Research Article
Open Access

Nutritional and elemental analysis of some selected fodder plants of Darazinda FRDI Khan, Pakistan

Abstract

Eight species Convunvulus prostrates, Portulaca quadrifida, Taraxacum officinale Albizia lebbeck, Olea ferruginea, Salvadora oleoides, Suaeda fruticosa and Vitex negundo were analyzed for macro and micro minerals in three phenological stages i-e Pre-reproductive, reproductive and post reproductive stages which showed that Ca, Al, P, N, S, Na, K, Mg were macro and Fe, Si, Cu and Cl were micro-nutrients. 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.

Volume 4 Issue 1 - 2016

Ulfat Samreen, Muhammad Ibrar, Lal badshah, Barkat Ullah

Department of Botany, University of Peshawar, Pakistan

Correspondence: Ulfat Samreen, Department of Botany, University of Peshawar, Pakistan,
Email goldenbookpk53@yahoo.com

Received: January 14, 2016 | **Published:** July 08, 2016

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.[2,3] 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 30million herds of livestock support by rangelands, which play an important role in Pakistan annual export income.[4] 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.[5] 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.[6] Al does not affect the seed germination, but impair the growth of new roots and establishment of seedling.[7] The common responses of shoots to Al are: ultrastructural 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 leaf and shoot biomass decrease.[8] Sulphur is an important element, which take active part in protein forming nutrients. Sulphur deficiency can also result in Nitrogen deficiency. Due to S deficiency cereals and forage grasses, yellowing of newly emerging leaves occur. S deficiency also leads to cupping and purpling of leaves.[9] 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.[10] 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, 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".[11]

Materials and methods

Chemical analysis of some forage plants

Eight palatable plants species were collected from the research area. For mineral and proximate analysis these plants were dried, powdered and stored in plastic bags.

Mineral composition

Plant samples were dried at 70°C in air tight oven for 48 hour following method of AOAC.[12] For mineral composition of Ca, Mg, Fe, Mn, Zn, Cu, etc the powdered plant materials were analyzed by using Spectrometer of Atomic Absorption.[13–15]

Statistical analysis

Statistically t-test was applied for chemical contents comparison of herbaceous and woody plant species.

Proximate analysis

Determination of the moisture

Equipment and glassware: Electric balance, Electric oven, Petri dish and desiccators

Procedure: In a clean weighted Petridish about 2gram of respective eight plants samples were taken respectively (W1). The Petri dishes were partially covered with lid, placed in electric oven at temperature of 105°C for 4-6hours, and was then transferred these petri dishes to

desiccators for 30 minutes to cool down; after that, weighted again (W2) of these Petri dishes. The following formula for calculating percent moisture contents was as follow.[16]

% Moisture = X/wt of sample ×100

Where

$X=W_2 - W_1$= Weight of the sample (after heating)

W_2=Wt of empty Petri dish+after heating of sample

W_1=Empty Petri dish Wt

Ash Contents: At 550°C- 600°C for 8 hrs in the muffle furnace one to two grams of plant sample was ignited and ash contents of samples were determined by following method AOAC.[12] Ash contents percentage were calculated by following formula:

$$\%Ash\ Content = \frac{Wt\ of\ ash}{Wt\ of\ fresh\ Sample} \times 100$$

Nitrogen/Crude Protein

Determination of proteins by "Macrojeldahl distillation method"

Reagents: 32% NaOH, Conc. H_2SO_4, 4% Boric Acid, K2SO4, CuSO4 and 0.1 N standard HCl solution.

Mixed indicator: Dissolve 0.016g of methyl red and 0.03g of bromocresol green in 100 ml of alcohol.

Apparatus: Kjeldahl flask, apparatus of digestion and distillation, burette etc

Digestion of Plant: Determination of all nutrients involved wet digestion of plant samples. One gm plant sample add in concentrated selenium sulphuric acid and hydrogen peroxide was added to each digestion tube for digestion. On heating blocks these digestion tubes with sample was heated. In order to remove the color digestion was continued at 350°C. Then these prepared solutions were diluted with distilled water and stored in tubes. These solutions were used for the analysis of nitrogen /crude protein, crude fiber etc by using following methods.

