

## Investigation on study of wild relatives of grasses and their importance for grazing habitat of wild Herbivores in Tadoba Andhari Tiger Reserve Maharashtra State

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### Abstract:

Wild Relatives of grasses are naturally distributed in the grasslands of Tadoba Andhari Tiger Reserve, the wild relatives are the parental genera of cultivated crops, the diversity of wild relatives of grasses variable with the change in soil texture and soil ecology , soil physical properties. The important wild relatives of grasses reported from Tadoba Andhari Tiger Reserve are *Setaria pumilla* , *Setaria italica* , *Sorghum halpense* , *Panicum scorbiculatum* , *Oryzariumhipogon* , *Elusincindica* , *Panicum milliacum* , *Paspalum canare* , *Panicum notatum* , *Paspalum paspalodes* , *Panicum sumatrense* , *Saccharum spontanium* , *Sorghum contraversum* , *Sorghum deccanense* , *Urochloa panicoides*. Wild relatives of grasses identification and conservation by seeds collection and enrichment useful to maintain composition of grasslands in Protected Areas. Wild relatives of grasses are nutritive and having good forage value with reference to grazing habitat of wild herbivores and play vital role in grasslands management.

**Key Words:** Wild relatives of grasses , Tadoba Andhari Tiger Reserve , grasslands Management and conserve diversity of wild relatives.

### Introduction:

Grasses are one of the largest and most valuable groups of flowering plants, consisting of 610 genera and 10,000 species (Cope, 1982). Clayton and Renvoize (1986) put the total number of grasses in the world about 10,000 species, 651 genera were recognized and assigned numbers indicating their phylogenetic status based upon various evidences. It ranks third in number of genera after the Compositae and Orchidaceae and fifth in number of species after the Compositae, Orchidaceae, Leguminosae and Rubiaceae (Good, 1953). Grasses are widespread than any other family of flowering plants. The great adaptability of different species has enabled them to thrive under the most varied conditions. They form the climax vegetation of the semiarid prairies of the American continent, the steppes of Asia and the savannas of Africa. Grasses exceed all other in the importance of its products. It provides food in the form of cereals for man and forage for most animals. Many species of native and introduced grasses are utilized in improved pastures (Salter, 1952).

A grass is taxonomically defined as any species within the large family (Gramineae or Poaceae) of monocotyledonous plants having narrow leaves, hollow stems, and clusters of very small, usually wind-pollinated flowers. Grasses include many varieties of plants grown for food, fodder, and ground cover (Grass 2014). Grasses are often confused with sedges (Cyperaceae family) and reeds (Restionaceae family). However, sedges do not have a leaf sheath and their leaves are attached directly to the culm—a diagram of grass anatomy is provided in Appendix C. The culms of sedges are also angular, while grass culms are circular. The grass family is the fifth largest plant family on earth with over 700 genera and 9700 species. About ten percent of the grass species worldwide can be found in southern and tropical Africa; the major genera of which are *Eragrostis*, *Pentstemon*, *Panicum*, *Sporobolus*, *Aristida*, *Digitaria*, *Stipagrotis*, *Setaria*, *Brachiaria*, and *Hyparrhenia* (Van Oudtshoorn 2009).

Almost all animal species and food chains depend on grass because grass occurs across the world and is almost always edible. The groups of animals that depend most directly on grass for food are birds, insects, rodents, and grazers. There are many bird species, such as *Quelea* finches, the most common bird on earth with a population of over 1.5 billion in Africa alone, that solely eat grass seeds. Grass provides the only food source for seed-eating birds, and the birds play an integral role in seed dispersal. Insects use grass for both food and shelter. Disruption of these grassland ecosystems can cause a dangerous under or overabundance of insect species. Rodents consume grass seeds or the base of the plant where the most nutrients are stored. Grazers have the largest impact on grasslands and typically graze in large herds which makes spatially expansive impact. Grazers remove old plant material, stimulate new growth, and provide nutrients in the form of manure. Although predators and decomposers are also ultimately dependent on grass species, it is primary consumers—specifically herbivores—that have the biggest causal relationship with grass species. Herbivores and grass species composition are highly interdependent.

