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Full Length Research Paper

Taxonomic studies of grasses and their indigenous uses in the salt range area of Pakistan

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The present investigations were carried out in Salt Range area of Pakistan, regarding the morphology of grasses as an aid to their correct identification, their distribution and indigenous uses in the area. The study area is globally known by its large salt reserves and it has rich floral diversity. From the study area 62 species of grasses belonging to 11 tribes were collected. The largest tribe was Paniceae followed by Andropogoneae having 18 and 12 species, respectively. The grasses play an important role in economy of the people of the area. Mainly, grasses are used as fodder in the area; some grasses are used for thatching and for medicinal purpose. There is deterioration of the habitat of grasses due to overgrazing. *In situ* conservation is recommended for future research.

Key words: Taxonomic studies, grasses, indigenous uses, salt range.

INTRODUCTION

Grasses are one to the largest and most valuable groups of flowering plants, consisting of some 610 genera and about 10,000 species (Cope, 1982). Clayton and Renvoize (1986) put the total number of grasses in the world about 10,000 sp. 651 genera were recognized and assigned numbers indicating their phylogentic status based upon various evidences. It ranks third in number of genera after the Compositeae and Orchidaceae and fifth in number of species after the Compositeae, Orchidaceae, Leguminoseae 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 semi arid 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. There can be no doubt that cereal and pasture grasses are economically the most important plants in the world, and it would be quite impossible to imagine how mankind could continue agriculture without them. In the developed countries like United States, the principal sources of meat and dairy food (basic constituents of diet) are cattle, sheep and swine. Dairy cattle are maintained in tame pastures. Many species of native and introduced grasses are utilized in improved pastures (Salter, 1952).

A high proportion of the most fertile and productive soils of the world were developed under a vegetation cover of grasses. Roots, stolons, rhizomes and litter from the annual replacement of leafy culms are not only soil binders, but also are effective soil stabilizers. In both agricultural and range forage areas, over utilization and abuse have resulted in the loss of vast quantities of top soil by the action of wind and water. Through experience man has learned that a perennial grass cover provides the best means of checking surface soil loss and rebuilding depleted soils (Gould, 1968).

Pakistan possesses a unique position of being stretched from almost zero meters at the seashore to the second highest peak of the world K2 (8611 m).It spread over an area of 79.6 million hectares within the geographical limits between 24 - 37^{o} N and 61 - 75^{o} E. Mountains and foot hills of the north and west of the country cover about half of its area. The remaining half comprises the Indus plain towards the east, intersected by river Indus and its tributaries. The country is mostly arid with 75% of its parts receiving are annual precipitation of less than 250 mm and 26% annual precipitation of less than 250 mm and 20% of it less than 125 mm.

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Only 10% of the area in the northern mountain ranges receives in between 500 and 1500 mm rainfall (Ahmad and Waseem, 2004).

Pakistan has a great diversity of landscapes. The high mountain ranges of the Hindu Kush, Himalayas and Karakuram, the snow covered peaks, eternal glacier, the high lying cold deserts, the vast irrigated plains, the bleak hot low lying thar and thal deserts, the impressively rugged rocky plateaus in Sind and Baluchistan and the coastal shores provide all the possible habitats for the development of plant communities (Ahmad and Waseem, 2004), and grasses that form the dominant vegetation over extensive areas and show great adaptability for life under very diverse ecological conditions, very little is known about the grasses of the arid area including the salt range. Many efforts have been made to carry out compre-hensive morphological investigations regarding their habitat, and identification of the grasses of salt range.

Physically, the salt range begins in the east of Jehlum in the Tilla Jogian and Bakrala ridges. It runs southwest to the north of the river Jehlum for some distance before turning northwest to cross the river Indus near Kalabagh (Ahmad and Waseem, 1964). On the west of River Indus, the Salt Range continues southwards to the districts of Bannu and D.I. Khan. The salt Range of Punjab has rich floral diversity (Ahmad and Waseem, 2004). Grasses that are beneficial to man in various aspects, for example, wild life is depen-dent upon grass and grassland habitats for food, shelter and normal completion of their life cycle. Marsh and swamp grasses exist together with the associated species of typha (cattails), Carex and Cyperus (Sedges) and provide food and cover for various species of birds and small animals (Gould, 1968). The salt range that has very old civilization and globally unique for its salt reserves, people of that area use grasses for various purposes (thatching, making brooms, making huts for animals and shelter, for making ropes) ,even some grasses are used as medicine and mainly as a fodder for their cattle. Hence there was a need to study grasses of the area, and for their correct identification and distribution in the area.

METHODOLOGY

The present study is the outcome of the 2 years of critical, minute and systematic study of grasses and their uses by the local people of the area. Field trips were carried out in every season and in all the representative localities of the area, and plants of same species were collected from different sites and from different habitats to observe their morphological differences. Nomenclature of each taxon has been checked under the rules of International Code of Botanical Nomenclature.

A map of the area with the important places of collection is given. Detailed morphological studies were carried down under dissecting microscope and different morphological characters were observed and their identification was confirmed by flora of Pakistan (Nasir and Ali, 1970-2002). All the specimens are collected in triplicate and they were deposited in the herbarium of Quaid-I-Azam University, Islamabad (Pakistan). Botanical names of the plants are arranged tribe wise, followed by their local name, english name, distribution, habitat and key characters to identify grasses of theSalt range of Pakistan.

RESULTS AND DISCUSSION

The grasses of Salt Range have been classified tribe wise comprising their voucher number, botanical name, flowering period, diagnostic characters and distribution (Tables 1 and 2). Sixty two (62) grass species have been studied from Salt range

Diversity of grasses

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 value of grasses to mankind has been recognized since the dawn of human civilization and culture of cereal grasses dates back to a period when man was emerging from wild beast stage. 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 animals, range forage and soil conservation (Gould, 1968).

Salt range and grasses

In the present studies 62 species of grasses from Salt range of Pakistan belonging to 11 tribes were collected, as shown in Table 1. The largest tribe was Paniceae having 18 species, while other major tribes were Andropogoneae and Eragrastoideae with 12 and 10 species respectively. Paniceae comprises the important fodder species such as *Brachiaria distachya*, *Pennisetum orienttale*, *Cenchrus ciliaris*, *Digitaria nodosa* and *Setaria glauca*. There are several cultivars of *Pennisetum typhoides* and *P. orientale*, which are the main species in cultivation for the food production in the area. *P. orientale* and *P. typhoides* will serve as a source of germ plasm in this area in future. These species and cultivars may be conserved in this area. The species of Andropogoneae may serve as fodder species for grazing and for storage in winter when there is shortage of fodder. *Dicanthium* and *Vetiveria zizanoides* of Andropogoneae is a group of *annulatum, Chrysopogon serrulatus*, *Heteropogon contortus*, *Imperata cylendrica* and *Sorghum halepense* cover the major portion of Salt Range to serve for grazing. These species are collected in the growing sea-

Table 1. Key to the identification of grasses of Salt Range of Pakistan.

