Review Article

Grasses as an Immense Source of Pharmacologically Active Medicinal Properties: An Overview

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Grasses are ubiquitous herbs/plants belonging to various families such as- Poaceae/Gramineae, Cyperaceae and Juncaceae. Grasses are important for humans as well as animals. Crop and forage grasses are used as food and feed for human and livestock, respectively. These are also used as garden ornamentals, to control soil erosion, for commercial purposes and for medicinal purposes. Some of the grasses are the rich sources of metabolites such as proteins, carbohydrates, mineral constituents, flavonoids, alkaloids, glycosides, terpenoids, amino acids, albuminoids, volatile compounds, fragrant oil, vitamins, saponins, tannins etc. Traditionally, grasses were used as medicines to treat various ailments such as cancer, cough, cramps, diarrhea, dysentery, epilepsy, headache, hemorrhage, hypertension, measles, stones, urogenital disorders, warts, wounds, etc. Grasses show various pharmacological properties such as anti-bacterial, anti-fungal, anti-malarial, anti-protozoan, anti-mutagenicity and anti-oxidant properties. This review provides a first comprehensive report on therapeutic properties, biological effects, pharmacological activities, secondary metabolites, and commercial uses of grasses.

Keywords: Grasses; Poaceae; Medicinal Value; Pharmacological Activity; Therapeutic Property; Secondary Metabolites.

Introduction

Grasses are perennial herbs/plants, belong to Poaceae (grass family), Cyperaceae (sedge family) and Juncaceae (rush family). Among these families, the members of Poaceae family are known as true grasses. These are cosmopolitan distribution throughout the tropics and subtropics. Approximately 10,000 - 11,000 species of grasses belong to about 700 genera of the world species (Clayton and Renvoize, 1989; Watson and Dallwitz, 1994). The family Poaceae includes most plants used for pasture, lawns & turfgrass. Grasses like Perennial rye grass (*Lolium perenne*), Scutch grass (*Elymus repens*), Annual blue grass (*Poa annua*) used as turfgrass. Lemon grass, khus grass, bamboo, crabgrass etc. are used for flavors, building material, commercial purpose. Grasses are also known for their nutritive value viz., rice, wheat, maize, jowar, bazra, sugarcane (Dashora and Gosavi, 2013).

Members of family Cyperaceae are distributed throughout the world, but abundant in temperate zones. It comprises 70 genera and 4000 species. In India, it is represented by 441 species. Members of Cyperaceae family are similar to true grasses. These three families are collectively called as graminoids (grass and grass-like plants). The members of all three families have different morphological features in term of stem, leaves, flowers and fruits.

The family Juncaceae consists of 8 genera and about 464 known species, widely distributed in hemispheres and temperate regions (Xu and Chang, 2017). Members of the Juncaceae family, such as *Luzula* are used for kidney disease, *Juncus textiles* are used in the manufacture of mats, chairs etc.

Description of Prominent Grasses

Some of the prominent grasses and their medicinal

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Fig. 1: Shows monograms of grasses a *Agropyron repens*; b *Cyprus rotundus*; c *Cymbopogon citratus*; d *Cynadon dactylon*; e *Triticum aestivum*; f *Vetiveria zizanioides*; g *Bambusa aurndinacea*; h *Desmostachya bipinnata*

importance are discussed and brief description of all these grasses are given in Table 1.

Other Medicinal Grasses

Apart from these, Some other grasses that have minor medicinal importance are discussed below such as:

***Paspalum conjugatum* (Berg.)** is a perennial grass, commonly known as Carabao grass, Buffalo grass, T-grass, Sourgrass, Cowgrass and belongs to family Poaceae. Carabao grass is used as cereals and grass forages. Fresh grass is used for pastures and cut-and-carry system, or for hay. The plant is used for diarrhea, dysentery and used as painkillers, etc.

***Lolium temulentum* (L.)** is an annual grass, commonly known as Rye-grass, Darnel etc., belonging to family Poaceae. Rye grass is commonly used as fodder and to control soil erosion. Rye grass is a weed, which grows with wheat it is also referred as false wheat (Keener, 2009). For paralysis *Lolium* is used as medicine (Boericke, 2011).

***Anthoxanthum odoratum* (L.)** is commonly known as Sweet vernal grass, Holy grass, Vanilla grass etc. which belongs to family Poaceae. Sweet vernal grass

is also grown as lawn grass because of its fragrance, due to the presence of coumarins. It is used for headache, nausea, sleeplessness and for the infection of the urinary tract. It is also used as flavoring agent in food.

