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Nutritional Analysis of Some Selected Fodder Plants of Darazinda Area, F.R. D.I. Khan, Subtropical Range, Pakistan

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Abstract: Eight species *Convolvulus prostrates*, *Portulaca quadrifida, Taraxicum officinale, Albizia lebbeck, Olea ferruginea, Salvadora oleoides, Suaeda fruticosa* and *Vitex negundo* were analyzed for macro and micro minerals in three phenological stages *viz:* Pre-reproductive, reproductive and post reproductive and the result showed that Ca, Al, P, N, S, Na, K, Mg were macro and Fe, Si, Cu and Cl were micro-nutrients in these plants. Nutritional analysis showed that moisture, ash contents, crude protein, crude fiber, crude fat and carbohydrate contents are non significant at three phenological stages of herbs and woody species.

Key words: Nutritional and elemental analysis · Selected fodder plants · Darazinda, D.I.Khan. Pakistan.

INTRODUCTION

Determination of range animal productivity depends upon the amount and nutritive quality of vegetation available to grazing animal. Age and their physiological function like gestation, growth maintenance, fattening, location and determination of the nutritional demands of livestock. Plant material is divided into fibrous and non fibrous contents. Due to overstocking most rangelands of Pakistan may have sufficient forage but of low palatability [1]. Proteins are fundamental components of all living cells because it is building unit of enzymes, hormones and antibodies which are necessary for the proper functioning of an organism. For growth and repair of tissue proteins are essential in the diet of animals. All the nitrogenous compounds present in forage feed is reliable source of overall nutritional status referred as crude protein. They are directly related to digestibility, calcium, vitamins and phosphorus contents [1,2]. Macronutrients are important constituents of body fluids as electrolytes in order to protect and maintain the structural components of the body organs and tissues. In growth, reproduction, health and proper functioning of the animal's body minerals play a vital role. About 30 million herds of livestock support by rangelands, which play an important role in Pakistan annual export income [3]. Visible symptom of Al toxicity is Inhibition growth of root and shoot. The earliest symptoms appear on roots. Shoots with Al observed are less affected for Mn toxicity [4]. Root with a consequence of Al-induce the elongation of root. Roots are usually become strong and brittle and tips of root and lateral roots become thick and turn to brown [5]. Al does not affect the seed germination, but impair the growth of new roots and establishment of seedling [6]. The common responses of shoots to Al are: ultra structural and cellular changes in leaves, increased resistance in rates of diffusion, stomatal aperture reduction, chlorosis and necrosis of leaves, total decrease in size and number of leaves and shoot biomass decrease [7]. Sulphur is an important element, which take active part in protein forming nutrients. Yellowing of newly emerging leaves occur due to deficiency of S in cereals and forage grasses. S deficiency also leads to cupping and purpling of leaves [8]. Chlorine is an important element frequently accumulating in undesirable quantities, particularly in semiarid regions so its absence to the seas along with other salts causes a problem. However, in agricultural areas, chlorine is a useful element to crops because of less supply from natural sources. The nutritional disease due to chlorine deficiency yellowing of the leaves chlorosis and finally death necrosis of leaf tissue occur. Growth was exceedingly restricted due to chlorine deficiency and plants fails to set fruit [9]. Plants typically absorb bio available silicon in the form of silicate known as monosilicic or ortho silicic acid. Silicon in plants can stimulate plant photosynthesis, nutrient uptake, decrease susceptibility to disease and insect damage,

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alleviate water and various mineral stresses and also decrease the toxic effects of aluminium. Silicon is taken up by plants as silic acid through the root system and moves upwards in the transpiration stream and then move to sites of strong evapo-transpiration where it transformed into insoluble polymers [10].

MATERIALS AND METHODS

Eight palatable plants species were collected, dried, powdered and analyzed for minerals like Ca, Mg, Fe, Mn, Zn, Cu, etc. The t-test was applied for chemical contents comparison of herbaceous and woody plant species. The proximate analysis of the plant species was determined by finding the following parameters.

Moisture Contents: About 2 grams of powder of respective plant samples were taken in separate Petri dishes and were placed in the electric oven at temperature of 105°C for 4-6 hours and then transferred these to desiccators for 30 minutes to cool down. The same were weighted again to find moisture contents (%) by using following the formula [11].