S. No	Botanical Name / Voucher Number	Tribe	Flowering Period	Diagonstic Characters
01	*Arundo donax* Linn. / 130	Arundineae	June-December	Height upto 5 m.,having long and broad leaves. Internodes hollow,having woody rhizomes. Leaves cordate or rounded at the base. Panicle 21-30 cm long,terminal . Ligule membranous, lacerte at the tip.
02	*Pharagmites karka* (Retz.) Trin.ex Steud./ 102	Arundineae	Oct-Nov	Height more than 5 m,perennial, rhizomatous, tall and short reeds, leaves narrow than *Arundo donax*. Rough to touch on the lower side in the upper half of leaf blade. Silky hairy panicle. The leaf blade tips stiff and pointed, scabrid on the margin. Ligule a fringe of hairs.
03	*Aristida adscensionis* Linn./ 343	Aristideae	March-November	Lemma having 3 awns, middle awn larger than lateral awns, leaves narrowly linear erect or geniculately ascending. culm 36-37 cm high
04	*Enneapogon persicus* Boiss. / 362	appophoreae	June-August	Lemma 9 nerved, nerves extending into 9 awns. Awns about 7 mm long. Tufted wiry perennial , upto 40 cm high.
05	*Acrachne racemosa* (Heyne ex Roem. & Schult.) ohwi / 312	ragrostideae	June-August	Plant height 19-50cm, geniculately ascending or erect, leaf blades often whitish green and toothed at margens, spikes laterally compressed with serrate outline. Upper glume with awn about 0.7-1.0 mm long.
06	*Dactyloctenium aegyptium* (Linn.) Willd./ 69	Eragrostideae	July-October	Plant upto 52cm high, rooting at the lower nodes. Inflorescence digitate having 4-5 secund spikes, the spikes terminating in a pointed extension. Disarticulation of spikelets above the glumes .
07	*Dactyloctenium scindicum* Boiss./ 368	Eragrostideae	July-September	Stoloniferous perennial, rooting at lower nodes, forming extensive spreading mats. Leaf blades hispid on both sides. Inflorescence digitate having 4-5 short spikes. Spikes sickle shaped (falcate). Rachis extended into a pointed tip.
08	*Desmostachya bipinata* (Linn.) Stapf./ 405	Eragrostideae	June-October	53-110 cm high, rhizomatous , roots arising from the rhizomes. Leaf blades stiff and hard, 60-71.5 cm long, panicle 13-50cm long, consisting of many spikes, panicle green , often tinged violet-purple or whole panicle violet purple .
09	*Eleusine indica* (Linn.) Gaertn./ 36	Eragrostideae	June-November	Inflorescence digitate, composed of 2-5 ascending spikes, 6-11 cm long, spike look like a closed zipper, Glumes persistent and equal, Leaf blades flat or folded ,
10	*Eragrostis ciliansis* (All.) Lut. ex F.T. Hubbard./ 293	Eragrostideae	March-October	Erect or ascending, panicle 4-18.5 cm long, small spikelets at the base of inflorescence, and large on the top ,having oval and oblong spikelets on pedicel.
11	*Eragrostis papposa* (Roem. & Schult.) stued. / 220	Eragrostideae	April-October	Panicle open and dispersed. Spikelets on long and slender pedicels. Spikelets oblong., leaf blades stiff & narrow, 2.1-3.0 cm long.

Table 1. Contd.

12	*Octhochloa compressa* (Forssk.) Hilu./ 326	Eragrostideae	April-September	Stoloniferous, perennial, culms prostrate.Leaf blades narrow pointed, sparsly hairy at the base,upto 5cm long, 2mm wide. Inflorescence having 2-5 digitate spikes. The spikes 1.5-4.0 cm long,having 2-3 florets, and one sterile lemma,spikelets lanceolate and deciduous. Both glumes 1 nerved ,upper glume larger than lower glume, both glumes keeled. Glumes shorter than the adjacent lemma. Lemma 3 nerved, palea boat shaped,2 keeled.
13	*Sporobolus arabicus* Boiss./ 512	Eragrostideae	Feburary-July&August.	Leaves involuted, stiff pointed at the tips. open or loose panicle. Glumes persistent, unequal 1nerved & purplish spikelets having one floret. Spikelets disarticulating above the glumes, upper glume little shoter or equal to lemma.
14	*Leptochloa panicea* Retz./ 22	ragrostideae	May-June-October	Panicle composed of several slender, ascending branches, spikelets 1.5-2.0 mm long, upper and lower glumes 1nerved, thin memberanous, Lemma elliptic, 3 nerved.palea similar to its Lemma.
15	*Cynodon dactylon* (Linn.) Pers./ 173	Chlorideae	Mostly Mar-Nov.All year around.	Perennial grass, mostly throughout the year. A rhizomatous, stoloniferous, perennial grass. Culms slender, leaves narrow pointed. Inflorescence digitate having 4-5 spikes. Spikelets on one side of rachus ,having one floret 1.9-2.3 mm long, Lower glume thin nembranous, narrowly oblong, keeled.Upper glume similar to lower one.Lemma membrauos ,boat shaped,3 nerved and keeled.
16	*Chloris dolicostachya* Lag. / 330	Chlorideae	June-August	Plant Height 80cm, geniculately ascending, rooting at the lower nodes, inflorescence sub-digitate having 3-5 racemes, spikelets 5-7 mm long, laterally compressed. Upper glume as long as spikelet, 1 nerved, hyaline, Lower glume half of the length of Spikelet , hyaline, 1 nerved, scabrid on the nerves. Upper lemma, awned, awn length 2.5mm long, Lemma having 8.5 mm long awn,callus hairy.Upper lemma some what broad in middle.
17	*Chloris barbata* Sw./ 324	Chlorideae	June-August	Grass with flat basal culm. Inflorescence pink & green, spikelets having 3 awns,spikelets disarticulating above the glumes
18	*Tetrapogon villousus* Desf./ 393	Chlorideae	March-September	Plant height 28-65cm, two spikes merged together, rarely separating at maturity. Inflorescence at the tip of culm, composed of two villous spikes that are closely sticked together and make the inflorescence cylendrical. Spikelets arranged in two rows on the spikes. Sheath of lower leaves closely over lapping each other. Most leaves arise at the base.
19	*Tetrapogon cenchriformis* (A.Rich.) Clayton./ 268	Chlorideae	March-September	Spikes spatheolate, other characters similar to *Tetrapogon villosus* .

Table 1. Contd.

20	*Tragus roxburghii* Haller./ 398	Zoysieae	May-October	Annual or perennial grasses, rooting at the nodes, erect or geniculately ascending or prostrate for some distance and then erect., height upto 20cm. stiff cylindrical spike like inflorescence. Disarticulation at the base of each spikelet cluster. Spikelets subequal, lanceolate and prickly in appearance. Upper glume 5 nerved ,nerves forming ribs on which prickles present.
21	*Brachiaria distachya* (Linn.) Stepf. / 313	Paniceae	July-September	A grass upto 75cm long,rooting at the nodes,nodes pubiscent, panicle 8.5-12.5 cm long, spikelets present at distance from each other upto 2.8 mm long. Upper glume as long as spikelet, pubiscent, 7 nerved. Lower glume one third of the length of spikelet, 3 nerved, upper lemma rugose.
22	*Brachiaria ramose* (Linn.) Stepf. / 420	Paniceae	June-July&October	Plant height upto 55cm, having secondary branchlets .An irregular panicle, 8-12.5 cm long. The rachus and pedicel of main axis with sparsely stiff hair,. rachis green nerved, upper glume as long as spikelet, 7 nerved ,pubiscent membranous. Lower gulme 3 nerved, one third of the length of spikelet ,spikelet ovate and elliptic .
23	*Brachiaria*. *reptans* (Linn.) Gardner & Hubbard / 146	Paniceae	June-November	Prostrate, creeping, many branches arising and growing prostrately. Spikelets disarticulating above the pedicel. Inflorescence having 3-5 racemes. Spikelet 1.8-1..9 mm long. Upper glume 7 rerved, as long as spikelet. Lower glume very short, faintly nerved, 0.3-0.4 mm long.
24	*Brachiaria eruciformis* (J.E.sm.) Stapf. / 291	Paniceae	July –September	A plant 45 cm high,ascanding. Leaf blades linear lanceolate. Inflorescence having 4-6 secund racemes, spikelets pubiscent, 2 mm long elliptic, spikelets in a single row on one side of rachus. Upper glume pubescent, 5 nerved, as long as spikelet. Lower glume very minute.
25	*Cenchrus ciliaris* Linn./ 164	Paniceae	March – October	Plant height up to 80 cm. involucre 8-10 mm long, inner bristles stiff, flattened, ciliated in the lower half but scabrid in the upper half. The lower region greenish in the middle, connate (fused) in lower 0.5 mm portion above the rim.
26	*Cenchrus setigerus* Vahl. / 62	Paniceae	March – September	Tufted perennial, geniculately ascending 4.4 -6.7 cm long, false dense spike. The rachis of inflorescence zigzag (flexuous). Involucre cup shaped.The inner bristles, rigid, connate, flat and forming a cup, the outer bristles very minute. The involucres enclosing 3 spikelets 3.3-3.9 mm long oblong lanceolate. Inner bristles with greenish mid lines and dark purple at tips. The outer bristles filiform and antrorsely scabrid. Whitish to purplish red inflorescence.

Table 1. Contd.

