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Effect of drinking saline water on performance, digestibility and nitrogen utilization of growing camels feed different quality roughages

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Abstract— *This study was conducted to evaluate the effect of three roughages that were fed ad lib. with two types of water on feed intake, digestibility, water utilization and performance of growing she-camels. Twenty-four healthy growing she-camels (30-36 months old and 448.50 ± 29.30 kg body weight) were housed individually in metabolic cages and randomly allotted to three treatments. The experiment lasted for 60 days. Three roughages were Egyptian clover hay to represent optimum grazing conditions, rice straw to represent dry season grazing and Atriplex halimus to represent arid rangelands dominated by halophytes. Roughages offered to camels ad lib. The concentrates used were corn grains and cottonseed meal. Concentrate intakes calculated, per unit metabolic body weight (kg0.73). Final body weight and ADG were affected by roughages. Nutrients intake was affected (P<0.05) by roughage type but not for drinking water and their interaction. Camels fed Atriplex had higher (P<0.05) in dry matter intake, roughage intake and roughage (% DMI) than hay and straw. Corn intake was greater (P<0.05) in camels fed Atriplex and straw whereas, was lower (P<0.05) in camels fed hay. Camels fed hay had higher (P<0.05) in dry matter digestibility followed by straw and then Atriplex. Organic matter, crude fiber and Nitrogen free extract digestibility were higher (P<0.05) in camels fed hay and straw as compared to Atriplex whereas, crude protein was higher (P<0.05) in Atriplex and hay as compared to straw. Free water intake, feed water, total water intake and fecal water were higher (P<0.05) in camels fed Atriplex as compared to hay and straw. Urinary water was higher (P<0.05) in camels fed Atriplex followed by hay and then straw. Free water intake, feed water, total water intake and fecal water were higher (P<0.05) in camels fed Atriplex as compared to hay and straw. Urinary water excretion was higher (P<0.05) in camels fed Atriplex followed by hay and then straw. In conclusion, camels fed on Atriplex showed a clear improvement in growth, digestibility, and nitrogen utilization in a similar way to camels fed on hay.*

Keywords— ***growing she-camels, roughages type, water type, intake, performance, water utilization.***

I. INTRODUCTION

Dromedary camel (*Camelus dromedarius*) is an important livestock species that is exceptionally well adapted to harsh environmental conditions. They are functionally and metabolically ruminant herbivores. Ruminant herbivores are distinguished by their multipart stomach. This anatomical structure and the microorganisms that inhabit the rumen network allow for longer retention of ingested feed and anaerobic microbial digestion of cellulosic materials, and consequently production of volatile fatty acids and microbial protein synthesis. Camels are bred because of their extraordinary strength to withstand hunger and thirst for a long time in the environmental conditions [1] In addition, its high ability to convert scarce desert resources into milk and meat makes it even more important to pastoralists [2,3].

Camels are non-selective grazers with a digestive system that has evolved - adapt to unfavorable conditions and has a greater activity of cellulolytic bacteria [6,7] Camels had a greater capacity to utilize low-quality roughages that are high in NDF and ADF and less digestible[6,7]. Camels are typically associated with a

lower feed intake and greater efficiency of forage utilization, which may be due to their large body size and longer retention time, which gives more opportunity for microorganisms to digest non-structure carbohydrates [7]. On the other hand, camels prefer to consume salty bushes which are rich in moisture and salt. Salts present in such plants help to meet the physiological functions of camels [8,9] reported that the high moisture content of salt bushes ensures a good portion of the camel water requirement in areas where water is the most limiting factor for animals. Feeding halophytes especially for camels can be an appropriate method in arid regions to reduce the problem of forage shortage. Camels have adapted rumen microbial communities that enable them to take advantage of the non-protein nitrogen found in halophytes.

Camels have adapted mechanisms that allow it to withstand prolonged water deprivation especially in the absence of readily available water and survive when feed resources are scarce or of poor quality [10]. Camels are able to replenish in a relative short period of time the water lost. Whereas changes of water metabolism, body fluid and its regulation, body temperature, kidney function, appetite and hormonal aspects during dehydration have been studied in the past [11-14].

Lack of forage and water deprivation are important barriers to camel production in arid and semi-arid regions of the harsh climate. However, they are slowly being replaced by stable systems which should properly take into account the feeding of camels in these systems. Therefore, the present study was conducted to evaluate the effect of different forages and types of water on intake, nutrient digestibility, and performance of camels.

