

## THE GRASSES OF LUCKNOW DISTRICT

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## ABSTRACT

This paper gives an account of the grasses of Lucknow District. About 65 genera and 130 species belonging to the 3 tribes of Panicoideae and 15 tribes of Pooideae are described. Of these 18 tribes the tribe Paniceae, Andropogoneae, Eragrosteae and Chlorideae are dominant in having 48, 31, 18 and 8 species respectively. Keys to the tribes, sub-tribes, genera and species are given. Correct names, notes on habit and habitat, exact localities of occurrence, names of collectors and their field numbers are appended to every species enumerated.

## INTRODUCTION

The flora of Lucknow District (Uttar Pradesh) has been studied in detail by several workers (Anderson 1859, Patil 1960, '63, Kapoor 1962, Srivastava 1963, Balapure & Srivastava 1964 and Trivedi & Sharma 1965) all of whom have provided list of common plants of the district. Special attention to the various genera of grasses was given by Patil (1960) who provides a key to the identification of grass genera of the district. Other reports of the grass flora of the district are scattered in various works (Anderson 1859, Duthie 1883, 1888, Hooker 1897, Bor 1947, 1960, Raizada 1954, Raizada, Bharadwaja and Jain 1957, Raizada and Jain 1966). Similar works on the grasses of the adjoining areas such as Agra (Bharadwaja 1957), Allahabad (Panigrahi and Rajagopal 1968), Gorakhpur (Gupta 1969) were also consulted.

Since the grass flora is of economic importance, particularly in a predominantly agricultural and pastoral community, the author undertook an intensive survey of the grasses of Lucknow district (U.P.) during 1960-62. During this survey about 130 species of grasses were collected. These include both naturally occurring wild species as well as a few introduced ones. The cultivated species are marked with an asterisk (\*). Free use has been made of the existing collection of grasses in the Herbarium, National Botanic Gardens, Lucknow.

The nomenclature used is after Raizada (1957, 1966) and Bor (1955, 1960). The works of Hubbard (1934), Rhind (1945) and Senaratna (1956) have also been consulted. The following table gives an analysis of the various taxa of the Gramineae of the area.

PANICOIDEAE			POOIDEAE		
Tribes	No. of genera	No. of species	Tribes	No. of genera	No. of species
Maydeae	1	1	Bambuseae	2	2
Andropogoneae	23	31	Festuceae	1	1
Paniceae	13	48	Eragrosteae	6	18
			Aveneae	1	1
			Arundineae	2	2
			Oryzeae	3	3
			Phalarideae	1	1
			Thysanolaenae	1	1
			Arundinellae	1	1
			Agrosteae	2	2
			Sporoboleae	1	4
			Stipeae	1	3
			Zoysiae	2	2
			Hordeae	1	1
			Chlorideae	3	8
Total	37	80	Total	28	50

## Sub-family : PANICOIDEAE

## KEY TO THE TRIBES (AFTER BOR 1940)

1. Male and female spikelets in separate inflorescences or in different parts of the same inflorescence and of different appearance; lemmas hyaline or membranous and thinner than the glumes

1. Maydeae

- 1'. Spikelets all hermaphrodite, with male or barren or hermaphrodite spikelets mixed in the same inflorescence and so arranged that a male or barren spikelet is near a hermaphrodite spikelet, if unisexual the lemma of the fertile floret indurated:

2. Spikelets often in pairs, one sessile the other pedicelled, those of each pair similar or more often dissimilar, rarely solitary and all alike; glumes as long as the spikelet and enclosing the florets, more or less rigid, and

firmer than the lemmas which are both hyaline or membranous; upper lemma usually awned ...

## 2. Andropogoneae

- 2'. Spikelets solitary or paired, more or less similar; glumes membranous; gl. I usually smaller or sometimes suppressed; lower lemma resembling the gl. II in texture; upper lemma papery to very tough and rigid, usually awnless ...

## 3. Paniceae

## Tribe 1. Maydeae

ZEA LINN.

**\*Zea mays** Linn.

Cultivated in Grass Garden. Cultivated in the area. NBG; *Bharadwaja*, Sept. 1957.

Hindi: *Makka*, *Makai*; The Maize or the Indian corn plant.

## Tribe 2. Andropogoneae

## KEY TO THE SUB-TRIBES

- |   |                   |
|---|-------------------|
| 1. Spikelets of a pair similar, hermaphrodite, joints slender, linear or more or less clavate above, thickened ...  | 1. Saccharinae    |
| 1'. Spikelets of a pair dissimilar, the sessile hermaphrodite, the pedicelled male or sterile or rarely more or less similar, then the joints and pedicels thick: |                   |
| 2. Joints and pedicels trigonous or round or flat:  |                   |
| 3. Sessile spikelet with one male and one hermaphrodite floret; upper lemma awned ...   | 2. Ischaeminae    |
| 3'. Sessile spikelet only with one hermaphrodite floret; or also with one lower male; upper lemma unawned ...   | 3. Rottboelliinae |
| 2'. Joints and pedicels slender, rarely thickened upwards; sessile spikelet 1-flowered, usually awned:  |                   |
| 4. Racemes usually arranged in panicles or verticillate along the main axis, never spatheate, joints and pedicels not furrowed                                    | 4. Sorghinae      |
| 4'. Racemes digitate, sub-digitate or in pairs or solitary terminal, usually spatheate ...  | 5. Andropogoninae |

## KEY TO THE GENERA OF SUB-TRIBE SACCHARINAE

- |   |                    |
|---|--------------------|
| 1. Racemes in more or less compound panicles or racemously arranged on an elongated common axis; spikelets 1-flowered; upper lemma unawned or awned, awn arising between the teeth of the bidentate apex or terminal: |                    |
| 2. Spikelets all pedicelled, one with a short pedicel, the other long pedicelled ...  | 1. <i>Imperata</i> |
| 2'. Spikelets one sessile, the other pedicelled:  |                    |

- |  |                     |
|--|---------------------|
| 3. Upper lemma obtuse or truncate or 0 ... | 2. <i>Saccharum</i> |
|--|---------------------|

- |  |                     |
|--|---------------------|
| 3'. Upper lemma awned or mucronate ... | 3. <i>Erianthus</i> |
|--|---------------------|

- 1'. Racemes on a short common axis or digitate or sometimes solitary; spikelets 1-flowered or rarely 2-flowered; upper lemma incised, awned from the sinus or from the shortly bidentate apex:

- |  |                   |
|--|-------------------|
| 4. Racemes digitate, paired or scattered ... | 4. <i>Eulalia</i> |
|--|-------------------|

- |   |                        |
|---|------------------------|
| 4'. Racemes solitary; gl. II and lower lemma both awned ... | 5. <i>Pogonatherum</i> |
|---|------------------------|

## IMPERATA Cyrill.

**\*Imperata cylindrica** (Linn.) P. Beauv.

*I. arundinacea* Cyrill.

Hardoi Road, *Bharadwaja*, 22 Sept. 1957, "a very common species in open grassy places."

Sans.: *Darbh*; Hindi: *Dabh*, *Bharuhi ghas*.

## SACCHARUM Linn.

## KEY TO THE SPECIES

- |   |                          |
|---|--------------------------|
| 1. Peduncle hairy below the panicle; rhachis very fragile; hairs very white—silvery ... | 1. <i>S. spontaneum</i>  |
| 1'. Peduncle not hairy; rhachis less fragile:   |                          |
| 2. Lower glume of sessile spikelet glabrous; upper glume also glabrous ...              | 2. <i>S. officinarum</i> |
| 2'. Lower glume of sessile spikelet with long hairs ...                                 | 3. <i>S. bengalense</i>  |

**Saccharum spontaneum** Linn.

Very common along the river banks and in marshy places, also in dry localities along the railway tracts. Balaganj, *Bharadwaja* 48085, "abundant throughout", 22-9-1957; Rehman Khera, "abundant".

Sans.: *Kash*; Hindi: *Kans*.

**\*S. officinarum** Linn.

The sugarcane plant. Cultivated in canal-irrigated areas within the district and in several parts of India.

Sans.: *Ikshu*; Hindi: *Ganna*, *Ikh*, *Ukh*, *Ponda*, *Ganda*.

**S. bengalense** Retz.

*S. munja* Roxb.

*Erianthus munja* (Roxb.) Jeswiet

Paper mill, Nishat Ganj, *Janki Prasad* 17451, 17-4-1954. Grows mixed with *Saccharum spontaneum* Linn. in similar localities throughout the area.

Hindi: *Munja*, *Sarkanda*.

