

THE GENUS *ERAGROSTIS* P. BEAUV. IN RAJASTHAN

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ABSTRACT

The present study is an account of 18 species of *Eragrostis* P. Beauv. collected in Rajasthan (only 11 species reported in literature). With the help of the key characters and short description every species can be identified. Some good, new diagnostic characters have been added in the key. Short ecological notes for every species has been supplemented.

INTRODUCTION

Host was the first to describe a species of *Eragrostis* in Gram. Austr. 4: 14. 1809. However, as there was no diagnostic generic description, the name *E. minor* Host was considered invalid. The next valid publication is by P. Beauv. in Ess. Agrost. 70. 1812. Palisot de Beauvois based his genus *Eragrostis* on *Poa eragrostis* Linn. and called the latter *Eragrostis poaeoides* P. Beauv.

Taxonomy of grass family has been considered to be a difficult one among the flowering plants and the genus *Eragrostis* P. Beauv. in particular is supposed to be one of the most difficult group in the family Gramineae. Species belonging to this genus have overlapping characters and the hybridization of inter and intra-species categories produces a perplexing situation for the taxonomists working in the area. Key characters based on merely measurement (spikelets, inflorescence, leaf, stem, glumes and awns) are not good enough to separate the species distinctly. There should be a combination of two or preferably three characters in the key.

Out of 38 species of *Eragrostis* P. Beauv. found in India, about 18 species have been collected from Rajasthan (Blatter & Hallberg, 1918-21; Gupta, 1971; Joshi, 1956; Majumdar, 1969; Puri *et al.*, 1964; Ramdeo, 1969; Sarup, 1951, 57; Vyas, 1967 etc.). The genus has the largest number of species in Gramineae from Rajasthan, but little attention has been paid towards the taxonomic status of the taxa and their correct identity due to the lower economic value and perplexing taxonomic problems. The transfer of some species from the genus *Eragrostis* to *Diandrochloa* (de Winter, 1960; Henry, 1967) is also debatable. Considering the importance of the group, the present study was undertaken with a view to provide information regarding the correct identity, nomenclature and the taxonomic status of the taxa. During the critical examination of the specimens loaned from B. S. I. Allahabad (BSA), Poona (BSI), Jodhpur (BSJO) etc. it was noted that anther, seed and ligule characters, not given due consideration by earlier workers, have much taxonomic value. Besides the ecological notes, economic value and flowering and fruiting period, important diagnostic characters have also been mentioned here.