% Moisture = X/wt of sample ×100

Where
X = W2 - W1= Weight of the sample (after heating)
W2 = Wt of empty Petri dish + after heating of sample
W1 = Empty Petri dish Wt

Ash Contents (%): One to two grams of each plant sample was ignited at 550 °C to 600 °C for 8 hrs in the muffle furnace and ash contents of samples were determined by following method [12].

$$\text{Ash Content (\%)} = \frac{\text{Wt of ash x 100}}{\text{Wt of fresh Sample}}$$

Nitrogen / Crude Protein: One gram of dry powder plant samples was taken in digestion flask containing digestion mixture (Copper Sulphate, Potassium Sulphate and Ferrous Sulphate in the ratio of 5, 94 and 1, respectively). 25 ml of conc. Sulphuric acid was then added to the flask and digested in digestion flask (kjeldatherm) for 6 hours. Then the flask was removed, cooled and then transferred to 250 ml flask. Distilled water was added in order to make the volume level to 50 ml of the above solution. Strong alkali 10 ml was added to make it alkaline and then added 50ml of 4% Boric Acid solution. Then transferred it to the distillation flask and mixed 3-5 drops of indicator. Then 50 ml water and 60 ml of 32% NaOH solution were added to it. At the same time 0.1 N HCl was added in the burette to the content of the flask. Noted the reading and the percentage of protein was determined using the following formula [14].

$$(\text{N \%}) = \frac{(V1-V2)\times 14.01\times 0.5\times 100}{\text{(sample in mg)}}$$

V1= Reading of sample after titration
V2= Reading of blank after titration
14.01= Nitrogen Atomic weight (N)

Contents of crude protein (%) were calculated for all the plant samples by multiplying the nitrogen content of the sample by 6.25

Protein (%) = Percent of Nitrogen × 6.25.

Crude Fats (Ether Extract): Two grams of each plant sample was packed in filter paper (cellulose extraction thimble) and placed in Soxhlet apparatus [13] of extraction chamber. A clean and dried round bottom flask of 250 ml filled with Petroleum ether was connected to the extraction tube containing thimble and the apparatus of Soxhlet was run for 5-6 hours. The solvent extract in the round bottom flask was evaporated by using water bath and then reweighted and the crude fats (%) were then calculated by the following formula [11].

$$\text{\% Crude Fiber} = \frac{\text{X x 100}}{\text{Wt of Sample}}$$

X = W2 - W1= Wt of the fats
W1 = Empty flask Wt
W2 = Empty flask Wt + sample Wt after solvent evaporation.

Determination of Crude Fiber: Two grams of residue materials remaining from crude fat were transferred to digestion flask along with 0.5g asbestos and about 200 ml boiling 0.255 N of Sulphuric acid was added and the flask was connected to the condenser and boiled for 30 minutes. These contents were filtered through linen cloth in fluted funnel. Residues were washed to remove the acids and then transferred again to digestion flask and boiled with 0.313 N of NaOH. Addition of NaOH was continued till the volume reached to 200 ml. For 30 minutes the flask was then connected to the reflux condenser and boiled. This hot residue was then filtered

separately through Gooch crucible prepared with asbestos mat. Residue was then thoroughly washed with boiling water followed by Ethyl Alcohol (15 ml). The residue was transferred to crucible and dried at 110°C in hot air oven (W1). These crucibles were then transferred to the muffle furnace, ignited till it converted into white grey powder (W2). Crude fibers were then calculated by following formula [14].

$$\% \text{ Crude fibers} = \frac{W2-W1 \times 100}{\text{Wt of sample}}$$

Carbohydrates Contents: Carbohydrates contents were calculated by subtracting the sum of the weights of proteins, fat, crude fibers, ash and moisture contents from 100.