27	*Pennisetum Orientale*L.C.Rich. / 224	Paniceae	April – November	Plant more than 1.2 m long. Long inner bristles 2.5 mm long. Bristles not connate at the base. Involuere enclosing 4 spikelets. Inner bristles whitish and hairy about half of the length and purplish and scabrid on the upper half. Spikelets lanceotate, 5 mm long. Upper glume 4 mm long, hyaline, I nerved with a short awn point. Lower glume 1 nerved, 2-6 mm long, about half of the lengh of spikelet. Upper and lower lemma setaciously accuminate.
28	*Digitaria sanguinales*(Linn.)Scop. / 392	Paniceae	June – September	Plant height upto 47 cm. inflorescence digitate, 8-12.5 cm long having 3-6 racemes. Inflorescence at the tip of culm. Rachis and pedicel triquetrous and scabrid. Spikelets 3mm long and alternatively along rachis in pairs. One having short pedicel and other having long. Upper glume shorter than spikelet, 2.5-3.0 mm long.lanceolate to narrowly ovate, lower glume minute.
29	*Digtaria nodosa* Parl. / 327	Paniceae	March – September	Tussocky perennial, rhizomatous. The base of leaves stiff hairy. Inflorescence having 3-6 racemes (4-6 cm long). Upper glume shorter than spikelet, about 2 mm long, villous at the margins, 3 nerved. Lower glume very minite.
30	Echinochloa colona (Linn.)Link / 347		May – September	Geniculately ascending , rooting at lower nodes.Inflorescence 4-6 cm long, composed of racemes arranged on central axis. Spikelets ovate elliptic, pubiscent and cuspidate, whole of the spikelet disarticulating..spikelet in pairs ,irregularly arranged on the rachis. Ligule absent. Tip of upper palea reflexed.
31	*Panicum maximm* Jacq./ 136	Paniceae		Plant height more than 1-5m having tussocky roots., Leaf blades upto 24.5 cm long ,stiff and thick ,pointed at tips. inflorescence 11.5 cm long, whole spikelet shed off including glumes. Glumes unequal, 5 nerved, ovate. Lower glume, 1 nerved, purplish, about half of the length of spikelet, obtuse.
32	*Paspalum paspaloides* (Michx.) scribner ./ 411	Paniceae	April-May-August-November	Height upto 75cm, stoloniferous, leaf blades linear lanceolate, Inflorescence having two racemes. Spikes flattened on the back, keeled on the axial side. keel narrowly winged and wavy. Spikelets ovate oblong, 3mm long, upper glume puberulent (as long as spikelet). Lower glume absent. Often black stigmas apparent on the tip of spikelet.
33	*Paspalidium flavidum* (Retz.) A. camus/ 354	Paniceae	July-October	12.5-47cm long, tufted annual, erect, leaves blunt. Inflorescence 8.5-24cm long, with racemes present at distance from each other. Rachis of raceme flexuous and flattened. 4-9 racemes alternatively present in inflorescence ascendingly. More or less appressed to the axis.

Table 1. Contd.

34	*Setaria glauca* (L.) Beauv. or *setaria pumila* (poir.) Roem & Schult./ 281	Paniceae	May-October	Plant height upto 60cm. Bristles unequal upto 6mm long and antrorsely barbed. Upper glume 5 nerved ,more than half of the length of spikelet. Lower glume a little shorter than upper glume.
35	*Setaria italica* (Linn.) P.Beauv./ 105	Paniceae	July-October	Plant height 54cm, panicle 8-16.5cm long, bristles antrorsely barbed and 8mm long. Glumes persistent .upper floret disarticulating at maturity.
36	*Setaria verticllata* (linn.) P. Beauv/ 335	Paniceae	April-October	Plant height upto 50cm.Panicle adhering with other panicles and with clothes. Bristles retrorsely barbed. Upper lemma and palea rugose, lower lemma membranous, its palea hyaline and 2 keeled. Upper glume membranous,as long as spikelet,7 nerved, lower glume membranous, 3 nerved, less than half of spikelet.
37	*Setaria intermedia* Roem.&Schult / 300	Paniceae	June-September	Plant up to 65 cm high, geniculately ascending. Sometimes decumbent and rooting at the lower nodes. Leaves with tubercle based bristles, present sparsly on both surfaces of the leaves. Panicle lobed in lower part and tapering upwords. Upper glume half of the length of spikelet.
38	*Setaria viridis(*Linn.)P.Beauv./ 280	Paniceae	May – September	Erect, ascending or geniculately ascending. Bristles antrorsely barbed. Upper glume, 5 nerved ,as long as spikelet.Lower glume one third of the length of spikelet.
39	*Bothriochloa bladhii* (Retz.)S.T.Blake/ 148	Andropogoneae	May – November	Plant height 55 -88 cm. sometimes longitudinal grooves present in the internode. Short stiff hair present on the abaxial side of leaf blade. Inflorescence pale whitish or slightly blackish, digitate having 4-10 spikes. Spike length 5-7 cm, a pair of sessile and pedicelled spikelets. Lower glume of sessile spikelet with a circular pit above the half of the glume in middle. Upper lemma having awn 18.5 mm long. The pedicels of pediceled spikelets with membranous median line.
40	*Chrysopogon serrulatus* Trin./ 12	Andropogoneae	April – September	Tufted perennial, 60-130 cm high, basal leaves papillose hairy at margins. Leaf blades glacuous, dentate on margens. Inflorescence a panicle with long slender filform branches beared at the tip. A triad of spikelets on a slender filiform branch,.2 pedicelled spikelets and one sessile spikelet in the middle. Glumes subequeal, pedicelled spikelet dense hairy at base, its upper glume purplish,7nerved with a slender awn upto 8.5 mm long.
41	*Dicanthium annulatum* (Forssk.) Stapf. / 171	Andropogoneae	March-November	A perennial, culm upto 1m tall, nodes hairy. Leaf blades flat or rolled. Inflorescence having digitate or sub digitate spikes. Having a pair of spikelets pedicelled and sessile. Upper lemma of sessile spikelet with awn, 9.5-16 mm long, minute hairy.

Table 1. Contd.

42	*Dicanthim fovelatum* (Del.) Roberty / 360	Andropogoneae	March-September	A perennial, height more than 70cm ,nodes hairy. Leaf blades narrow linear, pointed on the tips, leaves stiff hairy at the base. Inflorescence of solitary narrow spike, a pair of sessile and pediceled spikelets. Sessile spikelet elliptic 2.2-2.3mm long. Lower glume of sessile spikelet with awn about 17.5 mm long pedicelled spikelet without awn.
43	*Eulaliopsis binata* (Retz.) C.E Hubbard./ 141	Andropogoneae	March-July	Grass more than 85 cm long Inflorescence terminal. Pale yellow, composed of 2-4 subdigitate racemes. Mostly leaves arising from the base, very long, folded or convolute wiry sometimes stiff and erect, upto 68cm long, white wolly at the base.
44	*Heteropogon contortus* (linn.) P.Beauv.ex Roem.& schult./ 89	Andropogoneae	June-November	Recognized by a bunch of twisted awns at the tip of inflorescence that get entangled with clothes. Leaf blades auriculate, a few stiff hair at the leaf base. Adaxial surface rough, some racemes may be spatheolate, the basal sheaths laterally compressed. Lemma of the upper female or bisexual floret narrow projected into a start well developed awn that entangled with clothes.
45	*Imperata cylendrica* (Linn.) Raeuschel / 79	Andropogoneae	March-November	Upto 38cm high plant, rhizomatous, having cylendrical white silky inflorescence, dark yellow anthers prominent in inflorescence ,blades stiffy erect, sprout immediately if burnt. So difficult to eradicate
46	*Cymbopogon jwarancusa* (Jones.) Schult / 89	Andropogoneae	April-November	Aromatic culm at the base and scented roots. Leaf blades aromatic when chewed, basal sheats whitish and flat. Panicle spatheolate, Sessile spikelet bisexual or female, upper glume boat shaped (Keeled).
47	*Sorghum halepense* (Linn.) Pers / 56	Andropogoneae	May-October	Plant height upto 2m. Perennial, rhizomatous having adventitious roots. Leaves linear to linear lanceolate. Panicle lax ,having long slender compound branches. Pair of sessile and pedicelled spikelet below the tips but in threes at branchlet tips, one sessile and two pedicelled spikelets. Both glumes equal, upper lemma of sessile spikelet awned or awnless.
48	*Saccharum bengalense* Retz./ 270	Andropogoneae	October-January	Light yellowish, grey or white villous panicle 40cm long, culms upto 4m high. Leaf blades upto 70cm long, the whitish part i.e mid rib occupying the great part of the width. Leaf blades scabered, channeled, coriacious and stiff. Spikelet lanceolate, hairy at the base of spikelet.
49	*Saccharum. spontanium* Linn. / 1209	Andropogoneae	July – September	Plant height upto 2mm. Panicle more than 30 cm long. Leaves long up the 45 cm,. thick and depressed on. the adaxial surface, glacuous, glabrous and whitish on adaxial side.Culms dense hairy just below the inflorescence. Pedicelled spikelet detached above the pedicel. Long hairs present below the spikelet.