Procedure: By Macro kjeldahl method Protein (% Nx6.25) was determined. One gram of dry ground plants samples were taken in digestion flask repectively. Digestion mixture (Cu SO4, K2SO4 and ferrous sulphate in the ratio of 5, 94 and 1 respectively) then added 25 ml of conc Sulphuric acid 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. After distillation, for titration it was then collected in flask. Add 0.1 N HCl in burette to the content of the flask. Noted the reading and the percentage of protein was determined using the following formula.[15]

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

V_1= Reading of sample after titration

V_2= 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 Fiber

Fat determination (ether extract)

Chemicals, Equipment and glassware: H.T (Tecator), Petroleum ether B.P (40-60°C), Soxhlet extraction apparatus, Extraction thimbles, water bath, heating mantle.

Procedure: For the extraction of crude Fat Soxhlet apparatus was used[17] 2gram of each plant sample was packed in filter paper (cellulose extraction thimble) and placed in apparatus of extraction chamber. A clean and dried pre weighted round bottom flask of 250ml filled with Petroleum ether and connected to the extraction tube containing thimble. The apparatus of soxhlet run for 5-6hours. The solvent extract in the round bottom flask was evaporated by using water bath and then reweighted (W2). Percentage of fats was then calculated by the following formula.[15]

$$\%\ Crude\ fibers = \frac{X}{Wt\ of\ Sample} \times 100$$

X = W2 - W1= Wt of the fats

W1 = Empty flask Wt

W2 = Empty flask Wt + sample Wt after solvent evaporation.

Determination of crude fiber

Glassware and Equipment: Muffle furnace, apparatus of crude fiber extraction (Fiber Tec System M. Tecator), Suction pump and oven.

Reagents: Sulphuric Acid (H_2SO_4) 0.255N, Sodium Hydroxide (NaOH) 0.313 N, Asbestos, Ethyl Alcohol and Petroleum Ether.

Procedure: 2gms of these residue materials remaining from crude fat were transferred to digestion flask along with 0.5g asbestos and about 200 ml boiling 0.255 N, H_2SO_4 was added. For 30minutes the flask was connected to the condenser and boiled. 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 0.313N of NaOH. Addition of NaOH was continued till the volume reached to 200ml. For 30minutes 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 (15ml). The residue was transferred to crucible and dried at 110°C in hot air oven (W_1). These crucibles were then transferred to the muffle furnace, ignited till it converted into white grey powder (W_2). Crude fibers were then calculated by following formula.[15]

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

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

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

Citation: Samreen U, Ibrar M, badshah L, et al. Nutritional and elemental analysis of some selected fodder plants of Darazinda FRDI Khan, Pakistan . *Adv Plants Agric Res.* 2016;4(1):232–240. DOI: 10.15406/apar.2016.04.00127