Carbohydrate (%) = 100 – (Protein +fats +crude fiber +ash + moisture contents)

RESULTS AND DISCUSSION

Elemental Analysis: The present data showed that the average P contents of three phenological stages was 0.01ppm, N content was 2.21ppm, Mg was 0.09ppm, Al was 0.1ppm, S was 0.05ppm, Cl was 0.07ppm, Si was 0.15%, K was 0.05ppm and Ca was 0.91 in *Convolvulus prostrates*. *Portulaca quadrifida* showed 0.05ppm P, 5.19ppm N, 0.34ppm Mg, 0.09ppm Al, 0.1ppm Cl, 0.20% Si, 0.90ppm K, 0.19ppm Ca,0.30ppm Na and 0.06 S. *Taraxicum officinale* showed 0.05ppm P, 3.39ppm N, 0.20ppm Mg, 0.06ppm Al, 0.10ppm Cl, 0.18ppm Si, 0.11ppm K, 0.46ppm Ca and 0.06 S. *Albizia lebbeck* showed 0.20ppm P, 3.82ppm N, 0.34ppm Mg, 0.09ppm Al, 0.06ppm S, 0.1ppm Cl, 0.20% Si, 0.90ppm K, 0.19ppm Ca, Cu 0.10 ppm, Fe 0.08ppm and 0.06 S. *Olea ferruginea* showed 0.01ppm P, 3.72ppm N, 0.18ppm Mg, 0.10ppm Al, 0.04ppm Cl, 0.26% Si, 0.45ppm K, 0.45ppm Ca, Cu 0.13ppm and 0.06 S. *Salvadora oleoides* showed 0.02ppm P, 5.95ppm N, 0.23ppm Mg, 0.09ppm Al, 0.86ppm Cl, 0.18ppm Si, 0.04ppm K, 1.15ppm Ca, 0.05ppm Cu and 0.44ppm S. *Suaeda fruticosa* showed 0.03ppm P, 4.11ppm N, 0.60ppm Mg, 0.07ppm Al, 0.21ppm Cl, 0.14ppm Si, 0.63ppm K, 0.56ppm Ca, 0.06ppm Cu and 1.14ppm S. Similarly, *Vitex negundo* showed 0.07ppm P, 2.67ppm N, 0.34ppm Mg, 0.17ppm Al, 0.54ppm Si, 0.18ppm K, 0.31ppm Ca, 0.12ppm Cu and 0.07ppm S (Tables 1 and 2). Tahira *et al.* The elemental values from aerial part of five medicinal plants *Convolvulus arvensis* L., *Rumex dentatus* L., *Physalis divaricata* D. Don, *Achyranthes aspera* L. and *Chenopodium ambrosiodes* L., of District Swabi Khyber Pakhtoon Khwa, Pakistan [15]. Elements were determined by Atomic Absorption Spectrophotometer (AAS); a total 10 elements five micro and five macro elements like Na, Al, Fe, Mn, Zn and K, P, Mg, Ca and S were measured. The mineral contents of four medicinal plants like *Achryanthus aspera, Solanum nigrum*, *Peganum hermla* and *Mentha longifolia* of Khushab Valley, Pakistan. For elemental analysis Absorption Spectrometric method was used for essential elements such as Cu, Na, Fe, Cd, Mn, Ni, Pb and Cr were present in medicinal plants [16].

Nutritional Analysis: On proximate analysis *Convolvulus prostrates* showed 53.46 % Moisture contents, 10.16 % ash, 6.9 % crude proteins, 4.06 % crude fibers, 5.13 % fats and 79.0 % carbohydrates. *Portulaca quadrifida* showed 37.83% moisture content, 8.2% ash, 6.4% crude proteins, 12.16% crude fibers, 0.83% fats and 73.23% carbohydrates. *Taraxicum officinale* showed 73.63% moisture content, 7.5% ash, 10.26% crude proteins, 11.2% crude fibers, 10.16 %fats and 71.03% carbohydrates. *Albizia lebbeck* had 58.10 % moisture content, 10.40% ash, 8.23% crude proteins, 12.40% crude fibers, 8.13% fats and 68.96% carbohydrates. *Olea ferruginea* showed 57.20% moisture content, 9.30% ash, 8.50% crude proteins, 6.93% crude fibers, 20.1% fats and 75.20% carbohydrates. *Salvadora oleoides* showed 61.60% moisture content, 9.56% ash, 9.60% crude proteins, 8.13% crude fibers, 10.70% fats and 72.63% carbohydrates. *Suaeda fruticosa* showed 42.63% moisture contents, 8.26% ash, 10.86% crude proteins, 11% crude fibers, 12.03% fats and 69.86% carbohydrates. *Vitex negundo* showed 47.20% moisture content, 8% ash, 11.16% crude proteins, 21.13% crude fibers, 12.46% fats and 59.83% carbohydrates (Tables 3 and 4). Crude fibers, proteins, fats and oils, ash, moisture and carbohydrates contents of aerial parts of *Amaranthus viridus, Chenopodium album, Medicago denticulata, Setaria viridus* and *Sonchus arvensis* were determined by using Atomic Absorption Spectrophotometer [14]. Total ash, crude protein, crude fiber, nitrogen free extracts, acid detergent fiber, neutral detergent fiber, hemi-cellulose, carbohydrate and moisture contents from aerial part of five medicinal plants *Convolvulus arvensis, Rumex dentatus*, *Physalis divaricata*, *Achyranthes aspera* and *Chenopodium ambrosoides* of district Swabi, Khyber Pakhtunkhwa, Pakistan were determined [15]. The nutritional contents of *Achyranthes aspera, Solanum nigrum, Peganum harmala* and *Mentha longifolia* from Khushab Valley, Pakistan and results showed that *Mentha longifolia* had protein (7.491%) and ash (22.79%). *Peganum harmala* had fats (12.59%) and carbohydrate (75.23%) and *Achryanthus aspera* had moisture (6.82%) [16].