Key to the species of *Eragrostis*

1. Spikelets not breaking up at maturity ... *E. tef*
1. Spikelets breaking up at maturity :
 2. Spikelets breaking up from above downwards; rhachis fragile :
 3. Keels of the palea ciliate :
 4. Panicles compact and dense (little effuse in *E. ciliaris* var. *clarkei*) :
 5. Palea hairs longer than the width of floret and glands of hair base conspicuous; anthers 2; annual ... *E. ciliaris*
 5. Palea hairs shorter than the width of floret and glands of hair base inconspicuous; anthers 3; perennial ... *E. riparia*
 4. Panicles effuse :
 6. Inflorescence sticky due to glands on branchlets, to which grains of sand also adhere ... *E. viscosa*
 6. Inflorescence not sticky; no gland on branchlets and glumes ... *E. tenella*
 3. Keels of palea scabrid or smooth, not ciliate :
 7. Panicles thyrsiform, bearing numerous capillary branches; lemma 1.5 mm long, markedly truncate ... *E. aspera*
 7. Panicles oblong or linear; inflorescence branches not capillary; lemma about 1 mm long :
 8. Branches of the panicle almost whorled; spikelets loose, scattered, usually less than 8 flowered; grain 0.7 mm long, elliptic ... *E. japonica*
 8. Branches of the panicle mostly solitary; spikelets densely clustered, 6 to 10-flowered; grain 0.5 mm long, ovoid ... *E. diarrhena*
 2. Spikelets breaking up from below upwards; rhachis tough; lemma falling away with or without the paleas :
 9. Plants glandular :
 10. Lower branches of panicle fascicled or subwhorled; with glandular bands below culm nodes ... *E. pilosa*
 10. Lower branches of panicle not whorled; glandular bands below the culm nodes absent :
 11. Pedicels of spikelets with crateriform glands; spikelets 1.5-2 mm wide; no specific smell in plant ... *E. poaeoides*
 11. Pedicels without crateriform glands; spikelets 2-4 mm wide; disagreeable odour in plant when fresh ... *E. cilianensis*
 9. Plants eglandular :
 12. Spikelets ovate to ovate oblong, 4-12 x 2-3 mm ... *E. unioloides*
 12. Spikelets linear, less than 2 mm wide :
 13. Lemmas upto 1.5 mm long :
 14. Anthers 2 :
 15. Culms about 12 cm long; spikelets 4 to 8-flowered; lemma very acute ... *E. multicaulis*
 15. Culms always more than 12 cm long; spikelets 10 to 30-flowered; lemma acute to sub-acute with overlapping margins ... *E. gangetica*
 14. Anthers 3 :
 16. Caryopsis truncate at both ends, 0.7 mm long, dorsally slightly grooved; spikelets slaty grey to black ... *E. nigra*
 16. Caryopsis cylindrical, 0.5 mm long, smooth; spikelets grey or purple ... *E. atrovirens*
 13. Lemmas over 1.5 mm long :
 17. Spikelets versatile; pedicels over 5 mm long; lemmas broadly ovate-acute ... *E. tremula*
 17. Spikelets not versatile; pedicels less than 2 mm long; lemmas narrow, elliptic or lanceolate, acute ... *E. pappiana*

Eragrostis tef (Zucc.) Trotter in Bull. Soc. Bot. Ital. 62. 1918.

Poa tef Zucc. Diss. Ist. Pianta Panizz. Abiss. 1774.

Culms branching and spreading, 30-100 cm tall. Panicle large and open. Ligule membranous; spikelets 5 to 9-flowered, 6-8 mm long. Palea scabrid. Anthers 2, yellow, 0.8 mm long. Caryopsis spindle-shaped, red brown, about 1 mm long.

Ecological notes: It grows along the road sides, river and nala's beds, rock crevices wherever moisture is available. Flower-

ing and fruiting occur from Aug. to Dec. Grains are used as famine food and it may be grown as crop for hay.

Specimens examined: JHALAWAR: Verma 3465 (BSA); Manoharthana, Verma 3483 (BSA); Kapildhana, Wadhwa 9895 (BSA).

E. ciliaris (Linn.) R. Br. in Tuckey, Narr. Exp. Congo App. 478. 1818.

Poa ciliaris Linn. Syst. Nat. 2: 875. 1759. Weak annual, about 35 cm tall. Ligule ciliate, with long hairs at the throat of sheath. Panicle spike like, appears woolly

due to the long cilia on the keel of paleas. Spikelets densely clustered; lemma 1-1.5 mm long, obtuse, midnerve slightly excurrent. Anthers 2, light pink, about 0.2 mm long; grain 0.3-0.5 mm long, ovate or elliptical.

Ecological notes: This species is common on sandy soils, rocky places, along the road, river, and nallas during rainy season, usually flowering and fruiting from Aug. to Oct.

Specimens examined: JODHPUR: Rao 67180 (BSI), Shetty 107, 248, 271, 308 (BSJO); Pokharan, Jain 40733 (BSI), Wadhwa 4969 (BSA); Amarsagar, Wadhwa 5189A (BSA); JAISALMER: Tiwari 720 (BSJO); Ramgarh, Wadhwa 5114 (BSA); Monohargarh, Wadhwa 5098 (BSA); Vinjurai, Wadhwa 5316 (BSA); JAIPUR: Wadhwa 4828, 4852 (BSA); KOTA: Majumdar 13151 (BSA); CHITTORGARH: Majumdar 12219 (BSA); PALI: Rao 66752 (BSI), Shetty 1379, 1939 (BSJO); BARMER: Shetty 2333 (BSJO); BIKANER: Roy 2035 (BSJO); CHURU: Roy 2478 (BSJO); King 541217 (CAL.).