Results and discussion

Elemental analysis

The present data showed that at three phonological stages *Convunvulus prostrates*L. (0.91ppm), *Portulaca quadrifida*L.,(0.19ppm), *Taraxacum officinale* (0.40ppm) while woody plants like *Albizia lebbeck* L. (0.46ppm), *Olea ferruginea* Royle (0.45ppm), *Salvadora oleoides*(1.15ppm)**,** *Suaeda fruticosa* Forssk. (0.56ppm) and *Vitex negundo* L. was 0.31ppm. *Convunvulus prostrates* L. (0.05ppm), *Portulaca quadrifida*L.,(0.90ppm), *Taraxacum officinale* (0.84 ppm) while woody plants like *Albizia lebbeck* L. (0.11ppm), *Olea ferruginea* Royle (0.45ppm), *Salvadora oleoides*(0.04ppm), *Suaeda fruticosa* Forssk. (0.63ppm) and *Vitex negundo* L. was 0.18ppm (Table 1) (Table 2). *Portulaca quadrifolia* L.,(0.30ppm), *Taraxacum officinale* (0.21ppm) while woody plants like *Suaeda fruticosa* (0.40ppm) and *Vitex negundo* L. was 0.34ppm. The average P contents in herbs and woody plants 0.01ppm (*Convunvulus prostrates*), 0.05ppm (*Portulaca quadrifida*), 0.20ppm(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (0.05ppm), *Olea ferruginea* (0.01ppm), *Salvadora oleoides*(0.02ppm), *Suaeda fruticosa* (0.03ppm) and *Vitex negundo* was 0.03ppm. The average Nitrogen content 2.21ppm (*Convunvulus prostrates*), 5.19ppm (*Portulaca quadrifida*), 3.93ppm(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (3.82ppm), *Olea ferruginea* (3.72ppm), *Salvadora oleoides*(5.95ppm), *Suaeda fruticosa*(4.11ppm) and *Vitex negundo* was 2.67ppm (Table 1) (Table 2). Mg content 0.09ppm (*Convunvulus prostrates*), 0.34ppm (*Portulaca quadrifida*), 0.18ppm(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (0.20ppm), *Olea ferruginea* (0.18ppm), *Salvadora oleoides*(0.23ppm), *Suaeda fruticosa*(0.60ppm) and *Vitex negundo* was 0.13ppm. Mg content 0.09ppm (*Convunvulus prostrates*), 0.34ppm (*Portulaca quadrifida*), 0.18ppm(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (0.20ppm), *Olea ferruginea* (0.18ppm), *Salvadora oleoides*(0.23ppm), *Suaeda fruticosa*(0.60ppm) and *Vitex negundo* was 0.13ppm. Al content in tested plants 0.1ppm (*Convunvulus prostrates*), 0.09ppm (*Portulaca quadrifida*), 0.19ppm(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (0.06ppm), *Olea ferruginea* (0.10ppm), *Salvadora oleoides*(0.09ppm), *Suaeda fruticosa*(0.07ppm) and *Vitex negundo* was 0.17ppm.Sulphur content in tested species were 0.05ppm (*Convunvulus prostrates*), 0.06ppm (*Portulaca quadrifida*), 0.38ppm(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (0.06ppm), *Olea ferruginea* (0.1ppm), *Salvadora oleoides*(0.44ppm), *Suaeda fruticosa*(1.14ppm) while in *Vitex negundo* 0.07ppm. Chlorine is present in 0.07ppm (*Convunvulus prostrates*), 0.1ppm (*Portulaca quadrifida*), 0.35ppm(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (0.1ppm), *Olea ferruginea* (0.04ppm), *Salvadora oleoides*(0.86ppm), *Suaeda fruticosa*(0.21ppm) while in *Vitex negundo* chlorine was absent. Si contents in tested plants 0.15% (*Convunvulus prostrates*), 0.20% (*Portulaca quadrifida*), 0.59%(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (0.18%), *Olea ferruginea* (0.26%), *Salvadora oleoides*(0.18ppm), *Suaeda fruticosa*(0.14ppm) while in *Vitex negundo* was 0.54ppm. Recent results showed that 0.01% (*Convunvulus prostrates*) at pre reproductive stage, *Portulaca quadrifida* and(*Taraxacum officinale* have no copperwhile woody plants like *Albizia lebbeck* (0.1ppm), *Olea ferruginea* (0.13ppm), *Salvadora oleoides*(0.05ppm), *Suaeda fruticosa*(0.06ppm) while in *Vitex negundo* 0.12ppm. Bahadur *et al.,*[18] evaluate the elemental analysis of some fodder plant species like *Amaranthes viridus, Chenopodium album, Medicago denticulata, Setaria viridus* and *Sonchus arvrnsis*. Elemental composition of aerial parts was determined by using Atomic Absorption Spectrophotometer (AAS). A total of 16elements; Na, Mg, Rb, Al, Si, P, S, K, Ca, Fe, Ti, Ni, Cl, Mn, Cu and Zn were observed. Tahira *et al.,*[19] evaluate 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. 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. Ghani *et al.,*[20] evaluate mineral contents of four medicinal plants like *Achryanthus aspera, Solanum nigrum*, *Peganum hermla*and *Mentha longifolia* of Khushab Valley,Pakistan. For elemental analysis AbsorptionSpectrometric method was used for essential elements such as Cu, Na, Fe, Cd, Mn, Ni, Pb and Crwere present in medicinal plants (Figures 1-8).

