Research Article

Seasonal Variations of Moisture and Ash Content in Common Trees and Shrubs Used as Fodder in Quetta District

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ABSTRACT

Almost all of the mineral content of plants is recovered in the ash; ash gives an indication of the total mineral content. Leaves of the two trees and four dominated shrubs from three topographical localities of Quetta, Balochistan (Pakistan) *Fraxinus xanthoxyloides* and *Pistacia khinjuk*, *Amylgdalus brahuica*, *Prunus eburnea*, *Caragana ambigua*, *Sophora mollis*, were collected and analyzed for moisture and ash content seasonally during four different seasons, namely spring, summer, winter and fall. The *P. khinjuk* showed high ash content it ranged from (0.532mg-0.436/10 gm). Maximum ash content was found in autumn season at Zarghoon region *P. khinjuk* contain high ash content as compare to *F. xanthoxyloides*. Dry weight of ash was more or less similar in all three habitats**.** In case of shrub species maximum ash content 0.592/10gm in *S. mollis* at Hazargangi. The minimum amount (0.400/10 gm) in *C. ambigua* during winter season. From Karkhasa the maximum dry weight (5.8/10gm) was calculated in *S.mollis* from Karkhasa and lowest amount was observed in *A. brahuica* (4.8/10gm).

Keywords: P. khinjuk, F. xanthoxyloides, C. ambigua, A. brahuica, S.mollis, C. ambigua.

INTRODUCTION

The need to develop cheap and readily available alternative feeding materials to support livestock growth has become imperative. About 65-70 % of Pakistan is categorized as rangeland. These rangelands provide about 60 % of the total feed requirement for livestock[1-2]. Trees and shrubs are increasingly recognized as important components of animal feeding, especially as suppliers of protein. Leaf protein sources obtained in leaf vegetables, legume trees, browse plants, fodder trees and shrubs as feed resources to all classes of livestock offer tremendous potentials and are receiving increasing attention[3-6]. The use of fodder trees and shrubs has been secondary to these efforts, despite their potential value in prevailing small farm systems[7]. Similarly, farmer's local knowledge on indigenous fodder trees and shrub species are not strongly supported by scientific investigations. Grazing livestock have depended largely upon forage to fulfill their mineral requirements according to climates. Forages rarely satisfy all of the needed mineral requirements of grazing livestock[8]. It has been reported that mineral concentrations in both soils and plants affect the mineral status of grazing livestock[9]. The importance of trees, shrubs and herbs for their nutrition capacity for browsing and grazing animals, especially in areas of poor quality pastures for longer period of time. These nutrients contents were subject to less variation than with grasses and this particularly enhances their values as dry season feeds for livestock[10-11]. The current status of animal protein deficiency in developing world is caused by lack of forage. Fodder trees and shrubs have always played a role in feeding livestock in difficult environmental conditions, where the available grazing is not sufficient to meet the maintenance requirements of animals for part of the year, the contribution from trees and shrubs is significant. Tree fodders contain high levels of crude protein and minerals and many show high levels of digestibility. They are readily accepted by livestock and presumably because of their deep-root systems, they continue to produce well into the dry season. However, anti-nutritive factors can be a problem in some species[12]. Natural pasture and crop residues are major sources in the highlands. These feed resources are characterized by low digestibility, protein content and mineral composition[13]. Unfortunately, the technology has not been fully adopted by the small holder farmers who own the ruminants[14]. *Leucaena* contains a toxic factor mimosine which is lethal when consumed in excess of 50% by small ruminants[15] while fresh *Gliricidia* exudes a repulsive odor which limits its consumption. These make further processing crucial to consumption at expected level. Two common trees *Fraxinus xanthoxyloides* (G.Don) and Pistacia *khinjuk* Stock six dominated shrubs *Caragna ambigua* Stock, *Sophora mollis* (Royle) *Amylgdalus brahuica* (Boiss), *Prunus eburnea* Aitch, were collected from Quetta district seasonally for two years. Much work was done in these species but no seasonal differences in moisture and ash content was recorded from three habitats. These trees are used as fodder during late spring to early fall, because the temperature of the area varies from mid October to early March, so the fluctuation of the season might be affect on moisture and ash content.