Table 1. Contd.

50	*Vetiveria ziizanoides* (Linn.) / 77	Andropogoneae	September	Tufted perennial, more than 1 m high. Leaf blades keeled at the base, panicle with whorls of numerous slender racemes composed of several to many spikelets. A pair of two spkielets pedicelled and sessile. Glumes lanceolate, oblong and coriacious.Upper glume 3.7-3.8 mm long, black spines on the mid of back. Lower glume also with stiff spines on the margens and on mid of back, shiny stiff.
51	*Poa annua* Linn. / 210	Poeae	March-November	A tufted annual grass having slender culm. Leaf blades hooked or boat shaped at the tip. Inflorescence 5-7cm long, shiny panicle, spikelet lanccolate, 5.5mm long having 4 florats. Upper glume larger than lower glume. Both glumes keeled.
52	*Poa infirma* H.B.K. / 167	Poeae	March-April	This grass is very similar to *P.annua* in morphology, but it is distinguished by its shorter anthers 0.2-0.5mm long, only a little longer than their breadth.
53	*Lolium persicum* Boiss. & hohen. ex Boiss / 213	Poeae	March-April	Annual grass, culm height from 35-46 cm, leaf blades auriculate, scabrid on the surface and on the margins. Inflorescence 4.5-18.5 cm long having spikelets atternate in opposite rows with one edge sink in hollows in the continuous axis (their edges fitting in hollows in the axis). Spikelets present at distance of 1.4-2.0 cm .Lower glume present only in the terminal spikelet.
54	*Avena fatua* Linn. / 259	Aveneae	March-May	A grass upto 80cm high panicle with pendulous spikelets. Spikelets scattered, 2-3 flowered, with all lemmas awned, breaking up at maturity beneath each lemma, the point of detachment being marked by a rounded, horse shoe shaped scar. (A common weed of arable and waste places, often abundant among wheat, barley and oat.
55	*Avena sterilis* sub sp. *Avena ludoviciana* (Dur.) Gill &Magne / 256	Aveneae	March-April-May	Plant height 20-60cm, geniculately ascending or erect. Panicle with pendulous scattered lanceolate spikelets, 2 awned, 2-3 flowered, breaking above the glumes but not between the florets. Glumes persistent, 9-11 nerved, lanceolate. In *Avena ludoviciana*, the axis breaks at the base of the lowest lemma only and this is with only one horse shoe shaped scar. It is also abundant in wheat fields.
56	*Agrostis viridis* Gouan / 276	Aveneae	March-August	A stoloniferous perennial grass of moist habitats, upto 1m tall. Culms erect or ascending. Leaf blades linear to linear lanceolate .Panicle pyramidial, lobed, spikelets having one floret. Glumes ,1nerved, sub equal, scabrid on the mid nerve and on the margins. Lemma truncate and denticulate, dentate at tip, palea bilobed at the tip.

Table 1. Contd.

57	*Koeleria argentea* Griseb. / 191	Aveneae	March-April	Plant 23-37 cm tall. Leaf blades 5.5-18cm long, scabrid on the surface and on the margins, panicle 3-5cm long, cylindrical, somewhat lobed in the lower part. Spikelets glistening and shiny. Spikelets having 4 florets. Glumes sub equal or lower glume shorter than upper glume Upper glume lanceolate, broad than lower glume, 3 nerved, keeled, scabrid on keel. Lower glume narrow, 1 nerved, greenish in the middle and membranous at the margins. Caryopsis 1mm long,narrow oblong.
58	*Polypogon monspeliensis* (Linn.) Desf. / 244	Aveneae	Throughout much of the year. But mostly between Mar-July	Annuals culms 6-60cm tall geniculatly ascending, sometimes decumbent, roots at lower nodes. Panicle ovate to oblong.,cylindrical and somewhat lobed and interrupted. Spikelets 1.2-1.5mm long, having one floret, both glumes awned and sub equal. Awns whitish, thin and slightly scabird. Both glumes one nerved, keeled, ciliated at the margins, two lobed at the tip and awn arising between the lobe. Caryopsis ovoid 0.15-0.5mm long.
59	*Polypogon fugax* nees ex steud / 217	Aveneae	May-August	It is distinguished by *P. monspeliensis* on the basis of awn length. Awns of glumes 0.6-3mm long, seldom more than length of glume while in *P. monspeliensiis* awns of glumes 4-7mm long, at least twice the length of glume. Caryopsis oval, 0.15-0.3mm long.
60	*Phalaris minor* Retz. / 187	Aveneae	March-May	Annuals, clums 50-68cm tall, erect or decumbent .L eaves flat linear lanceolate ,scabrid along margens, ligule membranous, 3.5-6.0 mm long. Panicle contracted, ovoid or cylindric, pale green. Spikelets ellipsoid, acute, laterally strongly compressed, glumes equal, 5-6 mm long ,3 nerved, acute, keels winged.
61	*Bromus pectinatus* Thunb / 200	Bromeae	March-April	Annual grass upto 50cm tall. Nodes blackish, internodes glacuous and glabrous, leaf blades shiny, hairy on the both surface. Inflorescence a raceme 10-15cm long, having pedicelled spikelets, the pedicels 1-28cm long, the pedicels antrorsely scabrid, spikelets 14-2.3cm long, 5mm wide, lanceolate and awned. Spikelets having 10 floretes, upper glume larger than lower glume, 3 nerved. Upper glume pubescent on the back and membranous at the margins. Lemmas papery, 7-9 nerved, curved along margins, having awn 4-11mm long.
62	*Bromu catharticus* Vahl / 275	Bromeae	April-July	Lemmas strongly laterally compressed and keeled, 9 nerved having an awn point 0.7mm long.

son and are stored for winter use. Hence these grasss-pecies contribute as a major component for the development of the area as a permanent source of fodder. *Saccharum bengalense, Saccharum spontaneum*

Table 2. Phytogeography of grasses of Salt Range of Pakistan.

S. No.	Botanical Name / Local Name / English Name	Distribution in World	Distribution in Pakistan / Salt Range	Occurrence/Habitat	Economic Importance
01	*Arundo donax* Linn./ Nari/ Giant reed, nal grass	Mediterranean region eastwards to Burma. North Africa, introduced in the United states.	Mardan . Takht Bhaai, Hazara . Swat . Kashmir, Rawalpindi . / Soon sakesar (Sodhi, Uchali) Kallar Kahar.	Rare in rocks river beds and streams. Common on road side in Kallar Kahar. red sandy soil.	Thatching
02	*Pharagmites karka* (Retz.) Trin.ex Steud./ Nar/ Common Reed, Ditch Reed ,Pit-Pit (New Guinea) tropical reed (Australia)	Tropical Africa, Polynesia, Northern Asia and tropical Asia.	Gilget Agency, Peshawar . Baltistan, Sakadro, Kashmir, Attock , Rawalpindi / Soon Sakesar, (Kanhati garden, Sodhi, Uchali)	Rare along stream banks, near Uchali lake, wet rocky places, near stream, sandy clay,wet sandy soil.	Thatching
03	*Aristida adsceansionis* Linn./ Lamba/	Occurs in any disturbed poor soils in grassland and open bush throughout tropical Africa, introduced to the united states.	Gilgit Agency, Peshawar , Mardan , Swat , Hazara , Kashmir, Muzzafarabad, Kohat , Rawalpindi , Murree, Attock , Jhelum ,Choa Saidan Shah, Lahore , Kalat, Hyderabad, Thar parkar / Soon Sakesar, Khewra, Kallar Kahar,Choa Saidan Shah	Common in rocky habitation, wet places, slopes of mountains.	Fodder
04	*Enneapogon persicus* Boiss./ Feather pappus grass	Europe, South westernAfrica North west tropical ,Soviet middle Asia, Western Asia and Arabia	Gilgit Agency, Khyber , Waziristan , Peshawar , Kohat , Attock , Rawalpindi , Sargodha, Khushab , Sakesar, Lorali , Lyallpur / Khewra Mountains	Common on mountains near khewra. red sandy clay	Fodder
05	*Acrachne racemosa* (Heyne ex Roem. & Schult.) ohwi/ Goose grass	Tropical Africa, South East Asia & Australia	Hazara , Huripur, Swat , Mardan , Rawalpindi , Rawalpindi Ayub park, Kahuta, Jhelum , Sargodha , Khushab / Sakesar, Khewra,Kallar Kahar	Very rare on mountains, common in wet places, and lawns during rainy seasan .	Fodder
06	*Dactyloctenium aegyptium* (Linn.) Willd./ Madhana/ Crow foot grass, Egyptian grass	Widely distributed in tropical and warm temperate regions of old world.	Kashmir, Hazara , Swat , Rawalpindi , Jhelum , on Khewra Road, Multan , Sukkar , Karachi , Karachi University, Thar Parkar / Soon sakesar, Choa Saidan Shah,, Dhoke Seela, Kallar Kahar, Khewra	Common in cultivated fields ,shady places, wet lands.	Fodder
07	*Dactyloctenium scindicum* Boiss./ Madhana	Kenya, North to Sudan and east ward to North West India.	Bannu , Kohat , Attock , Dhok Pathan, Jhelum , Khewra, Quetta , Sibi , D.G Khan , Karachi , Thar parkar / Khewra & Sakesar Mountains (Narwari)	On Mountain Slopes of Khewra & Sakesar.	Fodder
08	*Desmostachya bipinata* (Linn.) Stapf./ Dab/ Big cord grass (U.S.A) or Salt reed grass, Halfa grass (Australia)	Throughout the middle east to India,China, North & tropical Africa.	Peshawar , Swat, Jhelum, Rawalpindi , Kashmir, Quetta , Karachi , Thatta , Hyderabad, Thar parker / Kallar kahar, soon sakesar , Dhok Seela, Chakwal	Common in waste places, near fields, along road side, rare on mountain slopes.	For making brooms