Nutrinional analysis

Moisture content showed that herbs and woody plants have 53.46% (*Convunvulus prostrates*), 37.83% (*Portulaca quadrifida*), 73.63%(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (58%), *Olea ferruginea* (57.2%), *Salvadora oleoides*(61.6%), *Suaeda fruticosa* (42.63%) and in *Vitex negundo* was 47.2%. ash contents of herbs and woody plants were 10.16% (*Convunvulus prostrates*), 8.2% (*Portulaca quadrifida*), 7.5%(*Taraxacum officinale*) while woody plants like *Albizia lebbeck* (10.4%), *Olea ferruginea* (9.3%), *Salvadora oleoides*(9.56%), *Suaeda fruticosa*(8.26%) while in *Vitex negundo* 08%. crude proteins in herbs and woody species were 6.9% (*Convunvulus prostrates*), 6.4% (*Portulaca quadrifida*), 10.26%(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (8.23%), *Olea ferruginea* (8.5%), *Salvadora oleoides*(9.6%), *Suaeda fruticosa*(10.86%) while in *Vitex negundo* 11.16%. crude fiber of herbs and woody species were 4.06% (*Convunvulus prostrates*), 12.16% (*Portulaca quadrifida*), 11.2%(*Taraxacum officinale*) while woody plants like *Albizia lebbeck* (12.4%), *Olea ferruginea* (6.93%), *Salvadora oleoides*(8.13%), *Suaeda fruticosa*(11%) while in *Vitex negundo* high crude fiber 21.13%. high fat contents were present in woody plants in which *Olea ferruginea* with 20.1%. Fat content of herbs showed that 5.13% (*Convunvulus prostrates*), 0.83% (*Portulaca quadrifida*), 10.16%(*Taraxacum officinale*) while woody species like *Albizia lebbeck* (8.13%), *Salvadora oleoides* (10.7%), *Suaeda fruticosa* (12.03%) and *Vitex negundo* with 12.46%. showed that 79% (*Convunvulus prostrates*), 73.23% (*Portulaca quadrifida*), 71.03%(*Taraxacum officinale*)while woody plants like *Albizia lebbeck* (68.96%), *Olea ferruginea* (75.2%), *Salvadora oleoides*(72.63%), *Suaeda fruticosa*(69.86%) and *Vitex negundo* 59.83% (Table 3) and (Table 4). Bahadur *et al.,*[18] evaluate the nutritional analysis of some fodder plant species like *Amaranthes viridus, Chenopodium album, Medicago denticulata, Setaria viridus* and *Sonchus arvrnsis*. Proximate composition of crude fibers, proteins, fats and oils, ash, moisture and carbohydrates contents of aerial parts was determined by using Atomic Absorption Spectrophotometer (AAS). Tahira *et al.,*[19] evaluate the nutritional 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. Nutritional analysis like total ash, crude protein, crude fiber, nitrogen free extracts, acid detergent fiber, neutral detergent fiber, hemi-cellulose, carbohydrate and moisture contents of wild medicinal plant species were determined and showed significant results. Ghani *et al.,*[20] evaluate

Citation: Samreen U, Ibrar M, badshah L, et al. Nutritional and elemental analysis of some selected fodder plants of Darazinda FRDI Khan, Pakistan . *Adv Plants Agric Res.* 2016;4(1):232–240. DOI: 10.15406/apar.2016.04.00127

nutritional contents of four medicinal plants like *Achryanthus aspera, Solanum nigrum*, *Peganum hermla*and *Mentha longifolia* of Khushab Valley, Pakistan. Proximate analysis showed that in *Mentha longifolia* protein (7.491%), ash (22.79%) was highestand in *Peganum hermla,* fats (12.595%) carbohydrate (75.23%) and in *Achryanthus aspera* moisture (6.82%) was present.

Table 2 Test of elemental analysis of plants species

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	66.2	63.05
54.9	62.56	66.2	59.37	59.67	60.63
60.29	60.92	58.63	60.17	61.7	66.44
	51		50		54.27
	62		61		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	4.6	4	4.65
4.24	5.28	5.13	10.8	2.43	1.78
	5.14		3.71		3.5
	3.17		2.12		2.72
0.853 NS		0.336 NS		0.663 NS	
Oxygen (O)					
30.17	32.5	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	28.2
	37.91		39.86		38.57
	33.16		34.93		32.1
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	
Magnesium (Mg)					
0.12	0.27	0.09	0.18	0.08	0.17
0.5	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)					
0.1	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	0.2
	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	0.11	0.06	0.12	0
0.16	0.09	0	0.11	0.12	0.12
0.18	0.1	0.21	0.07	0.2	0.1