E. riparia (Willd.) Nees, *Agrost. Brass.* 512. 1829.

Poa riparia Willd. in *Ges. Natur. Freunde Berlin Neue Schrift* 4: 185. 1803.

Ligule ciliate. Panicle delicate, contracted, very narrow, subcylindric; rhachis glabrous; spikelets crowded, 1-1.25 mm long, rounded at the apex; palea ciliate but cilia shorter than the width of floret; glands of hair base not conspicuous as in *E. ciliaris*; anthers 3, 0.2 mm long, light pink. Caryopsis brown, ovoid, 0.4-0.5 mm long.

Ecological notes: Usually found in south India but Majumdar has collected this species from Banswara. Common on loam or sandy moist soil. Flowering and fruiting from Aug. to Nov.

Specimens examined: BANSWARA: Majumdar 10223B (BSA); MADRAS: Gamble 20786, Barber 4387 (MH); S. A. & Cot, Barber 4263 (MH).

E. viscosa (Retz.) Trin. in *Mem. Acad. Sci. Petersb.* 1(6): 397. 1830.

Poa viscosa Retz. *Obs. Bot.* 4. 1786.

A weak annual grass, more than half of the plant is panicle. Inflorescence, glumes and younger parts of stem are sticky owing to the presence of glands. These glands are usually brownish black to which sand particles adhere. Ligule base and mouth of sheath with very long cilia. Lemma 1-1.25 mm long, smooth or scaberulous on the keel. Anthers 2, yellowish or pinkish brown, 0.2 mm long, grain pale brown, polished 0.5 mm long.

Ecological notes: It is found in wasteland and along the road-sides on sandy gravelly moist soils during rainy season. Flowering and fruiting during Sept. to Nov.

Specimens examined: JODHPUR: Stover 19 (BSI); CHITTORGARH: Bansil, Verma 1722, Majumdar 10203, 10312 (BSA); S. ARCOT: Barber 6062 (MH); CHINGLEPUT: Barber 11198 (MH); MADRAS: Palur, Narayanswamy 4119 (MH); SIROHI: Mt. Abu, Duthie 6781 (CAL.).

E. tenella (Linn.) P. Beauv. ex Roem. et Schult. *Syst. Veg.* 2: 576. 1817.

Poa tenella Linn. *Sp. Pl.* 1: 69. 1753.

Stem slender, weak, tufted. Ligule ciliate, throat of sheath with long hairs. Panicle open, pyramidal, to elliptic, 2-14 cm long, 10-30 mm wide; lemma scaberulous on the keel; palea hairs usually shorter than the width of the floret. Anthers 3, light to dark pink, 0.2-0.3 mm long. Grain pale to light brown, 0.4-0.6 mm long, ovoid and polished.

Ecological notes: This species grows on a variety of habitats e.g. wasteland, road sides, pastures, dry moist places, on loam, sandy, gravelly, and saline soils. Field observation shows that from July to October flowering and fruiting is abundant but in moist and warm places it continues all round the year in India.

Specimens examined: JHALAWAR: Verma

3365, 6801, *Wadhwa* 7467 (BSA); *Eklera*, *Wadhwa* 7657 (BSA); *Monoharthana*, *Verma* 3475 (BSA); *Dhani Talai*, *Verma* 1782 (BSA); *JAIPUR*: *Wadhwa* 4829 (BSA); *SIROHI*: *Mt. Abu*, *Jain* 60185 (BSI); *PALI*: *Jawaidam*, *Rao* 66752 (BSI); *JODHPUR*: *King* 854 (CAL); *Tiwari* 610 (BSJO); *JAISALMER*: *Wadhwa* 8417 (CAL.).