***Avena sativa* (L.)** is commonly known as oats and belongs to family Poaceae. It is widely cultivated in central and northern Europe, tropical Africa, South Africa etc. It is used for human consumption as well as livestock feed (Miraj and Kiani, 2016). It is a rich source of proteins, minerals, lipids etc. and contains several phytochemicals viz., avenanthramides, flavonoids, triterpenoid saponins, gramine etc. It is used for anti-inflammatory, pro-apoptotic, anti-oxidant, antitumor, diuretic, wound healing properties etc. (Singh *et al.*, 2013).

***Hordeum vulgare* (L.)** is commonly known as barley and belongs to family Poaceae. It is widely distributed in all over the world. Starch is the main constituents of barley, other chemical components are present is hordenine, β glucans, tocopherols, polyphenols, proteins lipids etc. (Zhu, 2017). It showed some medicinal properties such as- glycemic effect, gastrointestinal effect, antihypertensive effect, anti-carcinogenic effect (De and Lunasin, 2005; Behall *et al.*, 2006).

Table 1: Brief description of grasses

S. No.	Scientific name	Common name	Distribution	Plant part used	Medicinal uses	Pharmacological activity	Major chemical constituents	Reference
1.	<i>Agropyron repens</i> L. (<i>Elymus repens</i>) (Fig. 1a)	Quackgrass, couch grass	Temperate Europe to Central Asia	Rhizome, root and seeds	Enuresis, urinary incontinence, cystitis, urethritis, prostatitis, stomach problems, phytotoxic effects	Hypoglycemic, hypolipidemic, anti-inflammatory, antimicrobial, effects on motility, diuresis and treatment of urinary tract infection	Carbohydrates, mucilaginous substance, pectin, tritacin, cyanogeneticglycocides, flavanoids, saponins, volatile oils, phenolic compound, essential oils, mono-terpenes, sesquiterpenes, vanillin glucoside, iron and other minerals, large quantity of silica etc.	Al-Snafi, 2015; Deane, 2014; MDidea, 2014; Petrova <i>et al.</i> , 2009; Maheriet <i>al.</i> , 2008; Hagin and Bobnick, 1991
2.	<i>Cyperus rotundus</i> Linn. (Fig. 1b)	Nutgrass, Nagarmotha	Indigenous to India found in tropical, subtropical and temperate regions	Aerial part, tuber, root and rhizome	Nausea, vomiting, dyspepsia, fever, diarrhea, cough, dysentery, malaria, bronchitis, skin disease, insect bites, food poisoning and indigestion	Anti-inflammatory, analgesic, anti-convulsant, anti-emetic, antispastic, antidiarrhoeal, hemodynamic, hepatoprotective, anti-malarial activity, wound healing activity, antibacterial activity	Flavanoids, terpenoids, mono and sesqui-terpenes, glycosides, starch, tannins, glycerol, linolenic acid, myristic acid and stearic acids. It is also an important ingredient of anti-aging ayurvedic neutraceutical chyavanprash etc.	Sri, 2013; Kilani <i>et al.</i> , 2005; Sri and Prince, 2012; Sharma and Gupta, 2007; Puratchikody <i>et al.</i> , 2006; Birdar <i>et al.</i> , 2010
3.	<i>Cymbopogon citratus</i> (DC.) Stapf. (Fig. 1c)	Lemongrass	Native to South India and Sri Lanka	Leaves, flowers, root, stalk	Cough, nervous disorder, skin irritation, anti-depressant, insect	Antibacterial, anti-fungal, anti-protozoan, anti-diarrhoeal, anti-oxidant, anti-repellent, fever, carminative	Citronellol, neral, geranial, myrcene, terpenes, alcohols, citral, natural precursor for production of semi synthetic vitamin A etc. malarial, anti-inflammatory	Manvitha and Bidya, 2013; Srivastava <i>et al.</i> , 2013; Shah <i>et al.</i> , 2011; Harbone, 2010; Rangari, 2009
4.	<i>Cynodondactylon</i> L. Pers. (Fig. 1d)	Doob grass, durva grass, Bermuda grass, dog's tooth	Cultivated throughout the tropics and subtropics	Leaves, root, flowers, and seeds	Cancer convulsions, cough, cramps, diarrhea, stones, dysentery, epilepsy, headache, hypertension, urogenital disorders, warts and wounds	Anti-diabetic, anti-oxidant, anti-proliferative, anti-ulcer, anti-inflammatory, antidiarrheal activity, anti-arrhythmic activity, white spot syndrome virus and human vaccinia virus	Tritacin, glycosides, saponins, flavanoids, tannins, carbohydrates, agropyrene etc.	Nagori and Solanki, 2011; Chandra <i>et al.</i> , 2013; Singh <i>et al.</i> , 2009; Babu <i>et al.</i> , 2009; Singh <i>et al.</i> , 2007; Patil, 2005; Oudhia, 2003

Table 1: Contd....