Citation: Samreen U, Ibrar M, badshah L, et al. Nutritional and elemental analysis of some selected fodder plants of Darazinda FRDI Khan, Pakistan . *Adv Plants Agric Res.* 2016;4(1):232–240. DOI: 10.15406/apar.2016.04.00127

Table Continued

Pre-Rep		Reproductive		Post-Rep	
	0		0.07		0
	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	0.07	0.05	0.07	0	0.06
0.06	0.12	0.09	0.09	0.05	0.09
0.96	0.59	0.06	0.2	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)					
0.1	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		0.2
	0		0		0
0.480 NS		0.383 NS		0.499 NS	
Potassium (K)					
0.06	0.14	0.04	0.1	0.07	0.1
1.05	0.37	0.67	0.37	1.03	0.63
0.84	0.07	0.93	0	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	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)					
0.1	0.07	0	0.1	0	0.13
0	0.09	0	0.16	0	0.16
0	0.07	0	0	0	0.08
	0.1		0	0	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
-	-	-		-	-
-	-	-		-	-
	-				-

Citation: Samreen U, Ibrar M, badshah L, et al. Nutritional and elemental analysis of some selected fodder plants of Darazinda FRDI Khan, Pakistan . *Adv Plants Agric Res.* 2016;4(1):232–240. DOI: 10.15406/apar.2016.04.00127

Table 3 Nutrional analysis of some plants of Darazinda

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	11.2	7.2	3.2	5.2	78.8
	Post-Rep	55.3	9.2	8	4.7	7	78.1
	Mean	53.46	10.16	6.9	4.06	5.13	79
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	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	9.3	12	11	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	9.5	6.9	13	9	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	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	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	67.1
	Reproductive	42.3	9	10.2	9.8	11.1	71
	Post-Rep	45.5	7.3	9.2	12	13	71.5
	Mean	42.63	8.26	10.86	11	12.03	69.86
8. Vitex negundo L.	Pre-Rep	46.1	9.1	8.6	20.1	11.5	62.6
	Reproductive	47	8.4	11.4	21	12.1	59.2
	Post-Rep	48.5	6.5	13.5	22.3	13.8	57.7
	Mean	47.2	8	11.16	21.13	12.46	59.83

Citation: Samreen U, Ibrar M, badshah L, et al. Nutritional and elemental analysis of some selected fodder plants of Darazinda FRDI Khan, Pakistan . *Adv Plants Agric Res.* 2016;4(1):232–240. DOI: 10.15406/apar.2016.04.00127

Table 4 Statistical analysis (t. test) of nutrinional analysis

Pre-Rep		**Reproductive**		**Post-Rep**	
Herbs	**Woody**	**Herb**	**Woody**	**Herb**	**Woody**
Moisture content (%)					
52.1	56.1	53	58.2	55.3	60
35.4	56.1	36.1	57	42	58.5
72.3	60.1	73.1	61.3	75.5	63.5
	40.1		42.3		45.5
	46.1		47		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	8.2
	8.5		9		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	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
11.3	6.5	12.3	6.8	12.9	7.5
11.4	7.3	10.2	8.1	12	9
	11.2		9.8		12
	20.1		21		22.3
0.967 NS		0.955 NS		0.994 NS	
Fat contents (%)					
3.2	7.3	5.2	8.1	7	9
0.3	18.2	0.7	20.1	1.5	22.1
9.3	10.2	10.2	10.5	11	11.6
	12		11.1		13
	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		71.5
	62.6		59.2		57.7
0.526 NS		0.861 NS		0.526 NS	

Citation: Samreen U, Ibrar M, badshah L, et al. Nutritional and elemental analysis of some selected fodder plants of Darazinda FRDI Khan, Pakistan . *Adv Plants Agric Res.* 2016;4(1):232–240. DOI: 10.15406/apar.2016.04.00127