E. aspera (Jacq.) Nees, *Fl. Afr. Austr.* 408. 1841.

Poa aspera Jacq. *Hort. Vindob.* 3: 32. 1776.

Panicle large, loose, thyriform, distinguishable from any other Indian species, 20-30 cm long and 7-15 cm wide. Ligule reduced to ciliate rim; hairs long at the throat of the sheath; spikelets on long, fine pedicels, 4-10 × 1-1.5 mm long, 6 to 22-flowered. Lemma 1.2-1.7 mm long; keels of palea scabrid. Anthers 3, pink, 0.3 mm long. Grains subglobose, about 0.5 mm long.

Ecological notes: It is usually found on sandy or sandy loam soils during rainy season. Moist and shady habitat is preferred by this species. Flowering and fruiting period is Aug. to Oct.

Specimen examined: *BIKANER*: *Gajner*, *Roy* 2074 (BSJO).

E. japonica (Thunb.) Trin. in *Mém. Acad. Sci. Petersb.* 1(6): 405. 1831.

Poa japonica Thunb. *Fl. Jap.* 51. 1784.

Branches of the panicle more or less whorled. Ligule membranous; spikelets loose, scattered, few-flowered (usually less than 8-flowers). Lemma less than 1 mm long; stamens 2, yellow, 0.3 mm long; palea scabrid. Caryopsis reddish brown polished, 0.7 mm long, elliptic.

Ecological notes: It commonly grows on clay and black cotton soil, on the banks of dry ponds and streams, forming clumps in rock crevices near water holes, occasionally in cultivated fields and roadsides. Flowering & fruiting occur from Sept. to January, in moist places upto March.

Specimens examined: *JHALAWAR*: *Eklera*.

Majumdar 10045 (BSA); *Bhawanimandi*, *Verma* 3494 (BSA); *CHITTOR*: *Bansi*, *Verma* 1717 (BSA); *JAISALMER*: *Rao* 67070 (BSI); *BIKANER*: *Roy* 2165, 2361, 2377 (BSJO); *DUNGARPUR*: *Verma* 147 (CAL.).

E. diarrhena (Schult.) Steud. *Syn. Pl. Glum.* 1: 266. 1854.

Poa diarrhena Schult. *Syst. Veg.* 2: 616. 1927.

Panicle branches mostly solitary, sometimes variable; ligule membranous; spikelets clustered, 6 to 14-flowered; lemma about 1 mm long; palea scabrid; stamens 2, yellowish brown, about 0.3 mm long. Caryopsis reddish-brown, polished 0.5 mm long, ovoid in shape, embryo-end pointed.

Ecological notes: Usually grows on damp soil near water holes in rocks crevices, around the moist bed of tanks and river-beds. It is a tall grass found growing where good soil and moisture is available. The plants collected from dry place or during the off season are relatively much smaller.

Specimens examined: *KOTA*: *Chambal* river bed, *Majumdar* 100130, 10122 (BSA); *JHALAWAR*: *Majumdar* 10091 (BSA); *DUNGARPUR*: *Marwa*, *Verma* 147 (BSA); *JODHPUR*: *Shetty* 1434, 2197 (BSJO).

Critical notes: de Winter (1960) proposed that *E. japonica* and *E. diarrhena* should be transferred to the genus *Diandrochloa*, because they possess membranous ligule, 2 stamens and scabrid or smooth palea-keel. Based on the above Henry (1967) transferred *E. japonica* and *E. diarrhena* to the genus *Diandrochloa*. The present investigation does not support the views of de Winter and Henry. It is therefore proposed to treat these species under the genus *Eragrostis* P. Beauv.