Evaluating a Grassland There are four main measures to evaluate a grassland: grazing value, ecological indicator status, succession stage, and perenniality. Several factors that can help conservation managers determine whether their area is providing valuable grazing material. By identifying grass species in the area, grazing value can be determined. Grazing value is defined as the quality and quantity of material from an individual available for grazing (Van Oudtshoorn 2009).



Grasses inhabit the earth in greater abundance than any other comparable group of plants. Some are adapted to warm, humid and tropical climate while others are established in the polar regions, where the growing season is two months or less and direct sunlight is absent for many months of the year. Some are important elements of marsh and swamp vegetation, and other inhabit desert regions where the annual precipitation is 5 inches or less. Even before the time of recorded history, the grains of grasses provided a staple food supply for the human race (Gould, 1968). The members of this group are present in all the conceivable habitats, suitable for growth of plant communities (Mitra and Mukherjee, 2005). Grasses are used as forage for domesticated, wild animals and soil conservation (Gould, 1968).

#### TadobaAndhari Tiger Reserve Forest Diversity :

"Tadoba" is taken from the name of the god "Tadoba" or "Taru", worshipped by the tribes who live in the dense forests of the Tadoba and Andhari region, while "Andhari" refers to the Andhari river that meanders through the forest.

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land. Tadoba National Park and Andhari wildlife sanctuary together form the Tadoba-Andhari Tiger Reserve. The total area of the Tadoba-Andhari tiger reserve is about 1,727 km<sup>2</sup>.

Tadoba National Park was established in the year of 1955. Total area of the park is 116.55 Km<sup>2</sup>. The Andhari Wildlife Sanctuary was formed in the year 1986. Total area of the Andhari Wildlife Sanctuary is 508.85 Km<sup>2</sup>.

Total core area of the tiger reserve is 625.40 Km<sup>2</sup>. Total buffer area of the tiger reserve is 1101.60 Km<sup>2</sup>. The reserve also includes 32.51 Km<sup>2</sup> of protected forest and 14.93 Km<sup>2</sup> of other areas. The monsoon season begins in June; the area receives heavy rainfall during this season (approx. 1275 mm) and humidity around 66-70%.

TadobaAndhari Tiger Reserve is a predominantly southern tropical dry deciduous forest with dense woodlands comprising about eighty seven per cent of the protected area. Teak is the predominant tree species. Other deciduous trees found in this area include ain (crocodilebark), bija, dhauda, salai, semal and tendu. Beheda, hirda, karayagum, mahuamadhuca (crepe myrtle), palas (flame-of-the-forest, Buteamonosperma) and Lanneacoromandelica (wodier tree). Axlewood (Anogeissuslatifolia, a fire-resistant species), black plum and arjun are some of the other tropical trees that grow in this reserve.

Aside from the keystone species, the Bengal tiger, Tadoba Tiger Reserve is home to other mammals, including: Indian leopards, sloth bears, gaur, nilgai, dhole, striped hyena, small Indian civet, jungle cats, sambar, barking deer, chital, chausingha and honey badger. Tadoba lake sustains the marsh crocodile, which was once common. Indian star tortoise, Indian cobra and Russel's viper also live in Tadoba. The lake contains a wide variety of water birds, and raptors. 195 species of birds have been recorded, including three endangered species. The grey-headed fish eagle, the crested serpent eagle, and the changeable hawk-eagle are some of the raptors seen in the park.

Poaceae is the one of the largest family among the monocotyledons in the world. The grass vegetation broadly divided into two types depending upon their life-span, Ephemeral vegetation consisting mainly of the grasses that complete the life cycle during rainy season or after rainy season. Grasses autumn or long lived vegetation with species that grow with the rains but complete their life-cycle after rains. The species like *Arthraxon lancifolius*, *Arundenellapumila*, *Sporobolus coromondelianus*, *Digitaria ternata*, are the chief components of farmers category. On the contrary the species like *Heteropogon contortus*, *Andropogon pumulus*, *Chrysopogon fulvus*, *Dicanthium caricosum*, *Setaria forbesiana*, *Pennisetum hohenackeri* which form the autumn vegetation are either perennial vegetation forming large tufts.