II. MATERIALS AND METHODS

The experiment was conducted at Maryout Research Station, Desert Research Center, Alexandria, Egypt.

2.1. Animals, diets, and experimental design

Twenty-four healthy growing she-camels (*Camelus dromedarius*) with an average initial body weight (BW) of 448.50 ± 29.30 kg and 30-36 months old were used and the experiment lasted for 60 days. Animals were housed individually in shaded floor pens for the duration of the experiment. The experiment was arranged as a 3 × 2 factorial experiment in a completely randomized design by using three forages and two types of water. Animal were weighed every two weeks after overnight fast and on two consecutive days and the average daily gain (ADG) was calculated.

The three roughages were used to represent the prevailing different grazing conditions in arid rangelands. Those were Egyptian clover hay to represent optimum grazing conditions, rice straw to represent dry season grazing and *Atriplex halimus* to represent arid rangelands dominated by halophytes. The concentrates used were corn grains and cottonseed meal selected as the commonly used energy and protein supplements, respectively. Roughages offered to camels *ad lib*. twice daily at 8:00 and 16:00 hours. Refusals were weighed at the following morning and daily intake was recorded on dry matter basis. Concentrate intakes calculated, per unit metabolic weight (kg 0.73), from a previous experiment [15], actual intake is presented below. in an attempt to control anticipated excessive soluble carbohydrates intake and possible adverse effects on rumen function and feed utilization [15]. The animals are drunk once every day, either tap water or salty 10,000 parts per million. The proximate composition of feed ingredients is presented in Table 1. Refusals were weighed daily, and feed intake was recorded. Samples of the roughages and concentrates were collected and analyzed for DM by drying to constant weight in a forced-air oven at 60℃ for 48 h [16]. Samples were pooled for each camel.

Table 1. Proximate composition of feed ingredients, % DM basis.

Proximate Constituents	Corn grains	Cottonseed meal[1]	Egyptian clover hay	*Atriplex halimus*[2]	Rice straw
Dry matter	86.65	90.88	86.08	34.98	87.43
Ash	1.71	24.73	13.35	25.37	21.68
Organic matter	98.29	75.27	86.65	74.99	78.32
Crude protein	10.76	15.84	14.26	11.70	4.55
Crude fiber	3.77	19.30	34.23	28.62	28.86
Ether extract	3.92	10.86	4.40	2.94	2.52
N-free extract	79.84	29.27	33.76	31.37	42.39

[1]Un-decorticated, heat treated and mechanically pressed CSM, produced in a traditional oil mill,
[2]Leaves and succulent branches typically consumed by grazing animals.

2.2. Digestion trials

At the end of the experimental period, camels were placed in metabolic cages for 15 days, 8 days of adaptation to the metabolic cages and 7 days to collect faeces and urine. Total daily faecal output of each camel was collected thoroughly mixed and weighed. A 10% subsample of daily

faecal output was analyzed for DM by drying to constant weight in a forced-air oven at 60℃ for 48 h [16]. Dried ingredients, orts and faecal samples were ground in a Wiley mill with a 1-mm screen. Samples were analyzed for ash, ether extract, crude fiber and crude protein according to [16]. Urine samples were collected in plastic containers containing 100 ml of H2SO4. Total daily urine output was weighed and recorded. A 10% subsample was collected and then analyzed for N [16].

2.3. Statistical analysis

Main effects and interactions were evaluated using the GLM repeated-measures analysis of variance procedures of the NCSS statistical package [17]. The type of roughage and concentrate levels were the independent variables, and type of water (water tap and saline water) levels were repeated within roughages. Newman-Keuls multiple comparison tests was applied to the means of the main effects, i.e. type of roughage, R-means, and level of concentrates, type of water (water tap and saline water) B-means. Statistical significance was declared at $P \leq 0.05$.

III. RESULTS

Chemical composition of the roughages is presented in Table 1. Three forages were selected differ in their crude protein content. Crude protein was higher for clover hay, intermediate for the *Atriplex halimus*, and lowest for rice straw. Two concentrates were selected differ in their chemical composition Table 1. Cottonseed meal was higher in their contents of crude protein, ash, crude fiber, and lower in nitrogen free extract compared with corn grain.

Effects of roughages type and drinking saline water on the performance of the camels are presented in Table 2. Initial body weight was not affected whereas, final body weight and ADG were affected by roughages type ($P<0.05$) but not for drinking water and their interaction.