E. pilosa (Linn.) P. Beauv. *Ess. Agrost.* 71: 162-175. 1812.

Poa pilosa Linn. *Sp. Pl.* 68. 1753.

Lowest branches of panicle fascicled or sub-whorled with glands below and above

the lowest nodes; ligule ciliate. Spikelets very narrow and straight. Lemma acute with purple tip, 1.4-2 mm long, more or less appressed to the rhachilla. Palea smooth. Anther 3, dark pink, 0.2 mm long. Grain brown, ellipsoid, 0.6-1 mm long.

Ecological notes: It grows on various soil types on the bank of ponds, cultivated fields, waste places, in swamps and muddy places. Plenty of moisture is needed by this species. Flowering and fruiting occur from Sept. to Dec.

Specimens examined: KOTA: Majumdar 10469, 10395, 13246, 13283 (BSA); CHITTOR: Oraidam, Verma 1660 (BSA); JAISALMER: Rao 67154, 67073 (BSI); Kuri Kotari, Wadhwa 5256; Ramgarh, Wadhwa 51113, 5164, 5151A (BSA); Phalsund, Wadhwa 4958, 4952 (BSA); BARMER: Luni river bed, Rao 66930 (BSI); TONK: Shetty 481, 1037 (BSJO); BIKANER: Roy 2162 (BSJO); JODHPUR: Shetty 196 (BSJO).

E. poaeoides P. Beauv. Ess. Agrost. 162. 1812.

Poa eragrostis Linn. Sp. Pl. 68. 1753.

Leaf margins and sheaths glandular, ciliate; ligule truncate. Panicle branches relatively stout and stiff. Crateriform glands present on the pedicels or spikelets and inflorescence branches, sometimes not obvious on young inflorescence and spikelets. Spikelets 1.5-2 mm wide, olive-grey or purplish; lemmas ovate-obtuse about 2 mm long. Palea scabrid. Anthers 2, about 0.2 mm long. Caryopsis red brown 0.6 mm, round in outline and slightly dorsally flattened.

Ecological notes: It is very common in Rajasthan, growing in moist and dry places, on sandy, gravelly, rocky soils, cultivated fields and wastelands.

Specimens examined: CHITTOR: Pratapgarh, Majumdar 12233 (BSA); JODHPUR: Shetty 123, 245, 272 (BSJO); Shergarh, Wadhwa 4730, Pokhran 4944 (BSA); UDAIPUR: Verma 15 (BSA); JHALAWAR: Bhawanimandi, Verma 3504 (BSA); BIKANER:

Roy 2021, 2109, 2155 (BSJO); TONK: Shetty 483 (BSJO); BARMER: Shetty 2206, 2285, 2332 (BSJO); JAISALMER: Tiwari 809, 719 (BSJO).

E. cilianensis (All.) Vignolo-Lutati in Malpighia 18: 386. 1904.

Briza eragrostis Linn. Sp. Pl. 1: 70. 1753.

Poa cilianensis All. Pl. Pedem. 2: 246. t. 91. f. 2. 1785.

Plants glandular with disagreeable odour when fresh; all glands pitted. Ligule a ring of hairs. Pedicels shorter than the spikelets giving crowding effect; spikelets 2-4 mm wide; lemmas 2-2.8 mm long, glandular on the keel; palea persistent, scabrid. Anthers 3, yellow brown, 0.3 mm-0.5 mm long. Grain rugulose, reddish-brown, globose, 0.5 mm in diameter.

Ecological notes: It usually occurs on heavy soils like clay, clay-loam and black cotton soils in moist places. Flowering and fruiting during and just after rains.

Specimens examined: UDAIPUR: Majumdar 1249B (BSA); Parlakapul, Majumdar 10324 (BSA); PALI: Shetty 1517, 1950 (BSJO); JAISALMER: Petel 564 (CAL.).

E. unioides (Retz.) Nees ex Steud. Syn. Pl. Glum. 1: 264. 1854.

Poa unioides Retz. Obs. Bot. 5: 19 1789.