## ERIANTHUS Michx.

**\*Erianthus ravennae** (Linn.) P. Beauv.

Along Gomti bank, *Srivastava* 68832. It is cultivated as an ornamental.

## EULALIA Kunth

**Eulalia leschenaultiana** (Decne) Ohwi

A perennial with slender underground rhizome, along the bank of the nullah. Kukrail farm, *Bharadwaja & Malik* 37666, 31.10.1956.

## POGONATHERUM P. Beauv.

**\*Pogonatherum paniceum** (Lamk.) Hack.

NBG, *Misra* 8056, 23.3.1954.

KEY TO THE GENERA OF SUB-TRIBE  
ISCHAEMINAE

- |   |                     |
|---|---------------------|
| 1. Racemes many-noded, espatheate, pairs of spikelets many ...                    | 1. <i>Ischaemum</i> |
| 1'. Racemes 1-noded, reduced to 3 heteromorphic spikelets partially spatheate ... | 2. <i>Apluda</i>    |

## ISCHAEMUM Linn.

**Ischaemum rugosum** Salisb.

It is a common grass growing in wet marshy places especially in rice fields and it is so much like it that until the plants have come into flower they are with difficulty distinguished from it. Flowering at the end of the rainy season. Chota Chandganj, *Ram Singh* 2300, 2.11.1951.

## APLUDA Linn.

**Apluda mutica** Linn.

*Apluda varia* Hack. subsp. *mutica* Hack.

Throughout the area during monsoon in hedges and bushes. It can grow on a variety of soils. NBG, *Ojha* 89514, 25.10.1961, *Uma Shanker* 15923, 24.9.1954, Amethi village, *Srivastava* 24913, 5.3.1956; Kukrail forest, *Bharadwaja* 37645, 31.10.1956.

KEY TO THE GENERA OF SUB-TRIBE  
ROTTBOELLIINAE

- |  |                        |
|--|------------------------|
| 1. Sessile spikelet globose; gl. I verrucose, pitted; pedicelled spikelet reduced ...  | 1. <i>Hackelochloa</i> |
| 1'. Sessile spikelet not globose:  |                        |
| 2. Racemes much compressed; axis tough and tardily disarticulating, joints of axis and pedicel fused; spikelets all alike ...  | 2. <i>Hemarthria</i>   |
| 2'. Racemes cylindrical, readily disarticulating; joints of axis and pedicel fused or free; spikelets more or less dissimilar: |                        |
| 3. Pedicelled spikelets distinct and more or less of the same size as sessile ...  | 3. <i>Rottboellia</i>  |
| 3'. Spikelets all sessile ...  | 4. <i>Mnesithea</i>    |

## HACKELOCHLOA O. Ktze.

**Hackelochloa granularis** (Linn.) O. Ktze.

It prefers moist places and open grasslands.

Barsanda forest, sporadic, collected from Mango Orchard; Balaganj, *Bharadwaja* 48099, 22.9.1957.

## HEMARTHRIA R. Br.

**Hemarthria compressa** (Linn. f.) R. Br.

A hygrophilous species growing in rice fields and other moist situations. Military farm, Kukrail, Kursi Road, *Ram Singh* 1149, 17.8.1950.

## ROTTBOELLIA Linn. f.

**Rottboellia exaltata** Linn. f.

Common in grazed land and rice-fields. Flowers at the end of the rains. In jowar fields along the margin, Hardoi Road, *Bharadwaja* 48084.

## MNESITHEA Kunth

**Mnesithea laevis** (Retz.) Kunth

Fairly common. Kukrail, *Bharadwaja & Malik* 37646, 31.10.1956.

## KEY TO THE GENERA OF SUB-TRIBE SORGHINAE

- |  |                       |
|--|-----------------------|
| 1. Glume I flattened on the back ...   | 1. <i>Sorghum</i>     |
| 1'. Glume I not flattened on the back:   |                       |
| 2. Spikelets in threes at the ends of branches, one sessile and two pedicelled ... | 2. <i>Chrysopogon</i> |
| 2'. Spikelets in pairs, one sessile and the other pedicelled ...                   | 3. <i>Vetiveria</i>   |

## SORGHUM Moench.

## KEY TO THE SPECIES

- |   |                        |
|---|------------------------|
| 1. Spontaneous grass, spikelets deciduous | 1. <i>S. halepense</i> |
| 2. Cultivated grass, spikelets persistent | 2. <i>S. vulgare</i>   |

**Sorghum halepense** (Linn.) Pers.

Very common throughout the Khera. Rehman Khera, *Nanhe Ram* 48065, 13.9.1957.

Hindi: *Barru*; The Johnson grass.

**\*S. vulgare** Pers.

Cultivated throughout the area for grain and fodder.

Hindi: *Jwar*, *Juar*, the Great Millet.

**\*S. durra** (Forsk.) Stapf

Cultivated. Kukrail pasture field, *Bharadwaja & Malik* 37668, 31.10.1956.

## CHRYSOPOGON Trin.

**Chrysopogon aciculatus** (Retz.) Trin.

NBG, Grass-plot, *Balapure* 93028, 7.9.1965.

## VETIVERIA Bory

**Vetiveria zizanioides** (Linn.) Nash

Near marshes and ponds. Prefers heavy soil, where it is gregarious. Khas is an important grass of economic value. Itaunja, *Kaul & Party* 29174, 28.11.1956.

Sans.: *Ushir*; Hindi: *Khas*.

KEY TO THE GENERA OF SUB-TRIBE  
ANDROPOGONINAE

1. Lemma awned from the back; leaves cordate from the base ... 1. *Arthraxon*
- 1'. Lemma awned from the sinus or tip, rarely awnless:
  2. Margins of the gl. I of the fertile spikelet inflexed and the gl. sharply biceeled; callus short, obtuse; the back of the gl. sometimes deeply sunk between the keels; awn glabrous or scabrid, rarely hairy:
    3. Lemma awned from the tip:
      4. Racemes solitary at the ends of the culms or branches, sometimes in scanty false panicles ... 2. *Eremopogon*
      - 4'. Racemes digitate or arranged on a short common axis:
        5. Sessile spikelets of all pairs perfect, awned ... 3. *Bothriochloa*
        - 5'. Sessile spikelets of the lower 1-3 pairs male or neuter, awnless ... 4. *Dichanthium*
    - 3'. Lemma awned from a sinus:
      6. Racemes solitary, terminal on the culms and branches ... 5. *Schizachyrium*
      - 6'. Racemes always binate ... 6. *Cymbopogon*
  - 2'. Margins of the gl. I of the fertile spikelet not involute, inflexed or 2-keeled or, if so, only close to the tips; spikelets with rounded sides or quite terete; callus elongate acute or pungent; awn more or less hirsute; fertile lemma 2-fid, awned from sinus:
    7. Racemes terminating the culms and their upper branches; pedicelled spikelets male or neuter ... 7. *Heteropogon*
    - 7'. Racemes few noded, much contracted, the lowest pair or pairs of spikelets forming an involucre at the base of each:
      8. Perfect spikelets with a pointed callus, readily separating from the involucre ... 8. *Themeda*
      - 8'. Perfect spikelets without a callus, falling with the involucre ... 9. *Iseilema*

ARTHRAXON P. Beauv.

*Arthraxon lancifolius* (Trin.) Hochst.

Sometimes found in xerophytic conditions also. On old walls, NBG, *Srivastava* 68815.

EREMOPOGON (Hack.) Stapf

*Eremopogon foveolatus* (Del.) Stapf

Kukrail, *Bharadwaja* 48010, 21.1.1957, also from Amausi Aerodrome.

BOTHRIOCHLOA O. Ktze.

## KEY TO THE SPECIES

1. Inflr. axis longer than the lowest raceme, aromatic ... 1. *B. odorata*
2. Inflr. axis shorter than the lowest raceme, non-aromatic ... 2. *B. pertusa*

*\*Bothriochloa odorata* (Lisboa) A. Camus

A tall perennial grass, cultivated. NBG, *Bharadwaja*, Dec. 1957.

This species is very similar to *B. intermedia* in structure, but the fact that its tissues contain an aromatic oil entitles it to specific rank (Bor 1960).

*B. pertusa* (Linn.) A. Camus

Very common in lawns and cultivated fields. Flowers in October and throughout the winter. Rehman Khera, *Nanhe Ram* 48051, 13.9.1957.