Table 1: Elemental analysis of some fodder plants of Darazinda area, F.R. D.I. Khan, Subtropical range, Pakistan

Plant Species	Phenological stages	C (ppm)	N (ppm)	O (ppm)	Na (ppm)	Mg (ppm)	Si (ppm)	Al (ppm)	P (ppm)	S (ppm)	Cl (ppm)	K (ppm)	Ca (ppm)	Cu (ppm)	Fe (ppm)
A.	Herbs														
1.Convunvulus prostrates L.	Pre-Rep	66.85	2.21	30.17	-	0.12	0.10	0.07	0.01	-	0.10	0.06	0.23	0.10	-
	Reproductive	64.65	2.23	32.43	-	0.09	0.18	0.11	0.01	0.05	0.05	0.04	0.15	-	-
	Post-Rep	66.20	2.21	30.84	-	0.08	0.18	0.12	0.01	-	0.07	0.07	0.21	-	-
	Mean	65.9	2.21	31.14		0.09	0.15	0.1	0.01		0.07	0.05	0.91	-	-
2. Portulaca quadrifida L.	Pre-Rep	54.90	6.11	36.69	0.24	0.50	0.16	0.16	0.07	0.06	0.08	1.05	0.13	-	-
	Reproductive	51.0	5.46	41.55	-	0.16	0.31	-	0.03	0.09	0.07	0.67	0.23	-	-
	Post-Rep	59.67	4.0	33.95	0.37	0.36	0.14	0.12	0.05	0.05	0.15	1.03	0.21	-	-
	Mean	55.19	5.19	37.39	0.30	0.34	0.20	0.09	0.05	0.06	0.1	0.90	0.19		-
3. Taraxicum officinale	Pre-Rep	60.29	4.24	31.35	0.21	0.21	0.75	0.18	0.02	0.96	0.15	0.84	0.68	-	-
	Reproductive	58.63	5.13	32.26	0.25	0.16	0.18	0.21	0.51	0.06	0.29	0.93	0.54	-	-
	Post-Rep	61.70	2.43	32.17	0.19	0.17	0.84	0.20	0.08	0.14	0.63	0.77	-	-	-
	Mean	60.20	3.93	31.92	0.21	0.18	0.59	0.19	0.20	0.38	0.35	0.84	0.40		
B.	Woody Plants														
4. Albizia lebbeck L.	Pre-Rep	62.28	4.16	32.50	-	0.27	0.12	-	0.06	0.07	0.06	0.14	0.26	0.07	0.06
	Reproductive	61.52	4.53	32.49	-	0.18	0.29	0.06	0.05	0.07	0.09	0.10	0.52	0.10	0.11
	Post-Rep	63.05	2.78	32.74	-	0.17	0.14	-	0.06	0.06	0.15	0.10	0.61	0.13	0.08
	Mean	62.28	3.82	32.57		0.20	0.18	0.06	0.05	0.06	0.1	0.11	0.46	0.1	0.083
5. Olea ferruginea Royle.	Pre-Rep	62.56	1.91	33.81	-	0.18	0.23	0.09	0.01	0.12	0.03	0.37	0.46	0.09	-
	Reproductive	59.37	4.60	34.34	-	0.14	0.24	0.11	0.02	0.09	0.05	0.37	0.42	0.16	-
	Post-Rep	60.63	4.65	32.46	-	0.22	0.33	0.12	0.02	0.09	0.04	0.63	0.49	0.16	-
	Mean	60.85	3.72	33.53		0.18	0.26	0.10	0.01	0.1	0.04	0.45	0.45	0.13	-
6.Salvadora oleoides	Pre-Rep	60.92	5.28	29.93	-	0.29	0.18	0.10	0.01	0.59	1.07	0.07	1.49	0.07	-
	Reproductive	60.17	10.8	27.27	-	0.18	0.16	0.07	0.01	0.20	0.51	-	0.59	-	-
	Post-Rep	66.44	1.78	28.20	-	0.23	0.20	0.10	0.05	0.53	1.01	0.06	1.37	0.08	-
	Mean	62.51	5.95	28.46		0.23	0.18	0.09	0.02	0.44	0.86	0.04	1.15	0.05	-
7. Suaeda fruticosa Forssk.	Pre-Rep	51.0	5.14	37.91	0.43	0.53	0.13	-	0.02	0.92	0.23	0.56	0.44	0.10	-
	Reproductive	50.0	3.71	39.86	0.44	0.71	0.17	0.07	0.03	1.42	0.21	0.74	0.66	-	-
	Post-Rep	54.27	3.50	38.57	0.35	0.57	0.14	-	0.04	1.09	0.20	0.61	0.58	0.09	-
	Mean	51.75	4.11	38.78	0.40	0.60	0.14	0.07	0.03	1.14	0.21	0.63	0.56	0.06	-
8.Vitex negundo L.	Pre-Rep	62.0	3.17	33.16	0.35	0.11	0.54	0.18	0.06	0.08	-	0.18	0.33	0.12	-
	Reproductive	61.0	2.12	34.93	0.32	0.15	0.39	0.14	0.02	0.02	-	0.12	0.06	0.08	-
	Post-Rep	62.92	2.72	32.10	0.37	0.13	0.71	0.21	0.02	0.11	-	0.25	0.54	0.17	-
	Mean	61.9	2.67	33.39	0.34	0.13	0.54	0.17	0.03	0.07		0.18	0.31	0.12	-