MATERIALS AND METHODS

Study area

Quetta district which are divided in to southern, eastern and northern parts where the mean temperature, rain fall, humidity and wind varies seasonally, the topography of the three study sites are totally different, beside this physical properties and chemical composition of the soil varies (which are not mentioned here). Foliage samples of dominate trees and shrubs were collected from three sites of Quetta district for two years. Hazargangi Chiltan National Park, situated near Quetta at a distance of 20Km towards N W at 30^{o} 07 N longitude, 66^{o}58 E and 1700 m altitude it has Mediterranean climate with dry semi arid type of vegetation, the mean maximum temperature in summer is $36C^{o}$ and mean minimum temperature in winter is $–10C^{o}$, while rain fall varies between 250-300 mm per year; Karkhasa is the slopes of Chiltan range has rocks where the precipitation occurs only in winter. It lies at altitude 30^{o} 09 and longitude 66^{o} 55 (Hunting survey Corporation 1960), climate of the valley is arid with low precipitation, rain fall varies from year to year, maximum temperature in July rises to 35 C^{o} and in winter it goes to $–10C^{o}$; Zarghoon region is located to the southern part approximately between latitude 30^{o} 39 N and longitude 67^{o} 15E. This locality has tremendous variation from hill top to valley. Rain and snow fall is dominated in winter; mean temperature in summer is $25^{o}C$ and mean minimum temperature in winter is $-15C^{o}$. These samples were carried out in four seasons: spring (late march), summer (June) winter and autumn. Three to eight randomly plants were selected and leave samples were randomly harvested (plucked by hand) and made one unit sample, three replicate were collected by same method after collection samples were brought to the department of Botany for identification.

Plant analyses

Foliage samples were cleaned to remove any dust or other particles. Fresh brought foliage of trees and shrubs10 gram was taken as fresh weight. Then allowed to dry at room temperature. Percentage of moisture content was calculated by following formula

$$\text{Moisture content \%} = \frac{\text{Fresh weight – dry weight X 100.}}{\text{Dry weight}}$$

Foliages were allow to pass grinding for making fine powder, Then ten gram grind samples were taken to determine as ash content by ignited the plant material in muffle furnace at 650 C^{o} for at least 8 hours. Ash was cooled in dedicator at room temperature and weight. Ash content of the samples was determined by AOAC, (1980).

$$\text{Ash \%} = \frac{\text{Wt of ash X 100.}}{\text{Wt of sample}}$$

Statistical analyses

The average ash content of two trees and four shrub species were analyzed by Gen stat.

RESULTS AND DISCUSSION

Ash content

Two dominant trees and four shrubs of Quetta valley from three habitats were evaluated for their ash content. *Fraxinus xanthoxyloides* and *Pistacia khinjuk*, *Amylgdalus brahuica*, *Prunus eburnea*, *Caragana ambigua*, *Sophora mollis*. The fresh weight, dry weight and ash content of two tree species and six shrub species are shown in (Table: 1-3).

The results of trees showed that ash content in *F. xanthoxyloides* ranged from (0.522mg-0.302/10 gm). Maximum ash content were found during spring season while lowest was found during winter season. Almost equal amount of ash was recorded from all three localities. The high ash content ranged (0.532mg-0.436/10 gm) was observed in *P. khinjuk*. Maximum ash content was found in autumn season and low amount was found in spring, however Zarghoon was the area in which high amount of ash was observed. *P.Khinjuk* had high ash content as compare to *F. xanthoxyloides*, and both species are non significant (P>0.05) in all three habitats. But significant regarding four different seasons. Dry weight in *P. khinjuk* ranged between 4.7-5.8gm while in *F. xanthoxyloides* it ranged between 5.5-4.6 gm. *P. khinjuk*. More or less the amount of dry matter was similar in all three habitats.