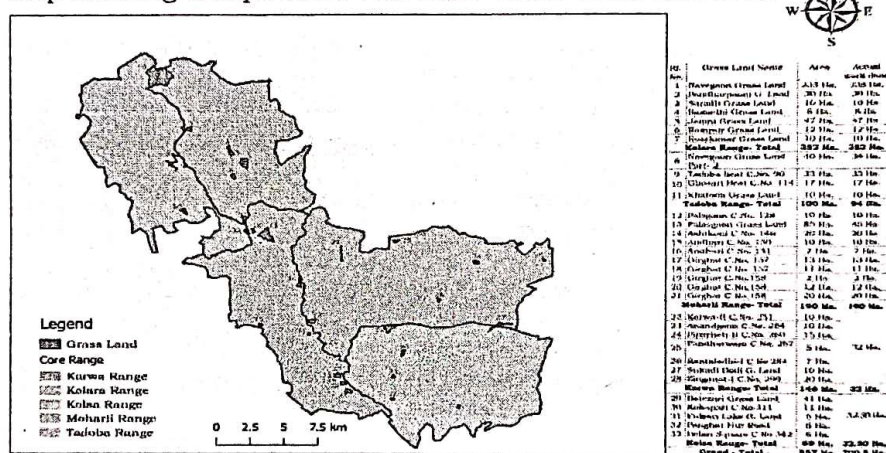
#### Tadoba-Andhari National Park/Coordinates 20.2484° N, 79.3607° E

Sr. No.	Name of grassland	Area in Hectares
	<b>Kolara Range grasslands</b>	
1	Navegaon part 1 (Rehabilitated Site)	235 Hectare
2	Kosekanar	10 Hectare
3	Pandharpauni	30 Hectare



4	Jamni(Rehabilitated Site)	47 Hectare
5	Samadhi	08 Hectare
6	Rampur	12 Hactre
7	Saradh	10 Hectare
<b>Tadoba Range Grasslands</b>		
1	Navegaon part 2	40 Hectare
2	Tadoba beat Comp. No. 90	33 Hectare
3	Khatoda	10 Hectare
<b>Moharli Range Grasslands</b>		
1	Palasgaon (Rehabilitated Site)	95 Hectare
2	Girghat	58 Hectare
3	Askoni Com. No. 146	20 Hectare
<b>Karwa Range</b>		
1	Sukdobodi	10 Hectare
<b>Kolsa Range Grasslands</b>		
1	Botezari	41 Hectare
2	Kohapari	11 Hectare
	Doni	65 Hectare
	<b>Kolsa (Rehabilitated village)</b>	<b>150 Hectare</b>

Map Showing Campa Work Year 2020- 21 in TATR Core area



### Objectives :

- Identification and Enumeration of Wild Relatives grasses plants.
- To identify the wild grasses plants from open grasslands with the help of morphological study by using regional floras.
- Exploration of plants from forest areas.
- To determine diversity of wild grass plants and its ecological significance in forest ecosystem.
- Floral association in grassland ecosystem and its role in forest Ecology.
- Phenological study of the wild grasses plants.
- Conservation and propagation of plants.
- In-situ conservation of plants , seed collection and enrichment in grasslands
- Ecological and morphological study of plants

### Methodology

- To select the sites /area for the study of wild grasses plants present in forest and grasslands ecosystem of Madhya Pradesh State.
- To arrange the regular field visits in three different seasons of the year, Rainy season , Winter season and Summer season.
- To observe the open grassland with special reference to phytosociology .
- G.P. S. study of grasses plants of Madhya Pradesh.
- Grasses distribution and their ecological and environmental study.



- Ecological significance of grasses in forest ecosystem.
- To prepare the photographic album of wild grasses plants.