Inflorescence branches ascending; ligule membranous; florets closely imbricate; spikelets ovate to ovate-oblong, 4-12 mm long, 2-3.5 mm wide. Shape of the spikelet and colour of the inflorescence are characteristic of this species. Lemmas narrowly ovate in side view, acute at the tip when flattened, membranous, tinged with pink or purple. Anthers 2, deep pink, 0.3 mm long. Palea scabrid. Grain dark brown, embryonic-end narrow, pointed, lower-end round and broad.

Ecological notes: It grows in variable habitats, usually along the ditches, in water logged areas, muddy sandy, clay and black

cotton soils after rainy season. Flowering and fruiting from Sept. to March.

Specimens examined: KOTA: *Majumdar* 13294 (BSA); Shahabad, *Majumdar* 10448 (BSA); JHALAWAR: *Verma* 3331 (BSA); Bijliya Bhadak forest, *Wadhwa* 5323 (BSA); UDAIPUR: *Rao* 66595 (BSI); DUNGARPUR: Ratanpur, *Kanodia* 82076 (BSI); SIROHI: *Nanda* 2185 (CAL.).

E. multicaulis Steud. Syn. Pl. Glum. 1: 426. 1855.

Annual. Ligule a short ring of hairs. Axils of the panicle glabrous. Panicle branches spikelet bearing nearly to the base. Spikelets usually 4 to 8-flowered and 3-4 mm long. Lemma and palea 1.3-1.5 mm long; palea scabrid. Anthers 2, dark pink, 0.2-0.3 mm long. Grains dark brown, 0.8 mm long, embryo-end truncate, other-end obtuse, rounded.

Ecological notes: In Rajasthan it has been collected on black soil in dry conditions. Flowering and fruiting occur from Sept. to Dec.

Specimen examined: BANSWARA: *Majumdar* 10229 (BSA).

E. gangetica (Roxb.) Steud. Syn. Pl. Glum. 1: 266. 1854.

Poa gangetica Roxb. Fl. Ind. 1: 341. 1820. Lower panicle branches not whorled, usually solitary. Ligule membranous, truncate. Spikelets linear, 1-1.5 mm wide, 4-10 mm long. Lemma 1-1.5 mm long, acute to sub-obtuse. Glumes lanceolate, about half of lemma. Palea scabrid; anthers 2, about 0.3 mm long, dark pink appearing blackish. Grain subglobose, 0.4-0.6 mm long. Narrow panicle, few branches and greyish spikelets are distinguishing characters of this species.

Ecological notes: This species has variable forms and habitats. Usually it grows on heavy soils on the bank of nalas, dry river beds in muddy places. Under favourable conditions flowering and fruiting occur

all round the year, but normal period is from Sept. to the end of Nov.

Specimens examined: KOTA: *Majumdar* 10869; Shahabad, *Majumdar* 10479 (BSA); CHITTOR: *Verma* 1716, *Majumdar* 10165 (BSA); JHALAWAR: Bijliya Bhadak forest, *Wadhwa* 5335 (BSA); SIROHI: Mt. Abu, *Jain* 60183 (BSI); BANSWARA: *Kanodia* 75599 (BSI), *Majumdar* 10172A (BSA) under *E. atrovirens*; SIROHI: *Rao* 67243 (BSI) under *E. atrovirens*; JHALAWAR: *Verma* 6777 (CAL.).

E. nigra Nees ex Steud. Syn. Pl. Glum. 1: 267. 1854.

Ligule a ring of hairs. Panicle open, spreading. Spikelets slaty grey to black; rhachilla of spikelets tough; lemmas falling from below upwards, ovate-acute, 1.5-1.8 mm long. Palea scabrid. Anthers 3, yellow, about 1 mm long. Caryopsis black, truncate at both ends, 0.7 mm long, dorsally slightly grooved.