Table 2. Contd.

09	*Eleusine indica* (Linn.) Gaertn./ Chemmar/Crow foot grass(Aus.) Goose grass(United States.) Crab grass (S. Africa)	Tropical and sub tropical regions, throughout the world	Kashmir, Hazara , Kohat , Karachi / Kallar kahar, Choa saidan shah..Soon Sakesar	Common on shady places, and near fields.	Fodder
10	*Eragrostis ciliansis* (All.) Lut. ex F.T. Hubbard./ Stink grass (Australia) grey love grass (Kenya) black grass (New South wales)	Tropical and warm temperate regions of the old world. Introduced to new world.	Peshawar , Kashmir, Loralai , Baluchistan Coast, Karachi , Thar parker / Soon Sakesar, throughout the area	Common in irrigated fields, rare on mountains.	Fodder
11	*Eragrostis papposa* (Roem. & Schult.) stued.	Spain & North Africa, through the middle east to India and Sudan to Arabia, East Africa	Swat , Kohat , Attock , Rawalpindi , D.I. Khan , Khairpur / Near Kallar Kahar, at the base of mountains	Rare at the base of mountains near kallar kahar, occasional at other places.	Fodder
12	*Octhochloa compressa* (Forssk.) Hilu./ Chhimbar	Africa, Arabia, Pakistan, India, North West India to North Africa	Kohat , D.I. Khan, Rawalpindi , Mardan , Karachi, Thar Parker, Hyderabad / Narwari(Soon Sakesar) ,Kariala ,Chakwal, Sodhi (Soon Sakesar) Dhok Seela	Near Mountains rare, common on mountains near Sodhi Slopes. Rare Near wild life sanctuary Chakwal .clay soil.	Fodder
13	*Sporobolus arabicus* Boiss./ Drop seed grass	Arabia, Iran and India	Bannu, Rawalpindi, Attock, Sibi, Quetta, Kalat, Makran, Karachi / Kariala (Chakwal), Dhok Seela, Soon Sakesar (Sodhi, Khabaki	Rare on stony soil, on the base of mountains ,clay sail	Fodder
14	*Leptochloa panicea* Retz./ Sprangle top	Africa, Western, Asia, Arabia, China, India, Malaysia, Australia, South, W. South America	Hazara, Hari pur, Mardan, Rawalpindi, Attock, Jhelum, Sialkot, Karachi / Soon Sakerar (Kanhati garden)	Occasional in wet and shady places, moist sandy soil ,rare	Fodder
15	*Cynodon dactylon* (Linn.) Pers./ Khubbal / Common Bermuda grass (united state). couch grass, green couch (Australia)	Tropical and warm temprate regions, throughout the world.	Peshawar , Chitral , Hazara , Rawalpindi , Murree hills, Quetta , Karachi, Thar parker / Common throughout the area	Abundent throughout the area,very common in moist places.	Fodder
16	*Chloris dolicostachya* Lag.	China to South East Asia and Northern Australia.	Rawalpindi / Narwari (Sakesar Mountains)	Rare on rocky mountains of Sakesar. Sandy Clay.	Fodder
17	*Chloris barbata* Sw./ Tumble wind mill grass, swollen wing mill grass.	Wide spread throughout the tropics .	Karachi / Narwari (Sakesar), Khewra	Very rare in Khewra and Sakesar mountains,on mountain slopes, red sandy clay soil .	Used as fodder ,when young .
18	*Tetrapogon villosus* Desf./ Sager	Tropical Africa, East Wards to India and west wards to North Africa	Khushab , Sakesar, Choa Saidan Shah. Dadu / Khewra, Sakesar, (Khabaki, Narwari) & Kallar Kahar	Common on mountains, slopes of Soon Sakesar near Kallar Kahar and Khewra.,	Fodder

Table 2. Contd.

19	*Tetrapogon Cenchriformis*(A. Rich.)Clayton.	Tropical Africa, East Wards to India and South Wards to Rhodesia & Angola.	Jhelum / Khewra	Rare on Khewra mountains	Fodder
20	*Tragus roxburghii* Haller./ Kuta gha	South East Africa, and East Africa	Kashmir, Jhelum Valley, Swat, Hazara, Abbotabad, Rawalpindi Kashmir, Karachi, Thar Parker / Sakesar (Kathwai, Mardwal,) Khewra, Kallar kahar Dhok Seela, Chakwal .	Rare at mountains foot, common near banks of fields, sandy soil	Used as fodder when young
21	*Brachiaria distachya* (Linn.) Stepf.	Kashmir, India to Sri lanka, Burma and Thailand, introduced in Africa .	Kashmir, Nowshera,Bhimber hills, in hills of Sind and Punjab / Sakesar,(Mardwal, Khabaki, Narwari)Chakwal	Under shade of trees. Moist clay soil, wet organic black soil with litter, rare	Fodder
22	*Brachiaria ramosa* (Linn.) Stepf.	Senegal to Yemen and south wards to Malawi, Rhodesia & South Africa, tropical Asia.	Dir , Kashmir, Jhelum Valley, Swat , Hazara, D.I Khan , Sialkot, Lorali, Dadi , Ther parker / Kallar Kahar ,choa saidan shah, Sakesar (Sodhi)	Common in waste places, in fields and near fields, clay soil, dry and wet sandy soil ,sandy clay.	Fodder
23	*Brachiaria. reptans* (Linn.) Gardner&Hubbard	Tropical Asia, Introduced throughout the tropics.	Hazara , Haripur, Swat, Mingora, Rawalpindi, Atock . D.I.Khan, Lahore, Khair Pur / Kallar Khar, Narwari (on way to Soon Sakesar)	Common along water courses and under the shade of bushes, near fields, wet clay soil .	Fodder
24	*Brachiaria eruciformis* (J.E.sm.) Stapf.	South Africa to the Mediterranean, eastwards to India	Hazara , Kashmir, Rawalpindi, Sargodha , Sakesar, Hyderabad, Mir Pur / Sakesar (Mardwal)	Very common weed of cultivated fields, near wet irrigated land, wet clay soil.	.Fodder
25	*Cenchrus Ciliaris* Linn./ Buffel grass (Aus), African foxtail (USA) Kenya, Dhaman grass, Anjan grass, koluk Katai (India)	Hotter and drier parts of India, Mediterrauian region, tropical and southern Africa, now widely introduced	Peshawar, Khyber Distt, Kohat, D.I.Khan, Attock, Quetta, Multan, Dadu / Dhok Seela (Chakwal) Kallar Khar (Sodhi Kathwai, Jaba) Kariala, Choa saidan Shah	Common on slopes of mountains, near fields, at the base of mountains, on mountains, sandy clay, stony clay, stony soil, clay soil.	Fodder
26	*Cenchrus Setigerus* Vahl./ Anjan, Dhaman / Bird wood gras (Aus) moda dhamas gress (India) anj an.	North West India and North East Tropical Africa	Kohat, Attock, Rawalpindi, Sialkot Lahore, Karachi, Hyderabad, Tharparker / Soon Sakesar (Sodhi Kathwai ,Kanhati garden), Choa Saidan Shah, Kallar Kahar	Rare on slopes, in fields with stony clay soil, rare near water courses clay soil, sandy soil, red sandy clay.	Fodder
27	*Pennisetum orientale*L.C.Rich ./ Oriental fountain grass	North Africa, Through Arabia to Central and South West Asia, India and Nepal	Chitral, Dir, Hazara Swat, Kashmir, Jhelum, Muzzafarabad, Gilgit, Sargodha and Karachi / Kallar Khar	Common on mountains, stony soil, clay soil.	Fodder
28	*Digitaria Sanguinales*(Linn .)Scop./ Hairy crab grass, Finger grass Pigeon grass.	Warm temperate region, throughout the world, penetrating into the tropics	Chitral, Hazara, Sawat, Kashmir, Gilgit, Rawalpindi, Quetta / Soon Sakesar (Narwari, Mardwal, Khabaki, Sodhi) Khewra, Dhok Seela, Chakwal	Common near fields, rare on mountains, clay soil, red clay.	Fodder

Table 2. Contd.

