AMAZING WORLD OF GRASSES

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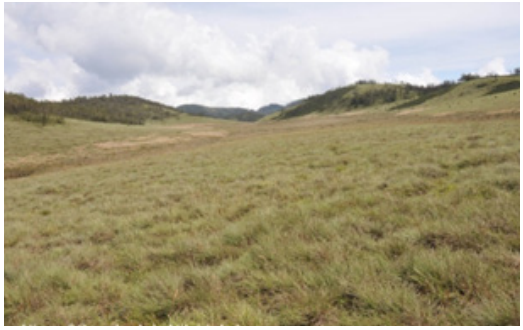
ABSTRACT

This paper discuss about the origin, distribution, economic importance of grasses as food, fodder, soil binders, essential oils, lawns, medicinal values, miscellaneous uses. Other amazing facts of grasses are also covered in detail. Field photographs of some of the grass vegetations and important grass species are provided for easy identification.

Keywords: *Amazing world, Conservation, Economic Importance, Grasses, Poaceae.*

1. INTRODUCTION

Grasses are the major food source all over the world. They belong to the family Poaceae. Grasses has wide ranges including rice, wheat, sugarcane, maize, millet, bamboo, turf grass (lawns) etc. There is no unanimity of opinion regarding the total number of genera and species of this family available in the world. As per Mabberley [11] it is distributed with about 9,550 species under 680 genera. On the other hand, Clayton & Renvoize [4] reported about 10,000 species belonging to 651 genera under 40 tribes and 6 subfamilies. These differences in numbers are mainly due to difference in opinion on the circumscription of many grass genera as well as species. Based on the number of genera, it is the third largest family among the Angiosperm (flowering plants) families after Asteraceae and Orchidaceae. When number of species is taken into consideration, it occupies the fifth position after Asteraceae, Orchidaceae, Leguminosae and Rubiaceae. In India, family Poaceae is the first largest family with 1,334 species (including bamboos) followed by Orchidaceae (1,229 species), Leguminosae (1,192 species), Asteraceae (860 species), Rubiaceae (616 species) and Cyperaceae (545 species). The origin, distribution and economic importance of amazing grasses are briefly explained and views of some of the grasslands (Fig. 1 and 2) are provided here.



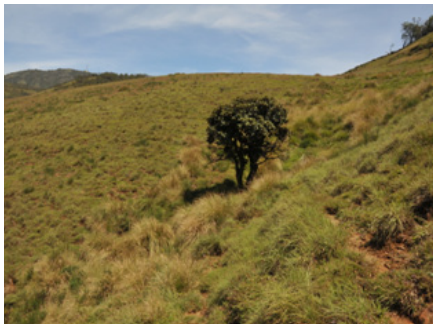


Fig. 1 and 2 : View of Grass lands in Sholas of Nilgiri hills, Tamil Nadu.

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2. ORIGIN

The origin of grasses is very ambiguous because of its less fossil records. In one opinion, the broadly tropical distribution of their nearest relatives like Joinvilleaceae, Flagellariace and Restionaceae suggested that grasses are tropical in origin. Voorhees & Thomasson [13] reported the discovery of fossil grass fruits under the tongue bone of Miocene Rhinoceros (5 to 23 million years ago). Thomasson [13], in his review of Palaeoagrostology pointed out that the early reports of grass type pollen fossils are of doubtful validity and can be referable to those of Restionaceae. According to Daghlian [5], there are records of occurrence of caryopsis and cuticle in Eocene (35 to 56 million years ago). In recent days, the Grass Phylogeny Working Group [8] opined that the grass family appears to have originated in the forests most probably of Southern Hemisphere.

One of the important discoveries in this line is that of Prasad et al. [16] of Birbal Sahni Institute of Paleobotany and Palaeozoology, Lucknow. Prasad and team isolated phytoliths from fossilized dinosaur dung which was collected from India. Phytoliths are isolated silica bodies found in the epidermis of some plants. Dr. Storemberg, a phytolith specialist of Swedish Academy of Sciences, Stockholm identified this to be of grass origin. This proves that grasses were available on this earth even when the dinosaurs were alive. It is known that dinosaurs lived in India around 65 million years ago shortly before they disappeared. Prasad and Storemberg concluded that grasses were available on this Earth much before 65 million years.