### Recognising the morphology of plant species

By using regional, local and national floras, the data from the herbarium specimens, the accounts on morphological details, diagnostic characters and range of variation studied. The grasses plants are observed at different stages vegetative and reproductive stages of the plants. The roots are observed from morphological point of view, to study the role of grasses in forest ecology and to modify the texture of soil. Observation of morphological characters under dissecting microscopes and magnifying lens. Study of root, stem, leaf and flowers morphology of the plants in specific season. Identification of grasses plants by using regional floras or national floras. To take the GPS coordinates of the plants at the different sites. Their identity requires a skill in systematic botany. This is perhaps the reason why wild relatives are meagrely represented in the germplasm collections. The wild relatives of crop plants by and large, occur as component of disturbed habitats within the major vegetation types. The information on their occurrence is available from different herbaria floristic accounts, floras, etc

### Use of herbaria

Herbaria with large collections of plant genetic resources including wild relatives of grasses assist the explorers in having an idea about the species diversity of a region. Herbarium field notes and associated data such as root, stem, leaf, flowers, fruits morphology and ecological characters with GPS coordinates seed maturity of wild relatives from the locality of collection help in planning the duration of exploration. Since the herbarium specimens are generally collected during flowering, this information can be considered to be optimal for seed collection.

### Collection and Conservation of plants

Observations and collection of plants before approaching for the field collection directly. On spot identification of target species and seed collection, drying storage and broadcasting in different grasslands for the insitu conservation purposes in forest ecosystem or new species to the collection of valuable germplasm of wild species for gene bank conservation.

### Collection of Wild Relatives

The collection missions are primarily aimed at tapping germplasm variability in Plant Genetic resources of different agri-horticultural Wild relatives of Grasses in the entire genepool. The germplasm is collected on the basis of priority for collection from targeted regions, and of species. The information on ecological distribution with precise location of species helps in collection of targeted gene pool

**Study area :** Core area grasslands of Tadoba Andhari Tiger Reserve .

1. Palasgaon grassland 2. Navegaon grassland 3. Jamnigrassland 4. Pandharpauni grassland 5. Botezari grassland.

### Observations:

#### Finger Millet (*Eleusine Coracana* (L.) Gaertn.)

Finger millet is commonly known as Ragi. It is a staple food for many people. There are two sub species - *E. africana* and *E. coracana*. *Eleusine* having only one wild relative in Madhya Pradesh *Eleusine indica* (L.) Gaertn. *E. indica* is the only wild species widely occurring which is morphologically and cytologically similar to *E. coracana* (Krishnaswamy, 1951). *E. indica* is of Indian origin and may be the immediate ancestor of finger millet (Mehra, 1963)

#### Proso millet (*Panicum milaceum* L.) and Little Millet (*Panicum sumatrense* Roth. ex Roemer Schult.)

Proso millet is commonly called kodo. It is supposed to be one of the oldest grain crops and is grown extensively in India. It is a quick growing drought resistance crop. It has two sub-species *psilopodium* and *sumatrense*. It is classified as race- *nana* and *robusta*, sub races- *laxa*, *erecta* and *compacta*. In Madhya Pradesh, *Panicum maximum* Jacq., *P. milare* L., *P. notatum* Retz., *P. psilopodium* Trin (related to *P. milare*), *P. repens* L., are present. Out of these species, *P. psilopodium* which is similar to the wild forms of *P. sumatrense* from which the later species might have originated (Anonymous, 1966).

**Kodo Millet (*Paspalum scrobiculatum* L.)** Kodo millet is locally called kodokutki. It has three races viz., *regularis*, *irregularis* and *variables*. In Madhya Pradesh wild related species, *Paspalum canarae* (Steud.) Veldk., *P. paspaloides* (Michx.) are present

#### Foxtail Millet (*Setaria italica* (L.) P. Beauv)

Foxtail millet is considered to be sweet, is used as a sedative to the gravid uterus. The grain is said to possess heating properties and when taken alone sometimes causes diarrhoea. The grain is astringent, diuretic and laxative and is useful externally in rheumatism. It is a popular remedy for alleviating the pains of



parturition (Kirtikar and Basu, 1935). Foxtail millet is locally called as wild baara. It is also known as Italian millet. Cultivation of foxtail millet dated back to the third millennium BC. *S. italica* is not known in the wild state except as a weed which escapes from cultivation. *S. italica* is divided into sub species *viridis* and *italica*. *S. italica* is further classified into three races *moharia*, *maxima* and *indica*, *viridis* is the ancestral form of *S. italica* on the basis of chromosome number.