In case of shrub species maximum ash content ranged between (0.592-0.400/10gm). Maximum amount (0.592) was recorded from *S. mollis* from Hazargangi, this might be due to that *S. mollis* leaves has thick cuticle that increases the thickness of leaves Table (1). *mollis* is used as fuel or green manure and as pesticide by the burning of whole plant to the local people. The minimum amount (0.400/10 gm) was recorded from *C. ambigua* during winter season from Karkhasa and medium amount (0.497/10 gm) was noted in *A. brahuica* from Karkhasa Table (3). The ash *P. eburnea* showed medium amount 0.463mg/10gm), almost all three habitats showed more or less equal amount of ash content in *P. eburnea*. The maximum dry weight (5.8/10gm) was calculated in *S.mollis* from Karkhasa and lowest amount was noted in *A. brahuica* (4.8/10gm) the medium amount was also in *A. brahuica* in Karkhasa and Zarghoon respectively Table (2). Almost all of the mineral content of plants is recovered in the ash; ash gives an indication of the total mineral content, but may be misleading because of high levels of silica or other no nutrient elements[16] reported that Leaves of *Parkinsonia aculeata, Pithecellobium dulce, Ceratonia siliqua, Leucaena glauca, Crataegus pubescens, Calliandra eriophylla, Dalea bicolor, Eysenhardtia texana, Atriplex canescens* and Amelanchier denticulata were analyzed through Dry matter (DM), crude protein and ash content of fodder tree leave high quality forages for ruminants. *Atriplex canescens, Leucaena glauca and Pithecellobium dulce* as high quality forages for ruminants.

Table 1: Average leaf moisture and ash content value of two trees and four shrubs at Hazargangi

	F. xanthoxyloides			*P. khinjuk*			*A. brahuica*			*P. eburnea*			*C. ambigua*			*S. mollis*		
	F Wt (gm)	D Wt (gm)	A Wt mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)
Spring	10	4.8d	0.436d	10	4.9d	0.436c	10	4.6d	0.531b	10	4.5c	0.432d	10	4.8c	0.486a	10	5.9	0.592
Summer	10	5.2c	0.489c	10	5.2b	0.489b	10	4.8c	0.522c	10	4.8b	0.489b	10	5b	0.393d	10	5.8	0.475
Autumn	10	5.5b	0.497b	10	5.00c	0.532a	10	5.1a	0.537a	10	5.3a	0.547a	10	5.1a	0.462	10	5.2	0.524
Winter	10	5.9a	0.522a	10	5.8a	0.412d	10	5.0b	0.419d	10	4.7ab	0.472ab	10	4.7c	0.417	10	5.4	0.57
Mean	10	5.35	0.486	10	5.23	0.467	10	4.88	0.502	10	4.83	0.485	10	4.9	0.44	10	5.58	0.54
L.S.D	*	0.1153	0.001384		0.001352	0.1104		0.1104	0.00745		0.1290	0.0006517		0.0942	0.00942		0.1153	0.000745
P.VALUE		17400	8.203.14		19304.69	22.55		44.82	6893.40		85.00	64573.69		55.00	24290.50		86.25	57650
F.VALU		<.001	<.001		<.001	0.001		<.001	<.001		<.001	<.001		<.001	<.001		<.001	<.001

Values are mean of three replicates and bearing different letters in the same column are significantly different from each other according to the analysis of variances (p< 0.05). Degree of freedom (df): df Treatment (3, 6).