3. DISTRIBUTION

Grasses which cover all conceivable habitats, form one of the most ecologically adapted groups of terrestrial plants. They are suitable to grow from sea level to even an altitude of 5000 m or more and are found in deserts as well as in alpine regions. They are absent only in regions that are too cold to support growth of plants. Grasses like *Leersia hexandra, Limnopoa meeboldii* and *Panicum paludosum* form components of marshy vegetation. *Lasiurus scindicus* and *Dactyloctenium scindicum* are examples of desert grasses. Some species are found in saline nutrient poor soils. Some are capable of adapting themselves to habitats contaminated with toxic metals such as Lead, Zinc, Copper or Nickel.

Grasses are usually annuals and perennials. Some of the annuals growing in Arctic and desert regions complete their life cycle in just one or two months. Most of the perennial grasses are flowering every year. Many Bamboo species are monocarpic, flowering and producing fruits only once in their lifetime after remaining in vegetative condition for a long time. Grasses range in size from a few centimeters (*Himalayan Poa*) to arboreal giants like *bamboos*, species of *Gigantochloa*, measuring up to 25 m or more in height.

4. ECONOMIC IMPORTANCE

Grasses are one of the most economically important plant families for human beings. Its economic importance is extended to several areas, including food production, industries, lawns etc.

4.1 Food

Grass family occupies 23% of land area of the world playing a significant role as a food provider, accounting for more than 80% of the calories consumed by the people of the world. A good number of grasses are cultivated for their edible grains. Among these, rice, sugarcane, wheat and corn are the first four most important food crops of the present world. According to one estimate, about 70% of the farm lands of the world are cultivated with crop grasses.

All our staple crops - rice, wheat, oats, rye, barley, maize, sorghum, millet and sugarcane are grasses. Rice is the staple food of more than half the world's population. Sugarcane, in addition to providing sugar is also used for the production of alcohol, which can also be used as a bio-fuel. In countries like Brazil and USA, millions of cars are running on bio-alcohol and petrol mixture.

Indigenous grasses like *Coix lacryma-jobi, Setaria italic, Echinochloa crusgalli, Eleusine coracana, Panicum miliaceum,* etc. are cultivated on limited scale for their edible grains in some localities. The grains of grasses like *Paspalidium flavidum, Paspalum longifolium, Arundinella setose, Dactylocitenium aegyptium, Echinochloa colonum, Eleusine indica, Eragrostis tremula, Ischaemum rugosum,* etc. are used by some communities during time of scarcity.

4.2 Fodder

Almost all, grasses have some degree of fodder values. Some examples of fodder grasses are *Alloteropsis cimicina, Andropogan lividus, Brachiaria mutica, Bothriochloa pertusa, Cenchrus spp., Echinochloa colomum, Panicum maximum, Paspalum distichum,* etc.

4.3 Soil Binders

Grasses that are rhizomatous, stoloniferous or those having remarkable root systems form good soil binders that can be used in soil conservation. On sandy areas, plants like Aeluropus lagopoides, Halopyrum mucronatum, Spinifex littoreus, Paspalum vaginatum, etc. can act as good soil binders. Cenchrus biflorus, Cynodon dactylon, Pennisetum spp., Sporobolus humilis subsp. minor, Tripogon roxburghii, Tripogon bromoides, other Tripogon spp. (Fig. 3) etc. are examples of other soil binders.

Fig.3. Soil Binders: Tripogon spp.

4.4 Essential Oils

Cymbopogon flexuosus (lemon grass oils: Fig. 4.), *Cymbopogon citratus* (lemon grass oil), *Vetiveria zizanioides* (vetiver oil) are some of the grasses yielding commercially used essential oil. Surprisingly, lemon grass essential oil is used as aromatherapy to relieve muscle pain, externally to kill bacteria, ward off insects, reduce body aches, and internally help our digestive system. It can also be used for flavouring tea and soups, adding fragrance to cosmetics, soaps, and homemade deodorizers.

Fig. 4. Cymbopogon flexuosus (lemon grass)

4.5 Paper Industry

Heteropogon contortus, *Saccharum arundinaceum*, *Saccharum spontaneum*, etc. are used in paper industry. Bagasse of *Cymbopogon nardus* and *Saccharum officinarum* are useful in making paper pulp. Species of *Themeda*, *Saccharum*, *Eulaliopis*, *Arundo* and *Phragmites* have proven quality for the manufacture of paper pulp.