DICHANTHIUM Willemet

## KEY TO THE SPECIES

1. Gl. I of the sessile spikelet oblong, obtuse or truncate, keel not winged, with a median nerve; sheaths terete ligule membranous, large ... 1. *D. annulatum*
- 1'. Gl. I of the sessile spikelet obovate or oblong-truncate, winged, no median nerve; sheaths compressed; ligule a short ciliate membrane ... 2. *D. caricosum*

*Dichanthium annulatum* (Forsk.) Stapf

Common in fields throughout the area. Grows in cultivated fields and gardens. Common, also in Nishat Ganj and Kukrail. Banarasi Bagh, *Bharadwaja & Malik* 37686, 12.11.1956.

*D. caricosum* (Linn.) A. Camus

This grass prefers rather dry and sandy places. NBG, Khaliya, *Hira Lal & Srivastava* 68816, Military farm, *Bharadwaja & Nanhe Ram* 42675.

SCHIZACHYRIUM Nees

*Schizachyrium exile* (Hochst.) Stapf

Few plants in the sandy soil. Rehman Khera, *Bharadwaja & Malik* 24629, 11.12.1956.

CYMBOPOGON Spreng.

*Cymbopogon martinii* (Roxb.) Wats.

Rusa oil is extracted from this grass which is used in medicine as a remedy for rheumatism. Central Drug Research Institute, Chhatar Manzil, *Janki Ammal*, Dec. 1956.

## HETEROPOGON Pers.

**Heteropogon contortus** (Linn.) Beauv. ex Roem. et Schult.

Common throughout the area in dry sandy localities. It grows on a variety of soils. A gregarious grass, abundant. Amausi Aerodrome, *Bharadwaja & Nanhe Ram* 42656, 12.12.1956.

Hindi: *Kutia*, *Soura ghas*; Eng.: *The spear grass*.

## THEMEDA Forsk.

## KEY TO THE SPECIES

1. Pairs of involucre spikelets at the same level, 5-10 cm long:
2. Racemes in globose or fan-shaped heads; sessile spikelets 3-4 mm long ... 1. *T. quadrivalvis*
- 2'. Racemes in densely congested heads, awns 3-6 cm long; involucre spikelets 6-10 mm long ... 2. *T. triandra*
- 1'. Pairs of involucre spikelets inserted at different levels ... 3. *T. arundinacea*

**Themeda quadrivalvis** (Linn.) Kuntze

In open spaces, not common, plants dried. Military farm, *Bharadwaja* 42678, 14.12.1956.

**T. triandra** Forsk.

Barabanki Road, in grasslands, *Srivastava* 68854; Arjunganj Military farm, *Srivastava* 68846.

**T. arundinacea** (Roxb.) Ridley

Gomti bandha, *Bharadwaja & Nanhe Ram*, Nov. 1957.

## ISEILEMA Anders.

**Iseilema laxum** Hack.

Sporadic, growing in a field, Banthra, Musa Bagh, *Bharadwaja* 48201, 22.9.1957.

Tribe 3. **Panicaceae**

## KEY TO THE GENERA (modified from Bor, 1940)

1. Spikelets falling singly, not subtended by bristles, or if so, then the bristles persisting after the spikelets have fallen (*Setaria*):
2. Spikelets in more or less open panicles, or with the panicles contracted and spike-like:
- \*Spikelets subtended by one to many bristle-like branchlets ... 11. *Setaria*
- \*\*Spikelets not subtended by bristle-like branchlets ... 3. *Panicum*
- 2'. Spikelets in one-sided spikes or spike-like racemes; spikes or racemes digitate or scattered, rarely solitary:
3. Upper lemma, more or less crustaceous or coriaceous, usually with narrow in-rolled margins; palea exposed:

4. Gl. I and lowest internode of the rachilla forming a swollen callus at the base of the spikelet: upper lemma mucronate or shortly awned ... 9. *Eriochloa*
- 4'. Gl. I and lowest internode of the rachilla not as in (4):
5. Gl. I (when present) turned away from the rachis of the racemes or spikes, the back of the upper lemma facing it i.e. spikelets adaxial:
6. Gl. I developed, although sometimes small:
7. Gl. I & II acuminate or awned rarely only acute; upper lemma not mucronate:
- \*Leaves linear gls. entire, I awn awnless ... 4. *Echinochloa*
- \*\*Leaves lanceolate; gls. slightly notched, gl. I awned ... 8. *Oplismenus*
- 7'. Gl. I awnless, if acuminate then with the upper lemma mucronate:
- \*Upper lemma acute, not mucronate ... 6. *Paspalidium*
- \*\*Upper lemma obtuse, mucronate or very short awned ... 7. *Urochloa*
- 6'. Gl. I usually absent; spikelets planoconvex ... 5. *Paspalum*
- 5'. Gl. I turned towards the rachis, the branch of the upper lemma turned away from it i.e. spikelets abaxial ... 10. *Brachiaria*
- 3'. Upper lemma thinly cartilaginous, usually with flat hyaline margins:
- \*Spikelets awnless ... 1. *Digitaria*
- \*\*Spikelets awned ... 2. *Alloterosopsis*
- 1'. Spikelets surrounded by an involucre of free naked or plumose bristles or of spines or rigid bristles united at the base into a cup:
- \*Involucre of free, naked or plumose-bristles ... 12. *Pennisetum*
- \*\*Involucre of spines or rigid bristles united at the base into a cup ... 13. *Cenchrus*

## DIGITARIA Heist

## KEY TO THE SPECIES (modified from Bor, 1955)

1. Hairs on the spikelets verrucose:
2. Annual ... 1. *D. longiflora*
- 2'. Perennial ... 2. *D. prestlii*

1'. Hairs on the spikelets never verrucose:

3. Hairs on the spikelets clavate, *i.e.* passing abruptly into an obtuse, obovate or globular head, much broader than the hair: ... 3. *D. stricta*
4. Tips of the pedicels cupuliform with hairs on the rim and below; hairs exceeding the summit ...

- 4'. Tips of the pedicels somewhat thickened, without a rim of hairs ... 4. *D. granularis*

3'. Hairs on the spikelets, if any, without a globular thickening, not clavate:

5. Spikelets of each pair heteromorphous, sessile spikelets nearly glabrous in front; the pedicelled coated with long hairs often spreading at maturity ... 5. *D. bicornis*

5'. Spikelets of each pair not heteromorphous, both spikelets of each pair with the same type of indumentum:

6. Nerves of the lower lemma smooth, without minute triangular spines on nerves:
7. Spikelets very narrowly lanceolate or linear lanceolate with apparently only 3 nerves visible on the lower lemma; glume II half as long as the spikelet or less; racemes very few ... 6. *D. timorensis*

- 7'. Spikelets broadly linear-lanceolate, with at least 5 nerves visible on lower lemma, glume II more than half the length of the spikelet ... 7. *D. adscendens*

- 6'. Nerves of the lower lemma with minute triangular spines in upper part; spikelets hairy ... 8. *D. sanguinalis*

### ***Digitaria longiflora* (Retz.) Pers.**

Eroded lands along Loni nala, *Srivastava* 68812.

### **\**D. preslii* (Kunth) Henr.**

Cultivated; village Jiamau. NBG, Grass-plot, *Bharadwaja*, 30.4.1957.

### ***D. stricta* Roth ex Roem. et Schult.**

Sporadic; Kukrail pasture. Rehman Khera, *Nanhe Ram* 48048, 13.9.1957.

### ***D. granularis* (Trin.) Henr.**

Very common in *Zizyphus* jungle; NBG; Imambar, *Nanhe Ram* 48080, 24.9.1957. Rehman Khera, *Nanhe Ram* 48066, 13.9.1957.

### ***D. bicornis* (Lamk.) Roem. et Schult. ex Loud.**

Kukrail, *Nanhe Ram* 48003, 15.1.1957, also from Rehman Khera.

### ***D. timorensis* (Kunth) Bal.**

Fairly common. Banarasi Bagh, *Bharadwaja & Malik* 37700, 15.11.1956.

### ***D. adscendens* (H.B.K.) Henr.**

Common along beds. NBG, *Malik* 25742, 26.6.1955, *Kapoor* 20404.

### ***D. sanguinalis* (Linn.) Scop.**

NBG, *Balapure*, October 1965.

### **ALLOTEROPSIS Presl emend. Hitch.**

### ***Alloteropsis cimicina* (Linn.) Stapf**

Annual, found in waste places, flowers at the end of the rainy season. Amli Bandhan forest, *Chunnu* 3519, 6.8.1952.