Table 2: T-test of the elemental analysis of some fodder plant species Darazinda area, F.R., D.I. Khan, Subtropical range, Pakistan

Pre-Rep		Reproductive		Post-Rep	
Herbs	Woody	Herbs	Woody	Herbs	Woody
Carbon (C)					
Herbs	Woody plants	Herbs	Woody plants	Herbs	Woody plants
66.85	62.28	64.65	61.52	66.20	63.05
54.90	62.56	66.20	59.37	59.67	60.63
60.29	60.92	58.63	60.17	61.70	66.44
	51.0		50.0		54.27
	62.0		61.0		62.92
0.760 NS		0.366 NS		0.745 NS	
Nitrogen (N)					
2.21	4.16	2.23	4.53	2.21	2.78
6.11	1.91	5.46	4.60	4.0	4.65
4.24	5.28	5.13	10.8	2.43	1.78
	5.14		3.71		3.50
	3.17		2.12		2.72
0.853 NS		0.336 NS		0.663 NS	
Oxygen (O)					
30.17	32.50	32.43	32.49	30.84	32.74
36.69	33.81	41.55	34.34	33.95	32.46
31.35	29.93	32.26	27.27	32.17	28.20
	37.91		39.86		38.57
	33.16		34.93		32.10
0.545 NS		0.201 NS		0.558 NS	
Sodium (Na)					
0.24	0.43	0	0.44	0.37	0.35
0.21	0.35	0.25	0.32	0.19	0.37
0.096 NS		0.251 NS		0.570 NS	

