

## SYSTEMATIC AND FLORISTIC STUDY OF SOME NEW RECORDS OF GRASSES OF INDIAN DESERT, RAJASTHAN

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### Introduction

The value of grasses to mankind has been recognized since very early times. The cultivation of cereal grasses dates back to a period when man was emerging from the nomadic stage. The extent to which man's evolution and present position of domination in the biological world has been affected by grasses is an interesting point of speculation. Most civilizations have developed in grassland regions and it is probable that were it not for the abundance and widespread distribution of grasses, the human population of the world would not have attained its present level.

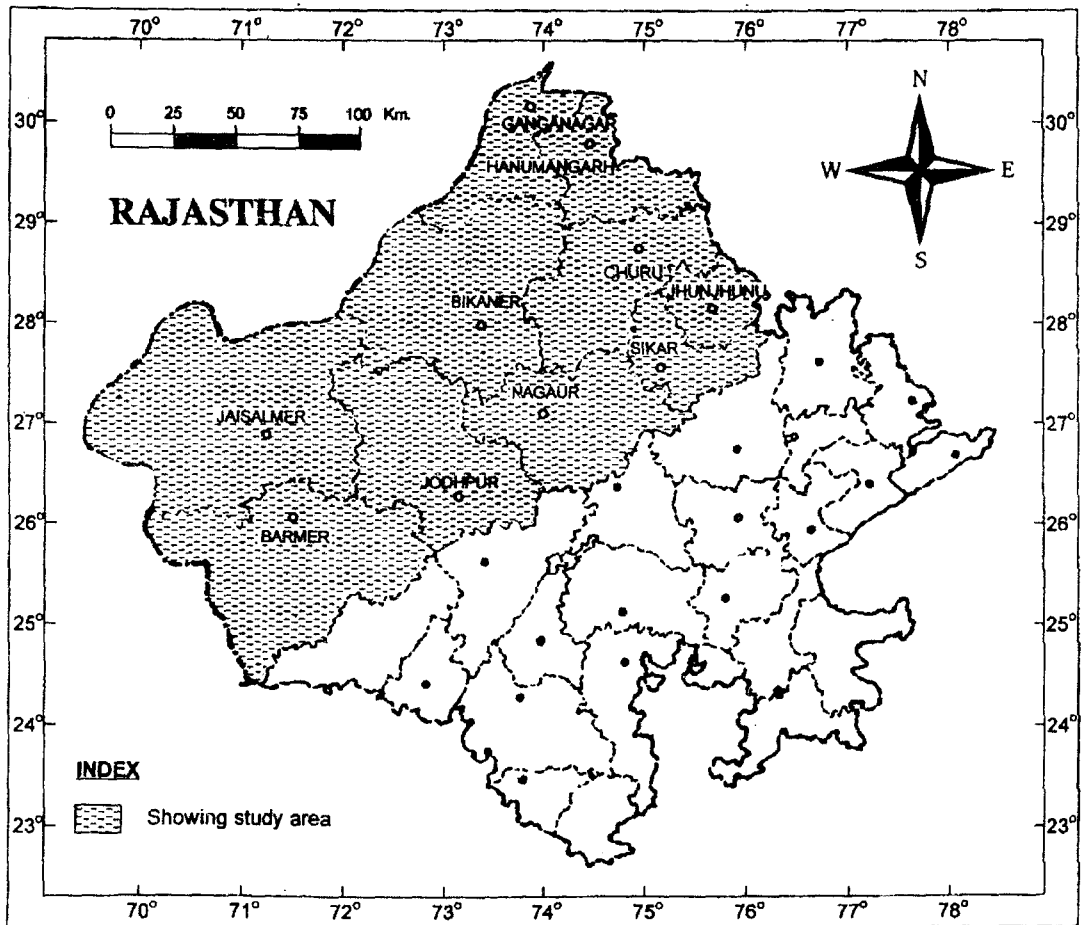
The Poaceae are one of the largest family of flowering plants, comprising some 10,000 species under approximately 896 genera (Tzvelen, 1989). In respect of number of species, they rank fifth and are only exceeded by the Rubiaceae, Asteraceae, Leguminosae and the Orchidaceae (Good, 1956). The family Poaceae is also one of the most important families to mankind. They are directly consumed as food by human beings or indirectly through the animal products. The role of grasses as soil-binders is too well known to need any elucidation. Grasses like Bamboo are also used as building materials, for making baskets,

brooms and for thatching roofs. In fact, the discussion on practical utility of grasses can be limitlessly voluminous. The grasses are so vital in the economy of nations and particularly in an agricultural country like ours, where the provision of food and fodder is a constant problem for the populace and it is surprising that more time and energy have not been devoted to the study of the Poaceae.

### Study Area

Rajasthan State, with 3,42,239 km<sup>2</sup> area, is located in the North-western part of India. Geographically it lies between 23° 3' to 30° 12' N latitude and 69° 30' to 78° 17' E longitude. The region covered in the present study lies in the North-western part of Rajasthan State between 25° 2' to 28° 30' N lat. and 70° to 74° E long. with an area of 2,00,638 km<sup>2</sup> under tree cover (Fig. 1). It includes the arid and semi-arid tracts of the districts of Ganganagar, Hanumangarh, Churu and Bikaner (in North), Jhunjhunu, Sikar and Nagour (in East), Jodhpur, Jaisalmer and Barmer (in West). The area, which is approximately 100 m amsl, is roughly rhomboidal in shape. Its western and northern border throughout its length adjoins Pakistan. The North-eastern boundary is situated in the districts of Pali and Jalore.

Fig. 1



Map of the study area

Physiographically it is the eastern extension of the vast area of the Thar desert.

*Climate* : The climate of the study area is characterized by extremes of temperature, severe drought accompanied by high wind velocity, low relative humidity, evaporation far exceeding precipitation and too scanty rainfall to support any appreciable vegetation. The lowest temperature for the year is recorded during the winter season.

The average yearly temperature is 24.2°C. The absolute lowest and highest temperature ever recorded during the last five years in the study area is 2.4°C (January, 1998) and 45.1°C (May, 2001), respectively. The normal yearly rainfall is 302.34 mm. Most of the rainfall is received during the month of July, August and some in September.

Bor (1940) in his work, entitled "Grasses of United province" recorded 92

species with modern conception of the taxa but the number of species dealt with in this work is really very small and some of them actually fall out of the boundaries of the Upper Gangetic Plains. Raizada *et al.* (1957, 1964) initiated studies on the systematic of Poaceae and have dealt with the tribes Maydeae, Andropogoneae and Paniceae occurring in the Upper Gangetic Plains. Bor's (1960) monumental work on the grasses of Burma, Ceylon, India and Pakistan, although very comprehensive, cannot meet the needs of a regional/local flora, particularly because most of the species dealt have brief descriptions and are without illustrations.

### Review of Literature

Ramchandra Rao (1941) published a list of some plants of the desert areas including those of Rajasthan and Sindh. Being an entomologist, he was naturally more concerned with the plants in relation to locusts. Griffith (1946) published a short note on the Flora of Sindh. Sarup (1951, 1954) listed plants of Jodhpur and its neighbourhood. Sankhla (1951) also enumerated plants of North-West Rajasthan together with their life forms. Sarup (1957, 1958) later compiled similar lists of the plants for Jaisalmer and Bikaner. Rolla and Kanodia (1962, 1963) have listed some common plants of the area supported by herbarium specimens from particular localities and adding notes on their flowering and fruiting seasons. Bhandari (1961a, b; 1963a, b; 1964b; 1965a; 1978) described 90 species of grasses under 52 genera from Indian desert in a series of papers reported more than 50 species of plants for the first time from this area and also provided some critical notes on the identity and nomenclature of quite a few of these. Sharma and Tiagi (1979)

described 91 species under 53 genera in their flora of North-East Rajasthan. Species dealt with in these floras are mostly without illustrations.