### **PANICUM Linn.**

#### **KEY TO THE SPECIES (modified from Senaratna, 1956)**

1. Upper lemma fairly rugulose ... 1. *P. maximum*

1'. Upper lemma smooth and polished:

2. Lower gl. less than  $\frac{1}{2}$  as long as lower lemma; upper gl. 9-11 nerved, or if 7 nerved, then lower lemma 7-9 nerved:

3. Perennials; stems creeping and rooting at the nodes:

4. Leaves glaucous, sheaths hairy for some distance; roots thick white; spikelets ovate-lanceolate, 2.5-3.2 mm long ... 2. *P. repens*

- 4'. Leaves dull green; sheath with a ring of hairs representing the ligule at the apex; roots fibrous; spikelets lanceolate, 3-3.5 mm long ... 3. *P. paludosum*

3'. Annuals usually, stems not creeping:

5. Spikelets 5-6.5 mm long; sheaths hirsute ... 4. *P. miliaceum*

- 5'. Spikelets 2.5-4.2 mm long; sheaths glabrous; stems slender; panicles effuse; leaves not tapering:

6. Spikelets 2.5-3 mm long ... 5. *P. psilopodium*

- 6'. Spikelets 1.5 mm long, panicle open, lax ... 6. *P. austro-asiaticum*

2'. Lower gl. more than  $\frac{1}{2}$  as long as lower lemma:

7. Leaves glabrous; lower gl. ovate acuminate ... 7. *P. antidotale*

- 7'. Leaves more or less hairy; lower gl. cuspidate ... 8. *P. trypheron*

**\*Panicum maximum** Jacq.

A tall perennial grass, introduced. It is a native of tropical Africa. "The Guinea grass". NBG, *Bharadwaja*.

**P. repens** Linn.

Fairly common along the Betwa nullah in water, Kukrail farm, common. Rehman Khera, *Bharadwaja* & *Nanhe Ram* 48058.

**P. paludosum** Roxb.

Near water, Chinhat lake, *Srivastava* 46985, 19.5.1958, *Awasthi*.

**\*P. miliaceum** Linn.

This is the common millet, cultivated in several parts of India, as a Kharif crop. Gaughat, on the bank of Gomti, *Uma Shankar* & *Chunnu* 3585, 9.2.1953, Rehman Khera, *Bharadwaja* & *Nanhe Ram* 42647, only a few plants near habitations in NBG.

**P. psilopodium** Trin.

Banthra farm, *Srivastava* 35057, 27.11.1957, *Bharadwaja*.

**P. austro-asiaticum** Ohwi

Not common. Kukrail, *Bharadwaja* & *Malik* 37648, 31.10.1956.

**P. antidotale** Retz.

Rooted in mud under shallow water, common. Flowers from October to December. La Martinier College tank, *Bharadwaja* 37642, 31.10.1956.

**P. trypheron** Schult.

Growing in field, not common. Balaganj, *Bharadwaja* 48091, 22.9.1957.

## ECHINOCHLOA P. Beauv.

## KEY TO THE SPECIES

- |   |                        |
|---|------------------------|
| 1. Ligule absent :  |                        |
| 2. Gl. I and upper lemma equally acute or cuspidate; racemes rather distant ... | 1. <i>E. colonum</i>   |
| 2'. Gl. I and upper lemma cuspidate or produced into an awn ...                 | 2. <i>E. crusgalli</i> |
| 1'. Ligule a fringe of stiff hairs, at least in the lower leaves ...            | 3. <i>E. stagnina</i>  |

**Echinochloa colonum** (Linn.) Link.

This grass is a weed of cultivation and is found in water logged areas and rice-fields. In shade, a few plants near human habitations; Banarasi Bagh, NBG, Govt. House and Utratia. Rehman Khera, *Bharadwaja* & *Nanhe Ram* 42646, 13.12.1956.

Hindi: *Jungli Sawan*.

**E. crus-galli** (Linn.) P. Beauv.

It prefers moist localities. Chota Chand Ganj, *Ram Singh* 2299, 2.11.1951.

**E. stagnina** (Retz.) Beauv.

Common in flooded fields, in shallow water. Rehman Khera, *Bharadwaja* 42652, 13.12.1956.

## PASPALUM Linn.

## KEY TO THE SPECIES

- |   |                            |
|---|----------------------------|
| 1. Spikelets broadly elliptic to suborbicular, obtuse, glabrous ... | 1. <i>P. scrobiculatum</i> |
| 1'. Spikelets oblong, acute; gl. II appressed silky ...             | 2. <i>P. distichum</i>     |

**Paspalum scrobiculatum** Linn.

Common in ditches and nullahs. Cultivated to some extent for grain in rainy season. Kukrail farm, *Bharadwaja* & *Malik* 37662, 31.10.1956.

Hindi: *Kodo*.

**P. distichum** Linn.

Common in marshes, Gomti bank and Banarasi Bagh. Village Jiamau, *Bharadwaja* & *Malik* 37685.

**\*P. dilatatum** Poir

A native of South America from Brazil to Argentina. NBG, *Awasthi*, 1951.

## PASPALIDIUM Stapf

## KEY TO THE SPECIES

- |   |                        |
|---|------------------------|
| 1. Leaves obtuse, sheaths compressed, keeled, ciliate at the mouth or at the base of the blade, upper racemes shorter than the internodes ... | 1. <i>P. flavidum</i>  |
| 1'. Leaves acuminate; sheaths terete, glabrous; upper racemes as long as or longer than the internodes ...                                    | 2. <i>P. punctatum</i> |

**Paspalidium flavidum** (Retz.) A. Camus

Kukrail pasture, *Bharadwaja* & *Malik* 37650, 30.10.1956.

**P. punctatum** (Burm.) A. Camus

Near water in marshes. Chinhat, *Bot. Club I*, 22010, 27.3.1955.

## UROCHLOA P. Beauv.

**Urochloa panicoides** Beauv.

Sporadic. Near Residency, *Malik* & *Nanhe Ram* 48038, 10.9.1957; also at Balaganj, *Bharadwaja* 48087.

## OPLISMENUS P. Beauv.

**Oplismenus burmannii** (Retz.) Beauv.

Common under shade, everywhere in the garden. Banarasi Bagh, *Bharadwaja* & *Malik* 37677, 12.11.1956.

## ERIOCHLOA Kunth

**Eriochloa procera** (Retz.) C. E. Hubbard

Common in moist soil; Amausi Aerodrome, fairly common along Banthra side. Prefers moist localities

where sometimes it forms gregarious patches. Village Jiamau, *Bharadwaja & Malik* 37688, 12.11.1956.

#### BRACHIARIA Griseb.

##### KEY TO THE SPECIES

- |  |     |                        |
|--|-----|------------------------|
| 1. Spikelets 1.8-2.5 mm long   | ... | 1. <i>B. reptans</i>   |
| 1'. Spikelets 2.5-4 mm long:   |     |                        |
| 2. Spikelets turgid, broadly elliptic or broadly ovate-elliptic, apiculate | ... | 2. <i>B. ramosa</i>    |
| 2'. Spikelets not turgid   | ... | 3. <i>B. distachya</i> |

**Brachiaria reptans** (Linn.) Gardner et Hubbard  
NBG, *Hira Lal* 22191, 13.8.1957.

#### **B. ramosa** (Linn.) Stapf

In fields; Chota Chand Ganj, *Ram Singh* 1136, Reserve forest, Kukrail, *Misra*, 23.7.1953; NBG; *Kapoor* 20474, 28.7.1955.

Hindi: *Latra Bara*.

#### **B. distachya** (Linn.) Stapf

Prostrate creeping herb, rooting at nodes; prefers sandy and loamy soil. Banarasi Bagh, *Bharadwaja & Nanhe Ram* 22606, 17.7.1955.

#### \***B. brizantha** (Hochst. ex A. Rich.) Stapf

Widely spreading grass, introduced from Africa. Rehman Khera, *Bharadwaja*, Dec. 1956.

#### SETARIA Beauv.

##### KEY TO THE SPECIES

- |   |     |                           |
|---|-----|---------------------------|
| 1. Leaves plicated between the main veins   | ... | 1. <i>S. megaphylla</i>   |
| 1'. Leaves not as in 1:   |     |                           |
| 2. Bristles retrorsely barbed   | ... | 2. <i>S. verticillata</i> |
| 2'. Bristles antrorsely barbed:   |     |                           |
| 3. Infl. a cylindrical spike:   |     |                           |
| 4. Spikelets 3 mm long; upper lemma coarsely rugose, boat-shaped and slightly keeled upwards, broad and dorsally strongly curved on the back in profile | ... | 3. <i>S. glauca</i>       |
| 4'. Spikelets 2.25 mm long; upper lemma usually finely rugose, narrow and dorsally gently curved, not at all keeled                                     | ... | 4. <i>S. pallidifusca</i> |
| 3'. Infl. not cylindrical spike   | ... | 5. <i>S. tomentosa</i>    |

#### \***Setaria megaphylla** (Steud.) Dur. et Schinz.

Cultivated. A native of Africa, introduced in India. NBG; *Bharadwaja*, Nov. 1957.

