



Research Article

Comparative morphological screening of some species of *Cenchrus* L. (Poaceae) from Thar Desert of Rajasthan, India.

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Abstract: In present study an attempt has been made to describe widely confused species of *Cenchrus* (Poaceae). The exact identification has been critically assessed. The name *Cenchrus* comes from the Greek word “Kenchrous” meaning millet. *Cenchrus* is an extremely variable genus having both annual and perennial species. Morphologically *Cenchrus* is very similar to *Pennisetum*. All species of *Cenchrus* are very much similar in their morphology except few micromorphological distinctions. It is a xerophytic C₄ grass, which grows in bunches and more often with creeping rhizomes. These grasses can exist under minimal level of precipitation ranging from as low as 95 mm to 1000 mm. *Cenchrus* is very efficient in water usages as its root draws soil moisture rapidly as compared to other plants. Various traits are known to wild species of genus *Cenchrus* but due to lack of enough studies their full potential has not been exercised. An attempt has been need to study morphology of three species common in our region so that these details can further be utilized to exploit these species for their full potential.

Keywords: Bur, *Cenchrus*, Forage, Glume, Medicinal, Morphology, Plumose.

Introduction

Grasses feed the world either directly as food crops, such as wheat, rice, millets and other grains or indirectly as primary fodder for the livestock. It is estimated that grasslands cover around 20% of the earth's total area. *Cenchrus* a member of the tribe Paniceae of the Poaceae family is also one of the important components of major grass cover of the world. *Cenchrus* probably originated in the eastern tropical Africa and tropical Asia and widely naturalized in new world countries. *Cenchrus* is a species-rich grass genus of the arid and semi-arid tropical world. The Royal Botanic Garden; Kew has recorded 25 species while Germplasm Resource Information Network (GRIN) of USDA reported 35 different species of *Cenchrus* (Goel *et al.*, 2011). Out of the 25-species recorded, three are planted for forage across the world, with *Cenchrus ciliaris* being the most valued. *C. ciliaris* is new to cultivation and has not gone through bottleneck of domestication, due to which extreme variability exists in the wild at interspecific level. Apart from this species, other species also have been shown to have the potential for forage production and more tolerance toward harsh conditions. *C. biflorus* and *C. setigerus* have the capability to withstand heat and frost and can grow on wide range of soil types. Morphologically *Cenchrus* is more similar to *Pennisetum* which leads to confusion for identification but can be differentiated from each other by the morphology of the inner involucre bristles. In *Cenchrus*, bristles are fused with each other at the base forming a spiny cup while free in *Pennisetum* (Stieber and Wipff, 2000; Tu *et al.*, 2002). That is the reason to

treat *C. ciliaris* as *Pennisetum ciliare* (L.) Link (Chen and Kuoh, 2004). *Cenchrus ciliaris* grows mainly on sandy soil and alluvial plains, along roadside, rocky hillsides, hot and dry areas and denuded arid lands (Quattrocchi, 2008). *C. ciliaris* best suits for the restoration of degraded arid ecosystems (Visser *et al.*, 2008; M'Seddi *et al.*, 2002).

Materials and Methods

Fresh, disease free plant samples were collected from different places of arid region of Rajasthan (Barmer and Jodhpur), India during rainy season (July to September). Plant samples used for this study were collected directly from wild population. Plant parts were measured using hard ruler and were observed under dissecting and compound microscopes. For morphological studies 10 specimens per species used for assessment of morphological traits.

Result and Discussion

Cenchrus ciliaris L.

Common name - Buffel Grass

Herbaceous, Perennial with rhizomatous roots. Culm erect, divided into nodes and internodes possess 1-2 grooves. Internodes are 3-13 cm in length and 1-1.5 cm wide. Leaf simple, sessile, alternate, blades flat, linear, 21-52 cm long, 3-10 mm wide, acuminate at apex, both surface possess hair, that are more prickly and prominent on adaxial surface with long sheathing leaf base and hairy margine. Ligule membranous and ciliate, lamina lanceolate. Inflorescence is a dense and cylindrical panicle of spikelets (3.5 x 4 mm). 10-15 cm long

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bears spikelets in clusters of 1-3. Spikelets sessile, surrounded by two whorls of bristles; bristles ciliate, the inner longer and thicker than the outer, with one conspicuously longer (DeLisle, 1963). Spikelets with 2 florets, one sterile and one fertile, lanceolate, acute at apex. Upper and lower glumes (4 x 3 mm, 2.8 x 2mm) are similar in shape, hyaline, ovate, glabrous, with equal length of spikelets. Flower pedicellate, bracteates (lemma, 4 x 5 mm and palea, 4

x 4.5 mm of fertile floret are similar, ovate, hyaline and glabrous), zygomorphic, incomplete, bisexual, tepals 2 (free). Anthers 3, introse, versatile, polyandrous, dithecous, antitepalous, dehiscence longitudinal. Stigma 2, plumose, terminally exerted, ovary superior, monocarpellary, unilocular with basal placentation. Caryopsis oblong, glabrous and dorsally compressed, 2-5.5 x 1-1.5 mm (Fig. 1).