The grasses of various districts of Jaipur, Alwar, Jhunjhunu and Mount Abu of Rajasthan were studied by Gandhi *et al.* (1961), Vyas (1967), Joshi and Sharma (1964), Kanodia and Deshpande (1961) and Kanodia and Gupta (1968) respectively.

Studies on the grasses of Indian desert have not received considerable attention. It is evident from the history of botanical exploration (Sharma and Tiagi, 1979; Bhandari, 1978; Shetty and Singh, 1987-1993); that much remains to be done on this important group of plants

### Material and Methods

During the present study an extensive survey of grasses of North-West part of Rajasthan was undertaken. All the grasses growing over the entire study area were collected in all the seasons of the year. The hilly area was surveyed at every visit by walking over the slopes, tops and base of the hills.

Among grasses, the leaves branches and inflorescence of different species of the same genera look very much alike in appearance to the naked eye and are liable to be passed unnoticed, thinking them one and the same species. So during the collection of grasses a closer examination of each and every sample was made with the help of hand lens. Generally five specimens of each species were collected and after drying, herbarium sheets were prepared according to customary methods (Lawrence, 1951). Voucher specimens have been deposited in the Herbarium of

Laboratory of Ethnobotany and Agrostology, Department of Botany, College of Science, Udaipur, Rajasthan. An effort was always made to dissect and identify the grass specimens soon after they were brought to the laboratory. In all cases, however the identification of grasses was finally confirmed by matching them in the herbarium of the Forest Research Institute, Dehra Dun.

The grasses are very good ecological indicators of habitats. On the basis of field observations during the survey of the grass flora of (90 grass species) North-West Rajasthan. So authors have classified various grass species of the region according to the type of habitat in which they have been found to grow. Besides this the grasses of the region have also been classified according to the economic importance (Table 1).

During the period under study, efforts for collection of germplasm of new recorded forage genetic stock of grasses i.e. cultivated varieties, obsolete cultivars, landraces and wild and weedy species from diverse habitats of the study area have been made. Germplasm of almost all these grass species except those which are of rare occurrence have been collected and supplied to the NBPGR, New Delhi along with passport data book for allotment of IC (Indigenous Collection) numbers.

### New Addition of Grass Flora Study

*Brachiaria eruciformis* Griseb. in Ledeb. Fl. Ross. 469. 1853; Fischer in fl. Mad. 3:1769. 1934; Bor in Fl. Assam 5:274. 1940; Raizada in Ind. For. Rec. (Bot.) 4:97. 1954; *Panicum eruciformis* Sibth. et Smith Fl. Graeca. 1:44. t. 59; *Brachiaria isachne* (Roth. Ex R. & S.) Stapf. in Prain, Fl.

Trop. Afr. 9:552. 1919; Haines, Bot. Bih. and Ori. 2:1004. 1924; Blatter and McCann, Bomb. Grass. 133. 1935; *Panicum isachne* Roth. ex R. & S. Syst. Veg. 2:458. 1817; Hook. f. Fl. Brit. Ind. 7:28. 1896. (Fig. 2).

Annual grass, culms 30-60 cm high, loosely tufted, geniculately ascending from a sometimes decumbent and rooting base, slender, much branched below, terete or slender, much branched below, terete or slender, glabrous. Leaf-blades linear-lanceolate, base rounded, acute, 2-6 cm long by 2-5 mm wide flat or convolute, rigid, glabrous or hairy, margins very scabrid; sheaths rather tight, terete or subterete, striate, softly hairy or glabrous except at the villosus nodes; ligules reduced to a dense fringes of hairs. Inflorescence of secund or sub-secund very narrow racemes, 2-10 in number, usually appressed to the filiform, scabrid axis, which is terete below and flattened upwards; racemes simple, dense, 1.25-2.5 cm long; rachis filiform, triquetrous, straight or slightly wavy, scabrid or ciliate; spikelets 2-seriate, imbricate, oblong, obtuse or sub-acute, flat on the back, 2-2.5 mm. long, softly pubescent. Lower glume truncate, hyaline scale; upper glume membranous, 2.5 mm long, 5-nerved, minutely hairy; lower lemma male or neuter very similar to the upper glume, 2.5 mm long, 5-nerved, palea very obtuse, 2 mm long; upper lemma hermaphrodite, 2mm long, crustaceous, shining, whitish; palea similar but flatter on back, 2mm long. Caryopsis oblong, elliptic or obovate-oblong, 1-1.5 mm long, more or less flattened on both the sides, mainly on the back, olive green.

*Fl. and Fr.* : July-September.

*Locality* : Ganganagar.

*IC number given by NBPGR, New Delhi* : 255336

*Specimen Examined* : Takhar, 244.

**Table 1**  
Habitat study of the grasses of Indian Desert

Sl. No.	Grass species	Codes*																
		AG	SBG	GSD	GHG	DRG	SOBG	GP	GCF	LG	SLG	HG	OW	ARG	MG	MM	TGM	
1	2	3	4	5	6	7	8	9	10	1	12	13	14	15	16	17	18	
1.	<i>Acrahe racemosa</i>	-	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-	
2.	<i>Aeluropus lagopoides</i>	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3.	<i>Apluda mutica</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	*	-	-	
4.	<i>Aristida adsceniosis</i>	-	-	-	-	*	-	*	-	-	-	-	-	-	-	-	*	
5.	<i>Aristida funiculata</i>	-	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-	
6.	<i>Aristida hirtigluma</i>	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	
7.	<i>Aristida hystriola</i>	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	
8.	<i>Aristida hystrix</i>	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	
9.	<i>Aristida mutabilis</i>	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	
10.	<i>Aristida pongopila</i>	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	
11.	<i>Aristida redacta</i>	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	
12.	<i>Aristida royleana</i>	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	
13.	<i>Arthraxon lanceolatus</i>	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-	-	
14.	<i>Arthraxon lancifolius</i>	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-	-	
15.	<i>Arundo donax</i>	*	-	-	-	-	*	-	-	-	-	-	-	-	-	-	-	
16.	<i>Avena fatua</i>	-	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-	
17.	<i>Avena sativa</i>	-	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-	
18.	<i>Bothriochloa intermedia</i>	-	-	-	-	-	*	-	-	-	-	*	-	*	-	-	-	
19.	<i>Bothriochloa pertusa</i>	-	-	-	-	-	-	-	-	-	-	*	-	*	-	-	-	
20.	<i>Brachiaria eruciformis</i>	-	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-	
21.	<i>Brachiaria ramosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*	-	
22.	<i>Cenchrus biflorus</i>	-	-	-	-	*	-	*	-	-	-	-	-	-	-	-	*	

Contd...

