracted usually flaccid 5-14 cm, oblong, branches sub erect or spreading, smooth. Spikelet 3-4×1.3 mm, ciliate, laterally compressed awnless, sub sessile, disarticulating below the spikelet. Glumes reduced to rim. Lemma coriaceous, obliquely oblong, 3.5-4×1.2 mm, margin inflexed ciliate, strongly 1



Cymbopogon martinii (Roxb.) S. Watson: A. Part of a plant with inflorescence; B-H. Sessile spikelet: B. Sessile spikelet (4.0 mm); C. Lower glume (4.0 - 4.8 x 1.2 mm); D. Upper glume (3.5 x 4.5 mm); E. Lower lemma (3.0 x 0.3 mm); F. Upper lemma (1.5 - 2.0 x 0.3 mm); G. Stamens (2.0 mm) and Pistil and Lodicules (3.5 mm); H. Pedicelled spikelet (4.0 - 4.3 x 1.0 mm); I. Lower glume (4.0 x 0.8 mm); J. Lower lemma (4.2 - 4.5 x 0.8 mm); K. Lower lemma (2.38 x 0.5 mm); L. Lower lemma (2.5 x 0.3 mm)

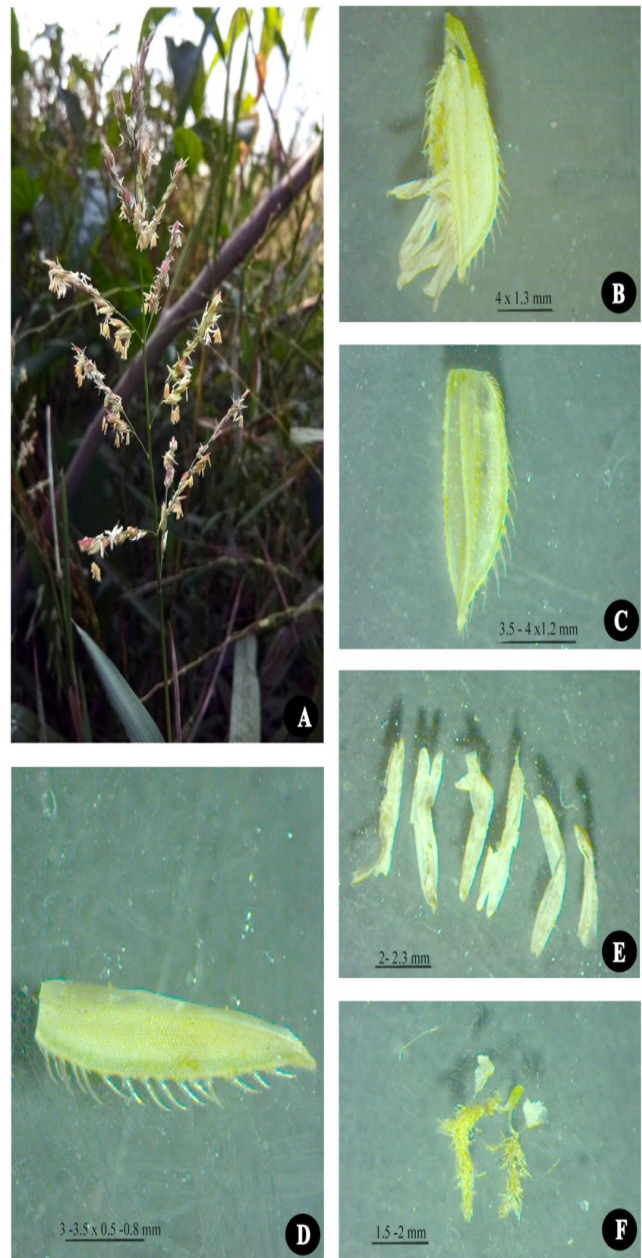
keeled, spinulose long keels, 5 nerved, apex, sub-acute. Palea coriaceous, linear lanceolate, 3-3.5 x 0.5-0.8 mm. Lower glume keels ciliate, 3 nerved, apex sub-acute. Lodicules 2, stamens 6, anther 2-2.3 mm, Pistil 1.5-2 mm.

Fl. and Frts: Throughout the year.