S. No.	Scientific name	Common name	Distribution	Plant part used	Medicinal uses	Pharmacological activity	Major chemical constituents	Reference
5.	<i>Triticum aestivum</i> L. (Fig. 1e)	Wheat grass	Cultivated almost all over the world	Leaves, roots, seeds	Diabetes, wound healing, tooth decay, enhance production of RBCs, control high blood pressure, enhances immunity, skin diseases, restores energy and vitality	Antibacterial, intestinal ulcer, skin toxicity, detoxifying agent	Chlorophyll, proteins, amino acids, anti-arthritis, anti-inflammatory, Vitamins, minerals, enzymes and bioflavonoids	Mogra and Rathi, 2013; Kumar <i>et al.</i> , 2016; Ben-Arye <i>et al.</i> , 2002
6.	<i>Vetiveria zizanioides</i> (Linn.) Nash (Fig. 1f)	Vetiver, khus grass, khus-khus	Uttar Pradesh, Haryana, Rajasthan, Bihar, Madhya Pradesh and throughout South India	Root and leaves	Fever, headache, dysentery, acidity, rheumatism, sprain, diaphoretic, epilepsy, mouth ulcer, snake bite, burns	Antioxidant, anti-bacterial, antifungal, anti-tuberculosis, anti-diarrhoeal, anti-inflammatory	Vetriverol, vetriverone, vetivene, vetriveryl acetate, benzoic acid, furfural, vetivene, vetivenylvetivinate, khusimene, a-amorphene, khusimone, calacorene, valencene, essential oil	Singh <i>et al.</i> , 2013; Bhusan <i>et al.</i> , 2013; Prasad <i>et al.</i> , 2019
7.	<i>Bambusaa rundinacea</i> (L.) Voss (Fig. 1g)	Bamboo, tabashir	Tropics, Subtropics, mild temp, regions	Leaves, stem, root, shoot, seed and culms	Cold, fever, epilepsy, osteoarthritis, osteoporosis	Anti-inflammatory, anti-ulcer, anthelmintic activity, anti-diabetic, antimicrobial, anti-fertility, anti-arthritis	Silica, glycosides, amino acids, enzymes, cellulose, hemi-celluloses, lignin, oxalic acid, HCN, benzoic acid	Gupta and Ranjan, 2016; Sangeetha <i>et al.</i> , 2015; Rathod <i>et al.</i> , 2011; Soni <i>et al.</i> , 2013; Zhang <i>et al.</i> , 2010
8.	<i>Desmostachya bipinnata</i> (Linn.) Stapf. (Fig. 1h)	Kusha, dab, drabha, Halfa grass, big cordgrass	North Africa to South Asia	Whole plant	Asthma, kidney stone, wound healing, jaundice, menorrhagia, haemorrhoids, diuretic properties	Antimicrobial, anti-inflammatory, analgesic, anti-ulcerogenic, anti-diarrhoeal, anti-cancerous, antioxidant, antidiabetic	Carbohydrates, sugars, proteins, amino acids, coumarins (scopoletin and umbelliferone), alkaloids, phenolics, tannins, flavanoids, kaempferol, quercetin, quercetin-3 glucoside, trycin, trycin-7-glucoside, triterpenoids, essential oil, benzene fraction compounds	Pandey <i>et al.</i> , 2013; Al-Snafi, 2017; Shakila <i>et al.</i> , 2014a, b; Panda <i>et al.</i> , 2009; Rahate <i>et al.</i> , 2012; Singh <i>et al.</i> , 2016; Awaad <i>et al.</i> , 2008; Sajja and Sraddha, 2015; Golla <i>et al.</i> , 2011

Conclusion

This brief review discusses the distribution, chemical constituents, medicinal values and pharmacological activities of grasses. True grasses only belong to family Poaceae, Cyperaceae and Juncaceae are only grass-like families. According to the above reports, grasses could be used as medicine for the wide range of biological, therapeutic and pharmacological values. It is used as food and fodder for humans and animals

respectively. Grasses are also used to protect soil erosion, and other commercial purposes. Therefore, there is urgent need to identify such important grasses and develop a strategy for their conservation and more research for human welfare.

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