	2	3	4	5	6	7	8	9	10	1	12	13	14	15	16	17	18
23. <i>Cenchrus ciliaris</i>	-	-	-	-	-	*	-	*	-	-	-	-	-	-	*	-	-
24. <i>Cenchrus setigerus</i>	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25. <i>Chloris dolichostachya</i>	-	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
26. <i>Chloris virgata</i>	-	*	-	-	-	*	-	*	-	-	-	-	-	-	-	-	-
27. <i>Chrysopogon fulvus</i>	-	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
28. <i>Chrysopogon gryllus</i>	-	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
29. <i>Cymbopogon jwarancusa</i>	-	-	-	-	-	-	*	-	-	-	-	-	-	*	-	-	-
30. <i>Cymbopogon martinii</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	*	-	-	-
31. <i>Cymbopogon schoenanthus</i>	-	-	-	-	-	-	*	-	-	-	-	-	-	*	-	-	-
32. <i>Cynodon barberi</i>	-	-	-	-	-	-	*	*	*	*	-	-	-	-	-	-	-
33. <i>Cynodon dactylon</i>	-	-	-	-	-	-	*	*	*	*	-	-	-	-	*	-	-
34. <i>Dactyloctenium aegyptium</i>	-	-	-	-	-	-	*	-	-	-	-	-	-	-	*	-	-
35. <i>Dactyloctenium indicum</i>	-	-	-	-	-	*	-	-	-	-	-	-	-	-	*	-	-
36. <i>Desmostachya bipinnata</i>	-	-	-	-	-	-	*	-	-	-	-	-	-	-	*	-	-
37. <i>Echinochloa colonum</i>	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*	-
38. <i>Echinochloa crusgalli</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*	*	-
39. <i>Eleusine indica</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*	*	-
40. <i>Eragrostiella bifaria</i>	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-	-	-
41. <i>Eragrostis cilianensis</i>	-	-	-	-	-	-	-	-	*	-	-	-	-	*	-	-	-
42. <i>Eragrostis ciliaris</i>	-	-	-	-	-	*	-	-	*	-	-	-	-	-	-	-	-
43. <i>Eragrostis pilosa</i>	-	*	-	-	-	*	-	-	-	-	-	-	-	-	-	-	-
44. <i>Eragrostis poaeoides</i>	-	*	-	-	-	*	-	-	-	-	-	-	-	-	-	-	-
45. <i>Eragrostis tremula</i>	-	-	-	-	-	*	-	-	*	-	-	-	-	-	-	-	-
46. <i>Eriochloa procera</i>	-	-	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-

Contd...

1	2	3	4	5	6	7	8	9	10	1	12	13	14	15	16	17	18
47.	<i>Hemarthria compressa</i>	*	-	-	-	-	-	-	-	-	-	-	-	-	*	-	-
48.	<i>Heteropogon contortus</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	*	-	*
49.	<i>Imperata cylindrica</i>	-	-	-	-	-	-	-	-	*	-	-	-	-	*	-	-
50.	<i>Isilema prostratum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51.	<i>Lasiurus hirsutus</i>	-	-	-	-	*	*	*	-	-	-	-	-	-	-	-	-
52.	<i>Lasiurus sindicus</i>	-	-	-	-	*	*	*	-	-	-	-	-	-	-	-	-
53.	<i>Latipes senegalensis</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
54.	<i>Melanocenchris abyssinica</i>	-	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-
55.	<i>Melanocenchris jacquemontii</i>	-	-	-	*	-	-	*	-	-	-	-	-	-	-	-	-
56.	<i>Octochloa compressa</i>	-	-	-	-	*	-	-	-	-	-	-	-	-	*	-	-
57.	<i>Oropetium roxburghiana</i>	-	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-
58.	<i>Oropetium thoeameum</i>	-	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-
59.	<i>Panicum antidotale</i>	-	-	-	-	*	*	*	-	-	-	-	-	-	*	-	-
60.	<i>Panicum turgidum</i>	-	-	-	-	*	*	*	-	-	-	-	-	-	-	-	-
61.	<i>Paspalidium geminatum</i>	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62.	<i>Paspalum compactum</i>	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63.	<i>Pennisetum hohneckeri</i>	*	-	-	-	-	*	-	-	-	-	-	-	-	-	-	*
64.	<i>Pennisetum purpureum</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
65.	<i>Phalaris minor</i>	-	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-
66.	<i>Phragmites karka</i>	*	-	-	-	-	-	-	-	-	-	-	-	-	*	-	-
67.	<i>Polypogon monspeliensis</i>	-	-	-	-	-	-	-	*	-	-	-	-	-	-	-	-
68.	<i>Rhynchelytrum villosum</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-

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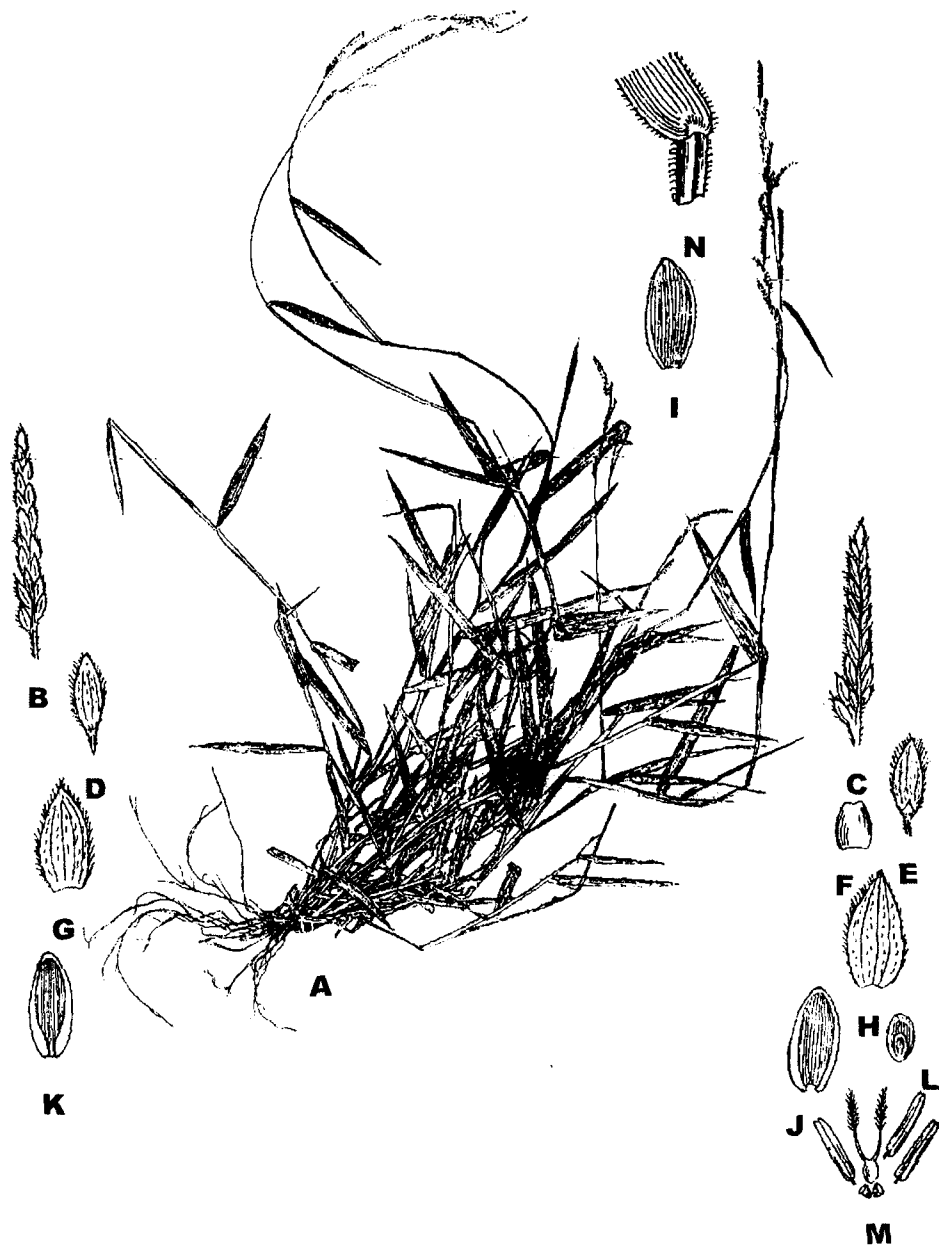
1	2	3	4	5	6	7	8	9	10	1	12	13	14	15	16	17	18
69.	<i>Saccharum bengalens</i>	-	-	-	-	*	*	-	-	-	-	-	-	-	*	-	*
70.	<i>Saccharum reveeneae</i>	-	-	-	-	-	*	-	-	-	-	-	-	-	-	-	-
71.	<i>Saccharum spontaneum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*
72.	<i>Setaria ischaemoides</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
73.	<i>Setaria nervosum</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
74.	<i>Setaria glauca</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*	-
75.	<i>Setaria tomentosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*	-
76.	<i>Setaria verticillata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*	-
77.	<i>Sorghum halepense</i>	-	-	-	-	-	*	-	-	-	-	-	-	-	*	-	-
78.	<i>Sporobolus capillaris</i>	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-	-
79.	<i>Sporobolus coromendelianus</i>	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-	-
80.	<i>Sporobolus diander</i>	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-	-
81.	<i>Sporobolus marginatus</i>	-	*	-	-	-	*	-	-	-	-	-	-	-	-	-	-
82.	<i>Tetrapogon tenellus</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
83.	<i>Tetrapogon villosus</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
84.	<i>Thelepogon elegans</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
85.	<i>Tragus biflorus</i>	-	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-
86.	<i>Tragus roxburghii</i>	-	-	-	*	-	-	*	-	-	-	-	-	-	-	-	-
87.	<i>Tripogon jacquemontii</i>	-	-	-	-	-	-	*	-	-	-	-	*	-	-	-	-
88.	<i>Tripogon lisboae</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
89.	<i>Tripogon roxburghianus</i>	-	-	-	-	-	-	-	-	-	-	*	-	-	-	-	-
90.	<i>Vetiveria zizanioides</i>	-	-	-	-	-	-	*	-	-	-	-	-	*	-	-	-