#### **S. verticillata** (Linn.) Beauv.

In shade near houses, fairly common; also from Rehman Khera. Banarasi Bagh, *Bharadwaja & Malik* 34734.

#### **S. glauca** (Linn.) Beauv.

Common throughout the area in cultivated fields and gardens. Malihabad, *Uma Shankar* 4802, 27.8.1957; mango orchard; also in NBG.

#### **S. pallide-fusca** (Schum.) Stapf

Fairly common; also at Rehman Khera in usar. Kukrail pasture, *Bharadwaja & Malik* 37651, 30.10.1956.

#### **S. tomentosa** (Roxb.) Kunth

Spreading grass, cultivated in Grass-garden; Banarasi Bagh, *Bharadwaja & Malik* 34739; Nishat Ganj, *Malik* 48045, 10.9.1957; fairly common in shady places. NBG; *Bharadwaja*.

#### \***S. italica** (Linn.) Beauv.

Cultivated, this is the fox-tail millet. Also cultivated for fodder and grain in Rehman Khera. Lucknow, *Bharadwaja*, 1957.

Hindi: *Kangni*; English: *The Italian Millet*.

#### \***S. barbata** (Lamk.) Kunth

Growing in garden, in the shade, probably introduced from Bengal. NBG; *Bharadwaja*.

#### PENNISETUM Rich.

#### \***Pennisetum orientale** L. C. Rich.

Stem thick, rhizomatous. Rehman Khera, *Bharadwaja & Nanhe Ram* 42638, 11.12.1956.

#### \***P. purpureum** Schumach.

Tall grass like sugar-cane in habit, probably introduced for cultivation as fodder. A native of tropical Africa but now introduced in many other tropical countries. This species is commonly known as Elephant Grass or Napier's fodder. NBG; *Bharadwaja & Malik*, 48008, 21.1.1957.

#### \***P. setosum** (Swartz) L. C. Rich.

Cultivated. NBG; *Hira Lal* 34770, 4.12.1956.

#### \***P. typhoides** (Burm.) Stapf et Hubb.

Cultivated throughout the area.

Hindi: *Bajra*, English: *The Pearl Millet*.

#### CENCHRUS Linn.

##### KEY TO THE SPECIES

- |  |     |                              |
|--|-----|------------------------------|
| 1. Bristles or spines of the involucre antrorsely barbed:                    |     |                              |
| 2. Bristles connate at the base only   | ... | 1. <i>C. ciliaris</i>        |
| 2'. Bristles connate above the base for 1-3 mm:                              |     |                              |
| 3. Inner bristles very slender, slightly widened at the base; outer numerous | ... | 2. <i>C. pennisetiformis</i> |
| 3'. Inner bristles rigid, flattened and subulate; outer few, or absent       | ... | 3. <i>C. setigerus</i>       |
| 1'. Bristles or spines of the involucre retrorsely barbed                    | ... | 4. <i>C. biflorus</i>        |



**Cenchrus ciliaris** Linn.

Common in fields and waste lands, grows on all kinds of soils and thrives even in dry soil. Village Jiamau, *Bharadwaja & Malik* 37692, 11.12.1956, in NBG and Rehman Khera.

**C. pennisetiformis** Hochst & Steud.

Not common, found in open spaces. Amausi Aerodrome, NBG; *Bharadwaja* 48014, 21.1.1957.

**C. setigerus** Vahl

Found in open spaces, not common. Amausi Aerodrome, *Bharadwaja & Nanhe Ram* 42672, 12.12.1956.

**C. biflorus** Roxb.

Fairly common in fields and waste places. Kursi Road, *Ram Singh* 1154, 29.8.1950.

**\*Melinis minutiflora** P. Beauv.

Cultivated; exotic. A native of Africa but now introduced into many tropical countries as a fodder grass. Rehman Khera, Soil Conservation farm, *Bharadwaja*, NBG.

**Sub-family : POOIDEAE****KEY TO THE TRIBES (modified from Hubbard)**

1. Shrubs or trees with woody, often tall, persistent culms; leaf-blades flat, many-nerved, often with transverse vein-lets, usually with a petiole-like base which is articulated with the sheath, spikelets bisexual; lemmas 5-many-nerved, usually awnless; lodicules usually 3; stigmas mostly 2 or 3 ... 1. Bambuseae
- 1'. Perennial or annual herbs; leaf-blades usually sessile and not articulated with the sheaths:
  2. Spikelets borne in open or contracted or spike-like panicles, less often in racemes or spikes and then with the lower or both glumes suppressed if on opposite sides of a continuous rhachis or with 2 or more fertile florets if on one side of the rhachis:
    3. Spikelets with 2 or more fertile florets, or if with one fertile floret then with sterile florets above it:
      4. Lemma and rhachis glabrous or hairy in the latter case with the hairs not enveloping the lemma or if so then with the lemma bearing a geniculate awn; low or moderately tall grasses:
        5. Glumes usually shorter than the lowest floret and with the upper florets distinctly exerted, rarely longer, and then with firm, dull margins like the lemmas; lemmas awnless or with a straight or curved awn from the entire or bifid apex, or several awned or lobed:
          6. Lemmas usually 5-many-nerved ... 2. Festuceae
          - 6'. Lemmas 1-3-nerved ... 3. Eragrostaceae

- 5'. Glumes usually as long as or longer than the lowest floret often as long as the spikelet and enclosing the florets; lemma awnless or more often awned from the back or the sinus of the 2-lobed tip; the awn usually geniculate; glumes or lemmas or both frequently with thin, shining margins ... 4. Aveneae
- 4'. Lemmas or rhachilla joints bearing long, silky hairs which envelop the lemma (at least in fertile florets); lemmas awnless or with a straight awn from the tip; often thin; tall grasses with usually large plume-like panicles ... 5. Arundineae
- 3'. Spikelets with one fertile floret (male or female in unisexual 1-flowered spikelets), with or without 1 or 2 male or barren florets below it:
  7. Glumes very minute or suppressed; palea 3-9-nerved; stamens usually 6; leaf-blades not transversely veined ... 6. Oryzaceae
  - 7'. Glumes usually well developed, at least the upper, rarely minute or suppressed:
    8. Spikelets with 3 florets, the lower 2 florets male or barren and the terminal hermaphrodite ... 7. Phalarideae
    - 8'. Spikelets with 1 or 2 florets:
      9. Spikelets with 2 florets, the lower male or barren, the upper hermaphrodite:
        10. Lower floret barren and without a palea; glumes upto half the length of the spikelet; rhachilla produced beyond the upper floret; spikelets disarticulating with part of the pedicel attached ... 8. Thysanolaenae
        - 10'. Lower floret male or barren, usually with a palea; upper glume as long as the spikelet; rhachilla disarticulating below the upper floret and not produced beyond it; glumes more or less persistent ... 9. Arundinellae

## 9'. Spikelets with one floret:

11. Spikelets usually breaking up at maturity, the rachilla disarticulating above the more or less persistent glumes, very rarely falling entire and then with firmly membranous, awned or 5-nerved lemmas:

12. Lemmas hyaline or membranous at maturity, rarely indurated and then laterally compressed, awnless or awned from low down on the back or from the entire or bifid tip:

13. Lemmas usually 3-5-nerved, frequently awned; glumes firmer and longer than the hyaline lemma or if shorter than the lemma, herbaceous-membranous and dull; grain usually with an adhering pericarp ...

10. Agrostaceae

- 13'. Lemmas 1-3-nerved, awnless; glumes and lemma very similar in texture, hyaline or thinly membranous, shining; grain usually with a free pericarp ...

11. Sporoboleae

- 12'. Lemmas indurated and rigid at maturity, terete or dorsally compressed, with involute or convolute margins, tightly enveloping the grain; with a terminal awn or sometimes awnless ...

12. Stipeae

- 11'. Spikelets falling entire at maturity, either singly or in clusters from the axis of slender spike-like panicles or racemes; lemma delicate, 1-3-nerved ...

13. Zoysieae

- 2'. Spikelets sessile or shortly pedicelled along one side of the rachis of solitary, digitate or scattered spikes or spike-like racemes (with 1 fertile floret and 1-3-nerved lemmas), on or the opposite sides of the rachis of solitary spike or racemes:

14. Spikelets on opposite sides of the rachis of solitary spikes ...

14. Hordeae

- 14'. Spikelets in 1 or 2 rows on one side of the usually continuous rachis of digitate spikes

15. Chlorideae

## Tribe 1. Bambuseae

## KEY TO THE GENERA

1. Trees. Stems unarmed, stem-sheaths hard, thinly trigose with golden hairs, top depressed, imperfect limbs lanceolate, auricles 2, narrow and wavy ...