#### Sugarcane (*Saccharum officinarum* L.)

Sugarcane is derived from the sanskrit word shakkara. This crop from the east provides a linguistic evidence of Indian origin of sugarcane. In Madhya Pradesh, many sweet based products are prepared from sugarcane. There is only one wild relative *Saccharum spontaneum* L. is present in TATR.

*Echinochloa colona* (L) Link, hort. Berol. 2: 209. 1833; Blatt. & McC. Bombay Grass. 148. 1935; Bor, Grass. Ind. 308. 1960. *Panicum colonum* L. Syst. Nat. ed. 10. 2: 870. 1759; Hook. f. Fl. Brit. India 7: 32. 1896; Cooke, Fl. Pres. Bombay 3: 447. 1958 (Repr. ed.). wild nachanigrass.

Herbs, annual, decumbent- ascending; culms 40-90 cm long, rooting at base. Leaves 3-30 x 0.4-2.0 cm, linear-lanceolate, scabrid, apex acute to acuminate. Racemes spiciform, distant, 5-10, 1.5-2.0 cm long. Spikelets c 0.3 cm long ovoid; lower glume ½ as long as lower lemma, broadly ovate; upper glume cuspidate, hairy; lower lemma ovate, hairy; upper lemma polished. (Plate VI, Fig. 35)

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Common weed, best soil binder grass in forest.
- Soil pH range required – 7.2 – 7.6
- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 51 % - 67%.

*Eleusine Gaertn. Fruct. Sem. Pl. 1: 7. 1788*

*Eleusine indica* (L) Gaertn. Fruct. 1: 8. 1789; Hook. f. Fl. Brit. India 7: 293. 1896; Cooke, Fl. Pres. Bombay 3: 560. 1958 (Repr. ed.); Blatt. & McC. Bombay Grass. 259. 1935; Bor, Grass. Ind. 493. 1960. *Cynosurus indicus* L. Sp. Pl. 72. 1753. 'Nachni'. (WILD NACHANI)

Herbs, annual, erect, tufted c 25 cm high; culms slightly compressed. Leaved 8-12 x 0.2-0.3 cm, linear, flat. Spikes 2-7 or more, 4.0-5.5 cm long. Spikelets c 0.3 cm long, ovoid or oblong, green. Grains oblong or globose.

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Sporadic annual grass grows in cultivated soil.
- Soil pH range required – 7.2 – 7.6
- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 51 % - 67%.

Field Note – Grass of dry soil, non palatable grass found in smaller grasslands.

*ORYZA* L. Sp. Pl. 1: 333. 1753

*Oryza rufipogon* Griff. Notul. 3: 5. 1851; Bor, Grass. Bur. Cey. Ind. Pak. 605. 1960; Laxmi. in Sharma *et al.* (eds.), Fl. Maharashtra, Monocot. 545. 1996; 151 Mouluk; Grass. Bam. India 1: 47. 1997; Naik, Fl. Marathawada 2: 1065. 1998.

Annual, culms 30-70 cm tall, tufted, terete, erect or decumbent, spongy, rooting at lower nodes, nodes glabrous. Leaf sheath 6-09 cm long, terete or compressed, keeled, glabrous, smooth. Ligule 15-31 mm long, membranous, Leaf blade 15-30 x 0.6-1.6 mm, flat, linear to ovate, keeled, scabrid on nerves and margins, apex acuminate. Panicles 10-22 cm long.

- Palatable
- Flowering Season : October.
- Fruiting Season : November
- Uses : Seeds edible grass.
- Ecological data : Common in marshy places.
- Soil pH range required – 7.1 – 7.5
- Rainfall range : 950 mm – 1180 mm.
- Temperature range : 26 °c – 39 °c.



- Humidity required : 68 % - 71%.

*Panicum antidotale* Retz. Obs. Bot. 4:17. 1786. Hook. Fl. Brit. India 7: 52. 1896; Cooke, Fl. Pres. Bombay 3:453. 1958 (Repr.ed); Blatt.&McC. Bombay Grass. 163. 1935. Bor, Grass. Ind. 322. 1960. Annual erect, diffusely branched, 1-2 mtr tall, creeping, grass. Leaves 10-40 cm long, linear-lanceolate. Panicle 15-22 cm long, Spikelets ovoid.