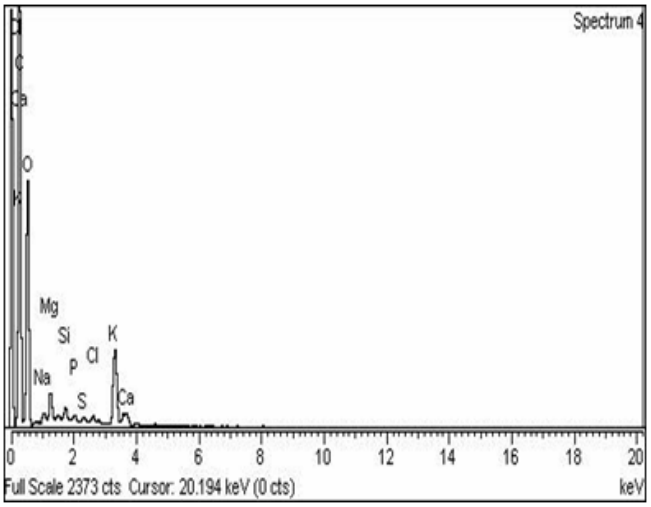

Figure 1 *Portulaca olaraceae.*

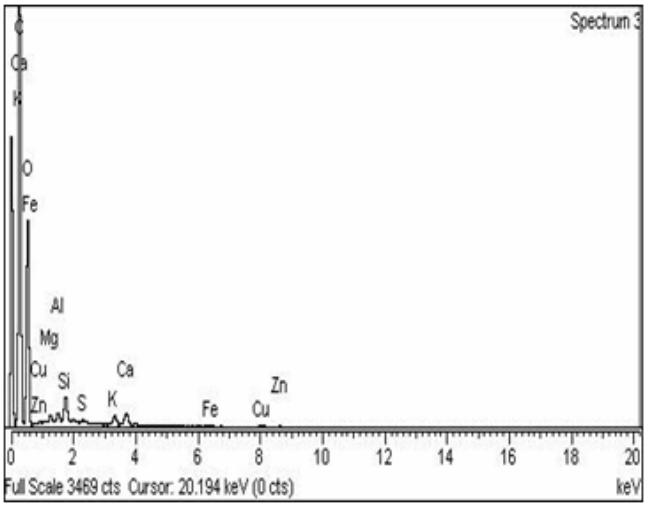

Figure 4 Vitex nugundu.

