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NUTRITIONAL STUDIES ON SHEEP FED SOME SALT PLANTS TREATED WITH BACTERIA IN SINAI

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SUMMARY

Cultivated salt plants (*Acacia saligna* and *Atriplex nummularia)* and natural rangeland (*Tamarix mannifera*) are considered the principal feed resources in arid and semi arid areas but they have low nutritive value. So, several treatments were applied to improve the utilization of salt plants as animal feed ingredient. The objective of this study was to investigate the effect of bacterial treatments on salt plants utilization and its nutritive value. The edible parts from leaves and stems of three salt plants were collected to mix (50% as *Tamarix mannifera* , 25% as *Acacia saligna* , 25% as *Atriplex nummularia*) and divided into three status wilted, dried and silage (bacteria was added with making silage). Each status was laboratory treated by cellulolytic bacteria (CB), nitrogen fixing bacteria (NB) or mixture of CB and NB in four treatments as follows: T_1 : Salt plants mix (SPM) + 10% molasses as control, T_2 : SPM + 10% molasses + CB, T_3 : SPM + 10% molasses + NB, T_4 : SPM + 10% molasses + CB + NB. As a result of laboratory study, silage had higher values of CP and lower values of CF, NDF, ADF, ADL. So, silages of the four treatments named S_1, S_2, S_3 and S_4, respectively, were used for evaluation in feeding and digestibility trials lasted 80 days on twenty-four mature Barki male sheep averaged (39.5 ± 1.19 Kg body weight) in four equal groups. The animals offered respective silage ad lib +200 gm concentrate feed mixture (CFM). Results indicated that S_3 and S_4 had the highest values of CP, however, S_2 had low values of CF, NDF and ADL. S_1 which untreated bacteriologically had the highest values of tannins, flavonoids and saponin than the treated silage. Data of the digestibility trail revealed that the animals fed S_4 were more efficient in utilized and digested nutrients. Also, the highest nutritive values were observed by animals fed S_4 (15.61 and 2.4 gm/kg body weight; for TDN and DCP, respectively) followed by S_3 and then S_2. Nitrogen retention was higher for S_3 and S_4. All experimental groups had similar values of ruminal pH and TVFA's, however, S3 and S4 had significant higher values ($P \leq 0.05$) of total nitrogen and NPN than other silages. It could be concluded that S_4, which contain cellulytic and nitrogen bacteria was the best treated form of salt plants fed to sheep during the dry season.

Keyword: *salt plants, sheep, bacterial treatment, digestibility, nutritive value, rumen parameter.*

INTRODUCTION

There are about 1100 species of halophytes in the Mediterranean Basin. Many of these may be considered forage species. They include annual and

perennial herbaceous species as well as shrubs and trees, (Houerou, 1994). Some of these halophytes (salt plants) that could be found in southern Sinai are *Tamarix mannifera, Atriplex nummularia* and *Acacia saligna* which contain some problems of feeding on them, such as the high levels of NDF, ADF, ADL and hemicellulose, which limit their utilization by sheep and goats (Kandil and El-Shaer, 1990). Also high level of some secondary metabolites and low nutritive value (Meyer and Karazov, 1991; Ben Salem *et al.* 2005). As a result of these problems halophytes have less and unpalatable. Many investigators studied the effect of treated salt plants by several physical and chemical treatments to improve nutritive values of salt plants (Youssef, 1999 and Eid, 2003). Bacteria can be produced large amounts of cells in rich proteins that commonly contain all the essential amino acids. In addition, to favourably high vitamin and mineral levels when it incubated with agro-industrial wastes. Further, the growth of microbes, on lignocellulosic wastes is able to furnish all the hydrolytic enzymes causing degradation of cell wall constituents and decrease the crude fiber (Abd El-Galil, 2000).

The objective of this work is to investigate the effect of bacterial treatments of some halophytes on its chemical composition, some anti-nutritional factors, intake, digestibility, nitrogen and water balance, nutritive values and some rumen liquor parameters.

MATERIALS AND METHODS

This study consists of two parts, the first part was laboratory study for three salt plants (*Tamarix mannifera, Acacia saligna* and *Atriplex nummularia*) treated by cellulytic bacteria (CB) and nitrogen bacteria (NB), The edible parts of these plants were collected and mixed as 50% of the mix was *Tamarix mannifera,* 25%, was *Acacia saligna* and 25% *Atriplex nummularia,* then the mixture divided to three parts, silage, wilted and air dried. Each part was treated with cellulytic bacteria (CB), nitrogen bacteria (NB) or a mixture of CB+NB. The incubation periods lasted about sixty days for silage, wilted and dried plants. Molasses were added to the salt plant mixture (SPM) at 10%. The experimental treatments for all status of SPM (silage, wilted and air dried) were: (T1) SPM + molasses (as control), (T2) SPM + molasses + CB, (T3) SPM + molasses + NB, and (T4) SPM + molasses + CB + NB.

From the laboratory study, silage (S) was chosen to applied in feeding trail on Barki sheep at Ras Sudr Research Station (Desert Research Center), South Sinai Governorate, Egypt. SPM was mixed with molasses without (S_1) or with CB (S_2), NB (S_3) or CB+NB (S_4). Ensiling period lasted sixty days by using four cement pits (1.5x2.0x1.5m).

Twenty four adult Barki male sheep with initial live body weight averaged 39.5 ± 1.9 Kg were used in this study for 60 days. The animals were randomly distributed in 4 groups (six animals each) and allotted in randomized design to one of the four dietary treatments as mentioned in the laboratory study.

