

EXECUTIVE SUMMARY

MAJOR RESEARCH PROJECT

MORPHO-TAXONOMIC STUDIES IN GRASSES OF VINDHYAN REGION (UTTAR PRADESH) WITH NOTES ON SEEDLING MORPHOLOGY

(F. NO. 43-96/2014 (SR), DT. 08/05/2015)

SANCTIONED BY

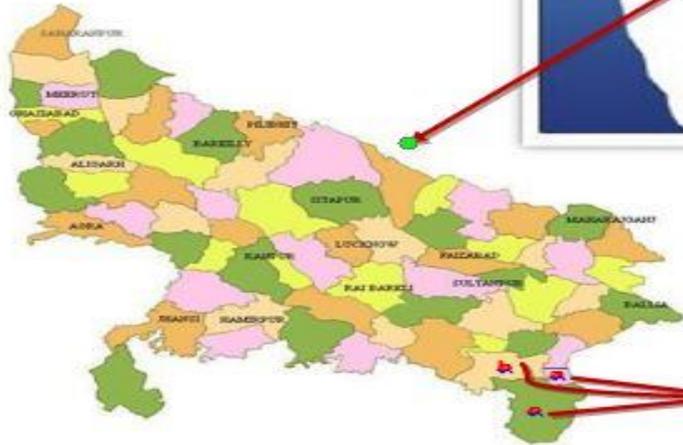
**UNIVERSITY GRANTS COMMISSION,
NEW DELHI**

DR AJAI KUMAR SINGH
PRINCIPAL INVESTGATOR

Department of Botany

UDAI PRATAP COLLEGE

VARANASI-221 002



Study Area

- a. Chandauli**
- b. Mirzapur**
- c. Sonbhadra**

EXECUTIVE SUMMARY

Species occurrence records are very important in the biodiversity domain. Two decades ago, at the first Earth's summit, most of the participating nations declared that human actions were destroying the Ecosystem of the Earth, eliminating biological diversity at an alarming rate. This conclusion led to the importance of documenting the biological diversity at morpho-taxonomic level.

Biological diversity is the key to adapting to global change. If we are to adapt food production system (in which members of Grasses are very much involved) to radically changing conditions in the coming decades, plants and animal diversity will be the single most critical resource for doing so. Therefore, developing countries should not leave any stone unturned so far as the conservation of biodiversity per se the protection of Indian ecosystem is concerned. Studies indicate that we have entered into a phase of mass extinction. Today we are losing 2-5 species per year or 1800 populations per hour. This calls for concerted efforts at documenting species, their threat status, and conservation of species and red-listed ecosystems.

Documenting biodiversity therefore is prime objective at global, national and regional levels. Floristic maps may serve to understand species distribution pattern along the range of complex environmental variables, and as much be of significance to predict their geographical relocation in response to climate change. The relationship is likely to be stronger within smaller geographical boundaries (like present study area) where environmental variables are relatively uniform compared to larger areas experiencing greater climatic diversity. Information on regional flora therefore can be of great utility. Further, on floristic information, such as dominant families like Poaceae in a region, can lead to several useful correlations.

An overview of systematics, the naming, classifying and ordering of life, shows that it has never been more relevant than in the present time of environmental crisis and species loss.

As a signatory to the Convention on Biological Diversity (CBD), it was obligatory for India to commit itself to capacity building in taxonomy and take up exploration and preparation of an inventory of living organisms.

The current system of plant taxonomy is based primarily on reproductive structures—it is the flowers of the plant, more than any other character, that really define the species. This is especially true of grasses (one of the most difficult group of plants from taxonomic view point), which often resemble each other so closely that species differentiation using only vegetative characters is very difficult. But during present investigation the attributes based on vegetative characters of Seedlings have been developed, which are found useful to differentiate and identify Grasses at seedling stage.

No plant family comes close to Poaceae in its importance to world agriculture. The word “grass” is used to describe those plant species most commonly used in lawns and pastures, or used to cover road shoulders. The English word grass probably comes from the Old High word gras, generally used to describe any herbage suitable for livestock grazing.

Grasses now cover about 20% of the land surface, about half that area being within the tropics. Presently Grasses comprises 823 genera and 12,096 species at world level (Simon *et al.*, 2011). Poaceae is the largest family of Indian flora, represented by 255 genera and 1291 species. According to Uniyal & Mathur (1944), in all there are 189 monotypic genera of Angiosperms in Indian Flora. The family Poaceae has the maximum number (32) of monotypic genera. Genus *Hubbardia* is said to be facing extinction threats.

Due to rapid rate of industrialization, transportation, mining, river valley projects and Dams and Canals the flora and vegetation of Vindhyan Region (present study area) is under threat.

