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FLORISTIC COMPOSITION OF GRASS SPECIES IN THE DEGRADING RANGELANDS OF CHOLISTAN DESERT

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Floristic composition of grasses in Cholistan desert has been lacking. Therefore, this study aims at s to provide the identification, life form, life trend and abundance of grass species in Cholistan desert. For the said purpose, floristic survey was carried out for a period of two years. Twenty seven grass species belonged to16 genera were identified. Floristic analysis reflects that the genus Eragrostis as being the most representative with 05 species (18.5%) followed in descending order by Aristida and Cenchrus with 04 species (14.8%) each and Panicum with 02 species (7.4 %) while the remaining genera have one species each. Therophyte was the most abundant life form consisted of 16 grass species (59.2%) followed by hemicryptophytes 09 species (33.3%) and phanerophytes 02 species (7.4%). Overall summary of grass species showed that, 06 species (22%) were very common, 14 species (52 %) were common and only 07 species (26%) were found rare. Overall 13 annuals grass species (48 %) and 14 perennials grass species (52%) were recorded. This floristic information will provide a useful starting point for further ecological and bio-prospective researches in this hot desert area.
Keywords: Grasses**,** floristic composition, Cholistan desert, life form

INTRODUCTION

The information about floristic composition of an area is said to be a perquisite for any phyto-geographical, ecological, and management activities. Floristic composition reflects the diversity of vegetation of an area and can be affected by many factors such as overgrazing, soil deterioration, deforestation and dependence of local people/pastoralists on plants. The identification of local plants along with description of an area is essential as it can provide particular species of the local area, growing season, species hardness, any new species establishing in the area and the effect of climatic conditions like over-grazing and drought on vegetation there (Ali, 2008).Floristic studies are often the only source for botanical information about a specific area and may provide a suitable starting point for more comprehensive studies (Keith, 1988). The listing of species and their conciseness, it is easy to handle and less time consuming that helps in the identification and correct naming of species, important resources for biogeographic study and biodiversity estimates (Saima *et al*., 2010). Very few studies regarding floral composition of Cholistan desert are available (Arshad and Rao, 1994; Arshad and Akbar, 2002; Akhtar and Arshad, 2006). There is an immediate need to revise the grass flora of Cholistan desert. The study area is located in Southern part of Punjab province (Pakistan). Cholistan desert is an extension of Great Indian Desert and lies between latitudes 27º 42' and 29º 45' North and longitudes 69º 52' and 75º 24' east (Baig *et al*., 1980). The major chunk of land comprising of sandy and clay patches in Cholistan desert. The Lesser Cholistan consists of large saline compact areas ('Dahars') alternating with low sandy ridges. Sand dunes are stabilized, semi-stabilized or shifting, while the valleys are mostly covered with sand. The soils of desert are categorized as either saline or saline sodic; with pH varied from 8.2-8.5 and 8.9-9.7 respectively (Akhter and Arshad, 2006). The Greater Cholistan is a wind sorted sandy desert consisted of river terraces, large sand dunes and a lesser amount of interdunal areas. Cholistan is one of the hottest deserts in Pakistan. The climate of the study area is hot arid with rainfall being the major factor influencing the life of local people as well as livestock. Temperatures are high in summer and mild in winter with no frost. In summer, temperature may reach up to 51ºC and in winter it drops down below freezing point (Hammed *et al*., 2002; Arshad *et al*., 2008). May and June are the hottest months with mean temperature 34ºC. Average annual rainfall varies from 100 to 200 mm. Most of the rainfall is received during monsoon (July-September) but winter rains (January-March) are also often (Arshad *et al*., 2006). Seed priming improves growth of rangeland grasses (Nouman *et al*., 2012). Due to scanty and unpredictable rainfall along with long spells of droughts, water is a limited resource in Cholistan desert. Aridity is the most striking characteristic of the area with dry and wet years occurring in clusters (Akhter and Arshad, 2006).