\*Codes description:

AG - Aquatic grass; SBG- Salt Belt grass; GSD - Grasses of sand dunes; GHG - Grasses of heavily grazed area; DRG - Drought Resistant grasses; SOBG - Soil binder grass; GP - Grasses of Pasture; GCF - Grasses of cultivated fields; LG - Lawn grass; SLG - Shade loving grass; HG- Hillocky area grass; OW - On walls grasses; ARG- Aromatic grasses; MG - Medicinal grasses; MM - Minor millets; TGM - Troublesome grasses after maturity.



Fig. 2



*Brachiaria eruciformis* Griseb.

A. Habit; B&C. Front and back view of spikelet; D&E. Front and back view of spikelet; F. Lower glume; G. Upper glume; H. Lower lemma; I. Palea; J&K. Upper lemma and its palea; L. Grain; M. Ovary, stamens and lodicules; N. Ligule

***Chloris dolichostachya*** Lagasca Gen. et Spec. Pl. 5:1816; Bor. Ind. Gr. 466. 1960; Fl. Del. 387. 1963; Fl. Raj. 150. 1964. N.E. Raj. 444. 1979; *Chloris incompleta* roth. Nov. Pl. Sp. 60. 1821; FBI. 7:290. 1896; Cooke 3:556. 1958; Bor UP Gr. 92. 1958. (Fig. 3).

A perennial grass with a procumbent stem, becoming erect later lower nodes rooting and bearing tufts of branches; leaves lamina narrow at base, apex tapering to a fine point, sheaths elongate, auriculated, hairy at mouth, ligule obscure or represented by long hairs.

Inflorescence: terminal spikes arranged digitately; spikelets imbricate, appressed; glumes very unequal, acuminate, the lower glume 2 mm long, upper glume 6 mm long, narrowed into a short awn; lower lemma 6 mm long, 3-nerved, with acute or 2-toothed tip, awn 5-8 mm long, capillary; palea also 6 mm long; upper lemma reduced to an awn.

*Fl. and Fruiting* : August- October.

*Locality* : Sikar and Jhunjhunu.

*IC number given by NBPGR, New Delhi* : 255262

*Specimen Examined* : Takhar, 303.

***Cynodon barberi*** Rang. et Tad. in J. Bombay Nat. Hist. Soc. 24:846. 1916. Bor. 469. 1960. (Fig. 4).

Perennial with slender, creeping stems, rooting at the nodes and invariably with two or three rarely more branches from each node; flowering branches are slender, erect or ascending, 2.5-15 cm long. Leaf-sheath is short, smooth, compressed with scattered long hairs at the mouth; ligule is a narrow membrane with the edge cut into narrow lobes; leaf-blade is flat, linear, acute or sub-acute, scaberulous, 0.8-8.5 cm long, 0.3-0.5 cm broad.

Inflorescence consists of three to five digitate spikes, 1.9-3.8 cm long, erect or

spreading pale green or purplish. Spikelets are compressed laterally, sessile or obscurely pedicelled, imbricate, alternately biseriate on the central side of the rachis, 1-flowered; the rachilla is produced into a bristle behind the palea, with or without a minute glume. There are three glumes. Lower glume lanceolate, acute, shorter than the upper, with a keel which is scabrid; upper glume lanceolate, acuminate, equal to or a little longer than the lower lemma with a scabrid keel. Lower lemma is obliquely oblong to ovate, sub-acute, truncate or 2-toothed, boat-shaped, sub-chartaceous, 3-nerved, paleate and distinctly keeled; the keel and the margins of the glume are densely covered with distinctly clavellate hairs; palea is firmly membranous, equal to or slightly smaller than the glume, linear-oblong, 2-keeled, densely hairy with clavellate hair along the keels, and 2-nerved; lodicules 2; stamens 3; ovary ovoid with two style branches. Grain free within the glume, oblong, smooth, transparent; embryo is about one-third the length of the grain.

*Fl. and Fr.* : July - October.

*Locality* : Jhunjhunu.

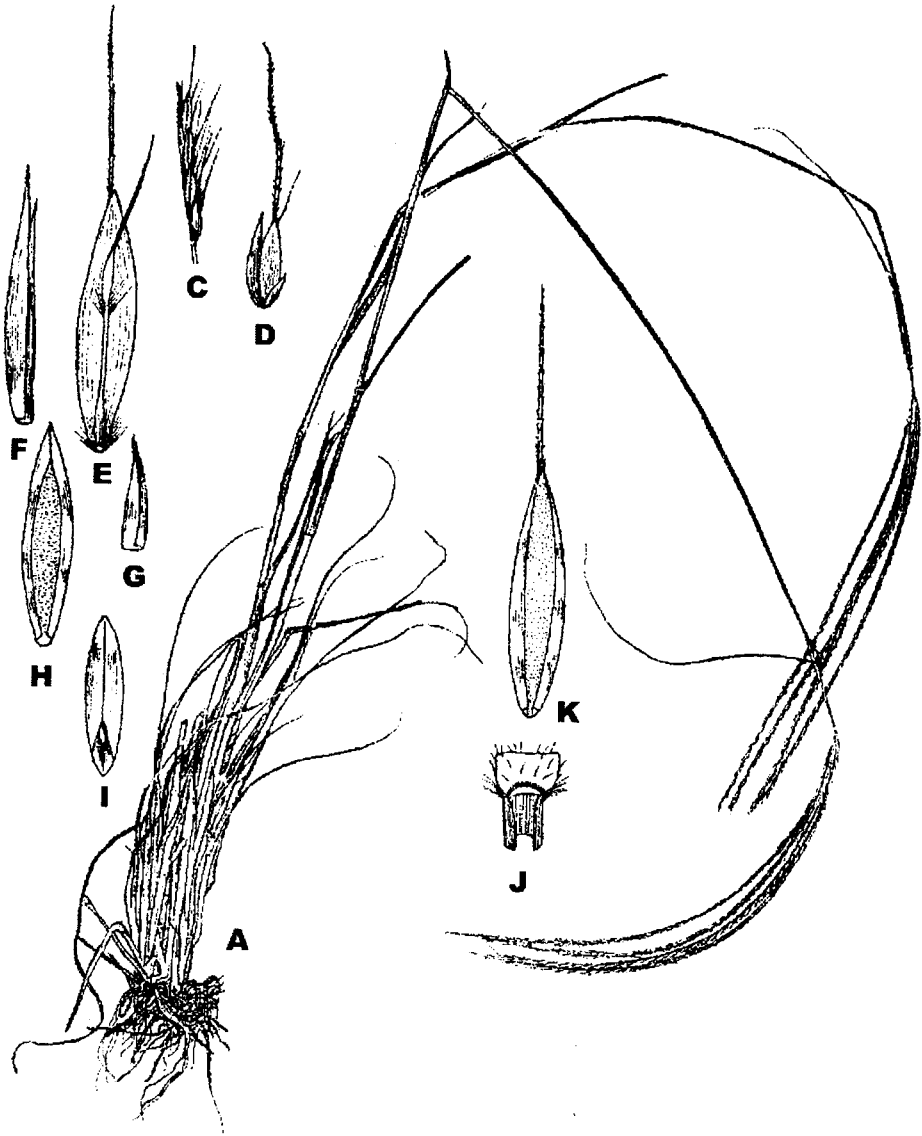
*IC number given by NBPGR, New Delhi* : 255343

*Specimen Examined* : Takhar, 310.