4.6 Lawn Grasses

Agrostis cimicina, *A. tenuis*, *Axonopus compressus*, *A. affinis*, *Chrysopogon aciculatus*, *Cynodon dactylon*, *C. barberi*, *Oplismenus burmannii*, *Paspalum conjugatum*, *Pennisetum clandestinum*, *Poa nemoralis*, *Poa trivialis*, *Stenotaphrum dimidiatum*, *Zoysia matrella*, etc. are some of the common lawn grasses used in landscaping.

4.7 Medicinal Value

Many of the grasses are of medicinal value. Aromatic grasses have traditionally been used in Indian and Chinese medicines because of their therapeutic properties; these same grasses are also used in aromatherapy as an essential oil. Some of the grasses are tabulated (Table 1) below with the parts used and their uses to control human diseases.

Table 1. Grasses and its uses

S.No.	Name of the species	Parts used	Uses
1.	*Arundinella nepalensis*	Whole plant	Healing wounds
2.	*Cynodon dactylon*	Whole plant	Diuretic
		Rhizome	Urino-genital troubles
		Leaf-juice	Ulcers
3.	*Alloteropsis cimicina*	Roots	Toothache
4.	*Vetiveria zizanioides*	Roots	Remedy for various health problems.
5.	*Pogonatherum crinitum*	Ashes	Skin diseases

4.8 Ornamental Grasses

The following are used in gardens, home and kitchen gardens, lawns for ornamental purpose which gives pleasant look. *Arundo donax* (fence), *Arundo donax var. versicolor* (striped leaves), *Arundinella pumila* (plumose inflorescence), *Briza maxima* (large golden yellow coloured nodding spike lets, (Fig. 5.), *Cortaderia selloana* (dense plumose golden yellow inflorescence), *Melinis repens* (purplish red to whitish coloured dense inflorescence), *Miscanthus nepalensis* (plumose inflorescence), *Pennisetum villosum* (cat tail like soft inflorescence), *Pogonatherum paniceum* (mini bamboo like leaves), *Setaria palmifolia* (plicate leaves with nodding inflorescence) are few to name.

Fig. 5. Briza maxima – wild ornamental grass

4.9 Miscellaneous Uses

4.9.1 Brooms – *Aristida setacea, Thysanolaena latifolia, Arundinella setose Eragrostis gangetica* etc.

4.9.2 Building Materials – *Arundo donax* - for light weight constructions.

4.9.3 Flavouring curries - Leaf buds of *Cymbopogon citrates.*

4.9.4 Thatching - Leaves of *Andropogon polyptychus, Arundo donax, Cymbopogon exaristata, Imperata cylindrica, Phragmites vallatoria, Saccharum spontaneum, Pseudanthistiria heteroclite, Themeda cymbaria, Themeda triandra* (Fig. 6), etc. are used as thatching material.

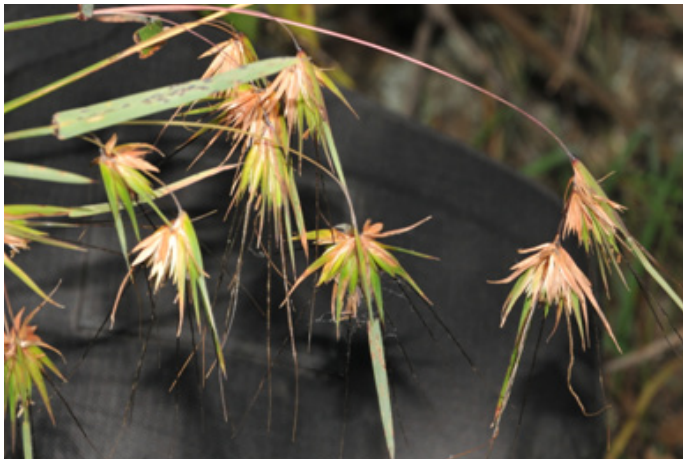

Fig. 6. Themeda triandra

5. OTHER AMAZING FACTS OF GRASSES

5.1 Grasses conserve water and clean the air

Grasses trap water and reduces soil erosion. The average grass yard can absorb more than 6,000 gallons of rain water. All plants help to clean the air. Grass areas trap about 12 million tons of dust and dirt from the air annually. One acre of grass can absorb hundreds of pounds of sulphur dioxide in a single year.