29	*Digtaria Nodosa* Parl	Africa North, Macronesia Northern Tropical and East Tropical	Kohat, Peshawar. Rawalpindi / Sakesar (Mardwal, Sodhi and Narwari	Rare on mountains, at the base of mountains, red sandy clay, clay	Fodder
30	Echinochloa colona./ Sanwak / Jungle rice (USA) Awnless baragard grass (Australia)	Widely spread in tropical Africa, Asia and Australia.	Dir, Hazara, Abbottabad, Swat, Rawalpindi, Karachi, D.G. Khan, Makran / Soon Sakesar, Choa Saidan Shah, Dhok Seela ,Chakwal	common weed of fields, and moist lands clay soil, moist clay soil.	Fodder
31	*Panicum maximum* Jacq./ Bansi gha/ Switch grass, Guinea grass	Tropical Africa, introduced to most other warm countries.	Swat, Sargodha, Lahore / Kallar Kahar, Soon Valley	Common on banks of fields, on slopes,Stony clay.	Fodder
32	*Paspalum paspaloides* (Michx.) scribner./ Knot grass (Hawai) water couch (Australia) eternity grass (United States)	Widely distributed over tropical region	Swat, Mingora, Kashmir, Rawalpindi, Sargodha, Karachi, Thatta / Kallar Kahar, Choa Saidan Shah, Dhok seela, Chakwal	Common along margins of ponds and ditches, in water, clay soil, Sandy clay.	
33	*Paspalidium flavidum* (Retz.) A. Camus/ Kangna	Tropical Asia	Dir, Rawalpindi, Kashmir, Sheikhupura, Lahore / choa saidan shah	Common along the road from Choa to Kallar Kahar, at base of mountainS .Clay soil	Fodder
34	*Setaria glauca* (L.) Beauv. or *setaria pumila* (poir.) Roem & Schult./ Yellow fox tail or Yellow bristle grass	Tropical & warm temperate regions of the old world, introduced to North America	Peshawar, swat, Hazara, Rawalpindi, Quetta, Loralai, Sahiwal, Khairpur, Hyderabad / Kallar kahar, choa saidan shah	Common on moist soil near water, wet sandy clay, wet clay soil ,common in open grassland .	Fodder
35	*Setaria italica* (Linn.) P.Beauv./ Kangni/ Fox tail bristle grass, Italian fox tail millet	Cultivated as a crop in china and parts of India and for fodder or bird seed in Europe and it is occasionaly grown in parts of Africa tropics warm temperate regions	Soon Sakesar (Mardwal)	Present in fields, dry clay soil	Fodder
36	*Setaria verticillata* (linn.) P. Beauv/ Ludhri/ Hooked bristle grass, bristly foxtail	Tropical & warm temperate regions .	Hazara, Swat, Rawalpindi, Sargodha, Loralai, Lahore, Thatta, Karachi. Thar Parker / Soon Sakesar (kathwai) karialla, Kallar Kahar, Choa Saidan Shah	Common on shady and wet places. Moist clay soil, sandy clay soil	Used as fodder when young
37	*Setaria intermedia* Roem.&Schult	India, Burma, Sri Lanka, Introduced to Tropical Africa.	Rawalpindi, Said Pur, Jhelum / Choa Saidan Shah, Kallar Kahar (Throughout the area)	Common in waste lands, shady places. Wet sandy soil,wet sandy clay soil.	Used as fodder when young
38	*Setaria viridis(*Linn.)P.Beauv./ Green bristle grass	In the cooler, regions of the old world, introduced to the new world	Chitral, Dir, Kashmir, Swat, Abbottabad, Gilgit, Sakardu, Rawalpindi, Quetta and Loralai / Kallar Kahar	Common in shady places, under the shade of trees ,common in Kallar Kahar	Fodder

Table 2. Contd.

39	*Bothriochloa bladhii* (Retz.)S.T.Blake/ Palvan	Old world tropics	Gilgit agency, Hazara, Abbottabad, Kashmir, Murree Hills and Sahiwal / Mardwal, Kanhati garden ,Kallar Kahar	Common near fields, sandy clay, clay soil, dry sandy soil.	Fodder
40	*Chrysopogon serrulatus* Trin./ Chita gha / Golden beared grass	Afghanistan to northern India, Nepal & Burma, Madagascar and tropical Africa.	Dir,Malakand, Kashmir, Mansehra, Abbotabad, Kashmir, Muree Hills, Sahiwal / Soon (sodhi, Jaba, Kathwai, Khura, Mardwal, Khabaki), Kallar Kahar, Choa Saidan Shah	common on mountains, abundant on mountain slopes, generally eaten by cattle .	Fodder
41	*Dicanthium annulatum* (Forssk.) Stapf./ Murgha ghas/ Sheda grass (Aus0. Kleberg blue stem (United States) pitilla (Cuba) lindi philipiues marvel grass, delhi grass (IND)	Tropical Africa to South east Asia, New Guinea and Northern Australia, Kenya ,Tanzania Senegal, Australia .	Peshawar, Kashmir, Hazara, Abbottabad, D.I Khan Sahiwal, Karachi, Hyderabad &Tharparker / Dhok Seela, Khokhar Zer, Soon (Sodhi), Mustafa abad, Kallar Kahar, Mardwal, Jaba, Kanhati Garden, Khabaki, Choa, Nowshahra	Common in Grass Land, Moist land, throughout the area near fields, on slopes of mountains, clay, wet clay soil, stony clay soil	Fodder
42	*Dicanthim foveolatum* (Del.) Roberty	North Africa, Eastern Africa, the middle east, Pakistan, India	Swat, Kashmir, Attock, Rawalpindi, Karachi, Makran, Dadu / Dhok Seela , (Chakwal) Khewra, Kallar Kahar, Choa Saidan Shah	Common On Mountains near Dhok Seela (Chakwal). common in sloppy mountains of Khewra. Clay Soil, Sandy rocky soil, Sandy Clay, stony clay soil.	Fodder
43	*Eulaliopsis binata* (Retz.) C..E Hubbard./ Babhir, Sabai grass	Afghanistan, east wards to Burma and Thailand, China, Philippines	Kashmir, Mangora, Waziristan, Kohat, Rawalpindi, D.I Khan / Soon, Kallar Kahar, Khewra, Choa Saidan Shah, Dhok Seela, Chakwal	Abundant on mountain slopes, stony soil, stony clay soil, sandy soil and near sandy stones .	For making ropes & mats
44	*Heteropogon contortus* (linn.) P.Beauv.ex Roem.& schult./ Suriala/ Common spear grass, black spear grass, (Aus) tangle head (U.S.A) Pili grass (Hawai)	Throughout the tropics and sub tropics, tropical & warm temperate regions	Kashmir, Hazara, Abbotabad, Rawalpindi Murree hills, Sargodha, Tharparker / Dhok Seela, Kathwai, Khura, Kallar Kahar, Kanhati, Garden, sodhi, Mardwal	Abundant on mountains throughout, sandy dry soil, clay soil.	Grazed when young
45	*Imperata cylendrica* (Linn.) Raeuschel/ Sword grass or Blady grass (Australia) Cotton wool grass, spear grass(Nigeria)	Throughout the old world tropics, extending to the Mediterranean and the middle east, also in chili (India, Australia, Eastern & S. Africa)	Chitral, Peshawar, Hazara, Kashmir, Mirpur, Sahiwal, Makran, Nawabshah / Soon near Uchali, Kathwai, Kallar Kahar, Khewra, Khabaki, Kanhati garden	Occasionaly along water coursers, common in fire burnt fields, near fields, wet soil, dry clay soil, sandy clay soil.	Grazed when young, thatching & Paper Industry

Table 2. Contd.