***Eleusine indica*** (Linn.) Gaertn. Fruct. 1:8, 1789; Cook in FPB 3:560, 1958; Bor in GBCIP 493, 1960. (Fig. 5).

An annual grass Culms tufted with short stems erect from often an decumbent base, glabrous, smooth, 30-60 cm tall. Leaf-blades flat, 7.5-30 cm long, 3-4 mm wide, narrowly linear in shape, flaccid, tapering to an acuminate tip, not contracted at the base, glabrous or with a few hairs near the base; sheaths flattened, keel ciliate; ligule narrow, membranous, ciliate.

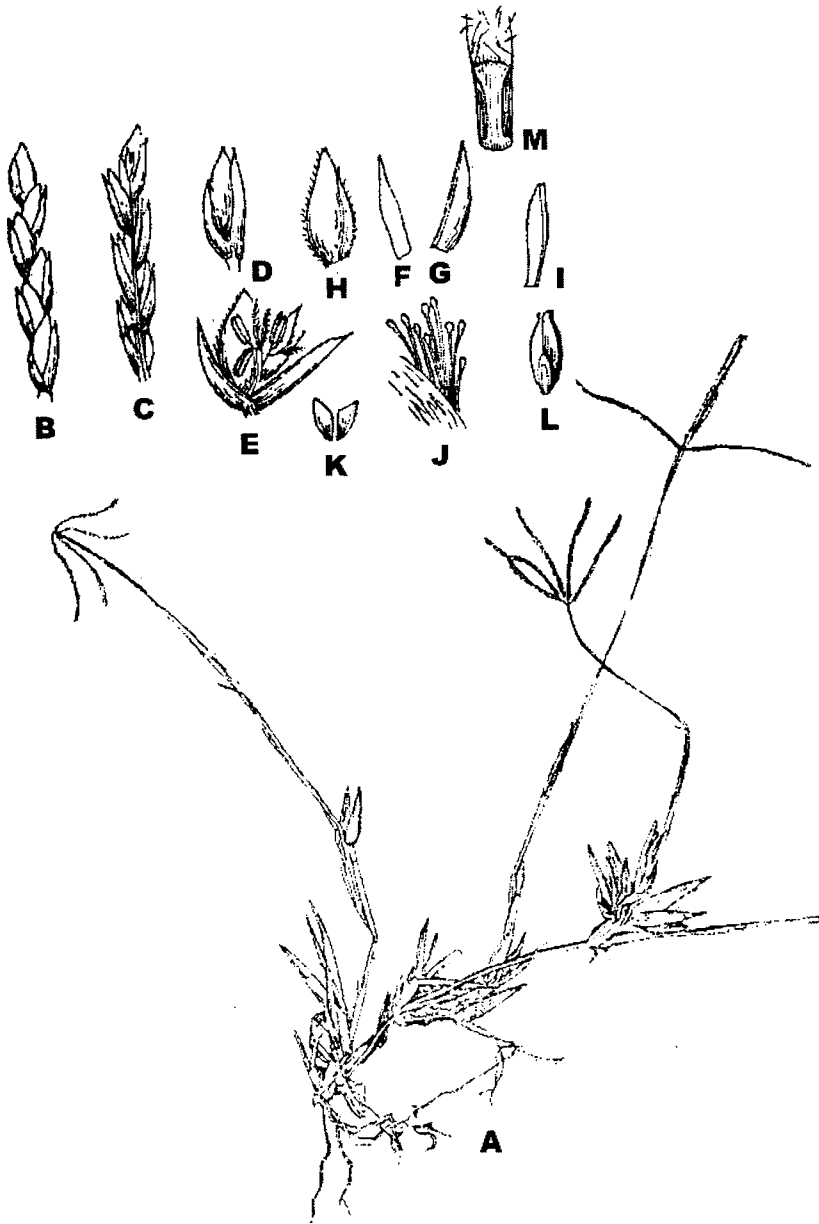
Fig. 3



*Chloris dolichostachya* Lagasca.

A. Inflorescence; B. Basal portion of the plant; C. Portion of a raceme showing the second awned spikelets; D. A single spikelet; E. Spikelet after removing lower and upper glume, the awned lemma and the rachilla with a small knob at the tip (representing an immature floret); F. Upper glume; G. Lower glume; K&H. Awned lemma and its palea; I. Seed (red coloured); J. Ligule.

Fig. 4

*Cynodon barberi* Rang et. Tad.

A. Habit; B&C. Front and back view of a portion of spike; D. A single spikelet; E. A spikelet with the flower out; F. Lower glume; G. Upper glume; H&I. Lemma and its palea; J. Clavellate hairs; K. Lodicules; L. Grain; M. Ligule.

Inflorescence : of three to seven digitate spikes radiating from the top of a glabrous peduncle, occasionally a subsidiary lower whorl is formed. Racemes 5-12 cm long, erect or slightly decurved; rhachis flat, green, scabrid on the margins, ending in a terminal spikelet; axils hairy and glandular. Spikelets : up to 6 mm long, imbricate, secund and pointing forward, 3-6 flowered, biseriate. Lower glume 1-6 mm long, ovate-oblong, acute, 1-nerved, keeled, scabrid on the keel. Upper glume 2.5 mm long, ovate-oblong, 3-7 nerved, shortly apiculate, keeled, scabrid on the keels. Lemmas ovate-oblong, shortly apiculate or obtuse, 3-nerved, cymbiform, 3.2 mm long; margins broadly hyaline; palea shorter, 2-nerved reduplicate or margins reflexed. Stamens 3; anther 0.8 mm long. Lodicules small, cuneate. Grain 2 mm long, chestnut in color, oblong and obscurely trigonous with an oblique base, transversely rugose, sometimes obscurely; tip obtuse or rounded.

*Fl. and Fr.* : July - October.

*Locality* : Ganganagar and Hanumangarh.  
*IC number given by NBPGR, New Delhi* : 255290

*Specimen Examined* : Takhar, 289.

***Eriochloa procera*** (Retz.) C.E. Hubbard in Kew Bull. 256. 1930; Fischer in Fl. Mad. 3:1767. 1934; Bor. in Fl. Assam. 5:268; 1940; Raizada in Ind. For. Rec. (Bot.) 4:97. 1954; *Agrostis procera* Retz. Obs. 4:19. 1786; *Eriochloa polystachya* Hook. f. Fl. Brit. Ind. 7:20. 1896 (non H.B. &K.) *Eriochloa ramosa* (Retz.) O. Kt. Rev. gen. pl. 2:775. 1891; Haines, Bot. Bih. and Ori. 2:1006. 1924; Blatter and McCann, Bomb. Grasses. 131. 1935. (Fig. 6).

A perennial grass. Stem: short creeping, rhizomatous, culms: 0.3-1.5 m tall, densely tufted, simple or branched,

erect or decumbent at the base, often geniculate, glabrous, swollen and pubescent at the nodes, striate. Leaves: erect, linear or linear-lanceolate, acuminate, flat, soft, striate, glabrous, 9.5-25 cm long, smooth or with scarcely scabrid margins; sheaths open, compressed, sub-carinate, glabrous or not, striate the upper the longer; ligule very short, hairy.