Fortunately, a vast range of drought tolerant and nutritious species of trees, shrubs and grasses, inhabit the entire

territory of Cholistan rangelands. The sparse vegetation of this area consists of xerophytes that are modified to extreme summer temperatures and moisture fluctuations with wide diversity of edaphic conditions. These plant species though slow growing but respond quickly to the favorable climatic conditions and most of the species have astounding potential to regenerate even with scanty rainfall. Several annuals and ephemeral species emerge out after rains complete their life cycle in a short spell and dry up after producing the seeds. Important genera of grasses include Cenchrus, Lasiurus and Panicum (Akhter and Arshad, 2006). The study area being as remote and hot place, is poorly explored with reference to floristic aspect, therefore present study was carried to document current diversity of indigenous grasses.

MATERIAL AND METHODS

The study area was thoroughly surveyed during the year 2008 and 2009 from time to time to learn the botanical and biological situations covering the each season (Fig. 1). Complete specimens of each species were collected in triplicate, dried, preserved, and mounted on standard herbarium sheets. Grasses were identified with the help of available literature (Arshad and Rao, 1994; Ali and Qiaser, 1995, 2004). The identified specimens were also matched with the National Herbarium, NARC Islamabad and Cholistan Institute of Desert Studies, Islamia University of Bahawalpur. The plant species were classified into different classes as followed by Raunkiaer (1934) as follows:

Figure 1. Map of Pakistan representing the study area (Cholistan desert)

***Therophytes*:** Annual seed bearing plants which complete their life cycle in one year and over winter; the unfavourable season by means of seeds or spores.

***Geophytes*:** Perennating buds located below the surface of soil including plants with deep rhizomes, bulbs, tubers and corms, etc.

***Hydrophytes*:** Submerged hydrophytes are those rooted in the muddy substratum. The above ground or upper parts die at the end of growing season.

***Hemicrytophytes*:** Herbaceous perennial in which aerial portion of plant dies at the end of growing season, leaving a perennating bud at or just beneath the ground surface.

***Chamaeophytes*:** Perennating buds located close to the ground surface (below the height of 25 cm). They include herbaceous, low woody trailing, low stem succulents and cushion plants.

***Phanerophytes*:** They are shrubby and tree species whose perennating buds are borne on aerial shoot reaching a height of at least 25 cm or more above the ground surface.

After having assigned life form to all the plants, Raunkiarian spectra was calculated as follows:

Biological spectra = A/B × 100

Where A = Number of species falling in a particular life form classes; B = Total number of all the species for that community/stand

RESULTS

In the current study, 27 grass species comprising of 16 genera belonged to family Poaceae were identified as shown in Table 1. Floristic analysis reflects that the genus Eragrostis as being the most representative with 05 species (18.5%) followed in descending order by Aristida and Cenchrus with 04 species (14.8%) each and Panicum with 02 species (7.4 %) while the remaining genera comprised of 01 species per genera collectively representing 44.4% of the Poaceae family. The complete list of genera is presented in Table 2. Moreover, therophyte was the dominant life form consisting of 16 grass species (59.2%) followed by hemicrytophytes with 09 species (33.3%) and phanerophytes with 02 species (7.4%) as shown in Figure 2. Out of total identified grass species, 06 species (22%) were found very common, 14 species (52 %) were common and only 07species (26%) were found rare as presented in the Fig. 3. Their life trend was comprised of 13 annuals grass species (48 %) and 14 perennials grass species (52%) as shown in Fig. 4.