1. *Dendrocalamus*

- 1'. Trees or shrubs, stem-sheaths glabrous, triangular or uniform, or hairy with brown or orange-yellow hairs, if hairs golden, then the stems are armed with spines, auricles 2, round or pliated edge

2. *Bambusa*

## DENDROCALAMUS Nees

\**Dendrocalamus strictus* Ness

NBG ; Botany Plot, *Hira Lal* 18685, December 1955.

Vern.: *Bans*. The Male Bamboo.

## BAMBUSA Schreb.

\**Bambusa bambos* (Linn.) Voss.

Cultivated around the forest. Dubagga, Nagaria nullah, *Nanhe Ram*.

Vern.: *Kanta Bans*. The Thorny Bamboo.

## Tribe 2. Festuceae

## POA Linn.

\**Poa annua* Linn.

Recently introduced in the plains of North India as a weed in green lawns. NBG ; near herbarium, *Kapoor* 24340, 30.1.1956.

## Tribe 3. Eragrostae

## KEY TO THE GENERA (modified from Hubbard)

1. Lemmas usually entire at the apex, obtuse, acute or acuminate or if two toothed (*Acrachne*) or awned from the tip (*Elytrophorus*) then glabrous near the margins and along the side nerves; cleistogamous spikelets not developed in the axils of the leaf-sheaths:
  2. Spikelets in open, contracted or spike-like panicles ... 1. *Eragrostis*
  - 2'. Spikelets sessile or very short pedicelled, loosely to densely imbricate in digitate or racemously arranged spikes or spike-like racemes, very rarely in solitary spikes (*Eleusine* spp.)
3. Axis and branches of the inflorescence ending in a spikelet:
  4. Spikelets falling at maturity from the axis of straight spikes, the latter numerous and crowded into a long narrow dense panicle; glumes 1-nerved ... 2. *Desmostachya*
  - 4'. Spikelets breaking up at maturity; spikes few to several:
    5. Spikes digitate or subdigitate; spikelets 3-6-flowered; glumes 1-5-nerved; grain oblong to globose, grooved, with a loose conspicuous pericarp ... 3. *Eleusine*
    - 5'. Spikes usually in pseudowhorls or scattered, spikelets 8-20 flowered; grain coarsely rugose, grooved or hollowed on one face, with an early deciduous pericarp ... 4. *Acrachne*
- 3'. Axis of spike terminating in a sharp point; upper glume mucronate or awned; spikes digitate, rarely racemose ... 5. *Dactyloctenium*

- 1'. Lemmas usually emarginate or 2-4lobed or toothed at the apex, rarely entire and then hairy along the nerves, frequently mucronate or awned, cleistogamous spikelets sometimes developed in the sheaths ...

## ERAGROSTIS P. Beauv.

## KEY TO THE SPECIES

1. Rhachilla of spikelets more or less jointed and breaking up from above downwards:
  2. Paleas ciliolate on the keels:
    3. Panicle effuse ... .. 1. *E. tenella*
    - 3'. Panicle spiciform or compact and dense ... .. 2. *E. ciliaris*
  - 2'. Paleas scaberulous or smooth on the keels:
    4. Spikelets densely clustered, 6-14 flowered ... .. 3. *E. diarrhena*
    - 4'. Spikelets loose, scattered, few flowered ... .. 4. *E. japonica*
- 1'. Rhachilla of spikelets tough, persistent, lemmas falling away from its base upwards:
  5. Spikelets always flat, usually elliptic-ovate to oblong, lateral nerves of lemmas very prominent, straight, almost percurrent, paleas deciduous with their glumes 5. *E. unioides*
  - 5'. Spikelets linear to linear-oblong, less compressed and with less prominent nerves than above or if so compressed and nerved then the paleas persistent:
    6. Annual ... .. 6. *E. nutans*
    - 6'. Perennial ... .. 7. *E. gangetica*
    7. Spikelets 2-6 mm broad, lemmas broad, more or less obtuse, 1.5-2.5 mm long, lateral nerves strong:
      8. Leaf margins glandular ... .. 8. *E. cilianensis*
      - 8'. Leaf margins not glandular ... .. 9. *E. tremula*
    - 7'. Spikelets 4-8 mm long; 1.5-2 mm wide; lemmas less than 2.5 mm long or if longer then narrower and more or less acute:
      9. Panicle rather stiff, branches and lateral pedicels usually short, lateral nerves of lemmas strong; leaf margins glandular ... 10. *E. poaeoides*
      - 9'. Panicle very loose, lateral nerves of lemmas obscure 11. *E. pilosa*

*Eragrostis tenella* (Linn.) P. Beauv. ex Roem. et Schult.

6. *Leptochloa*

Fairly common throughout the garden. Banarasi Bagh, *Bharadwaja & Malik* 37678, 12.11.1956.

*E. ciliaris* (Linn.) R. Br.

Prostrate herb, saw some plants in sandy soil; also from Kukrail. It is easily distinguished from other species by its compact cylindrical inflorescence. Banthra, *Bharadwaja & Nanhe Ram* 42660, 12.12.1956.

*E. diarrhena* (Schult.) Steud.

Banthra farm, *Srivastava* 35038, also in Arjun Ganj.

*E. japonica* (Thunb.) Trin.

On the way to the forest. Kukrail Reserve Forest, *Nanhe Ram* 48001, 15.1.1957.

*E. unioides* (Retz.) Nees ex Steud.

Quite common in wet places. The glumes are often purple or pink. *Balapure* 36562.

*E. nutans* (Retz.) Nees ex Steud.

Common in moist waste lands. This species is frequently confused with *Eragrostis gangetica* (*E. stenophylla* of the Flora of British India) but the latter is an annual. NBG; Woodland, *Srivastava* 66817.

*E. gangetica* (Roxb.) Steud.

NBG; *Bharadwaja*, Sept. 1957, also *Malik* 25738.

*E. cilianensis* (All.) Vigonolo-Lutati

Fyzabad Road, *Deo & Janki Prasad*, 7.7.1953.

*E. tremula* Hochst. ex Steud.

Not common, grows on sandy soil. Village Jiamau, *Bharadwaja & Malik* 37683, 11.12.1956, also from Rehman Khera.

*E. poaeoides* P. Beauv.

Common, annual, leaf glandular on margins. Mohanlal Ganj, *Bharadwaja*, Dec. 1956.

*E. pilosa* (Linn.) P. Beauv.

NBG; *Kapoor* 24025, 28.8.1955.

\**E. curvula* (Schrud.) Nees

Rehman Khera, *Bharadwaja & Nanhe Ram* 42636, 11.12.1956, also cultivated in NBG; exotic grass.

## DESMOSTACHYA Stapf

*Desmostachya bipinnata* (Linn.) Stapf

Very common in sandy soils, also at Banthra in dry sandy places. A perennial stoloniferous grass growing in deserts and flowers during the rains. Kukrail, *Nanhe Ram* 42698, 15.1.1957.

## ELEUSINE Gaertn.

*Eleusine indica* (Linn.) Gaertn.

Fairly common. Banarasi Bagh, *Bharadwaja & Malik* 37694, 15.11.1956.

Vern.: *Makra*.

## ACRACHNE Wight et Arn.

**Acrachne racemosa** (Heyne) Ohwi

Very common. Malihabad, Rehman Khera, Kukrail, *Bharadwaja*; NBG; *Malik* 20454, 27.6.1955.

## DACTYLOCTENIUM Willd.

**Dactyloctenium aegyptium** (Linn.) P. Beauv.

Very common. Banthra, *Srivastava* 17393, 27.9.1956.

## LEPTOCHLOA P. Beauv.

## KEY TO THE SPECIES

- |  |                        |
|--|------------------------|
| 1. Spikelets 2-3-flowered, less than 2.5 mm long ... | 1. <i>L. panicea</i>   |
| 2. Spikelets 4-6-flowered, 2.5 mm or more long ...   | 2. <i>L. chinensis</i> |

**Leptochloa panicea** (Retz.) Ohwi

Common. NBG; near Khaliya, *Kapoor* 24319, 20.10.1955.

**L. chinensis** (Linn.) Nees

NBG; *Malik* 16973, 27.6.1955.

Tribe 4. **Aveneae**

## AVENA Linn.

**\*Avena fatua** Linn.

Village Jiamau, *Ram Singh* 2169, 13.3.1951.