Grass is that indispensable form of plant life without which civilization, as we know it, would not exist. Of all plants, the grasses are the most important to man. All our bread stuffs – corn, wheat, oats, rye, rice, and sugarcane are grasses, others are ornamentals, forage crops, weeds, and even building materials (*Bamboos* and *Saccharum*). Grasses also have importance in the maintenance of wild and grazed grasslands, ecology and conservation. There can be no doubt that cereal and pasture grasses are economically the most important plants in the world. In developed countries, the principal sources of meat and dairy food (basic constituents of diet) are cattle, sheep and swine. Dairy cattle are maintained in tame pastures. Many species of native and introduced grasses are utilized in improved pastures.

It is estimated that grasses supply 60% of the world's food. Sugarcane and Bamboos (*Dendrocalamus strictus* common in some parts of the study area) are grasses. The Grasses forms an important and difficult group having considerable economic value but underestimated and under-appreciated.

The multi-ethnic composition within the Vindhyan Region (24⁰ 50' and 25⁰ 35' N latitude and 82⁰ 50' and 83⁰ 35' E longitude, sea level height 90 to 300 m) of Uttar Pradesh, India, makes it a distinct microcosm of Biodiversity. Tremendous developmental activities and rampant poverty are leading to change inland use patterns, habitat loss and fragmentation in the region. Similarly, in this region, in the past, selective logging and conversion to agriculture, and river valley projects, power projects, mining etc., have contributed to the decline of biodiversity. Unsustainable land use practices,

excessive subsistence dependence on forests etc., are major causes to the loss of biodiversity in Vindhyan Region (the present study area).

Efforts should therefore be made to encourage and support Morpho-Taxonomic investigations on neglected and difficult groups like Grasses, with special emphasis on comparative morphological studies of all life stages.

Floristic observations on grasses of *United Provinces & Upper Gangetic Plain* by Duthie (1883, 1886, 1888), Bor (1941), Raizada (1954), Raizada *et al.* (1957, 1961, 1964), Raizada & Jain (1964a, 1964b, 1966), Raizada *et al.* (1983) have been made in the past. In Uttar Pradesh, the taxonomic and floristic study of grasses at district level of Allahabad (Panigrahi & Raja Gopal, 1968), of Bijnor (Khan, 2002), of Deoria (Singh, 1995), of Gorakhpur (Gupta, 1969), Of Kheeri (Singh, 1982), of Lucknow (Patil, 1960; Srivastava, 1963; Balapure, 1971), of Meerut (Singh, 1971), of Sitapur (Tomar, 1984), of Varanasi (Roy, 1971), of Gautambudh Nagar (Chaudhary *et al.*, 2012), of Hastinapur (Khan *et al.*, 2009), of Sitapur (Kumar & Saxena, 2012), Check list of Grasses of Uttar Pradesh (Uniyal *et al.*, 1994) and of Eastern Uttar Pradesh (Singh, 2007) have been made.

Perusal of literature indicates that in Vindhyan Region of Uttar Pradesh, Grasses have not been attempted from taxonomic view point in detail, except few reports on floristics (Bhattacharya, 1963, 1964), Singh (2006) and Singh *et al.* (2009) and on Ethnobotany (Maheshwari & Singh, 1986; Maheshwari *et al.*, 1986; Singh & Prakash, 1994; Khanna *et al.*, 1996; Singh & Prakash, 1998; Singh *et al.*, 2002; Singh *et al.*, 2007; Chaudhary, 2010; Singh *et al.*, 2010; Singh *et al.*, 2012; and Tiwari & Singh 2012).

Floristic and taxonomic account of Grasses of Vindhyan Region would be advantageous with respect to their occurrence, variations, socio-economic

importance and Biodiversity management. Keeping this in view, present study was planned in 2015 with following objectives:

- To survey Vindhyan Region of Uttar Pradesh.
- To collect Grasses and their seeds of study area.
- To identify collected plant specimens.
- To describe identified taxa taxonomically.
- To prepare taxonomic keys.
- To prepare herbarium of the collected taxa.
- To prepare distribution map.
- To record morpho-taxonomic attributes of the grass seedlings.
- To collect data pertaining to socio-economic importance of grasses.

The present Morpho-Taxonomic study includes 125 grass species belonging to 51 genera. The largest genus was *Eragrostis* (16), followed by *Panicum* (11), *Brachiaria* and *Digitaria* (8), *Setaria* (7), *Paspalum* (6), *Echinochloa* (5), *Dichanthium* and *Sorghum* (4), *Aristida*, *Chloris*, *Paspalidium*, and *Saccharum* (3), 08 genera with 2 species each and remaining genera with single species each.