Distribution: All taluks of Shivamogga.

Habitat: aquatic grass.

Specimens examined: India, Karnataka,, Near Kavaledurga (Thithahalli), Shikaripura, Hosanagara and Bhadravathi of Shivamogga 14° 43' 197" N - 75° 07' 297"

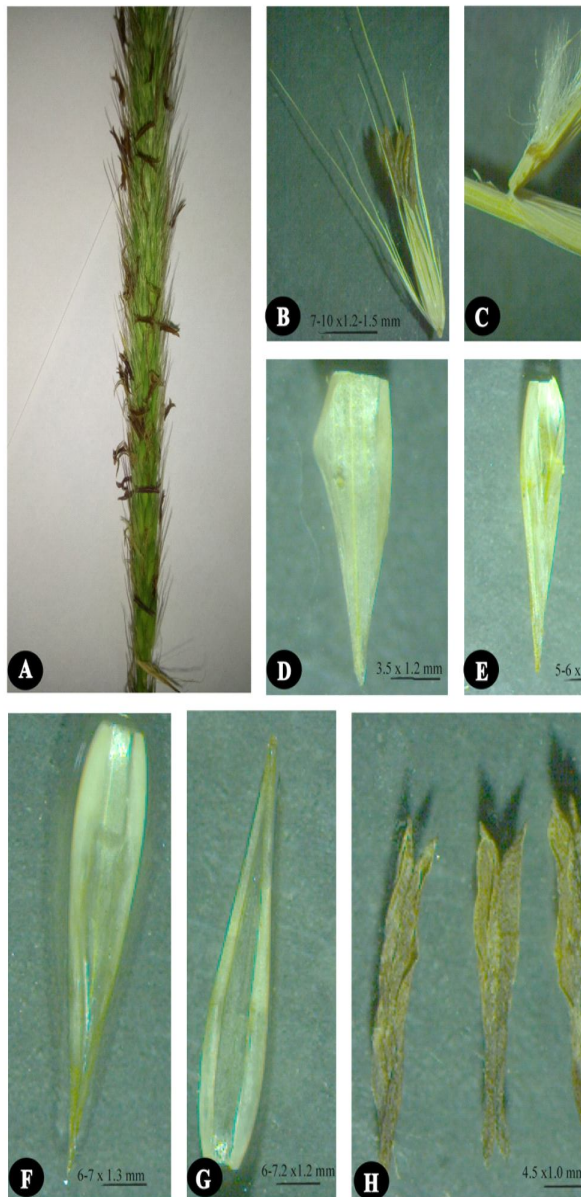


Leersia hexandra Sw.: A. Habit; B. Spikelet (4 x 1.3 mm); C. Lemma (3.5 - 4 x 1.2 mm); D. Palea (3 - 3.5 x 0.5 - 0.8 mm); E. Stamens (2 - 2.3 mm); F. Pistil and Lodicules (1.5 - 2 mm).

E 837m. Yogeesh Naik & Y.L Krishnamurthy, KUYLK4485.

Pennisetum hohoneckeri Hochst.ex.Steud., Syn. Pl. Glumac. 1(2): 103. 1854; Bor, Grass. Burma Ceylon India Pakistan 344.1960.

Perennial, Culms tufted, compressed 40-160 cm tall, erect, simple or branched, glabrous, nodes glabrous, leaf sheath up to 5- 20 cm long, compressed, distichous, glabrous, ligule a rim of hairs. Leaf blades compressed or flatten linear, 10-55x0.4 cm, scarboid, glabrous or



Pennisetum hohenackeri Hochst. ex Steud.: A. A spike; B. Spikelet x 1.2 - 1.5 mm); C. Ligule; D. Upper glume (3.5 x 1.2 mm); E. Lower (5 - 6 x 1.3 mm); F. Upper lemma (6 - 7 x 1.3 mm); G. Palea (6 - 7.2 x 1.2 mm); H. Stamens (4.5 x 1.0 mm).