Tribe 5. **Arundineae**

## KEY TO THE GENERA

- |  |                      |
|--|----------------------|
| 1. Lemmas glabrous; rachilla bearded ... | 1. <i>Phragmites</i> |
| 2. Lemmas with silky hairs on back ...   | 2. <i>Arundo</i>     |

## PHRAGMITES Trin.

**\*Phragmites karka** (Retz.) Trin. ex Steud.

Common along river banks. It is a perennial, hygrophilous tall grass with an underground thick rhizome. It thrives best in marshes and flowers after the rains. Butler palace, *Ram Singh* 2289, 23.10.1951, NBG; Grass-plot, *Balapure*.

## ARUNDO Linn.

**\*Arundo donax** Linn.

A perennial hygrophilous, tall grass with an underground creeping rhizome. Under cultivation it can do well in comparatively dry soils. Some variegated varieties are cultivated in the gardens as an ornamental. Flowers after the rains. The Giant Reed. Near Jumma Masjid, Hussainabad, *Nanhe Ram*; NBG; *Misra* 8044, 13.3.1954.

Tribe 6. **Oryzeae**

## KEY TO THE GENERA (modified from Bor 1960)

- |  |                      |
|--|----------------------|
| 1. Leaf-blades ovate-oblong or ovate-lanceolate with inflated sheaths; a floating grass; glumes absent; floret one; lemma awned, ... | 1. <i>Hygrorhiza</i> |
|--|----------------------|

1'. Leaf-blades linear, acute or acuminate; aquatic, grasses:

- |  |                   |
|--|-------------------|
| 2. Fertile lemma supported by two empty scales; tip of pedicel with 2 lips ...   | 2. <i>Oryza</i>   |
| 2'. Fertile lemma solitary; tip of pedicel without lips; spikelets imbricate ... | 3. <i>Leersia</i> |

## HYGRORHIZA Nees

**Hygrorhiza aristata** (Retz.) Nees ex Wight & Arn.

An aquatic floating grass. Abundant near the rice fields and can be easily recognised by lanceolate leaves with swollen bases. NBG; *Uma Shankar* 15908, 28.9.1954; Chihat, *Bot. Club* 22070, 27.3.1955; also from Rehman Khera.

## ORYZA Linn.

**\*Oryza sativa** Linn.

Prefers muddy and moist soil. Cultivated for its grains. Village Jiamau, *Bharadwaja*, Nov. 1956. Sans.: *Dhanya*; Hindi: *Dhan*; The rice plant.

## LEERSIA Soland ex Sw.

**Leersia hexandra** Swartz

An annual aquatic grass. Can be easily recognised by its slender floating culms with linear light green leaf-blades. Kukrail pasture, *Bharadwaja* & *Malik* 37649, 30.6.1956.

Tribe 7. **Phalarideae**

## PHALARIS Linn.

**\*Phalaris minor** Retz.

Arjun Ganj, *Ram Singh* 2216, 2.4.1951.

Tribe 8. **Thysanolaeneae**

## THYSANOLAENA Nees

**\*Thysanolaena maxima** (Roxb.) O. Ktze.

Cultivated. A hill side species, cultivated in the gardens for its graceful foliage and much branched inflorescences. NBG; Medicinal plot, *Balapure* 51688.

Tribe 9. **Arundinelleae**

## ARUNDINELLA Raddi

**Arundinella nepalensis** Trin.

Gomti Bandh, *Nanhe Ram* 48205, Sept. 1957.

Tribe 10. **Agrostaeae**

## KEY TO THE GENERA

- |                        |                     |
|------------------------|---------------------|
| 1. Glumes awnless. ... | 1. <i>Garnotia</i>  |
| 1'. Glumes awned, ...  | 2. <i>Polypogon</i> |

## GARNOTIA Brongn.

**\*Garnotia elata** (Arn. ex Miq.) Janowsky

An erect tufted grass with narrow leaves. Gomti Bandh, *Bharadwaja & Nanhe Ram*, Dec. 1958.

## POLYPOGON Desf.

**\*Polypogon monspeliensis** (Linn.) Desf.

Quite common, appears during winter season especially in wheat fields. The Beard Grass. Moosa Bagh, *Uma Shankar*, 6.3.1953; Kukrail, *Srivastava* 46946, 9.2.1958, weed of cultivated fields.

Hindi: *Phulahi Ghas*.

Tribe 11. **Sporoboleae**

## SPOROBOLUS R. Br.

## KEY TO THE SPECIES

- |   |                              |
|---|------------------------------|
| 1. Upper glume distinctly shorter than the lemma (i.e. less than three-quarters as long), lowest branches not truly whorled ... | 1. <i>S. diander</i>         |
| 1'. Upper glume as long, nearly as long as or longer than the lemma; lowest branches whorled or not:                            |                              |
| 2. Panicle contracted, lower branches not truly whorled ...   | 2. <i>S. maderaspatanus</i>  |
| 2'. Panicle effuse, spreading at least at maturity; lower branches truly whorled:   |                              |
| 3. Annual ...   | 3. <i>S. coromandelianus</i> |
| 3'. Perennial ...   | 4. <i>S. marginatus</i>      |

**Sporobolus diander** (Retz.) P. Beauv.

Common within the area. Grows on a variety of soils. Kukrail pasture, *Bharadwaja & Malik* 37656, 31.10.1956.

**S. maderaspatanus** Bor

Common in open grassy places. Also at Mohanlal Ganj. Prefers dry, sandy or alkaline soil. Amausi Aerodrome, *Bharadwaja* 42667, 12.12.1956.

**S. coromandelianus** (Retz.) Kunth

A dry land grass. Banthra, *Srivastava* 17328, 27.9.1956.

**S. marginatus** Hochst. ex A. Rich.

This is also a dry land grass. The roots are very thick and are covered with a soft felt of root-hairs. Mohanlal Ganj, *Srivastava* 46097, 8.5.1958.

Tribe 12. **Stipeae**

## ARISTIDA Linn.

## KEY TO THE SPECIES

- |   |                      |
|---|----------------------|
| 1. Glumes long awned, with awns 3-5 mm long; lower glume upto 17 mm long; upper glume upto 20 mm long, both inclusive of awns; sheaths long, open at ramifications, coriaceous-crustaceous, shiny, polished, yellow or crome-yellow ... | 1. <i>A. setacea</i> |
|---|----------------------|

1'. Glumes not long awned; awns at most 2 mm long:

2. Glumes unequal; the lower up to 6 mm long, not over two-thirds the length of the upper, which is 8.5-9 mm long; lemma shorter than the upper glume, about 8-8.5 mm long; awns of glumes 2 mm long; annual

2. *A. depressa*

2' Glumes not very unequal; the lower more than two-thirds the length of the upper; glumes not awned but upper emarginate with a very short mucro between the lobes ...

3. *A. adscensionis*

**Aristida setacea** Retz.

On old walls, Daulat Ganj-Rani Ganj area, *Srivastava* 68808, on eroded lands, Rehman Khera, *Srivastava* 68862.

**A. depressa** Retz.

Common on sandy soil. A xerophytic grass of arid and semi-arid regions, preferring sandy and dry localities. Kukrail pasture, *Bharadwaja & Malik* 37655, 31.10.1956, Amausi Aerodrome, *Bharadwaja* 42666, 13.12.1956, abundant towards Banthra road, dried plants; Banthra farm, *Bharadwaja & Nanhe Ram* 42628, 11.12.1956.

**A. adscensionis** Linn.

NBG; Medicinal Plants, Plot, *Kapoor* 24034, 5.9.1955, quite common; Kukrail forest, *Bot. Club*, 22097, 27.3.1955.

Tribe 13. **Zoysiaeae**

## KEY TO THE GENERA

- |   |                   |
|---|-------------------|
| 1. Spikelets solitary, glume I & II awned               | 1. <i>Perotis</i> |
| 1'. Spikelets clusters of 2-5; glume I & II awnless ... | 2. <i>Tragus</i>  |

## PEROTIS Ait.

**Perotis indica** (Linn.) O. Ktze.

A common grass growing in open waste places and dry fields. It is easily distinguished by its slender, purplish inflorescence. It prefers sandy places. Jiamau village, near I. G. Police residence, *Bharadwaja & Malik* 37671, 12.11.1956, common in sand.

## TRAGUS Hall.

**Tragus biflorus** Schult.

Common in waste places. A xerophytic grass preferring dry localities. NBG; *Uma Shankar* 3288, 8.8.1952, along water canal; Rehman Khera, *Bharadwaja & Nanhe Ram* 42631, 11.12.1956, only a few plants in sandy soil.