Inflorescence: a panicle of simple or branched spikes, erect or not, 5-12 cm long; rhachis slender angular, quite smooth; branches with naked base; pedicels solitary of 2-nate, the longer short than the spikelet, triquetrous, swollen at the apex and carrying silky hairs. Spikelets : very laxly imbricate, erect, 2.5-3.5 mm long, ovate-lanceolate, acuminate compressed, velvety, with hairs at the summit which are rigid, erect, not capitate, 0.3-0.4 mm long. Lower glume absent; upper glume 2.5-3.5 mm long, membranous, convex, ovate-lanceolate, acuminate, with the margins somewhat in rolled, 3-5-nerved, silky. Lower lemma empty 2.3-3.2 mm long, flatter, otherwise similar to the upper glume; palea absent; upper lemma hermaphrodite, 1.5-1.8 mm long, subcoriaceous, pale, shining, compressed dorsally, oblong-obtuse, sub-convex, margins narrowly inflexed and embracing the palea, with a few hairs at the top, continued into a mucro with short rigid erect hairs; palea a little shorter than the lemma, oblong, obtuse, almost flat with inflexed margins. Caryopsis free within the hardened lemma and palea, pointed at the base, obtuse above, compressed lenticular, smooth.

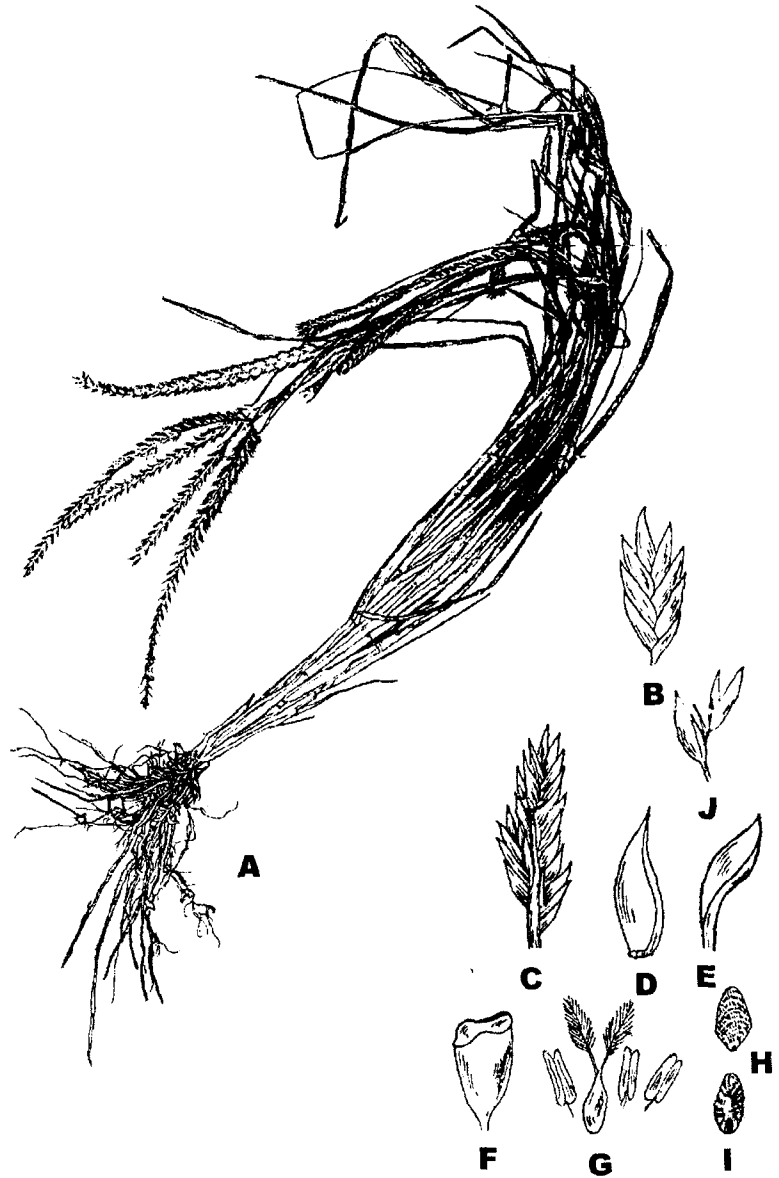
*Fl. and Fr.* : September- October.

*Locality* : Hanumangarh.

*IC number given by NBPGR, New Delhi* : 276726.

*Specimen Examined* : Takhar, 251.

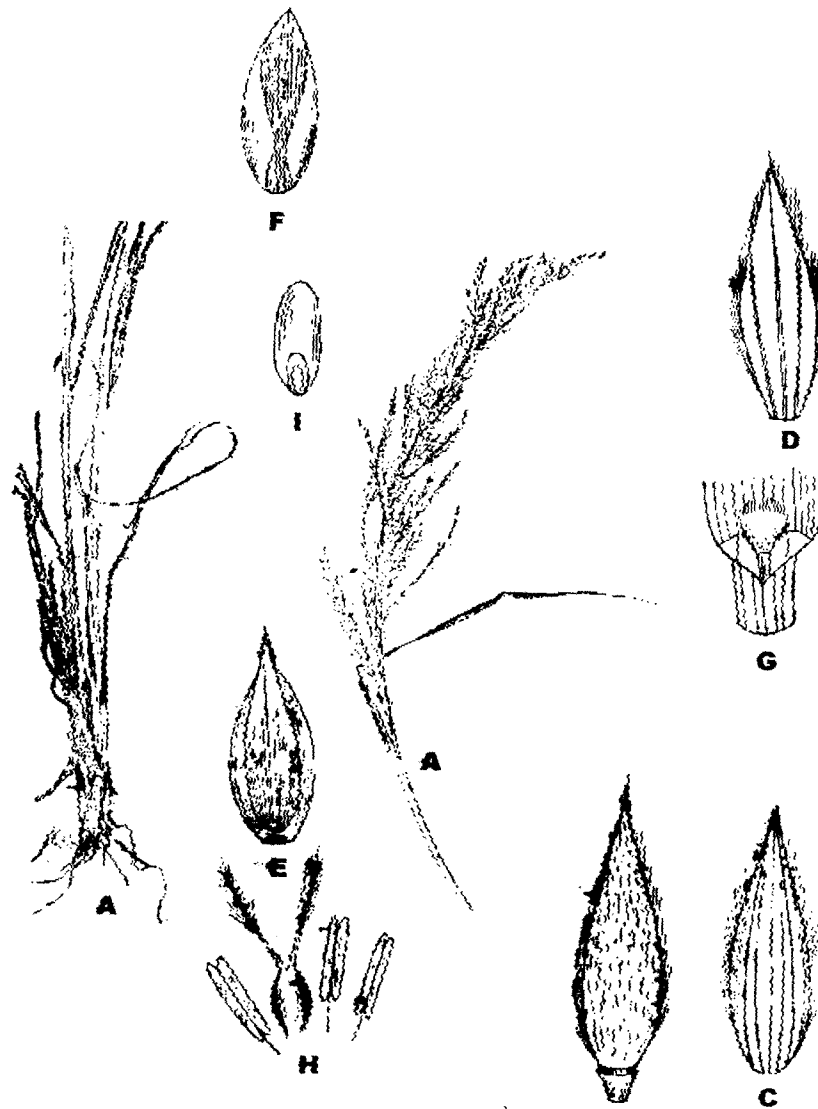
Fig. 5



*Eleusine indica* (Linn.) Gaertn.

A. Habit; B. Spikelet; C. A portion of the spikelet; D. Lower lemma; E. Palea of lower lemma; F. Upper lemma; G. Ovary and stamens; H.&I. Grain; J. Lemmas and their palea with the rachis.