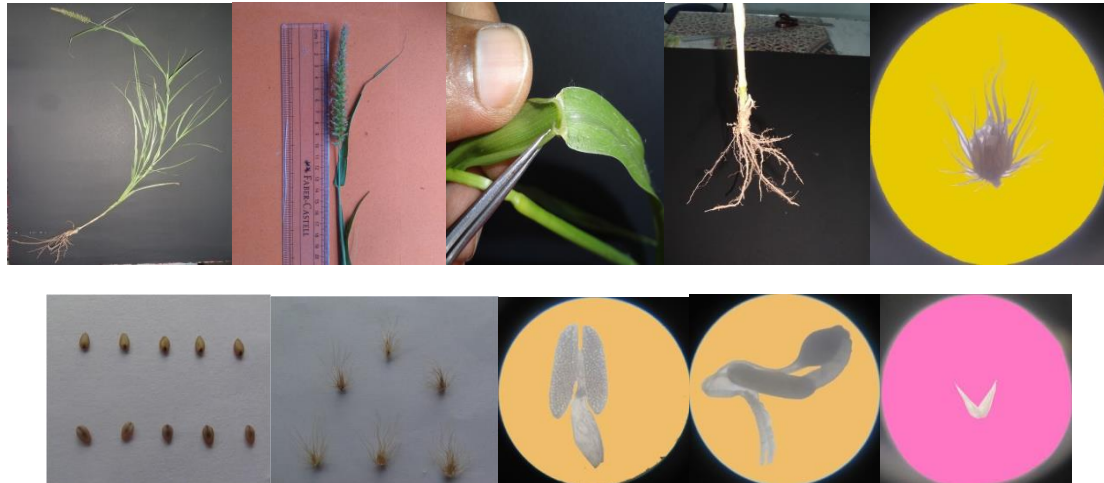


Figure 1. Various plant parts of *Cenchrus ciliaris*

***Cenchrus setigerus* Vahl**

Common name - Birdwood Grass

Structurally almost similar except few new features and measurement adventitious roots 9-16 cm long. Culms 40-100 cm long with nodes and internodes

(flattened, hairy with 1-2 grooves and 1-14.5 cm x 5-10 mm). Leaf ligulate (11-55.5 cm x 3-6.5 mm). Panical 3.5-9.5 cm long. Rachis bears spikelets in clusters of 1-3, involucrel bristles connate at base. Bristles numerous, rigid and spiny (Fig. 2).

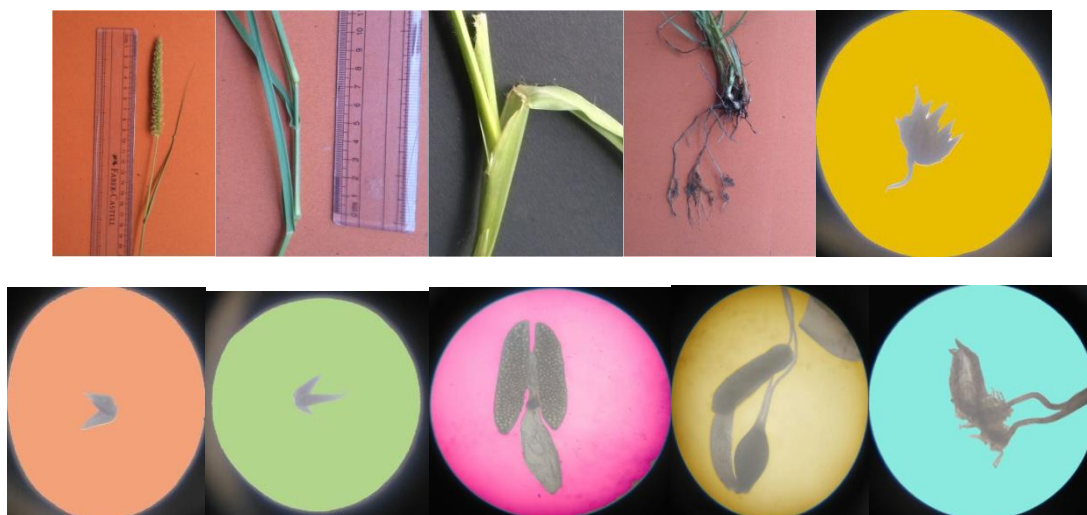


Figure 2. Various plant parts of *Cenchrus setigerus*

***Cenchrus biflorus* Roxb.**

Common name - Indian Sandbur

Shows similar characters but it is an annual, tufted, glabrous grass species. Culms rooting at lower nodes. Upper internodes are longer than lower ones. Leaf blades (12-36.5 cm long x 7-12 mm). Panical 9-14 cm x 7-15 mm.) bears deciduous

spikelets subtended by a rigid involucrel whorl of bristles (bur) connate at base. Outer bristles are short, spiny and numerous as compare to inner (Fig. 3). *Cenchrus biflorus* is well adapted to hot and dry tropical areas and might be a paleotropical invasive weed (Quattrocchi, 2008).



Figure 3. Various plant parts of *Cenchrus biflorus*

Conclusion

Morphological studies of the genus *Cenchrus* were carried out from Thar Desert. Observations on the species were recorded in the field as well as in the laboratory in their natural habitat and in living form. The results on plant morphological characteristics for the three species of *Cenchrus* fit well with the published literature on *Cenchrus ciliaris* (Goel *et al.*, 2011; Saini *et al.*, 2007; Chen and Kuoh, 2004), *Cenchrus setigerus* (Goel *et al.*, 2011; Saini *et al.*, 2007) and *Cenchrus biflorus* (Goel *et al.*, 2011; Saini *et al.*, 2007) except few differences of measurements. It may be because of climatic and habitat conditions or some other factor may cause such discrepancies. It has been observed that the biomass production and water uptake efficiency of this grass is better than other arid zone grasses that make it more potent and fit to harsh conditions of Thar Desert. Authors have analyzed so many medicinally important phytochemicals from this forage crop of high economic value (Arora *et al.*, 2017; Arora and Kumar, 2017; Arora and Kumar, 2018). This grass is relatively resistant to drought and overgrazing, produces high forage productions as compare to cost of establishment. Still there is huge scope to enrich the information of other aspects related to this grass and a systematic study involving various aspects is required to exploit it fully.

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