Tribe 14. **Hordeae**

## TRITICUM Linn.

**\*Triticum aestivum** Linn.

Widely cultivated throughout the area and in several parts of North India. NBG ; near Medicinal plot, *Kapoor* 24349, 18.2.1956.

Sans.: *Godhum* ; Hindi: *Gahun* ; The wheat plant.

Tribe 15. **Chlorideae**

## KEY TO THE GENERA

- |                      |     |                     |
|----------------------|-----|---------------------|
| 1. Spike solitary    | ... | 1. <i>Oropetium</i> |
| 1'. Spike digitate:  |     |                     |
| 2. Spikelets awnless | ... | 2. <i>Cynodon</i>   |
| 2'. Spikelets awned  | ... | 3. <i>Chloris</i>   |

## OROPETIUM Linn.

**Oropetium thomaeum** (Linn.) Trin.

A xerophytic grass, preferring old ravines, walls and similar other dry localities. It is a very short lived monsoon plant. Banthra grounds, *Srivastava* 17377, also at Rehman Khera.

## CYNODON Rich.

## KEY TO THE SPECIES

- |   |     |                             |
|---|-----|-----------------------------|
| 1. Culms stout, much branched up to 1 m tall; inflorescence of several whorls of spikes on an elongate rhachis; glumes very short; lemma bristly on the margins; plant with stolons   | ... | 1. <i>C. plectostachyus</i> |
| 1'. Culms slender, creeping below, not more than 30 cm tall; inflorescence of digitate or umbellate spikes; glumes as long as or slightly shorter than the lemma; plants with widely spreading stolons and with or without rhizomes | ... | 2. <i>C. dactylon</i>       |

**\*Cynodon plectostachyus** (K. Schum.) Pilger

Not common, naturalized ; cultivated, exotic. Kukrail, *Bharadwaja & Malik* 48005, 21.1.1957 ; NBG ; *Hira Lal* 7062, 28.1.1954.

**\*C. dactylon** (Linn.) Pers.

Very common grass throughout the garden. Common in fallow lands, in fields, gardens and along the road-sides. It is a common lawn-grass. Banarasi Bagh, *Bharadwaja & Malik* 37696, 15.11.1956.

Sans.: *Durva* ; Hindi: *Doob*, *Hariyali* ; the Bermuda grass, the Couch grass, creeping Dog's tooth-grass or creeping finger grass.

## CHLORIS Sw.

## KEY TO THE SPECIES

- |   |  |
|---|--|
| 1. Empty lemmas above the fertile floret solitary, well developed or rudimentary; |  |
|---|--|

2. Spikes usually up to 25 cm long, widely spreading; upper glume 5-7.5 mm long, empty lemma represented by a fine awn up to 1.25 cm long; plant erect from base ...

1. *C. dolichostachya*

2'. Spikes not more than 6.5 mm long, closely crowded, not spreading, ascending; upper glume 3-3.5 mm long, aristulate; empty lemma lanceolate, truncate with an arista 4 mm or more long; stems often prostrate, rooting at the nodes and sending up flowering culms ...

2. *C. virgata*

1'. Empty lemmas above the lowest two to four:

3. Spikelets 3 mm long or more; awns three, 2-3 mm long; lowest lemma elliptic in shape; upper oblong-obovate; culms stoloniferous. ...

3. *C. gayana*

3'. Spikelets 2.5 mm long; awns three, four or five, up to 8 mm long or more, plants often with stout prostrate stems sending up flowering culms from the rooted nodes:

4. A perennial, creeping below and rooting at the nodes; spikelets cuneate, with four or five awns; second lemma very similar to the lowest but smaller ...

4. *C. montana*

4'. An annual grass; spikelets plump, with three, rarely four awns; second lemma of thinner texture than the lowest, much smaller, truncate, obovate, eventually globose ...

5. *C. barbata***Chloris dolichostachya** Lagasca

Sporadic inside forest, in shade. A tall grass. Govt. forest, Nagaria nullah, *Bharadwaja* 48094, 22.9.1957.

**C. virgata** Sw.

Sporadic within the area. A tufted annual grass in fallow lands, orchards, gardens and on old walls. Rehman Khera, *Bharadwaja* 42665, 13.9.1957.

**\*C. gayana** Kunth

This species, which is also called "Rhodes Grass," has been introduced into India. where it does exceedingly well when grown as a crop (Bor, 1960). Rehman Khera, *Bharadwaja & Nanhe Ram* 42642, 11.12.1956.

**C. montana** Roxb.

A small perennial grass on sandy alluvial soil. Amla Bandhan forest, *Chunnu* 3510, 6.8.1952.

**\*C. barbata** Sw.

Common along Banthra roadside. An annual grass with pinkish-violet spikelets. Considered to be native of tropical America and found in tropics of south-east Asia (Bor, 1960). Amausi aerodrome, *Bharadwaja & Nanhe Ram* 42665, 12.12.1956.

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## REFERENCES

- ANDERSON, T. Notes on the Flora of Lucknow with catalogues of the cultivated and Indigenous Plants. *J. Asiat. Soc. Beng. N. S.* 28 : 89-120. 1859.
- BALAPURE, K. M. AND J. G. SRIVASTAVA. *The vegetation of Lucknow District* (U. P.). Lucknow, 1964.
- BHARADWAJ, R. C. *et al.* The Grasses of Agra District, (India). *Agra Univ. J. Res. (Sci.)* 5 : 285-320. 1957.
- BOR, N. L. *Gramineae*, in *The flora of Assam* by Kanjilal *et al.* Vol. V. 1940.
- Common Grasses of United Provinces. *Indian For. Rec. (Botany)* 2 : 1-220. 1947.
- The genus *Digitaria* Heist in India and Burma. *Webbia* 11 : 301-367. 1955.
- *The Grasses of Burma, Ceylon, India and Pakistan (excluding Bambuseae)*. London, 1960.
- DUTHIE, J. F. *A list of the Grasses of N. W. India. Indigenous and Cultivated*. Roorkee, 1883.
- *The fodder grasses of Northern India*. Roorkee, 1888.
- GUPTA, P. K. Common Grasses of Gorakhpur. *Indian For.* 95 : 324-329. 1969.
- HOOKE, J. D. *Flora of British India*, Vol. 7 (Gramineae by J. D. Hooker & O. Stapf). London, 1897.
- HUBBARD, C. E. *Gramineae in Hutchinson, J. Families of Flowering Plants*. Vol. 2 : 199-229. 1934.
- KAPOOR, S. L. On the Botany of Lucknow District. *J. Bombay nat. Hist. Soc.* 59 : 862-896, 1962.
- PANIGRAHI, G. AND T. RAJAGOPAL. Studies in the flora of Allahabad-VI "The family Gramineae-3 group Pooideae." *J. Indian bot. Soc.* XLVII : 219-246. 1968.
- PATIL, R. P. A key to the Genera of the Common Grasses of Lucknow and its environs. *Proc. Indian Acad. Sci. Sec. B.* 51 : 122-132. 1960.
- A contribution to the Flora of Lucknow. *Bull. bot. Surv. India* 5 : 1-35. 1963.
- RAIZADA, M. B. Grasses of Upper Gangetic Plain and some aspects of their ecology. *Indian For.* 80 : 24-46. 1954.
- Name changes in Common Indian Grasses. *Indian For.* 85 : 473-509, 1959.
- , R. C. BHARADWAJ AND S. K. JAIN. Grasses of the Upper Gangetic Plain, Pt. I, Panicoideae. *Indian For. Rec. (Botany) (N. S.)*, 4 : 171-277. 1957.
- AND S. K. JAIN. Grasses of the Upper Gangetic Plain, Pt. 2, Panicoideae. *Indian For. Rec. (Botany) (N. S.)*, 5 : 151-226. 1964.
- & —. Grasses of the Upper Gangetic Plain-Pooideae. *Indian For.* 92 : 637-642. 1966.
- AND V. S. SHARMA. New Plant Records for the Upper Gangetic Plain from Ajmer-Merwara. *Ibid.* 88 : 356-369, 1962.
- RHIND, D. *The Grasses of Burma*. 1945.
- SENARATNA, S. D. J. E. *The Grasses of Ceylon*. 1956.
- SHARMA, P. C. A note on the Flora of Lucknow District. *Bull. bot. Surv. India* 6 : 101. 1964.
- SRIVASTAVA, J. G. Forty-seven more grasses from Lucknow. *J. Bombay nat. Hist. Soc.* 60 : 484-487. 1963.
- TRIVEDI, B. S. AND P. C. SHARMA. Studies on the Hydrophytes of Lucknow and environs. *Proc. nat. Acad. Sci.* 35 : 1-14. 1965.