Ecological notes: Very common on hills and in waste places on rocky, gravelly and moist soils. Flowering and fruiting occur from Aug. to Nov.

Specimen examined: SIROHI: Mt. Abu, *Puri* 56684 (BSI).

E. atrovirens (Desf.) Trin. ex Steud. Nom. Bot. ed. 2. 1: 562. 1840.

Poa atrovirens Desf. Fl. Atlant. 1: 73. t. 14. 1798.

Strongly perennial grass. Ligule membranous, truncate. Panicle ovate or oblong; spikelets linear, pallid to grey or purple. Pedicels 1-3 mm long; lemma 1.4-2 mm long, acute to sub-acute at the tip when flattened. Palea scabrid. Anthers 3, brownish yellow, 0.6-1 mm long. Caryopsis red-brown, cylindrical, 0.5-1 mm long.

Ecological notes: This is wide spread and polymorphic species usually confined to moist or swampy soils. Flowering and fruiting occur from Aug to November, in moist places all round the year.

Specimens examined: CHITTOR: *Majumdar* 10165 (BSA); Pratapgarh, *Majumdar* 10172 (BSA); KOTA: *Majumdar* 13282; Shababad, *Majumdar* 13288A (BSA); Naka, *Verma* 445 (under *E. gangetica*); Shahabad, *Verma* 685 (BSA); BANSWARA: *Majumdar* 10299 (BSA) under *E. nigra*.

Critical notes: There is much similarity between *E. gangetica* and *E. atrovirens*. According to Bor (1960) in most of the Indian herbaria *E. atrovirens* is identified as *E. gangetica*. The former has 3 stamens and latter possesses 2 stamens, size also vary as described in the present text. Annual and perennial habit does not carry much weight in distinguishing these species.

E. tremula Hochst. ex Steud. Syn. Pl. Glum. 1: 269. 1854.

Poa tremula Lamk. Encycl. Meth. Bot. 1: 185. 1791.

Leaf margins and sheaths glabrous. Ligule membranous. Palea scabrid. Panicle branches diffused, solitary, filiform. Spikelets pallid to purplish bearing a distant resemblance to "fish insects", often curved, trembling on slender pedicels (usually over 5 mm long). Spikelets 8-50 mm long, 10 to 100-flowered. Lemma broadly ovate-acute, 2 mm long and 2.5-3 mm wide with irregularly wavy and hyaline margins. Stamens 2, deep pink, 0.3 mm long. Grain reddish brown, round like lentil seed and beaked at the embryo-end.

Ecological notes: Usually found on sandy, gravelly black cotton soils. Flowering and fruiting occur by the end of September and upto December.

Specimens examined: BANSWARA: *Kanodia* 75595 (BSA); DUNGARPUR: *Majumdar* 13259 (BSA); KOTA: *Majumdar* 10361 (BSA); JODHPUR: *Shetty* 196; PALI: *Rolla* 66763 (CAL.); *Singh* 3129 (BSJO); BIKANER: *Roy* 2162 (BSJO); BARMER: *Shetty* 2202, 2350 (BSJO); TONK: *Shetty* 1038 (BSJO).

E. pappiana Chiov. in Ann. 1st Bot. Roma 8: 371. 1908.

Superficially very similar to *E. tremula* but the pedicels are not more than 2 mm long. Ligule membranous, truncate, spikelets 1.5-2 mm wide; lemmas narrower, elliptic or lanceolate-acute. Paleas deciduous, scabrid. Anthers 2, light yellow, 0.6-1 mm long. Grain dark brown, spindle-shaped, narrow, 0.6-1 mm long; styles persistent.

Ecological notes: It grows on sandy and rocky places, dried nala and river beds. Flowering and fruiting from Sept. to Dec.

Specimens examined: JHALAWAR: *Manoharthana, Verma* 3466 (BSA). The identity of this specimen has been confirmed by N. L. Bor.

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