Table 2: Continued

Pre-Rep		Reproductive		Post-Rep	
Herbs	Woody	Herbs	Woody	Herbs	Woody
Magnesium (Mg)					
0.12	0.27	0.09	0.18	0.08	0.17
0.50	0.18	0.16	0.14	0.36	0.22
0.21	0.29	0.16	0.18	0.17	0.23
	0.53		0.71		0.57
	0.11		0.15		0.13
0.857 NS		0.449 NS		0.967 NS	
Silicon (Si)					
0.10	0.12	0.18	0.29	0.18	0.14
0.16	0.23	0.31	0.24	0.14	0.33
0.75	0.18	0.18	0.16	0.84	0.20
	0.13		0.17		0.14
	0.54		0.39		0.71
0.581 NS		0.912 NS		0.577 NS	
Aluminum (Al)					
0.07	0.00	0.11	0.06	0.12	0.00
0.16	0.09	0.00	0.11	0.12	0.12
0.18	0.10	0.21	0.07	0.20	0.10
	0.00		0.07		0.00
	0.18		0.14		0.21
0.002 S		0.750 NS		0.187 NS	
Phosphorus (P)					
0.01	0.06	0.01	0.05	0.01	0.06
0.07	0.01	0.03	0.02	0.05	0.02
0.02	0.01	0.51	0.01	0.08	0.05
	0.02		0.03		0.04
	0.06		0.02		0.02
0.853 NS		0.459 NS		0.912 NS	
Sulphur (S)					
0.00	0.07	0.05	0.07	0.00	0.06
0.06	0.12	0.09	0.09	0.05	0.09
0.96	0.59	0.06	0.20	0.14	0.53
	0.92		1.42		1.09
	0.08		0.02		0.11
0.637 NS		0.347 NS		0.287 NS	
Chlorine (Cl)					
0.10	0.06	0.05	0.09	0.07	0.15
0.08	0.03	0.07	0.05	0.15	0.04
0.15	1.07	0.29	0.51	0.63	1.01
	0.23		0.21		0.20
	0.00		0.00		0.00
0.480 NS		0.383 NS		0.499 NS	
Potassium (K)					
0.06	0.14	0.04	0.10	0.07	0.10
1.05	0.37	0.67	0.37	1.03	0.63
0.84	0.07	0.93	0.00	0.77	0.06
	0.56		0.74		0.61
	0.18		0.12		0.25
0.232 NS		0.310 NS		0.235 NS	
Calcium (Ca)					
0.23	0.26	0.15	0.52	0.21	0.61
0.13	0.46	0.23	0.42	0.21	0.49
0.68	1.49	0.54	0.59	0.00	1.37
	0.44		0.66		0.58
	0.33		0.06		0.54
0.228 NS		0.159 NS		0.186 NS	
Copper (Cu)					
0.10	0.07	0.00	0.10	0.00	0.13
0.00	0.09	0.00	0.16	0.00	0.16
0.00	0.07	0.00	0.00	0.00	0.08
	0.10		0.00	0.00	0.09
	0.12			0.08	0.17
0.363 NS		0.204 NS		0.02 S	
Iron (Fe)					
-	0.06	-	0.11	-	0.08
-	-	-		-	-
-	-	-		-	-
	-				-

Table 3: Nutritional analysis of some fodder plants of Darazinda area, F.R. D.I. Khan, Subtropical range, Pakistan