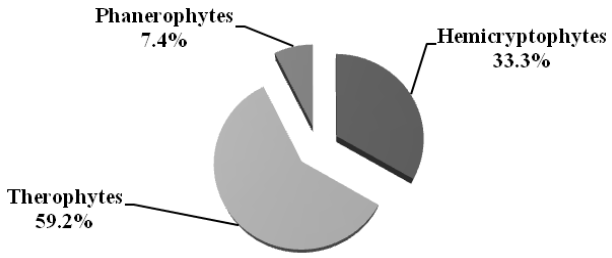

Figure 2. Life form spectrum of grass species

Table 1. Floristic list of grass species from Cholistan desert

Sr.#	Vascular name	Local name	Life form	Life trend	Abundance
1	*Aeluropus lagopoides*(Linn) Trin .ex.Thw	Kalarghaa	Hemicryptophyte	Perennial	Common
2	*Aristida adscensionis* L.	Lumb	Therophyte	Annual	Common
3	*Aristida funiculata*Trin. &Rupr.	Lumb	Therophyte	Annual	Common
4	*Aristida hystricula* (Edgew)	Lumb	Hemicryptophyte	Annual	Common
5	*Aristida mutabilis* Trin. &Rupr.	Lumb	Therophyte	Annual	Rare
6	*Cenchrus biflorus* (Roxb)	Bhurrat	Hemicryptophyte	Annual	Common
7	*Cenchrus ciliaris* (linn.)	Dhaman	Therophyte	Perennial	V. common
8	*Cenchrus prieurii* (Kunth.) A Marie	Dhaman	Hemicryptophyte	Annual	Rare
9	*Cenchrus setigerous* Vahl.	Dhaman	Hemicryptophyte	Perennial	Common
10	*Cymbopogon jwarancusa* (Jones.) schult	Khavi	Hemicryptophyte	Perennial	V. common
11	*Cynodon dactylon* (L.) Pers.	Khabbar	Hemicryptophyte	Perennial	common
12	*Enneapogon desvauxii* P.Beauv.	Dhui	Therophyte	Annual	Rare
13	*Eragrostis barrelieri* Dav.	Makni	Therophyte	Annual	Common
14	*Eragrostis ciliaris* (Linn.) R. Br	Makni	Therophyte	Annual	Common
15	*Eragrostis japonica* (Thumb.) Trin.	Makni	Therophyte	Annual	Common
16	*Eragrostis minor*	Makni	Therophyte	Annual	Common
17	*Eragrostis* spp.	Makni	Therophyte	Annual	Rare
18	*Lasiurus scindicus* Henrard	Sewen	Phanerophyte	Perennial	V. common
19	*Leptothrium senegalense* (kunth) W.DClayton	Madhani	Therophyte	Annual	Common
20	*Ochthochloa compressa* (Forsskal.) Hilu	Gandeel	Hemicryptophyte	Perennial	V. common
21	*Panicum turgidum* Forssk	Bansi	Phanerophyte	Perennial	Common
22	*Panicum antidotale* Retz.	Morrot	Hemicryptophyte	Perennial	Rare
23	*Pennisetum divisum* (J.Gmel.).Henrard	Morrot	Hemicryptophyte	Perennial	V. common
24	*Saccharum bengalence* Retz	Sarkanda	Hemicryptophyte	Perennial	Rare
25	*Sporobolus iocladus* (Nees. Ex. Trin.) Nees.	Swag	Hemicryptophyte	Perennial	Common
26	*Stipagrostis plumosa* (Linn.) Munro.ex T. Anders	Lumb	Therophyte	Perennial	V. common
27	*Tragus racemosus* (Linn.) All	Swanri	Therophyte	Annual	Rare

Table 2. Record of family Poaceae (Cholistan desert)

Sr.#	Genera	No. of species	Percentage (%)
1	Eragrostis	5	18.5
2	Aristida	4	14.8
3	Cenchrus	4	14.8
4	Panicum	2	7.4
5	Aeluropus	1	3.7
6	Cymbopogon	1	3.7
7	Cynodon	1	3.7
8	Enneapogon	1	3.7
9	Lasiurus	1	3.7
10	Leptothrium	1	3.7
11	Ochthochloa	1	3.7
12	Pennisetum	1	3.7
13	Saccharum	1	3.7
14	Sporobolus	1	3.7
15	Stipagrostis	1	3.7
16	Tragus	1	3.7
	Total	27	100.0