46	*Cymbopogon jwarancusa* (Jones.) Schult/ Khavi / Lwaran cusa grass	India, main Nepal, North East tropical Africa, Afghanistan, Iran & Iraq, Arabia, China	Dir ,Peshawar, Kohat, Sargodha, Quetta, Lahore ,Dadu, Karachi,Tharparker /Kallar Kahar, Choa Saidan Shah, Soon Valley, Chakwal, Khewra	Common on mountains rocky slopes, rare on edges of fields, sandy clay soil.	Medicinal
47	*Sorghum halepense* (Linn.) Pers/ Jangli Jawar/ John son grass, Aleppo grass, Aleppo millet grass	Mediterranean region ,introduced very easly to India, now wide spread through tropics.	Gilgit, Chitral, Kashmir, Hazara, Balakot, Sahiwal, Lahore, Tharparker / Sodhi (Soon) Kallar Kahar, Kala Bagh	Common on field borders, near fields, on mountain base, clay soil	Fodder
48	*Saccharum bengalense* Retz./ Sarrot, Kana, Sarkanda/ Munj sweet cane.	North & North west India, Afghanistan	Rawalpindi, Kahuta, Sialkot, Lahore, Hyderabad, Tando jam / Soon sakesar, (Khabaki Jaba, Khura, Kathwai) Khewra	Occasional in dry rocky areas, common near water channels of Kathwai, common on mountain bases of khewra ,stony clay, clay soil	Thatching and making mats
49	*Saccharum. spontanium* Linn./ Kai/ Wild sugancane , Pit-Pit (New Guinea)	Widely distributed in the warmer regions of the old world.	Peshawar, Kashmir, Hazara, Swat, Gilgit, Rawalpindi, Dadu, Larkana, Karachi ,Hyderabad, Tandojam / Soon (mardwal) sodhi Dhok Seela, Chakwal, Kallar Kahar	Very common along stream banks, margins of ponds. Very rare in dry places common near lakes .sandy clay soil.	Soil binder and Thatching
50	*Vetiveria zizanoides* (Linn.)/ Khas Khas/ Vetiver (Europe)	Throughout Africa, India, Burma, Sri Lanka, South east Asia.	Rawalpindi / Uchali (Soon Sakesar)	Very rare on edges of fields.	Perfume industry and Medicinal
51	*Poa annua* Linn./ Annual meadow grass, annual blue grass.	Cosmopolitan, not present in hot climates & deserts	Dir, Hazara, Thandiani, Kaghan & Naran, Kashmir, Rawalpindi, Murree hills, Ayub park, Faisalabad, Lahore / Sodhi, Kallar Kahar	Common on moist shady soil, common near fields, sandy clay, clay moist soil.	Fodder
52	*Poa infirma* H.B.K./ Early meadow grass	South America, Southern Europe, East Wards To The Himalayas and Central Asia.	Swat, Mingora, Rawalpindi, Sialkot / Nowshahra ,khabaki, Kallar Kahar	Common near irrigated wet soil, in moist shady places, clay soil .	Fodder
53	*Lolium persicum* Boiss. & hohen. ex Boiss/ Persian Rye grass	The middle east, southern U.S.S.R Pakistan	Rawalpindi , Murree hills, Quetta / Kallar Kahar	Not common, present in Kallar Kahar under shady trees, wet clay soil.	Fodder
54	*Avena fatua* Linn./ Jangli Jai / Sping or common wild oat	Europe, western and central Asia, introduced to many other countaries	Gilgit agency, Kashmir, Baltistan, Sakardu, Rawalpindi, Murree, Lahore / Choa Saidan Shah	Common in fields and near fields, clay soil	Fodder
55	*Avena sterilis* sub sp. *Avena ludoviciana* (Dur.) Gill &Magne/ Winter wild oat	Mediterranean region and the middle east, east wards of North west India.	Peshawar, Chitral, Malakand, Swat, Hazara (b/w Haripur & Abbotabad, Kohat, Hangu, Kashmir, Kotli, Quetta / Kariala (Chakwal uchali, Kallar Kahar, Nawshahra, Kanhati garden, Choa sadian shah	Common in fields and near fields, at the borders of the fields. Sandy clay, clay soil	Fodder

Table 2. Contd.

56	*Agrostis viridis* Gouan / Water bent grass	Mediterranean region, Arabia, Middle East, Pakistan, India, East Africa to Egypt, S. Africa, America, Australia	Chitral, Dir, Gilgit agency, Swat, Baltistan, Kohat, Attock, Kashmir, Quetta, Lorali Distt, Zhob / Kallar Kahar, Choa Sadian Shah	Sometimes present in water, common on marshy and shady places ,closely associated with *polypogon sp.* at some marshy places, wet clay soil .	Fodder
57	*Koeleria argentea* Griseb./ Silver hair grass	Afghanistan	Kashmir, Quetta / Soon Sakesar	Common on wet clay soil, at moist places in March & April	Fodder
58	*Polypogon monspeliensis* (Linn.) Desf./ Annual Rabbit foot grass	Europe, Africa, The middle east, Pak to China, introduced else where	Gilgit agency, Chirtral, Hazara, Mansehra, Kashmir, Peshawar, Rawalpindi, Sargodha, Lahore, Dadu, Karachi, Hyderabad, Turbat / Kariala (Chakwal) Kallar Kahar, Choa sadian shah, Dhok Seela, Mardan	Common in moist places, marshy places, along water courses, near sanitary pipes and channels, wet clay soil muddy organic soil, wet black humus soil	Little value as fodder
59	*Polypogon fugax* nees ex steud/ Asia minor blue grass	Iraq, East wards to Burma, Mainly in the Himalayan.	Dir, Kashmir, Hazara, Abbotabad, Swat, Kashmir Kotli, Rawalpindi, Murree, Sibi, Zhob / Khewra, Choa sadian shah	Found on moist and shady places. Abundant in wet sandy and marshy places, Moist clay soil.	Little value as fodder
60	*Phalaris minor* Retz./ Dunbi sitti / Small canary grass	World wide	Peshawar, Swat, Kohat, Hanza, Rawalpindi, Gujar Khan, Attock, Jehlum. Quetta, Manna Valley, Lahore, Karachi, Malir / Kanhati garden, Khabaki, Sodhi, Uchali, Chakwal, Kallar Kahar, Choa sadian shah	Occasional on waste land, in fields near wheat fields, on banks of fields, clay, moist clay soil	One of the most serious weeds of wheat fields and difficult to control.
61	*Bromus pectinatus* Thunb/ Japanese Broom	Sudan Republic, Through Ethiopia to Egypt, Sinai and Arabia, South Africa, India to China, Europe	Gilgit agency, Dir, Chitral, Kafiristan Valley, Kashmir, Chitral, Hazara, Attock, Rawalpindi, Quetta / Sodhi, Naushahra, Kanhati garden	Common on humus soil under shady trees, near fields, in shade on moist soil. wet clay soil ,black organic soil.	Fodder
62	*Bromus. catharticus* Vahl/ Rescue grass	Central & South west, Argentina	Peshawar, Rawalpindi, Murree hills / Kallar Kahar	Rare at shady places, wet clay soil.	Fodder

grasses which prevent erosion in dry sandy and moist sandy areas and also reduce the pressure of flood in many areas. *Saccharum spontaneum* and *Vetiveria zizanoides* are characteristic grasses of moist sandyareas while *S. bengalense* is commonly found in dry sandy areas. The species of *Poa* and *Lolium persicum* of the tribe Poeae and *Avena fatua*, *Avena sterilis*, *Polypogon monspeliensis*, *Polypogon fugax*, *Phlaris minor* and Species of *Bromus* constitute a group of grasses which are generally found as weeds in wheat fields and other crops in spring season from end of February to April. These grasses are collected as fresh fodder in spring season in Salt Range and Northern Pakistan. *Desmostachya bipinnata* is used as a permanent source of fodder for grazing and for storage for winter use in arid area of Salt Range and in Potohar region of northern Punjab. *Cynodon dactylon* of the tribe Chlorideae is used as a fresh fodder in the area. Hence these two species contribute as a permanent source of fodder in Salt Range and northern Pakistan. As it is evident that in the area, mostly grasses are used as a fodder, some are used for other purposes such as thatching, from medicinal point of view and a few are the serious weeds of fields. The investigations were carried out regarding their economic importance, habitat and morphological studies as an aid to the identification of grasses of Salt Range area of Pakistan.