Seedling morphology of 95 species of reported grasses have been recorded. Seedling morphology of grasses have been found very interesting and significant as far as their taxonomy is concerned. We have recorded clear cut distinction between two species of *Dactyloctenium* and it has been published in a reputed journal (*Notulae Scientia Biologicae*, 9(2): 301-306, 2017). The seedling of two reported species can be distinguished very easily on the basis of shape of coleoptiles, first leaf surface and shape. Similarly seedling morphology of six species of *Digitaria* (*International Journal of Advanced*

Research 4(8): 464-472, 2016), ten species of the tribe *Paniceae* (*J. Econ. Taxon. Bot.* 39(1): 98-120, 2015), two species of *Oryza* (*Annals of Plant Sciences* 4(04): 1068-1071, 2015), five species of *Echinochloa* (*Indian Journal of Forestry* 38 (1): 47-50, 2015), and three species of *Sorghum* (*International Journal of Current Research in Biosciences and Plant Biology* 2(7): 109-116, 2015) have been recorded and published. The results are found very much useful from morpho-taxonomic view point.

Taxonomic keys of all the reported taxa have been prepared (mature mother plant as well as seedlings).

In addition to this distribution maps as well as socio-economic importance of grasses have been recorded.

PUBLICATIONS OUT OF THE PROJECT

- 07. Singh, Ajai Kumar, Manish Kumar Srivastava & Ayush Kumar Singh 2017.** Caryopsis Morphology of some Grasses. *National Journal of Life Sciences* 14 (2): 109-113. [ISSN: 0972-995X, UGC approved].
- 06. Singh, Ajai Kumar, Ayush Kumar Singh & Manish Kumar Srivastava 2017.** Morphological variations in Caryopses and Seedlings of Two Grass species of the Genus *Dactyloctenium* Willd. *Not Sci Biol* 9 (2): 301-306. [ISSN: 2067-3264].
- 05. Singh, Ajai Kumar, Ayush Kumar Singh & Manish Kumar Srivastava 2016.** Taxonomy and Seedling morphology of six species of *Digitaria* (Poaceae) from Vindhyan Region, Uttar Pradesh, India. *Int. J. of Adv. Res.* 4 (8): 464-472. [ISSN: 2320-5407].
- 04. Singh, Ajai Kumar, Ayush Kumar Singh & Rishi Kumar Sahu 2015.** Taxonomic studies on some common Taxa of the Tribe *Paniceae* (Poaceae) and their Seedlings from Vindhyan Region, Uttar Pradesh, India. *J. Econ. Taxon. Bot.* 39 (1): 98-120. [ISSN: 2050-9768].

- 03. Singh, Ajai Kumar & Ayush Kumar Singh 2015.** On the seedling morphology of some grass weeds-*Echinochloa* P. Beauv. *Indian Journal of Forestry* 38 (1): 47-50 [ISSN: 0971-943; NAAS: 3.39].
- 02. Singh, Ajai Kumar, Ayush Kumar Singh & Rishi Kumar Sahu 2015.** Morphological characterization of three species of *Sorghum* seedlings (*S. bicolor*, *S. halepense* and *S. vulgare*). *Int. J. Curr. Res. Biosci. Plant Biol.* 2(7): 109-116. [ISSN: 2349-8080].
- 01. Singh, Ajai Kumar, R. K. Sahu & Ayush Kumar Singh 2015.** Morpho-Taxonomic distinction between *Oryza rufipogon* & *O. sativa* (Poaceae). at seedling stage. *Annals of Plant Sciences* 4 (04): 1068-1071 [ISSN: 2287-688X].