Effects of roughages type and drinking saline water on the feed intake of the camels are presented in Table 3. Feed intake was affected ($P<0.05$) by roughage type but not for drinking water and their interaction. Camels fed Atriplex had higher ($P<0.05$) intake of dry matter, roughage intake and roughage (% DMI) than hay and straw. Corn intake was greater ($P<0.05$) in camels fed Atriplex and straw whereas, was lower ($P<0.05$) in camels fed hay.

Effects of roughages type and drinking saline water on the components of are presented in Table 4. Organic matter, crude protein, crude fiber, rumen degradable protein, rumen un-degradable protein intakes were affected ($P<0.05$) by roughage type but not for drinking water and their interaction. Camels fed Atriplex had higher values ($P<0.05$) of organic matter intake and crude fiber intake than hay and straw. Crude protein intake, rumen degradable protein intake and rumen un-degradable protein were greater ($P<0.05$) in camels fed Atriplex and hay whereas, were lower ($P<0.05$) in camels fed straw.

Effects of roughages type and drinking saline water on the apparent digestion coefficients of diets consumed by camels are presented in Table 5. Digestion coefficients of diets was affected ($P<0.05$) by roughage type but not for drinking water and their interaction. Camels fed hay had higher ($P<0.05$) in dry matter digestibility followed by straw and then Atriplex. Organic matter, crude fiber and nitrogen free extract digestibility were higher ($P<0.05$) in camels fed hay and straw as compared to Atriplex whereas, crude protein was higher ($P<0.05$) in Atriplex and hay as compared to straw.

Effects of roughages type and drinking saline water on the nitrogen utilization are presented in Table 6. Nitrogen utilization was affected ($P<0.05$) by roughage type but not for drinking water and their interaction. Nitrogen intake and digested nitrogen were higher ($P<0.05$) in camels fed hay and Atriplex as compared to straw whereas, fecal nitrogen, urinary nitrogen and nitrogen balance were not affected.

Effects of roughages type and drinking saline water on the water intake and execration are presented in Tables 7and8 Water intake and execration were affected ($P<0.05$) by roughage type but not for drinking water and their interaction. Free water intake, feed water, total water intake and fecal water were higher ($P<0.05$) in camels fed Atriplex as compared to hay and straw. Urinary water was higher ($P<0.05$) in camels fed Atriplex followed by hay and then straw.

IV. DISCUSSIONS

The present experiment showed that final body weight and ADG were affected by the type of roughages. Similar results were observed by [18] who reported that ADG g/day of camels fed hay and Atriplex were higher than those of their mates fed rice straw with limiting concentrate offered to 50%. In agreement with [19,15,7] the straw is characterized by its poor of digestion, a longer retention time in the rumen and its low nutritional value, which negatively affected the performance.

Effect of saline water on ADG camels fed straw and drinking salt water was lower final body weight and ADG Similar findings were reported by [20] who reported that female camels lost 1.9% of their initial live body weight when drinking saline water.

Our results indicate that camels consumed higher amounts of Atriplex compared to hay and straw. This is consistent with similar findings found by [21]. [22] reported that camels need salt more than other livestock in their diets, which they get from Atriplex, which contain salts that may reach 25% of DM [23].

Table 2. Effect of type roughages and drinking water and saline water on the performance of the camels.

Water type (B)	Roughage, *ad lib.* (R)			Water Average	*P*-value[1]		
	Atriplex	hay	Straw		R	B	RxB
Initial body weight (kg)							
Fresh	448	446	446	447	0.35	0.61	0.33
Saline	446	447	446	446			
Roughage average	447	446	446	447			
± SEM	15.9						
Final body weight (kg)							
Fresh	480	483	468	477	<0.01	0.43	0.21
Saline	470	480	456	469			
Roughage average	475[a]	481[a]	462[b]	473			
± SEM	85.8						
Average daily gain (g/day)							
Fresh	531	608	360	500	<0.01	0.52	0.13
Saline	400	550	172	374			
Roughage average	465[a]	579[a]	266[b]	437			
± SEM	74.5						

[1] Probability values associated with roughage (R), water type (B), and roughage × water type interaction (R×B).
[a-e] Mean separation by Tukey MRT (P<0.05), valid comparison are between roughage average and between water watering an experiment.