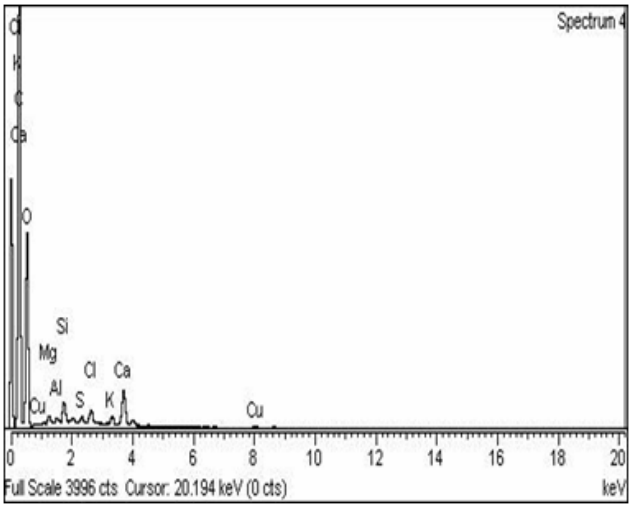

Figure 2 *Albezia lebbek.*

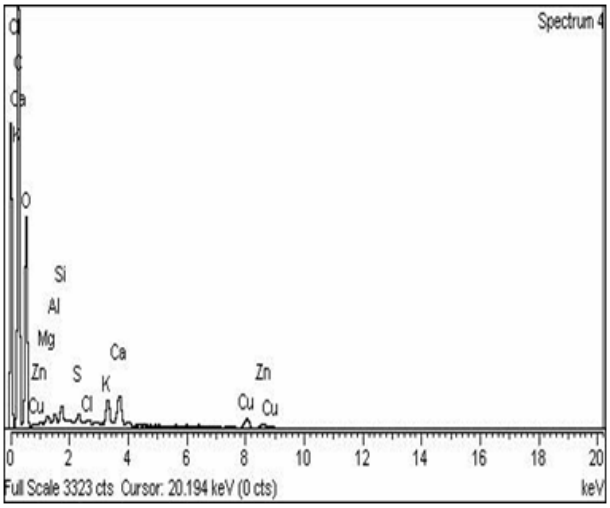

Figure 5 *Olea ferruginea.*

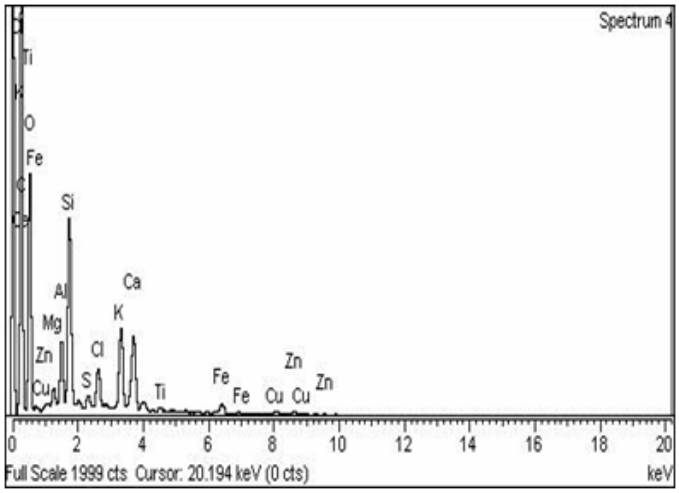

Figure 3 *Taraxicum officinale.*

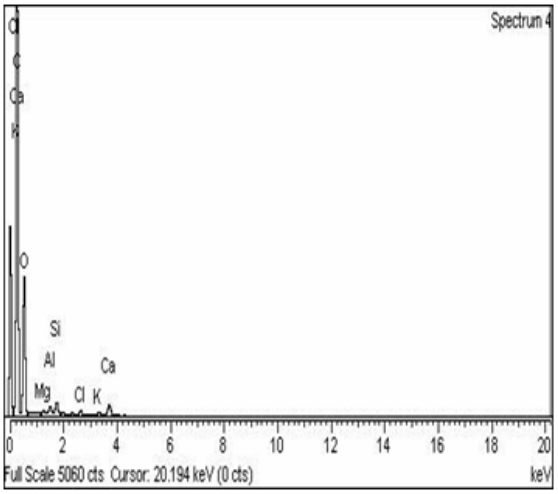

Figure 6 *Convulus prostrate.*

Citation: Samreen U, Ibrar M, badshah L, et al. Nutritional and elemental analysis of some selected fodder plants of Darazinda FRDI Khan, Pakistan . *Adv Plants Agric Res.* 2016;4(1):232–240. DOI: 10.15406/apar.2016.04.00127

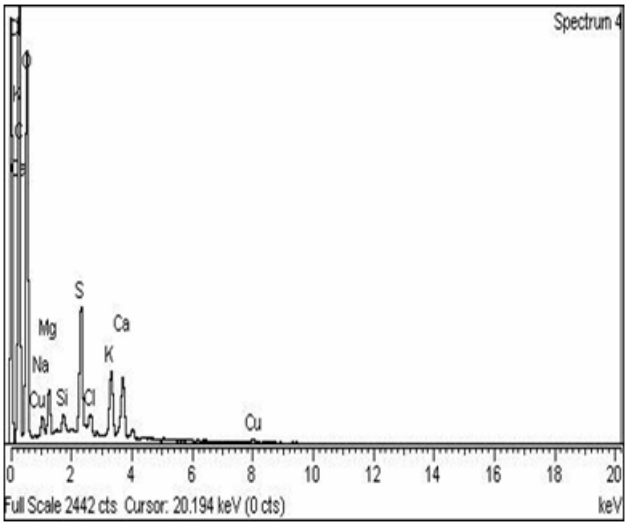

Figure 7 Suaeda fruticosa.