Plant species	Phenological stages	Moisture content (%)	Ash content (%)	Crude protein (%)	Crude fiber (%)	Fat contents (%)	Carbohydrate contents (%)
Herbs							
1.Convunvulus prostrates L.	Pre-Rep	52.1	10.1	5.5	4.3	3.2	80.1
	Reproductive	53.0	11.2	7.2	3.2	5.2	78.8
	Post-Rep	55.3	9.2	8.0	4.7	7.0	78.1
	Mean	53.46	10.16	6.9	4.06	5.13	79.0
2. Portulaca quadrifida L.	Pre-Rep	35.4	8.2	7.3	11.3	0.3	73.2
	Reproductive	36.1	9.1	6.2	12.3	0.7	72.4
	Post-Rep	42.0	7.3	5.7	12.9	1.5	74.1
	Mean	37.83	8.2	6.4	12.16	0.83	73.23
3. Taraxacum officinale	Pre-Rep	72.3	7.3	11.2	11.4	9.3	70.1
	Reproductive	73.1	8.2	10.3	10.2	10.2	71.3
	Post-Rep	75.5	7.0	9.3	12.0	11.0	71.7
	Mean	73.63	7.5	10.26	11.2	10.16	71.03
Woody Plants							
4. Albizia lebbeck L.	Pre-Rep	56.1	10.4	9.3	12.6	7.3	67.7
	Reproductive	58.2	11.3	8.5	11.6	8.1	68.6
	Post-Rep	60.0	9.5	6.9	13.0	9.0	70.6
	Mean	58.1	10.4	8.23	12.4	8.13	68.96
5. Olea ferruginea Royle	Pre-Rep	56.1	9.5	10.5	6.5	18.2	73.5
	Reproductive	57.0	10.1	5.6	6.8	20.1	77.5
	Post-Rep	58.5	8.3	9.5	7.5	22.1	74.7
	Mean	57.2	9.3	8.5	6.93	20.1	75.2
6.Salvadora oleoides	Pre-Rep	60.1	11.1	9.7	7.3	10.2	71.9
	Reproductive	61.3	9.4	8.9	8.1	10.5	73.6
	Post-Rep	63.5	8.2	10.4	9.0	11.6	72.4
	Mean	61.6	9.56	9.6	8.13	10.7	72.63
7. Suaeda fruticosa Forssk	Pre-Rep	40.1	8.5	13.2	11.2	12.0	67.1
	Reproductive	42.3	9.0	10.2	9.8	11.1	71.0
	Post-Rep	45.5	7.3	9.2	12.0	13.0	71.5
8. Vitex negundo L.	Mean	42.63	8.26	10.86	11.0	12.03	69.86
	Pre-Rep	46.1	9.1	8.6	20.1	11.5	62.6
	Reproductive	47.0	8.4	11.4	21.0	12.1	59.2
	Post-Rep	48.5	6.5	13.5	22.3	13.8	57.7
	Mean	47.2	8.0	11.16	21.13	12.46	59.83

Table 4: T-test of the nutritional analysis of some fodder plant species Darazinda area, F.R., D.I. Khan, Subtropical range, Pakistan

Pre-Rep		Reproductive		Post-Rep	
Herbs	Woody	Herb	Woody	Herb	Woody
Moisture content (%)					
52.1	56.1	53.0	58.2	55.3	60.0
35.4	56.1	36.1	57.0	42.0	58.5
72.3	60.1	73.1	61.3	75.5	63.5
	40.1		42.3		45.5
	46.1		47.0		48.5
0.704 NS		0.664 NS		0.746 NS	
Ash content (%)					
10.1	10.4	11.2	11.3	9.2	9.5
8.2	9.5	9.1	10.1	7.3	8.3
7.3	11.1	8.2	9.4	7.0	8.2
	8.5		9.0		7.3
	9.1		8.4		6.5
0.226 NS		0.152 NS		0.93 NS	
Crude protein (%)					
5.5	9.3	7.2	8.5	8.0	6.9
7.3	10.5	6.2	5.6	5.7	9.5
11.2	9.7	10.3	8.9	9.3	10.4
	13.2		10.2		9.2
	8.6		11.4		13.5
0.388 NS		0.798 NS		0.466 NS	
Crude fiber (%)					
4.3	12.6	3.2	11.6	4.7	13.0
11.3	6.5	12.3	6.8	12.9	7.5
11.4	7.3	10.2	8.1	12.0	9.0
	11.2		9.8		12.0
	20.1		21.0		22.3
0.967 NS		0.955 NS		0.994 NS	

Table 4: Continued

Pre-Rep		Reproductive		Post-Rep	
Herbs	Woody	Herb	Woody	Herb	Woody
Fat contents (%)					
3.2	7.3	5.2	8.1	7.0	9.0
0.3	18.2	0.7	20.1	1.5	22.1
9.3	10.2	10.2	10.5	11.0	11.6
	12.0		11.1		13.0
	11.5		12.1		13.8
0.281 NS		0.335 NS		0.353 NS	
Carbohydrate contents (%)					
80.1	67.7	78.8	68.6	78.1	70.6
73.2	73.5	72.4	77.5	74.1	74.7
70.1	71.9	71.3	73.6	71.7	72.4
	67.1		71.0		71.5
	62.6		59.2		57.7
0.526 NS		0.861 NS		0.526 NS	

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