sparsely pilose, apex acuminate. Panicles spiciform, 10-16 cm, rachis angular or pointed, scaberulous. Involucres on short pedicel, bristles, unequal scabrid, free at base, longest up to 2.5cm. Spikelet sessile, solitary, ovate 7-10 × 1.2-1.5 mm glabrous, acuminate. Lower glume reduced/absent. Upper glume hyaline, ovate, 3.4×1.3 mm, glabrous 3 nerved, apex acute. Lower lemma membranous; narrow to linear, ovate 5-6×1.3 mm long, glabrous 5-7 nerved, apex acute. Upper lemma sub-coriaceous narrow to linear ovate, 6-7×1.3 mm, glabrous 5-6 nerved apex acuminate. Palea sub-coriaceous, narrowly to linear ovate 6-7×1-1.3mm, glabrous, 2 nerved, apex acuminate. Lodicules absent, stamens 3, anther 4.5×1.0 mm. Caryopsis.



Perotis indica (L.) Kuntze: A. Habit; B. Collar with ligule; C. Spikelet (2 - 2.5 x 0.5 mm); D. Lower glume (2 - 2.5 x 0.4 mm); E. Upper glume (14 mm); F. Lemma (1 x 0.2 mm); G. Palea (1 x 0.1- 0.2 mm); H. Stamens (0.4 mm); I. Pistil; J. Caryopsis (1.5 - 2.0 x 0.3 mm).

Fl. and Frts: September to February.

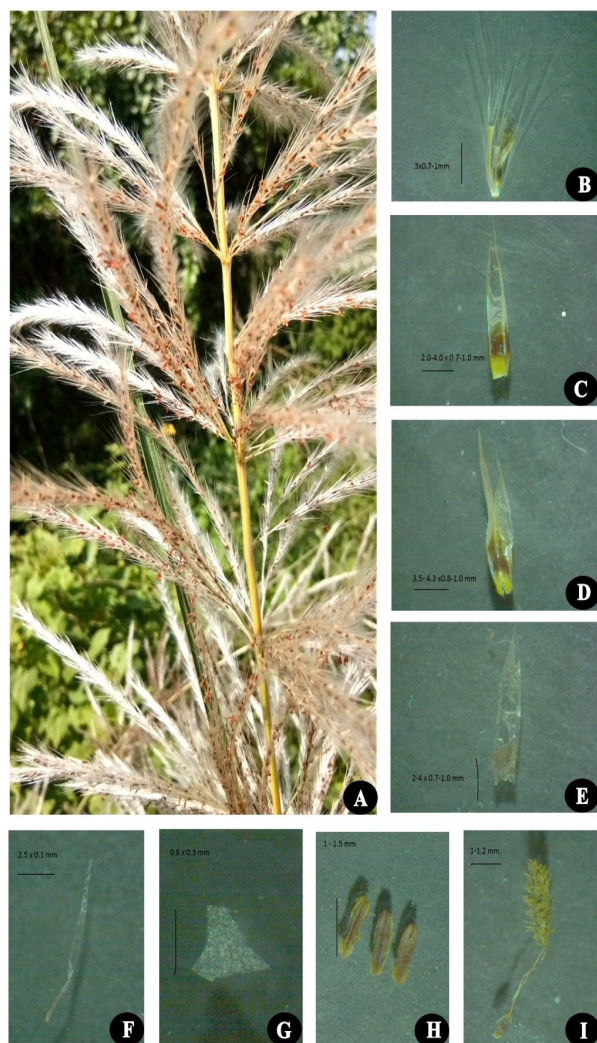
Distribution: Bhadravathi and Shikaripura taluks.

Habitat: Frequent along bank of stream river side and water courses.

Specimens examined: India, Karnataka, Near Shikaripura, and Bhadravathi of Shivamogga 14° 37' 88" N - 75° 25' 81" E 625m. Yogeesh Naik & Y.L Krishnamurthy, KUYLK4486.

Perotis indica (L.) Kuntze Rev. Gen. Pl. 2 1891; Blatt. & McCaen, Bombay Grass. 220.1935; Bor, Grass. Burma Ceylon India Pakistan 611.1960.