The Salt Range of Punjab has rich floral diversity of the low lying subtropical forest.(Ahmad and Waseem, 2004),and there are various habitats for the development of plant communities and grasses that form dominant vegetation over extensive area and show great adapta-

bility for life under very diverse ecological conditions. Live stock keeping is the major economic resource, forming an integral part of the community. It not only provides food, in the form of animal fat, milk and its products, but also a source of cashincome for local people. A large number of plant species are used as a fodder by the domestic animals. Free grazing is practiced to a great extent in the area. Grasses form the major source of fodder. Over-grazing is a common phenomenon and it is one of the factors that determine the local type of vegetation and it has injurious effects on seedling growth. The natural vegetation of the area is changed from forest to scrub and then to the treeless grassy area, if cattle have free access (Said, 1951). It has been observed that good fodder grasses like *Cenchres ciliaris*., *Bothriochloa* sp. and *Digitaria nodosa* are replaced by poor fodder grasses such as *Heteropogan contortus* (Ahmad, 1964).

There is a great variability in all the habitats studied regarding to soil texture and form, topography, species structure and composition. Grasses like *Acrachne racemosa, Enneapogon persicus, Dactyloctenium aegyptium, Echinochloa colona, Aristida adsencionis, Octhochloa compressa, Cynodon dactylon, Panicum antidotale* and *Tragus roxburghi* are considered good fodder grasses (White et al., 1959; Cope, 1982, Chaudhary, 1989).

C. dactylon that is present throughout the area is considered a first class fodder grass (Cope, 1982). High grazing pressure of live stock eliminated most of the grasses from the area but *C. dactylon* survived because it is a high yielding palatable species and very resistant to grazing and trampling (White et al., 1959). It is observed that *C. dactylon* shows maximum resistant to grazing, out of all the fodder species, while other fodder species are suppressed in the constant grazing area. *Cynodon* was present throughout the area, even in the saline soil. *Cynodon* can grow in slight saline conditions (Bernstein, 1958). It is able to shunt its photosynthates from the top to the roots to enable it to survive under saline conditions (Skerman and Riveros, 1990).

D. aegyptium a fodder grass that is present in cultivated fields, shady places and moist soil is more abundant and diverse species as compared to *D. scindicum.* It is adapted to soils of wide range of texture, and it is one of the most drought resistant grasses, because of its rapid growth and seedling in each wet season, even of short duration (Skerman and Riveros, 1990). *D. scindicum* is distinguished from *Dactyloctinium aegyptium* by having short and falcate spikes and are restricted to sandy mountain slopes. As Ahmad (1964) observed that species like *D. scindicum* grow frequently in places where wind blown sand has accumulated.

Chrysopogon serrulatus is liked by the cattle as a fodder in the area. It is observed that this species is very rare in the area having high grazing pressure. In the protected areas such as Chhumbi Surala wild life-sanctuary (Chakwal), it is the most dominant species of all the grasses (Chaudhary et al., 2001). *Acrachne racemosa* is reported a good fodder grass, is present only in the rainy season, in the wet and moist soil, near grassy lawns and moisture. It is distinguished by laterally compressed spikes with serrate outline.

Dicanthium annulatum a mostly used fodder is strongly associated at some places with *Bothriochloa* sp.It is very difficult to distinguish these species. In *Bothriochloa* the pedicels of the spikelets are with membranous median line, while it is absent in *Dicanthium* species.

Tragus roxburghii is often confused with *Cenchrus ciliaris,*is easily distinguished by relatively small size and nerves of the upper glume are with prickly ribs. It is found in the sandy soil. There are some grasses which are found in the small patch of the area,that is, *Paspalidium flavidum* which can be observed along the road of Choa Saidan Shah to Kallar Kahar while it is not recorded in other localities of the area.

Grasses as indicators of salinity

The distribution of grasses is governed by chemical and physical nature of the soil in the geographical region. Plants and soil characters are so independent that they become indicators of each other. A habitat under certain existing environment would permit plants adapted to the condition (Sarir et al., 1984). In the soil plant relationship, the plants reflect the ecological conditions of the inhabited area. *Polypogan fugax* is found in moist and shady places and is abundant in wet sandy and marshy places, show a clear difference with respect to habitat, as it is indicator of salinity, having very small size when growing in the saline soil. Hilgard (1911) and Kearney et al. (1914) recognized this fact that plants are the indicators of salinity.

In the saline soil species like *Cenchrus ciliaris, Sporobolus arabicus, D. annulatum* and *Polypogon sp.* are found, confirming the observations of Chaudhri et al. (1968). These species are widely distributed in Salt Range.

Miscellaneous uses of grasses

S. spontaneum, that is very common along stream banks and margins of ponds, is an excellent soil binder that is capable of colonizing areas such as soil and sand left bare by retreating floods. Its root system is extremely extensive and acts as an effective soil binder (Skerman and Riveros, 1990). Large tussock forming grasses such as *S. spontaneum* and *Saccharun bengalense* are only recorded along water channels (Chaudhary et al., 2001). It is also used in the area for thatching huts for the cattle and the hollow internodes of *Arundo donax* are used for making pens and musical pipes. *Arundo* is distinguished from S*. bengalense* by its hollow internodes and broad leaves. Tussocks of *Saccharum* species are useful for the nesting of animals and birds (Chaudhary et al., 2001).

The grass species having strong rhizomes are used to

hold the sides of cuts and banks of water tributaries consequently protecting them against erosion (Saini et al., 2007). Species like *Panicum antidotale, Panicum maximum, Cenchrus ciliaris,* and *Cenchrus setigerus* are recommended for the fixation and reclamation of sand dunes in areas of low rainfall (Yusufzai and Gandhi, 1999). These species are well distributed in Salt Range.

Some grasses such as *Eulaliopsis binata* locally known as Babhir and *Cymbopogan jwarancusa* (Khavi) are abundant on mountains and rocky slopes and near sand stones. Sand stone and lime stone are the common rock types of Salt Range (Ahmad and Waseem, 2004). *Eulaliopsis binata* that has very long and narrow leaves is used for making brooms, mats and ropes in the area.

Medicinal grasses

Cymbopogon jwarancusa has aromatic leaves and base of the stem, is used for curing chicken pox by the local people of the area. *Vetiveria zizanoides* has medicinal uses and also used in the perfume industry is almost near extinction in the area. It requires conservation in Salt Range. *S. spontaneum* is also used for medicinal purpose, its root decoction is given to cure eruptions on the skin caused due to excessive consumption of country liquor by different tribes of India (Mitra and Mukherjee, 2005). Its root decoction is taken for intestinal worms, fever and body pain (Jeeva et al., 2005). *C. dactylon* is also used from medicinal point of view (Mitra, 2000; Shinwari and Khan, 2000). Medicinal and aromatic plants play an important role in rural economy, all over the world, especially the developing countries

Need for conservation

Due to overgrazing and poor management practices the grass species are restricted to specific areas are more vulnerable such as *Paspalidium flavidum*, *Enneapogon persicus*, *Lolium* sp and *Chloris dolicostachya.* There are various factors which are instrumental in the deterioration of the habitat of grasses. Due to growth in live stock population in the area, there is more grazing pressure in the area. There is unrestricted grazing except the protected areas, and no body is responsible for conservation, resulting in ruination of the area. It is also observed that in some areas of Salt Range, nomadic tribes migrate from the warm low lands to pass the summer and their nomadic hurds increase pressure on fodder species of grasses which are already being heavily grazed. This area lies in the arid and semi arid region, characterized by low rainfall, high temperature, and low humidity. There are frequent droughts and theforage capacity fluctuates greatly with rainfall under such conditions. Efforts are required to prevent overgrazing, as once vegetation is lost, it is very difficult to restore it. There is also a need to introduce reforms that can increase the role of government along with communities to manage it on scientific lines.

Grasses of Salt Range have a wide range of diversity in the area. The 62 species of grasses belonging to 11 tribes constitute the major bulk of grasses of low mountainous areas and plains of northern Punjab of Pakistan. Majority of these grasses exist in the plains and low hill areas of India, Iran and Afghanistan.

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