Table 2: Average leaf moisture and ash content value of two trees and four shrubs at Zarghoon

	F. xanthoxyloides			*P. khinjuk*			*A. brahuica*			*P. eburnea*			*C. ambigua*			*S. mollis*		
	F WT (gm)	D Wt (gm)	A Wt (mg)	F WT (gm)	D Wt (gm)	A Wt (mg)	F WT (gm)	D Wt (gm)	A Wt (mg)	F WT (gm)	D Wt (gm)	A Wt (mg)	F WT (gm)	D Wt (gm)	A Wt (mg)	F WT (gm)	D Wt (gm)	A Wt (mg)
Spring	10	5.00ab	0.512a	10	5.0c	0.502c	10	5.0b	0.527b	10	4.9c	0.451d	10	5.0b	0.45c	10	5.5a	0.59a
Summer	10	5.32a	0.460d	10	5.2b	0.522ab	10	5.1ab	0.532a	10	5.1ab	0.463c	10	5.6a	0.531a	10	5.2b	0.57a
Autumn	10	4.97b	0.489c	10	5.6a	0.531a	10	5.4a	0.531a	10	5.3a	0.489a	10	5.3a	0.522b	10	5.3ab	0.52c
Winter	10	4.65c	0.499b	10	4.9d	0.422d	10	5.0b	0.497c	10	5.0b	0.472b	10	5.2a	0.417d	10	4.9c	0.55b
Mean	10	4.99	0.49	10	5.18	0.494	10	5.13	0.522	10	1100	0.469	10	5.28	0.482	10	5.23	0.56
L.S.D		0.5749	0.00791		0.6058	0.00099		0.68	0.001153		0.5520	0.001290		0.5582	0.0005767		0.1332	0.01153
P.VALUE		3.59	1.03206		5.92	29563.0		2.97	2472.25		213.96	1781.00		6.22	1.05405		44.69	68.25
F.VALUE		0.085	<.001		0.032	<.001		0.119	<.001		<.001	<.001		0.028	<.001		<.001	<.001

Values are mean of three replicates and bearing different letters in the same column are significantly different from each other according to the analysis of variances (p< 0.05). Degree of freedom (df): df Treatment (3, 6).

Table 3: Average leaf moisture and ash content value of two trees and four shrubs at Karkhasa

	F. xanthoxyloides			*P. khinjuk*			*A. brahuica*			*P. eburnea*			*C. ambigua*			*S. mollis*		
	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt (mg)	F Wt (gm)	D Wt (gm)	A Wt mg)
Spring	10	4.75a	0.489a	10	5.0a	0.499c	10	5.1b	0.498a	10	4.6b	0.52c	10	4.8ab	0.431a	10	5.5a	0.59a
Summer	10	4.9a	0.432c	10	5.2ab	0.515a	10	5.4ab	0.499b	10	4.9b	0.462b		4.9b	0.411a	10	5.2c	0.57b
Autumn	10	5.0a	0.459b	10	5.3a	0.512b	10	5.7a	5.0c	10	5.0a	0.439a	10	5.1a	0.459a	10	5.3b	0.52d
Winter	10	4.8a	0.302d	10	4.7b	0.513b	10	4.9ab	4.97d	10	4.8a	0.404d	10	4.7c	0.400a	10	4.9d	0.55c
Mean	10	4.86	0.421	10	5.05	0.51	10	5.28	2.742	10	4.83	0.456	10	4.88	0.425	10	5.23	0.56
L.S.D		0.5968	0.0013		0.5191	0.00133		0.574	0.005680		0.5748	0.1153		0.1332	0.0574		0.0576	0.016
P.VALUE		2.40	4546.25		3.67	380.69		126.25	932.58		262.51	12.25		22.19	1.36		281.00	27.12
F.VALUE		0.166	<.001		<.001	0.82		<.001	<.001		<.001	<.001		0.001	0.340		<.001	<.001

Values are mean of three replicates and bearing different letters in the same column are significantly different from each other according to the analysis of variances ($p < 0.05$). Degree of freedom (df): df Treatment (3, 6).

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