PARTICIPATION AND PRESENTATION IN INTERNATIONAL AND NATIONAL CONFERENCES

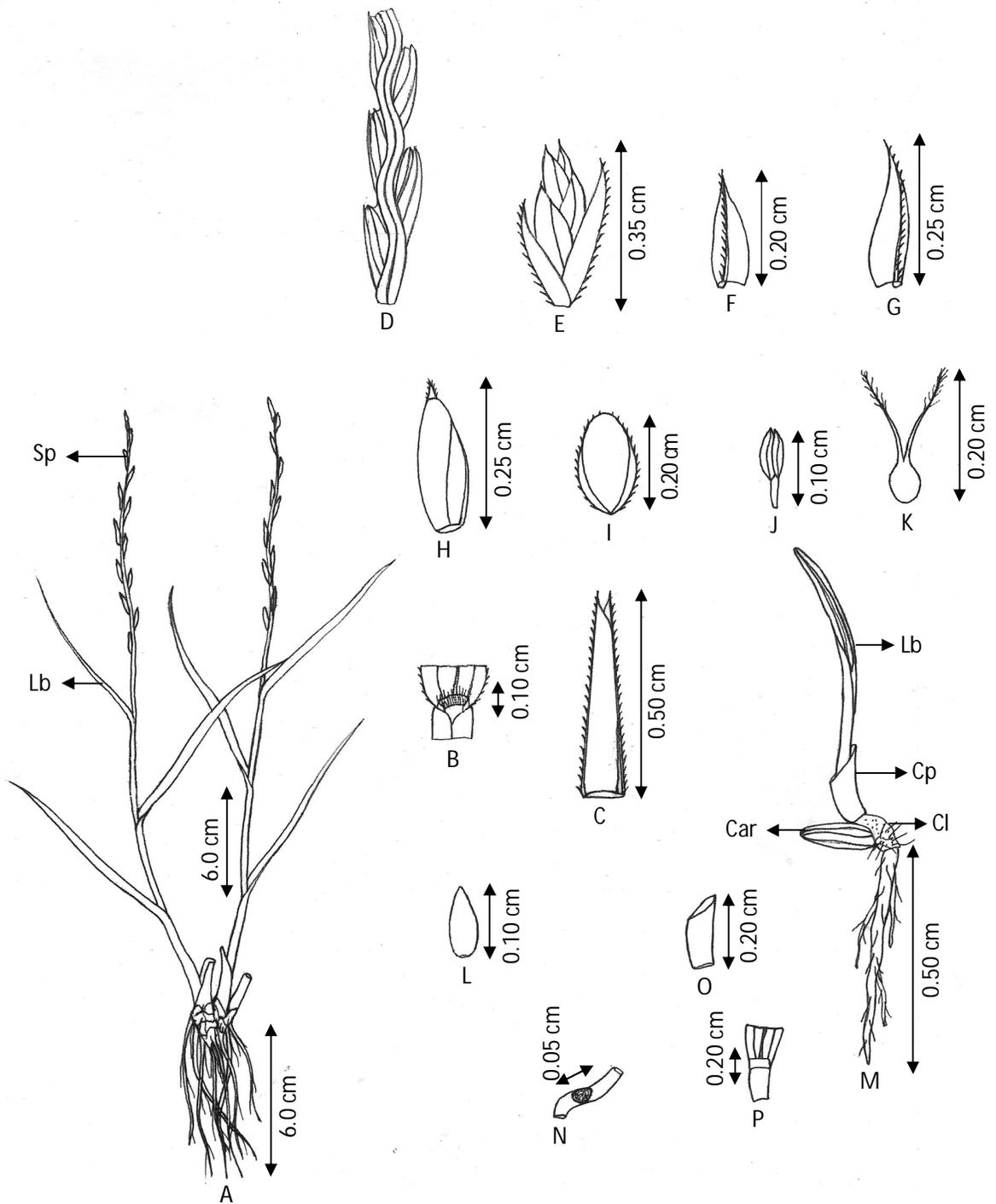
1. International Conference:

- A. Participation and Presentation of Paper entitled, “ Morpho-taxonomic.....Poideae” at XXVII Annual Conference of Indian Association for Angiosperms Taxonomy & International Symposium on Plant Systematics: Priorities and Challenges. Department of Botany, University of Delhi, Delhi.
- B. Participation and Presentation of Paper entitled “Systematic studies.....ten taxa” in Plant Sciences, 102nd Indian Science Congress, University of Mumbai, Mumbai, 3rd to 7th Jan., 2015.

2. National Conferences:

- A. Participation and Presentation of Research Paper at National Conference on Ecological Imbalances: A threat to Flora, Fauna, Economy & Human Survival (EITFES 2017). Govt. P.G. College, Saidabad, Allahabad (Vigyan Parishad Auditorium, Allahabad), 22-23 Sept., 2017.
- B. Participation and Presentation of Paper entitled “Morphological characterization of two grass weed seedlings-*Dactyloctenium aegyptium* and *D. aristatum*” in National Conference on “*Vistas of Scientific Approach for welfare of Society*” Department of Botany, K.

N. Govt. P. G. College, Gyanpur, Bhadohi, Uttar Pradesh, 30-31
march, 2016.



Zoysia matrella : A. Plant, B. Ligule, C. Prophyllum, D. Rachis with spikelet, E. Spikelet, F. Lower glume, G. Upper glume, H. Lemma, I. Palea, J. Stamen, K. Pistil, L. Caryopsis, M. Seedling, N. Scutellum, O. Coleoptile, Cl. Collet, Cp. Coleoptile, Car. Caryopsis, Lb. Leaf blade, Sp. Spikelet.