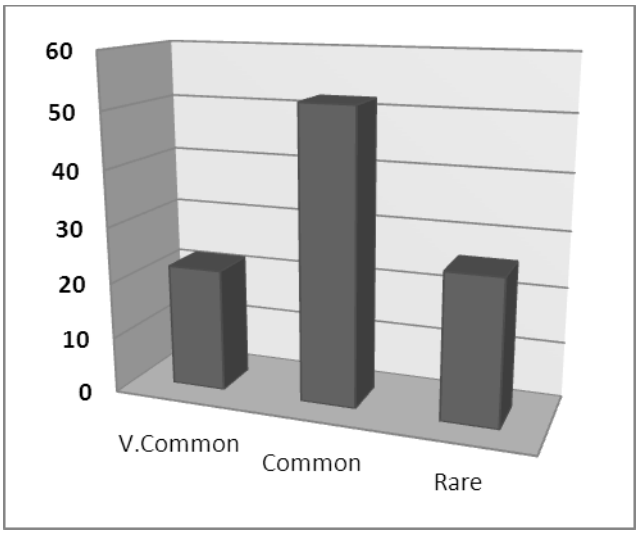

Figure 3. Abundance of grass species

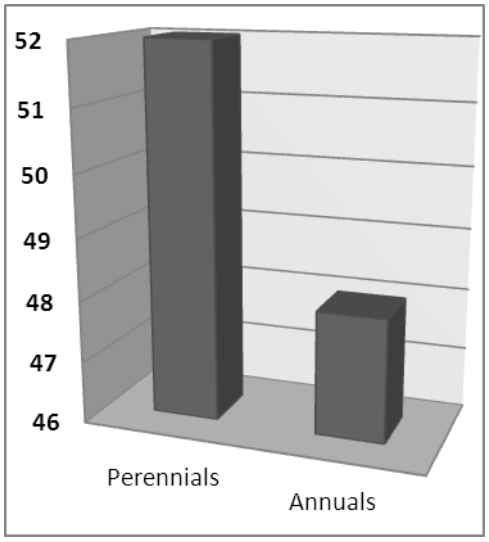

Figure 4. Life span of grass species

DISCUSSION

Current study provides a complete floristic list of grass species present in Cholistan rangelands. Based on our findings, 27 grass species were identified. The prominence of genus Eragrostis is to be expected with Scholes (1997) confirming the dominance of tall, tuft-forming species in the subtropical regions. On the other hand, life form spectrum of grasses showed that therophyte was the dominant one followed by hemi-cryptophytes and phanerophytes. The dominance of therophyte over other life forms in this area is mainly because of several reasons as extreme climatic conditions, overgrazing and human influences. This is in agreement with the findings of Barik and Mirsa (1998). According to them therophytes could tolerate adverse ecological conditions such as dry and cold climate in many regions of the world. Present findings are in line with the floristic studies conducted by Durrani *et al*. (2010), who reported that the therophytes were dominant in disturbed and degraded vegetation. Likewise, Qureshi *et al*. (2011) reported that dominance of therophytes is the response of severe climatic condition and anthropogenic pressure on flora. Forage grasses have different growth (Ullah *et al*., 2012). Our findings are also in line with those of Arshad and Akbar (2002), who reported that therophyte, was the dominant life form among the grasses of Cholistan desert. According to Asri (2003), therophytes are the indicators of dry conditions. The high percentage of therophytes in present study is also credited to human and animal activities. Kapoor and Singh (1990) concluded that the therophytic species was dominant in the highly grazed sites whereas the moderately grazed and less disturbed site showed a shift towards hemi-cryptophytic flora.

Rainfall is another factor responsible for plant growth in Cholistan (Arshad *et al*., 2008). The dominance of perennials grass species over annuals is in line with the findings of Qureshi *et al*. (2011). Accordingly the presence of perennial plants is an evident of low rainfall. Similarly Ashraf *et al*. (2009) has also revealed that the perennials had more contribution than annuals in feeding livestock of arid rangelands. During present study, it was observed that a lot of grass species have become common or rare and were observed in small patches or scattered forms. Qureshi and Ahmmad (2010) observed that the anthropogenic activities are a continuous threat in Nara desert and as a result, native species are diminishing at an alarming rate therefore, a large number of species were found rare. Present findings on floristic composition are also in agreement with other reports by Qureshi (2004, 2008), Durrani and Razaq (2010), Devineau and Fournier (2007) and Saeed *et al*. (2012).

***Conclusion*:** Studies on floristic composition of grasses provide a preliminary data of Cholistan desert. Yet it was a valuable glimpse of the area. It is further suggested that a detailed, comprehensive ecological study about the vegetation of Cholistan desert should be carried out immediately for implementation of conservation measures.

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