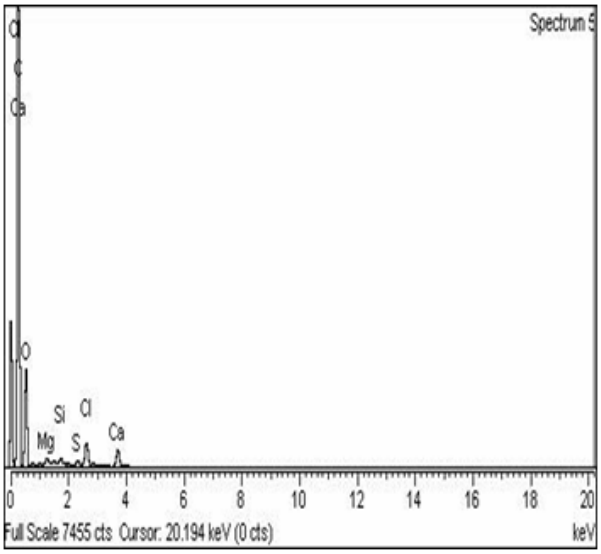

Figure 8 Salvadora oleoides.

Acknowledgements

None.

Conflict of interest

The author declares no conflict of interest.

References

1. Hussain F, Durrani MJ. Seasonal availability, palatability and animal preferences of forage plants in Harboi arid range land. *Pak J Bot*. 2009;41(2):539–554.
2. Ganskopp D, Bohnert D. Mineral concentration dynamics among 7 northern Great Basin grasses. *J Range Management*. 2003;56:174–184.
3. Anonymous. *Economic Survey*. Government of Pakistan, Finance Division, Islamabad, Pakistan; 2006.
4. Chang YC, Yamamoto Y, Matsumoto H. Accumulation of aluminium in the cell wall pectin in cultured tobacco (Nicotiana tabacum L.) cells treated with a combination of aluminium and iron. *Plant Cell Environ*. 1999;22:1009–1017.
5. Mossor–Pietraszewska T, Kwit M, £êgiewicz M. The influence of aluminium ions on activity changes of some dehydrogenases and aminotransferases in yellow lupine. *Biol Bull Poznañ*. 1997;34:47–48.
6. Nosko P, Brassard P, Krame JR, et al. The effect of aluminum on seed germination and early seedling establishment, growth and respiration of white spruce (Picea glauca). *Can J Bot*. 1988;66(11):2305–2310.
7. Thornton FC, Schaedle M, Raynal DL. Effect of aluminum on the growth of sugar maple in solution culture. *Can J For Res*. 1986;16(5):892–896.
8. Sahota TS. Importance of Sulphur in crop production. *Ontario Farmer*. 2005;38(42):25.
9. Perry R Stout, Johnson CM, Broyer TC. *Chlorine in Plant Nutrition experiments with plants in nutrient solutions establish chlorine as a micronutrient essential to plant growth*. California agriculture; 1956. 10 p.
10. Smith A, Nutrifert. *Silicon's key role in plant growth*. Australian Grainp; 2011. 35 p.
11. AOAC. *Official Methods of Analysis*. 15th ed. Washington, DC, USA: Association of Official Analytical Chemists; 1990;5:3–10.
12. Anonymous. *Manual for Feed Analytical Laboratory*. Islamabad, Pakistan: PARC; 1982.
13. Anonymous. Nutrient requirements of domestic animals. No5. *Nutrient requirements of sheep*. Washington DC, USA: Nat Acad Sci Nat Res Council; 1985.
14. Galyean M. *Techniques and Procedures in Animal Nutrition Research*. Department Animal & Range Conditions: New Mexico State University; 1985.
15. AOAC (Association of Official Analytical Chemists). *Official methods of analysis*. Gaithersburg, MD, Washington, USA; 2000.
16. AOAC. *Official Methods of Analysis*. 11th ed. Washington, DC, USA: Association of Official Analytical Chemists; 1984.
17. Zarnowski R, Suzuki Y. Expedient Soxhlet extraction of resorcinolic lipids from wheat grains. *Jour Food Comp & Anal*. 2004;17(5):649–663.
18. Bahadur A, Chaudhry Z, Jan G, et al. Nutritional and elemental analyses of some selected fodder species used in traditional medicine. *African Journal of Pharmacy and Pharmacology*. 2011;5(8):1157–1161.
19. Tahira M, Bahadur A, Shah Z, et al. Elemental and Nutritional analysis and Ethnomedicinal study of selected wild plants species of district Swabi. *Journal of Pharmacy Research*. 2012;5(9):4910–4913.
20. Ghani A, Ali Z, Islam T, et al. Nutrient evaluation and elemental analysis of four selected medicinal plants of soon valley Khushab. *Pak J Pharm Sci*. 2014;27(3):597–600.