Fig. 6



*Eriochloa procera* (Retz.) C.E. Hubb.  
A. Inflorescence; A1. Lower portion of the plant; B. A spikelet; C. Upper glume; D. Lower glume;  
E. Upper lemma; F. Palea of upper lemma; G. Ligule; H. Ovary and stamens; I. Grain.

***Hemarthria compressa*** (Linn. f.) R. Br. Prods. Fl. Nov. Holl. 207. 1810; *Rottboelia compressa* Cook in FPB 3:470, 1958; Bor in GBCIP 161, 1960. (Fig. 7).

Perennial, culms : Compressed, erect or decumbent, often branched, sometimes with pubescent nodes, flower bearing branches solitary or ternate, short, simple or very rarely somewhat branched, surrounded by sheaths. Leaves: flat or almost so, smooth or scabrid above and on margins, rarely on the slender median nerve below; sheaths not articulate or hairy in the throat, compressed and keeled, somewhat loose, much shorter than the internodes, ligules very short, truncate, membranous, ciliate.

Inflorescence : of racemes or false spikes, 7 cm long, compressed, erect, the upper often fascicled, sometimes somewhat incurved, slightly exerted from the sheaths, herbaceous, dark-green, joints of the rachis glabrous, thickened by the fusing of the pedicel, much shorter than the spikelets; with the back slightly, and front deeply, excavated, scar and articulation flat. Sessile spikelet : 4-4.5 mm long, linear-lanceolate; callus small, distinct, smooth, glabrous, lower glume 5 mm long, linear-oblong, emarginate or 2-toothed, often sub-oblique and narrowly winged back, flat, margins somewhat reflexed, marginal fold smooth to the tip, 7-9-nerved in the narrow grooves; upper glume 5 mm long, concave, sub keeled very thin, membranous, closely applied and often adnate to the excavation in the rachis, elliptic-lanceolate or ovate, acuminate, muticous, or very shortly subulate, aristate, 3-5 nerved. Lower lemma 4 mm long, oblong, obtuse, hyaline, 2-nerved; upper lemma 3.5 mm long, ovate-oblong, almost nerveless, its palea 2.5 mm. long, linear, obtuse, nerveless. Anthers 2.5 mm long. Stigmas laterally exerted.

Pedicelled spikelet: male or if hermaphrodite with rudimentary anthers, scarcely longer than or equal to the sessile in length, but narrower, linear-lanceolate or subulate, scabrid at the top; pedicel fused to the rachis; lower glume herbaceous, subcoriaceous, subulate or narrowly lanceolate, 7-nerved; upper glume free, a little longer than lower, hyaline but somewhat firm, acuminate or shortly aristate, 7-9 nerved; lemmas as in sessile spikelet. Terminal spikelet: with a long pedicel and with glumes longer, acuminate than others.

*Fl. and Fr.* : August-October.

*Locality* : 3MK, Ganganagar.

*IC number given by NBPGR, New Delhi* : 285241.

*Specimen Examined* : Takhar, 211.

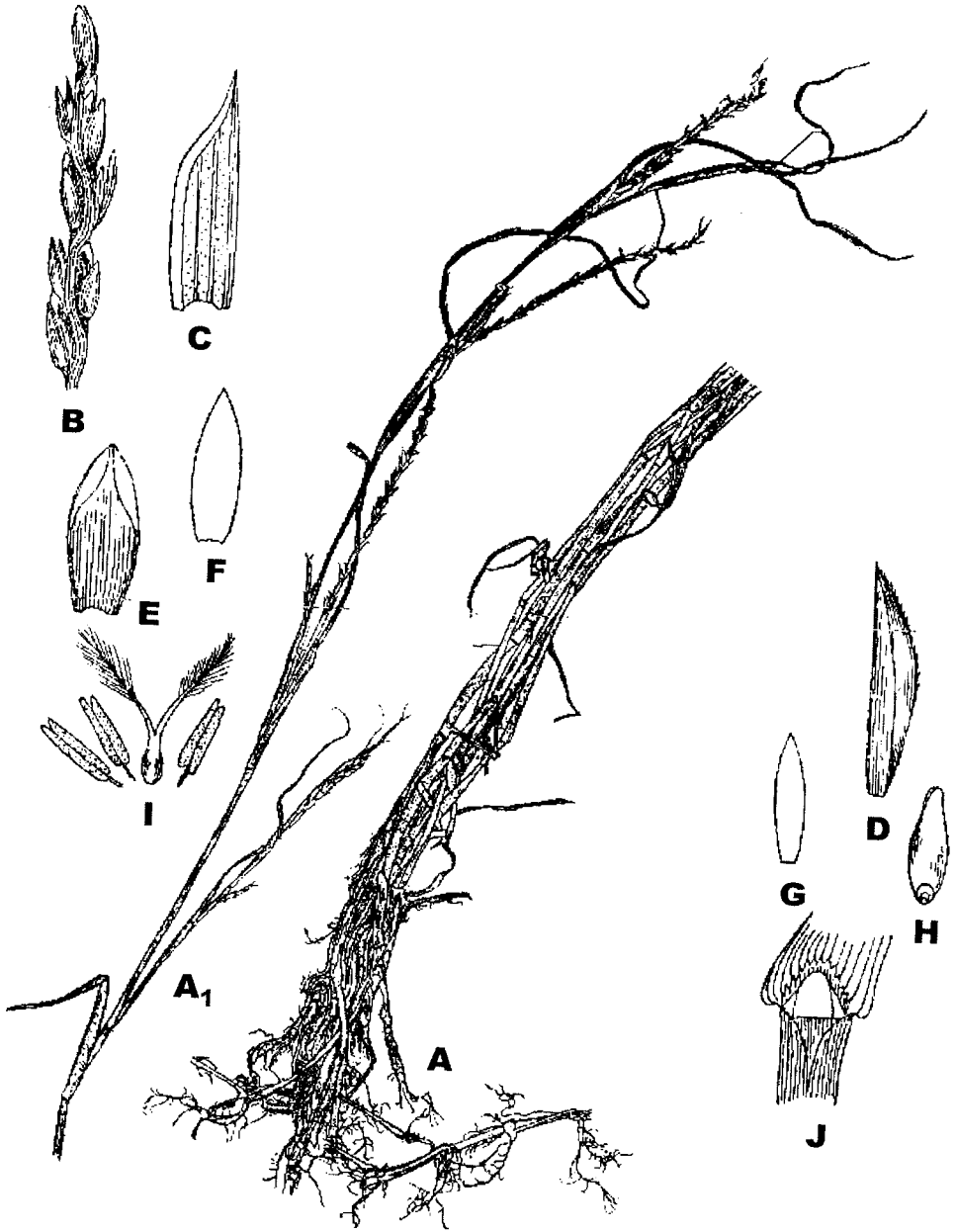
## Results and Discussion

On the basis of present study seven new genera of grasses to record in Indian desert flora first time i.e. namely *Brachiaria eruciformis*, *Chloris dolichostachya*, *Eriochloa procera*, *Cynodon barberi*, *Eleusine indica* and *Hemarthria compressa*. The perennial grasses of ecological importance in the study area are *Lasiurus indicus*, *Cenchrus ciliaris*, *Cenchrus setigerus*, *Panicum turgidum* and *Panicum antidotale* the grasses most suited under xeric conditions are *Lasiurus indicus* and *Panicum turgidum*. These grasses forms the pure pasture in Jaisalmer, Barmer natural pastures of these grasses are the gift of nature to the inhabitants of this region as economy of the people of this region subsists on the livestock which feed on these natural pastures.