5.2 Grasses help to keep our home cooler

It lowers the surface temperature around our home by 30-40 degrees compared to bare soil, and it is 50-70 degrees cooler than streets and driveways. Researchers calculated the landscapes of eight suburban homes have the cooling effect equal to 70 tons of air cooling.

5.3 Grasses feed people and other animals

Worldwide grasses are main part of people's diet. Grasses provide all of our cereal crops, the grazing for our domesticated cattle and sheep and most of world sugar. Grasses are the main food of amazing range of herbivores from tiny caterpillar, to deer and elk or Pandas which depend entirely on bamboos.

5.4 Pollution fighter

The thick root system of grasses traps pollutants as water filters through the soil.

5.5 Oxygen producer

Grasses do a major role in the constant production of oxygen.

5.6 Heat and noise reducer

Grass keeps the ambience cooler in hot weather. It also soaks up noise.

5.7 Soil saver

Grass roots knit themselves together and conserve the soil from erosion during torrential rain.

6. CONCLUSION

So, the grass family *Poaceae* plays an important role in maintaining the environmental ecosystem balance, act as chief food resources, prevents soil erosion which is one of the threats of biodiversity and become part and parcel of our day to day life. Hence, this amazing world of grasses should be protected and conserved with various measures including collection and preservation of germ plasm of wild relatives of crop plants, micro propagation, *in situ* and *ex situ* conservation, for our future generation.

REFERENCES

1. *Althaf Ahamed Kabeer, K. & V.J. Nair, 2009, Flora of Tamil Nadu – Grasses. BSI, Kolkata.*

2. *Avdulov, N.P., 1931, Kyryo-systematiche Untersuchungen de Familie Gramineen. (Russian with German Summary). Bull. Appl. Bot. Suppl ., Vol 44.*

3. *Bentham, G.1881.Notes on Gramineae.J. Linn. Soc. Bot. Vol 19, pp 1074-1215.*

4. *Clayton, W.D. & S.A. Renvoize, 1986, Genera Graminum: Grasses of the World, Kew Bull. Add. Ser. HMSO London , pp.1-389.*

5. *Daghlian, C.P. 1981, A review of fossil records of monocotyledons. Bot. Rev.Vol 47,pp 517-555.*

6. *Deshpande, U.R. & N.P.Singh, 1986, Grasses of Maharashtra. Pune.*

7. *Franklin Benjamin, J.H., K. Sasikala, C. Murugan, K.A.A. Kabeer and C. Kalidass, 2012, Bibliography of Indian Poacea, BSI, Kolkata.*

8. *GPWG, 2001, Phylogeny and Subfamilial Classification of the Grasses (Poaceae), Annals of the Missouri Botanical Garden Vol 88, Issue 3, pp 373-457.*

9. *Hooker, J.D., 1896, Flora of British India.Vol.7.l. Reeve and Co., London.*

10. *Jain, S.K. 1986, On the status of endemism of some grasses in India. J. Indian Bot. Soc. Vol 66, pp 237-247.*

11. *Mabberley, D.J., 2002, The plant Book. (repr.ed.), Cambridge Univ. Press, Cambridge.*

12. *Maulik, S.1997, Grasses and Bamboos of India. Scientific Publisher Jodhpur.*

13. *Nair, V.J. & S.Thomas, 2001, Poaceae In: Singh, N.P. & D.K. Singh (eds) Floristic Diversity and Conservation Strategies In India. Vol.4, BSI, Calcutta.*

14. *Nayar, M.P., 1980, Endemic flora of peninsular India and its significance. Bull. Bot. Surv. India Vol 22, pp 12-23.*

15. *Patunkar, B.W. 1980, Grasses of Marathwada, Scientific Publisher, Jodhpur.*

16. *Prasad, V., C.A.E. Stromberg, H. Alimohammadian, A. Sahni, 2005, Dinosaur coprolites and the early evolution of Grasses and Grazers. Science, Vol 310, pp1177-1180.*