Annul, Culms tufted, 10-55 cm tall, decumbent or ascending from a imbricate base, slender, nodes glabrous. Leaf sheath cylindrical (terete) or sub-compressed, 1-9 cm long, glabrous, ligule short, membranous. Leaf blade flat or undulate, narrowly ovate 1.32×0.4 cm, amplexicaul



Saccharum spontaneum L.: A. Habit; B. Spikelet (3 x 0.7- 1 mm) ; C. Lower glume (2.0 - 4.0 x 0.7 -1.0 mm); D. Upper glume (3.5 - 4.3 x 0.8 - 1.0 mm); E. Lower lemma (2 - 4 x 0.7 - 1.0 mm); F. Upper lemma (2.5 x 0.1 mm); G. Palea (0.8 x 0.3 mm); H. Stamens (1 - 1.5 mm); I. Pistil and lodicules (1 - 1.2 mm).

at base, glabrous margin spinulose-ciliate, apex acute. Racemes slender 5-60 cm long, cylindric, terminal rachis semi-terete, glabrous. Spikelet 1-2 mm long narrow, linear ovate 2-2.5×0.5 mm (excluded awn) purplish. Lower glume membranous 0.2-0.5mm, hispid 1- nerved produced into 11-15 mm long awn. Upper glume ovate similar to lower glume awn up to 14 mm. Lemma hyaline up to 1.0×0.2 mm, ovate, glabrous apex acute. Palea hyaline narrowly ovate 1.0×0.1-0.2 mm, nerveless. Lodicules 2, stamens 3, 0.4 mm long, Caryopsis rounded 1.5-2×0.3 mm, linear elliptic.

Fl. and Frts: November to December.

Distribution: Shikaripura & Bhadravathi taluks.

Habitat: Rare, sandy soil.

Specimens examined: India, Karnataka, Near Shikaripura, and Bhadravathi of Shivamogga 14° 26' 426"

N - 75°36' 326" E 609m. Yogeesh Naik &Y.L Krishnamurthy, KUYLK4487.

Saccharum spontaneum L., Mant. Pl. Altera 183. 1771; Hook.f., Fl.Brit. India:118.1896. Cooke, Fl. Presi. Bombay 3: 465.1958 (Repr.ed.); Blatt. & McCann, Bamboy Grass. 45.1935 Bor, Grass. Burma Ceylon India Pakistan. 214.1960.

Perennial, Culms tufted, 200-300 cm tall, rhizomatous, elongated, erect, simple or branched, glabrous, nodes glabrous, pilose. Leaf sheath compressed 15-45 cm long glabrous, ligule membranous 1.0-2.0 mm long. Leaf blade linear or ovate 10-85×0.2-1.0 cm glabrous, glaucous, apex acuminate. Inflorescence open panicle 20-40 cm long, raceme 3-15 cm long, silky villous, peduncles softy hairy, rachis slender. Joint slender, 2.0 mm long, curved with silky hair spikelet in pair sub-equal. Sessile flower ovate, 0.3×0.7-1.0 mm, awnless, callus densely bearded with long hairy. Lower glume sub-coriaceous, ovate, 2.0-4.0×0.7-1.0 mm, 2 nerved, margin inflexed, ciliate, apex acute. Upper glume membranous, slightly leathery, ovate, 3.5-4.3×0.8-1.0 mm, margin inflexed, hairy, apex acute. Lower lemma hyaline, ovate- elliptic, 2-4 mm×0.7-1.0 mm, 2 nerved, margin slightly inflexed, ciliate, apex acute. Palea absent. Upper lemma hyaline, linear elliptic, 2.5×0.1 mm, nerveless, apex acute. Palea minute, ovate 0.8×0.3 mm, nerveless acute. Lodicules 2, stamens 3, anther 1-1.5 mm long. Pistil 1.1 mm. Coryopsis oblong. Pedicel slender 1.0-1.4 mm long, densely villous. Pedicelled spikelet similar to sessile flowers.

Fl. and Frts: September to December

Habitat: Very rare at marshy place along streams and river banks.

Distribution: All taluks of Shivamogga district.

Specimens examined: India, Karnataka, Near Jog falls, Ambaragoppa Pond, and Bhadravathi of Shivamogga 14° 13' 992" N - 74° 49' 201" E 606m.Yogeesh Naik &Y.L Krishnamurthy, KUYLK4488.