The ecological study of grasses (90 species) according to their habitat

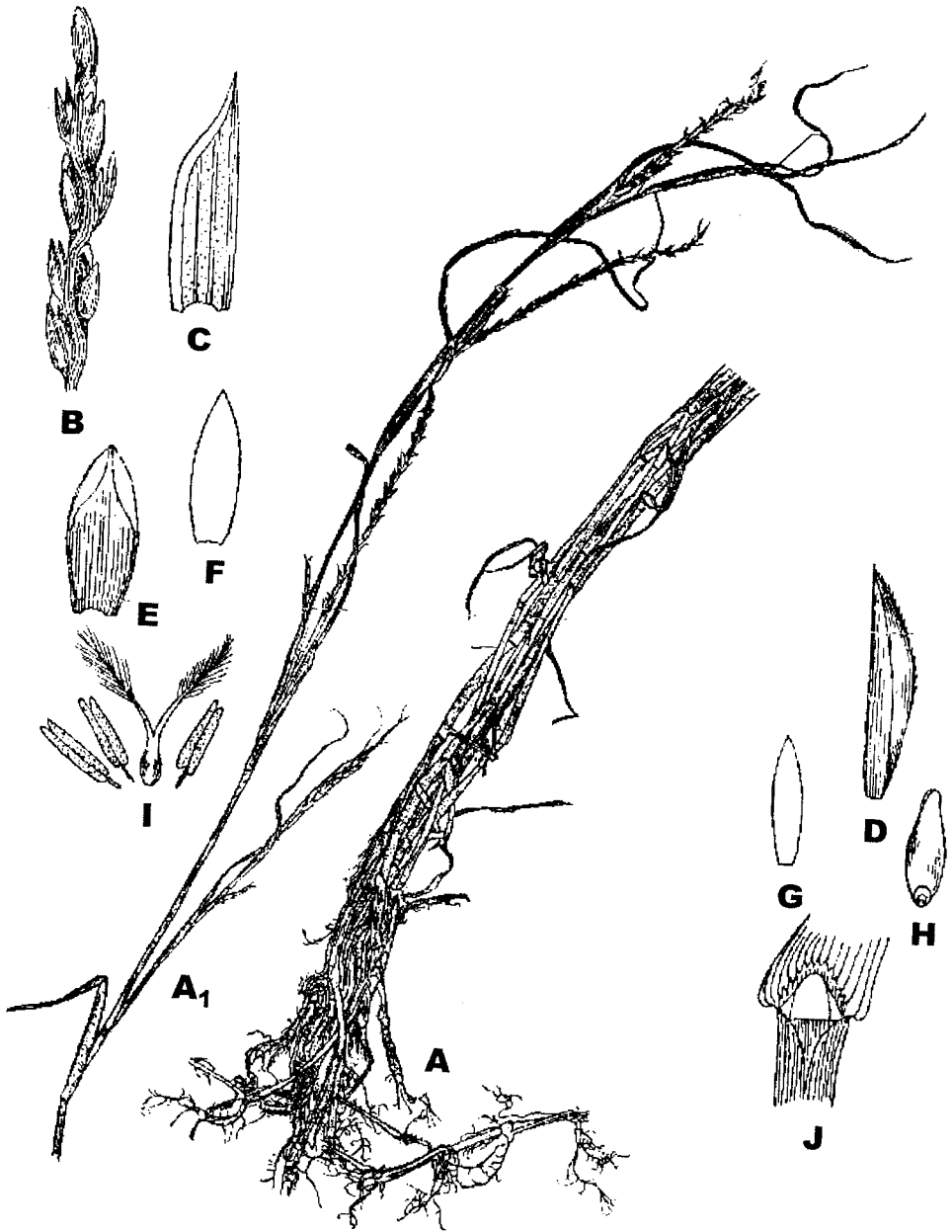


Fig. 7



*Hemarthria compressa* Linn. f.  
A. Habit; A1. Inflorescence; B. A part of raceme; C. Lower glume; D. Upper glume; E. Lower lemma; F. Upper lemma; G. Palea of upper lemma; H. Grain; I. Ovary and stamens; J. Ligule.

Fig. 7



*Hemarthria compressa* Linn. f.  
A. Habit; A1. Inflorescence; B. A part of raceme; C. Lower glume; D. Upper glume; E. Lower lemma; F. Upper lemma; G. Palea of upper lemma; H. Grain; I. Ovary and stamens; J. Ligule.

indicates that grasses can tolerate every type of habitat because of their high "ecological amplitude". The perennial grasses seem to be the best ecological indicators'.

The local people use these grasses to cure various ailments. For example *Apluda mutica*, *Cenchrus ciliaris*, *Cynodon dactylon*, *Dactyloctenium indicum*, *Dactyloctenium aegyptium*, *Desmostachya bipinnata*, *Echinochloa crusgalli*, *Eleusine indica*, *Hemarthria compressa*, *Heteropogon contortus*, *Imperata cylindrica*, *Panicum antidotale*, *Phragmites karka*, *Saccharum bengalense*, *Sorghum halepense* and *Vetiveria zizanioides* have remarkable medicinal properties.

### Conclusion and Recommendations

The condition of desert natural pastures is deteriorating on account of illicit overgrazing. Their proper management should focus on keeping these pastures in healthy condition so that future generations can also benefit from these precious natural resources. Seven new records from study area grasses seem to be due to irrigation facility by Indira Gandhi Canal System in the study area.

Certain grasses of the study area especially aromatic grasses *Chrysopogon*

*fulvus*, *Chrysopogon gryllus*, *Cymbopogon jwarancusa*, *Cymbopogon martinii*, *Cymbopogon schoenanthus* and *Vetiveria zizanioides* have high medicinal value. Certain traditional varieties, landraces and other grasses are also under stress. Hence efforts should be made to conserve these valuable species to avoid their total disappearance from the region. In this context an effort has been made by the authors to collect the germplasm of these species from the study area. The same have been given to the National Gene Bank at NBPGR, New Delhi for long-term conservation and utilization for plant breeders. Therefore, in the present paper an attempt was made to carry out the systematic and habitat studies of this most neglected but important group of plants. The more efforts are put for systematic collection of grasses and their germplasm as the present study is not the last word on grass diversity of the arid region.

The improvement of animal husbandry in the arid zone is largely dependent on the improvement of its natural grasslands. Rejuvenation of the grasslands through improved types of grasses and legumes needs to be carried out. Since there are limitations to productivity imposed by water scarcity in arid area, studies of the most efficient use of rainfall for pastures need to be carried out.

### Acknowledgements

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## SUMMARY

**Intensive and extensive survey over the last 7 years on the grass flora, family Poaceae of North-western Rajasthan has yielded unrecorded seven grasses genera from the this region. Those including the 90 grass species habitat study also carried out and collection of germplasm also done and deposited at NBPGR, New Delhi for long time conservation. Full description and illustration are provided for each genera in this paper.**

**Key words :** Grasses, Systematic study, Habitat, Germplasm, North-western Rajasthan, Indian Desert.

भारतीय मरुभूमि, राजस्थान की घासों के कुछ नए आलेखों का वर्गीकारिकीय और पादपीय अध्ययन  
एच०के० तखार व एस०एस० कटेवा

### सारांश

उत्तर-पश्चिमी राजस्थान में घासकुल के घासीय पादपों का विगत सात वर्षों में सघन और सुविस्तृत सर्वेक्षण किया जाने से इस क्षेत्र से घासों की पहले अनालेखित सात नई प्रजातियां प्राप्त हुई हैं। इन प्रजातियों में सम्मिलित नब्बे घास जातियों का प्राकृतावास अध्ययन भी किया गया और उनका बीज प्ररस (जर्मप्लाज्म) संग्रह करके एनबीपीजीआर, नई दिल्ली में लम्बे समय तक संरक्षित बना रहने के लिए जमा कर दिया गया। प्रत्येक प्रजाति का पूरा वर्णन और उनके चित्र भी साथ में दिए गए हैं।

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