Table 3. Average daily feed intake during the digestion trials, g/d/kg $^{0.75}$

Water type (B)	Roughage, *ad lib.* (R)			Water average	*P*-value[1]		
	Atriplex	Hay	Straw		R	B	RxB
Dry matter intake(DMI)							
Fresh	85.5	63.5	56.0	68.3	<0.01	0.29	0.45
Saline	96.9	63.4	57.9	72.7			
Roughage average	91.2[a]	63.4[b]	56.9[b]	70.5			
± SEM	4.58						
Roughage (DMI)							
Fresh	56.3	34.7	27.1	39.4	<0.01	0.28	0.38
Saline	67.6	34.6	28.1	43.4			
Roughage average	61.9[a]	34.6[b]	27.6[b]	41.4			
± SEM	4.18						
Roughage (% in DMI)							
Fresh	65.5	54.6	48.3	56.1	<0.01	0.28	0.34
Saline	69.8	54.6	48.5	57.6			
Roughage average	67.6[a]	54.6[b]	48.4[c]	58.9			
± SEM	1.51						
Corn (DMI)							
Fresh	23.8	20.6	22.3	22.2	0.01	0.67	0.85
Saline	23.9	20.6	22.9	22.5			
Roughage average	23.8[a]	20.6[b]	22.6[a]	22.3			
± SEM	0.64						
Cotton seed meal (DMI)							
Fresh	5.37	8.24	6.70	6.77	<0.01	0.64	0.78
Saline	5.39	8.22	6.90	6.84			
Roughage average	5.38[c]	8.23[a]	6.80[b]	6.80			
± SEM	0.16						
Concentrate (DMI)							
Fresh	29.2	28.8	28.9	28.9	0.67	0.66	0..83
Saline	29.3	28.8	29.8	29.3			
Roughage average	29.2	28.8	29.4	29.1			
± SEM	0.79						

[1] Probability values associated with roughage (R), water type (B), and roughage × water type interaction (R×B).
[a-e] Mean separation by Tukey MRT (*P*<0.05), valid comparison are between roughage average and between water watering an experiment.

Table 4. Components of diets g/d/kg$^{0.73}$

Water type (B)	Roughage, *ad lib.* (R)			Water	*P*-value[1]		
	Atriplex	Hay	Straw	average	R	B	Rx B
Organic matter intake (OMI)							
Fresh	69.5	56.6	49.6	58.6	<0.01	0.29	0.47
Saline	77.9	56.5	51.2	61.9			
Roughage average	73.7[a]	56.6[b]	50.4[b]	60.2			
± SEM	3.51						
Crude protein intake (CPI)							
Fresh	7.61	8.64	4.75	6.67	<0.01	0.29	0.46
Saline	8.47	8.61	4.89	7.33			
Roughage average	8.04[a]	8.62[a]	4.82[b]	7.16			
± SEM	0.35						
Crude fiber intake (CFI)							
Fresh	17.9	13.8	10.3	14.0	<0.01	0.47	0.40
Saline	21.1	13.8	10.6	15.2			
Roughage average	19.5[a]	13.8[b]	10.4[b]	14.6			
± SEM	1.20						
Rumen degradable protein intake (RDPI)							
Fresh	5.49	6.23	2.90	4.87	<0.01	0.30	0.44
Saline	6.13	6.21	2.99	5.11			
Roughage average	5.81[a]	6.22[a]	2.94[b]	4.99			
± SEM	0.001						
Rumen un-degradable protein (RUPI)							
Fresh	2.12	2.41	1.85	2.83	0.01	0.28	0.51
Saline	2.34	2.40	1.91	2.22			
Roughage average	2.23[a]	2.40[a]	1.88[b]	2.17			
± SEM	0.01						

[1] Probability values associated with roughage (R), water type (B), and roughage × water type interaction (R×B).
[a-e] Mean separation by Tukey MRT (P<0.05), valid comparison are between roughage average and between water watering an experiment.