Acknowledgements

Authors are gratefully acknowledging the financial support by the Kuvempu University, Shankaraghatta for studies. Both authors are grateful to Dr. Gopalakrishna Bhat, Poorna Prajna College, Udupi, Karnataka who have helped identification and confirmation of grass species.

References

- Barbhuiya, H.A., B.K. Dutta, A.K. Dasand and A.K. Baishya (2013). An annotated checklist of the Grasses (Poaceae) of Southern Assam. *Journal of species lists and distribution*, **9(5)**: 980-986.

- Bor, N.L. (1960). The Grasses of Burma, Ceylon, India & Pakistan, *Pergamon Press*. Oxford London.
- Gokhale and Yogesh (2004). Reviving traditional forest management in Western Ghats; study in Karnataka. *Economic and Political Weekly*, 3556-3559.
- Khude, V.S. (2016). Diversity studies of grasses around Arjunnagar. *Plant Archives*, **16(1)**: 477-478.
- Panwar, H.C. (1986). A study of management requirements in Corbett National Park, Proc. 25 working Session IUCN's Commission on National Parks and Protected Areas. Corbett National Park, India, 169-176.
- Parmar, S.P., K.A. Prajapati, Y.T. Jasrai and S.K. Patel (2012). Grasses and its diversity in Gujarat state- a review. *Life sciences Leaflets*, **10**: 56-66.
- Potdar, G.G., C.B. Salunkhe and S.R. Yadav (2012). Grasses of Maharashtra. *Shivaji University Press* Kolhapur, 1-2.
- Kumar, R. and B. Kumari (2017). Diversity of grass flora of Moradabad district with special reference to their utility. *International Journal of Botany Studies*, **2(6)**:166-169.
- Ramaswamy, S.N., M.R. Radhakrishna and D.A. Govindappa (2001). Flora of Shivamogga District, Karnataka. *Prasaranga, Manasagangothri*, Mysore. 691-692
- Rao, G.R., S.M.D. Chandran and T.V. Ramachandra (2012). Grasslands of Anshi-Dandeli Tiger Reserve Sahyadri Conservation Series 12 ENVIS Technical Report, **36**: 5-6.
- Rasheed, S., A.A. Khuroo, M. Hamid, A.H. Ganie, A.H. Malik and G.H. Dar (2016). *Phalaris canariensis* L. (Poaceae): A new alien plant record for Kashmir Himalaya, India. *Journal of Asia-Pacific Biodiversity*, 94-96.
- Rodgers, W.A. and V.B. Sawarkar (1988). Vegetation Management in wildlife Protected Area in India. *Aspects of Applied Biology*, **16**: 407-422.
- Shantz, H.L.(1954). The place of grasslands in the earth's cover of vegetation. *Ecology*, **35**: 143-145.
- Slietty, B.V. and K. Vivekananthan (1991). The endemic and endangered plants of little High Ranges. Idukki District. Kerala. In: Karunakaran. C.K. (ed.) *Proc. Symp. on Rare. endangered and endemic plants of the Western Ghats*. Kerala Forest Department. Thiruvananthapuram.
- Slietty, B.V. and K. Vivekananthan (1973b). New and little known taxa from Anaimudi and surrounding regions. Devikolani. Kerala V: A new variety of *Pogosgemon travancoricus* Bedd. *Bull. Botanical Survey of India*, **15(1-2)**: 155-157.
- Slietty, B.V. and K. Vivekananthan (1973c). Notes on some interesting grasses from Southern India. *Bull. Botanical Survey of India*, **15(3-4)**: 276-278.
- Slietty, B.V. and K. Vivekananthan (1968). New and little known taxa from Anaimudi and surrounding regions. Devikolam. Kerala I: A new variety of *Leucas vestita* Benth. *Bull. Botanical Survey of India*, **10(2)**: 237.
- Sudarshan, P. Bhat, S.M.D. Chandran and T.V. Ramachandra (2012). Status of Forests in Shimogga, Central Western Ghats LAKE: *National Conference on Conservation and Management of Wetland Ecosystem*, 1-3
- Swarupananadan, K., M. Balagopalan and S.C. Basha (1998). Vegetation dynamics of the grassland-forest ecosystem In the Western Ghats of Kerala. *KFRI Research Report*, 154.