- Palatable
- Flowering Season : Septeber – November.
- Fruiting Season : December
- Uses : Seeds edible, Best soil binder grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

*Panicum maximum* Jacq. Ic. Pl. Rar. 1:2, t. 13. 1781-86 7 Coll. Bot. 1:76. 1786. Hook. Fl. Brit. India 7: 52. 1896; Cooke, Fl. Pres. Bombay 3:453. 1958 (Repr.ed); Blatt.&McC. Bombay Grass. 163. 1935. Bor, Grass. Ind. 322. 1960.

Perennial densely tufted, erect, branched, 1-2 mtr tall, grass. Leaves 10-40 cm long, linear-lanceolate. Panicle 30-55 cm long, Spikelets oblong.

- Palatable cultivated grass.
- Flowering Season : November.
- Fruiting Season : December
- Uses : Fodder grass,
- Ecological Data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

*Saccharum spontaneum* L. Mant. Alt. 2: 183. 1771. Hook. f. Fl. Brit. India 7: 118. 1896; Cooke, Fl. Pres. Bombay 3:465. 1958 (Repr.ed); Blatt.&McC. Bombay Grass. 45. 1935. Bor, Grass. Ind. 214. 1960. Kans grass Wild relative of Sugarcane

Perennial rhizomatous tall tufted, 1-2.5 m tall, erect grass. Leaves narrow linear, sheath smooth, ligule ovate. Panicle large, silvery, Spikes with silver hairs, spikelets sessile.

- Palatable grass.
- Flowering Season : October.
- Fruiting Season : December
- Uses : Soil binder grass
- Ecological Data : Distributed in moist, marshy soil along the

bank of river.

Soil pH range required – 7.5 – 7.8

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 28 °c – 39 °c.
- Humidity required : 68 % - 71%.

Field Note – Grass indicator of wet soil with more water holding capacity.

*Setaria pumila* (Poir.) R. & S. Syst. Veg. 2:481. 1817; T. A. Cope in Nasir Ali, Fl. Pak. 143:181. 1982. *Panicum pumilum* Poir. in Lam. Encycl. 4:273. 1816. *Setaria pallidifusca* (Schumach.) Stapf & C.E. Hubb. in Kew Bull. 1930: 259. 1930; Bor, Grass. Ind. 363. 1960. *S. glauca* non (L.) P. Beauv. 1812; Hook. f. Fl. Brit. India 7: 78. 1960; Cooke, Fl. Pres. Bombay 3: 435. 1958 (Repr.ed); Blatt.&McC. Bombay Grass. 172. 1935; bor, op. cit. 360. 'Kolu'. Herbs, 20-60 cm high, tufted; culms many, spreading, ascending. Leaves 3-10 X 0.2-0.5 cm, linear. Spikes 1.5-5.0 X 0.3-0.7 cm. Spikelets 0.2-0.3 cm long, ovoid or ellipsoid, subacute; upper lemma rugose. Grains plano-convex.)

- Palatable grass
- Flowering Season : August – October
- Fruiting Season : December
- Uses : Fodder grass



- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Field Note – Annual , palatable grass , grains are edible , grass of smaller grassland , distributed in acidic soil. *Setaria verticillata* (L.) P. Beauv. Ess. Agrost. 51, 178. 1812; Hook. f. Fl. Brit. India 7: 80. 1996; Cooke, Fl. Pres. Bombay 3: 436. 1958 ( Repr. ed.); Blatt. & McC. Bombay Grass . 174. 1935; Bor, Grass. Ind. 365. 1960. *Panicum verticillatum* L. Sp. Pl. ed. 2: 82. 1762. (Chiktnagawat)

Annual herbs, 1m high, erect, rooting at lower nodes. Leaves 8-20 X 1.2-4.0 cm, linear or linear-lanceolate. Panicles 2.5-9.5 cm long. Spikelets c 0.2 cm long, ovoid, sub acute ; upper lemma finely rugose. Grains 0.2-0.23 cm long, ellipsoid.