Table 5. Apparent digestion coefficients of diets consumed by camels, %

Water type (B)	Roughage, *ad lib.* (R)			Water	*P*-value[1]		
	Atriplex	Hay	Straw	average	R	B	RxB
Dry matter							
Fresh	58.2	67.9	63.0	63.1	0.02	0.82	0.73
Saline	58.1	71.2	61.6	63.6			
Roughage average	58.1[c]	69.6[a]	62.3[b]	63.3			
± SEM	2.97						
Organic matter							
Fresh	55.5	69.4	67.2	64.1	0.01	0.71	0.76
Saline	54.6	72.8	67.5	64.9			
Roughage average	55.1[b]	71.1[a]	67.3[a]	64.5			
± SEM	2.94						
Crude protein							
Fresh	63.9	63.3	45.3	57.5	0.03	0.79	0.74
Saline	60.4	65.9	49.7	58.7			
Roughage average	62.1[a]	64.6[a]	47.5[b]	58.1			
± SEM	5.22						
Crude fiber							
Fresh	28.8	57.5	58.4	48.2	0.01	0.42	0.51
Saline	37.6	66.1	54.1	52.6			
Roughage average	33.2[b]	61.8[a]	56.3[a]	50.4			
± SEM	6.10						
Nitrogen free extract							
Fresh	63.5	75.5	72.6	70.5	0.03	0.71	0.59
Saline	59.6	76.6	73.1	69.8			
Roughage average	61.6[b]	76.1[a]	72.8[a]	70.2			
± SEM	2.48						

[1]Probability values associated with roughage (R), water type (B), and roughage × water type interaction (R×B).
[a-e] Mean separation by Tukey MRT (P<0.05), valid comparison are between roughage average and between water watering an experiment.

Table 6. Nitrogen utilization, mg N/day/kg$^{0.73}$

Water type (B)	Roughage, *ad lib.* (R)			Water	*P*-value[1]		
	Atriplex	Hay	Straw	average	R	B	RxB
Nitrogen intake							
Fresh	1217	1382	760	1120	<0.01	0.29	0.46
Saline	1355	1378	783	1172			
Roughage average	1286[a]	1380[a]	772[b]	1145			
± SEM	56.1						
Fecal nitrogen							
Fresh	432	507	415	451	0.16	0.66	0.26
Saline	538	470	393	467			
Roughage average	485	488	404	459			
± SEM	42.4						
Digested nitrogen							
Fresh	785	875	345	668	<0.01	0.59	0.99
Saline	817	908	390	705			
Roughage average	801[a]	891[a]	368[b]	687			
± SEM	78.6						
Urinary nitrogen							
Fresh	457	734	240	477	0.11	0.74	0.34
Saline	763	521	285	523			
Roughage average	610	627	263	500			
± SEM	159						
Nitrogen balance							
Fresh	328	141	105	191	0.66	0.95	0.38
Saline	54.6	387	105	183			
Roughage average	191	264	105	187			
± SEM	172						

[1] Probability values associated with roughage (R), water type (B), and roughage × water type interaction (R×B).
[a-e] Mean separation by Tukey MRT (P<0.05), valid comparison are between roughage average and between water watering an experiment.

Table 7. Water intake and execration, mg N/day/kg$^{0.82}$

Water type (B)	Roughage, *ad lib.* (R)			Water	*P*-value[1]		
	Atriplex	Hay	Straw	average	R	B	Rx B
Free water intake							
Fresh	148	111	125	128	0.01	0.23	0.63
Saline	143	108	108	119			
Roughage average	146[a]	109[b]	116[b]	124			
± SEM	7.69						
Feed water							
Fresh	73.5	20.2	13.5	35.7	<0.01	0.87	0.58
Saline	75.3	16.8	14.1	35.4			
Roughage average	74.4[a]	18.5[b]	13.8[b]	35.6			
± SEM	2.48						
Total water intake							
Fresh	234	144	149	176	<0.01	0.34	0.73
Saline	233	138	133	168			
Roughage average	233[a]	141[b]	141[b]	172			
± SEM	9.21						
Fecal water							
Fresh	29.8	17.4	12.7	19.9	<0.01	0.46	0.27
Saline	36.6	13.5	15.6	21.9			
Roughage average	33.2[a]	15.4[b]	14.1[b]	20.9			
± SEM	3.02						
Urinary water							
Fresh	45.1	56.9	29.3	43.8	0.02	0.11	0.04
Saline	110	44.7	32.4	62.4			
Roughage average	77.6[a]	50.8[b]	30.8[c]	53.1			
± SEM	11.9						

[1] Probability values associated with roughage (R), water type (B), and roughage × water type interaction (R×B).
[a-e] Mean separation by Tukey MRT (P<0.05), valid comparison are between roughage average and between water watering an experiment.