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

*Setaria italica* (L.) P. Beauv. Ess. Agrost. 51, 170, 178. 1812; Hook. f. Fl. Brit. India 7: 78. 1896; Cooke, Fl. Pres. Bombay 3: 437. 1958 ( Repr. ed.); Blatt. & McC. Bombay Grass. 175. 1935; Bor, Grass. Ind. 362. 1960. *Panicum italicum* L. Sp. Pl. 56. 1753.

Erect annuals, 60-100cm tall. Leaves 15-30 X 0.4-2.5 cm, Linear-lanceolate, minutely scaberulous on both sides and along margin. Panicles 8-12 cm long, compact. Spikelets 0.25 cm long, ellipsoid; lower glumes c 0.05 cm long, ovate, 1-nerved, upper glumes c 0.15 cm long, ovate, glabrous, rounded.

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

#### **SORGHUM Moench. Methodus 207. 1794**

*Sorghum halepense* (L.) Pers. Syn. Pl. 1: 101. 1805; Blatt. & McC. Bombay Grass. 5. 1953; Bor, Grass. Ind. 222. 1960; T.A. Cope in Nasir & Ali, Fl. Pak. 143: 295. 1982. *Holcushalepensis* L. Sp. Pl. 1047. 1753. *Andropogon halepensis* (L.) Brot. Fl. Lusit. 1: 89. 1804; Hook. f. Fl. Brit. India 7: 182. 1896; Cooke, Fl. Pres. Bombay 3: 502. 1958 (repr. ed.). *Sorghum miliaceum* (Roxb.) Snowden in J. Linn. Soc. 55: 207. 1955; Bor, op. cit. 223. *S. miliaceum* var. *parvispiculum* Snowden, op. cit. 209; Bor, op. cit. 'Boru' (Ran Jawari)

• Perennial, 3 m high, erect; culms simple or branched, solid. Leaves 10-45 x 1.5 cm, linear-lanceolate; sheaths striate; ligules short, membranous, ciliate. Panicles 15-35 cm long, decompounds. Sessile spikelets 0.4-0.5 cm long, ovoid-lanceolate; pedicelled spikelets as long as sessile but narrower. Grain sterile, dark brown.

- Flowering Season : August – October
- Fruiting Season : December
- Ecological Data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Conservation of wild relatives of crops is the most important task to match the challenges of erosion of species. The existence of these wild relatives are shrinking fast due to various bio-edaphic factors and disturbed habitats. In the present rate of threat of genetic erosion, we must collect all requisite information of the wild relatives to make use of their wider adaptability/tolerance/resistance to diseases and insect-pests, yield, quality attributes and other biotic and abiotic characters. In comparison to the cultivated land races, conservation and utilization.



## Wild Relatives of Grasses of TadobaAndhari Tiger Reserve

Sr. No.	Botanical Name	Common Name	Vernacular Name	Flowering Season	Fruiting Season
1	Brachiariareptans	Sawa/ sama	Ran Sama	August	Sept. -Oct.
2	Brachiariadistachya	Sama grass	Ran Sama	August	October
3	Setariaintermedia	Chikta	Ran Bajara	August	October
4	Setariaverticellata	Chikta	Ran Bajara	August	October
5	Sorghum halpens	Wild Jawar	Ban Jawar	September	November
6	Echinochloacolona	Wild sama	Ban sama	August	October
7	Elusineindica	Wild Nachani	Ban Nachani	September	November
8	Panicumsumatrense	Wild kutki	Ban Kutki	August	November
9	Panicumnotatum	Wild Kutki	Ban Kutki	September	November
10	Oryzaruphipogon	Wild Rice	Ban Dhan/ Chawal	August	November
11	PaspalumPaspalodes	Wild Kutki	Ban Kutki	cutki	October
12	Paspalumcanare	Wild kodo	Ban Kodo	August	October
13	Saccharumspontanum	Wild Sugarcane	Ganna origin	September	November
14	Setariapumilla	Wild Bajara	Ban Bajara	August	September
15	Urochloapanicoides	Wild Kutki	Ban Kutki	August	October

## Diversity in Wild Relatives

- Finger Millet (*Eleusinecoracana*) – *Eleusineafricana*
- Barley (*Hordeumvulgare*) – *Hordeumarizonicum*
- Rice (*Oryzasativa*) – *Oryzarufipogon*
- Pearl Millet (*Pennisetumglaucum*) – *Pennisetumpurpureum*
- Sorghum (*Sorghum bicolor*) – *Sorghum halepense*
- Broom millet (*Panicummiliaceum*) – *Panicumfauriei*

## Results and discussion :

Findings of research work in grasslands of TATR :

In the current exploration of wild relatives of grasses from the different grasslands of TadobaAndhari Tiger Reserve the genetic and species diversity is in the following manner.

Sr. No.	Name of grass genera	Number of spesies
1	<i>Brachiariareptans</i> <i>Brachiariadistachya</i>	Two spesies
2	<i>Setariaintermedia</i> <i>Setariaverticellata</i> <i>Setariapumilla</i>	Three spesies
3	<i>Panicumsumatrense</i> <i>Panicumnotatum</i>	Two spesies
4	<i>PaspalumPaspalodes</i> <i>Paspalumcanare</i>	Two spesies
5	<i>Urochloa</i>	One spesies
6	<i>Echinochloa</i>	One spesies
7	<i>Elusine</i>	One spesies
8	<i>Oryza</i>	One spesies
9	<i>Sorghum</i>	One spesies

In the present research study it is observed that the species diversity of wild grass genera depends upon the soil texture, moisture, humidity, water holding capacity. The composition and association of grasses also determines the wild relatives of grasses diversity. Generally it is found that the wild relatives of grasses are associated with soft palatable grasses with high percentage of fibre, ash, protein and moisture. The associates of wild relatives of grasses are: *Dicanthiumannulatum*, *Digitariastricta*, *Digitariaabludens*, *Iselimalaxum*, *Cynodondactylon*, *Ischemumindicum*.

The herbivores depend on soft palatable grasses as a primary consumers, Spotted deers, Barking deers, Chousinga, Black bucks mostly feed on soft palatable grasses which play an important role in grazing habitat of soft feeding herbivores. Grazing habitat of soft feeding herbivores associated with composition of grasslands, the grasslands are of three types; smaller, intermediate and taller grasslands. Wild relatives of grasses shows distribution in smaller and moist grasslands.



Threats to wild relatives of grasslands are : loss of natural habitats due to soil degradation , fragmentation of grasslands , loss of soil moisture due to climate change , changes in composition of grassland , invasion of woody species in grasslands , soil microbial composition and associates which grasses i,e soil mychorhiza and microorganisms which promotes the growth of grasses.

#### Conservative measures for wild relatives of grasses :

Loss of habitat: Many of the accessions currently held ex situ are from regions that have undergone significant land-use change over the past 50 years. The urban expansion in South and Central America has seen forests, grasslands and savannahs replaced by urban space. The expansion of agriculture, especially in Brazil, has resulted in vast areas of natural forests and grasslands being substituted by intensive production of crops such as soybean and improved monospecific pastures. There are ~ 60 million ha of *Brachiariabrizantha* cv. Marandu in Brazil, which is a dangerously narrow genetic base highlighting the importance of germplasm diversity. Similarly development and population growth in many parts of Africa have resulted in expansion of cropping and overgrazing of rangelands with associated loss of biodiversity. The changes in the economies and populations across the tropics have made the TSTF germplasm already held ex situ extremely valuable (sometimes irreplaceable) and in need of a particular focus on conservation.

#### Conservation of wild relatives of grass genetic resources

Secure conservation is at the heart of the Centres' stewardship of their collections and depends on the application of technical practices of high standard, based on an accurate assessment and appropriate management of risks.

The adequacy of the conservation technologies in use is key to meeting the objectives of long-term conservation of genetic diversity:

- As more land is coming under intensive cultivation, much of the natural diversity of species will be lost.
- Demand for use of forage genetic resources for increasing livestock production, as well as to maintain a more sustainable agricultural system, is expected to increase.
- The further study of the conserved germplasm will allow the easier identification of genotypes with potential for livestock feed for specific environments, as well as adequate germplasm to be re-established in degraded areas and also adapted to future climate changes.
- The adequate long-term conservation of germplasm will allow the preservation of essential forage biodiversity for current and future generations as global public goods.

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