Table 8. water intake, ml/day/kg$^{0.82}$

Water type (B)	Roughage, *ad lib*. (R)			Water average	*P*-value[1]		
	Atriplex	hay	Straw		R	B	Rx B
Free water intake (FWI)							
Fresh	147.74	110.97	124.74	127.82	0.007	0.233	0.628
Saline	143.32	107.65	107.55	119.51			
Roughage average	145.53^{a}	109.31^{b}	116.14^{b}	123.66			
± SEM	7.687						
Feed water (FDWI)							
Fresh	73.48	20.18	13.54	35.73	0.0000	0.875	0.577
Saline	75.32	16.78	14.11	35.40			
Roughage average	74.40^{a}	18.48^{b}	13.82^{b}	35.57			
± SEM	2.482						
Metabolic water (MWI)							
Fresh	12.73	12.95	11.02	12.23	0.254	0.457	0.937
Saline	14.07	13.50	11.57	13.05			
Roughage average	13.40	13.22	11.29	12.64			
± SEM	1.255						
Total water intake (TWI)							
Fresh	233.96	144.10	149.30	175.79	0.0007	0.339	0.727
Saline	232.71	137.93	133.23	167.96			
Roughage average	233.34^{a}	141.02^{b}	141.27^{b}	171.87			
± SEM	9.208						
TWI/GE							
Fresh	1.256	0.915	1.112	1.096^{a}	0.001	0.013	0.272
Saline	1.108	0.885	0.961	0.984^{b}			
Roughage average	1.182^{a}	0.899^{c}	1.039^{b}	1.040			
± SEM	0.0392						
TWI/DE							
Fresh	2.229	1.313	1.669	1.737	0.002	0.130	0.836
Saline	1.991	1.212	1.415	1.539			
Roughage average	2.110^{a}	1.262^{b}	1.542^{b}	1.638			
± SEM	0.1381						

[1] Probability values associated with roughage (R), water type (B), and roughage × water type interaction (R×B).
[a-e] Mean separation by Tukey MRT (P<0.05), valid comparison are between roughage average and between water watering an experiment.

This was confirmed by [24] who explained that camels need 6 to 8 times the amount of salt than other livestock requirement, and also indicated that camels that do not regularly receive salty feed need about 140 grams of salt per dat. Moreover, Atriplex is a green plant more palatable and preferred for camels than alfalfa hay and rice straw as indicated by [22].

Our results indicate that the camels fed on clover hay had higher digestibility values, as clover hay is considered a good-quality roughage that is high in its available content of nutrients, which explains the high digestion parameters. These results are consistent with [18]

Camels can efficiently digest low quality roughage that is low in nutritional value, which explains the high fiber digestibility coefficient of camels fed straw.The more efficient utilization of low quality roughage by camels is mainly the result of a higher cellulolytic activity of the microorganisms [5] and to a longer retention time of solid particles [6,7]. Camels fed Atriplex showed improved protein digestibility, which may be due to their content of non-protein nitrogen (NPN). [7] reported that Atriplex differs from conventional forage in terms of its high NPN content and About 44.5% of the protein content is NPN. The NPN compounds are degraded and used as a source of N for the synthesis of microbial protein. The effective uptake of non-protein nitrogen by rumen microbes and subsequent conversion to microbial protein, diets should contain suitable and adequate source of energy [25-28]. This also explains the increase in corn intake in camels group fed Atriplex.

Our results indicated that camels fed on Atriplex and hay had higher values of nitrogen intake and digested nitrogen more than straw. These could mainly be due to the type of forage and its content of [29,23]

The roughage type significantly affected the water intake and excretion. Atriplex camels group recorded the highest free water intake. Because Atriplex had high salt content [30]. Camels can be fed on a high tolerance saline fodder than any other animal [31]. Camels fed this diet drink a lot of water in order to eliminate the salts ingested.

Atriplex camels group recorded significantly higher feed water intake than those hay and straw groups due to that Atriplex had higher moisture content about 65% similar findings were recorded by [21]. Camels consumed Atriplex recorded higher water execration values than those fed on straw or hay. These results indicated that camels' kidneys seem to be better adapted to handling salt load especially when they fed on halophytic plants [32,33] pointed out that increasing water excretion through the urinary pathway is believed to be an adaptive mechanism assisting the animal in getting rid of excess salts and maintain osmolality of food and other body fluids. In addition, [34,35] reported that increasing salts increased water excretion in urine and faeces.

V. CONCLUSION

In conclusion, the results indicate that drinking saline water did not affect feed intake, digestibility and nitrogen utilization. whereas, roughages type had effect intake, digestibility and nitrogen utilization. Camels fed on Atriplex showed a clear improvement in growth, digestibility, and nitrogen utilization in a similar way to camels fed on hay. As for the camels fed on straw, they had the least effect on growth, digestibility, and nitrogen utilization.

VI. REFERENCES

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