Each animal, in the four groups, was given 200 gm/day concentrate feed mixture (CFM) which contained 33% undecortcated cotton seed cake, 32% wheat bran, 24% yellow corn grain, 5%

rice bran, 3% molasses, 2% limestone and 1% salt. Treated salt plants (silages) were given to the animals *ad-lib.* twice daily allowing for 20% refusals.

During the feeding trial (60 days) fresh water was available for animals all time, amount of feed offered and refusals for each group were daily measured. All animals were weighed at the beginning and then at biweekly intervals, body weight changes and daily gain were recorded for each animals.

At the end of the feeding trial three animals from each treatment were used in the digestibility trials for 15 day preliminary period followed by five days of collection period. During the collection period faeces and urine were quantitatively collected from each animal. The representative samples from each animal were mixed and saved for chemical analysis. At the last three days of the digestibility trail, rumen liquor fluid samples were obtained from the same animals of digestibility trail before feeding, 3 and 6 hrs. after feeding using a stomach tube.

Chemical Analysis:

Samples of feeds (offered and refusals), urine and faeces were analyzed according to A.O.A.C.(1990). Cell wall components, natural detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined (Goering and Van soest, 1970). Some anti-nutritional factors were determined as flavonoids according to Karawya and Abou Table (1982), saponine according to Balbaa *et al.*, (1981) and tannins according to Ali *et al,* (1991).

The pH of both silage and rumen liquor fluid were measured by using pH meter. Ruminal ammonia nitrogen was tested according to A.O.A.C. (1990) and total volatile fatty acids were determined according to Warner (1964).

Statistical Analysis:

Data were statistically analyzed using SAS (1998). Differences among means were compared using Duncan's multiple range test (Duncan, 1998).

RESULTS AND DISCUSSION

Laboratory studies:

Data of Tables (1 and 2) showed the effects of SPM as silage, wilted and dry treated by CB, NB or CB+NB on chemical composition, fiber fractions and some anti-nutritional factors. The presented data showed that silage form of SPM had significant ($P \leq 0.05$) higher values of CP and NFE and significant ($P \leq 0.05$) lower values of NDF, ADF, ADL, tannins and flavonoids. From the previous results the silage form of SPM was used in the feeding trial (Table, 2).

Data of Table (1) indicated that bacterial treatment by CB significantly ($P \leq 0.05$) decreased DM, CF, NDF, ADF, ADL, tannins and saponin. These findings may be related to increase cellulytic enzymes that secreted from bacteria. Similar results were obtained by Gado et al. (2007), who treated corn stalk, sugarcane bagasse and rice straw by bacteria. The data of Table (3) showed that S_1 and S_2 had the lowest values of CP, however, the highest values were observed with S_3 and S_4, which contain SPM + molasses + NB. On the other hand, S_2 and S_4 showed

Table (1): Effect of treatments on chemical composition (%, DM basis), fiber fractions (%, DM basis) and some anti- nutritional factors (mg %, DM basis) of salt plants mixture (SPM).

Plant status	Bacterial treatments	DM	OM	Ash	CP	CF	EE	NFE
Silage	SPM+molas	43.49	76.55	23.04	12.55^{b}	22.91^{a}	2.43	38.92^{b}
	SPM+molas+C.B	43.01	75.57	24.37	12.54^{b}	19.19^{b}	2.47	41.37^{a}
	SMP+molas+N.B	42.57	75.19	24.61	14.43^{a}	23.11^{a}	2.77	37.96^{b}
	SMP+molas+C.B+N.B	43.29	76.15	23.78	13.91^{a}	18.81^{b}	2.44	41.09^{a}
Wilted	SPM+molas	44.38	76.30	23.62	12.51^{b}	23.33^{a}	2.47	37.90^{ab}
	SPM+molas+C.B	42.47	76.66	23.18	12.74^{b}	20.12^{b}	2.59	41.26^{a}
	SMP+molas+N.B	42.88	76.40	24.57	14.51^{a}	23.42^{a}	2.43	35.06^{b}
	SMP+molas+C.B+N.B	42.78	75.71	24.10	14.51^{a}	21.55^{b}	2.44	37.38^{ab}
Dry	SPM+molas	43.00	76.25	23.76	12.33^{b}	31.05^{a}	2.45	30.19
	SPM+molas+C.B	42.42	76.04	23.78	12.49^{b}	29.18^{ab}	2.52	31.90
	SMP+molas+N.B	42.79	75.79	23.98	14.26^{a}	30.83^{a}	2.82	28.08
	SMP+molas+C.B+N.B	42.80	75.83	24.01	13.86^{a}	27.68^{b}	2.48	32.01

Table (1): Continue:-

Plant status	Bacterial treatments	NDF	ADF	ADL	Saponin	Tannin	Flavonoids
Silage	SPM+molas*	52.95	34.17	11.25	3.47^{a}	4.10^{a}	1.39
	*+C.B	56.38	34.92	9.75	2.23^{b}	2.30^{b}	1.12
	*+N.B	53.98	34.43	9.91	2.19^{b}	3.06^{ab}	1.20
	*+C.B+N.B	60.19	34.91	9.33	2.72^{ba}	2.97^{ab}	1.20
Wilted	*	57.64	32.94	13.79	2.19^{a}	3.89	1.17
	*+C.B	58.22	35.83	11.59	2.03^{a}	3.32	1.00
	*+N.B	56.67	36.37	12.08	1.53^{b}	3.63	1.09
	*+C.B+N.B	56.42	35.67	12.28	1.74^{b}	3.53	1.13
Dry	*	57.73	42.27	14.76	2.27^{a}	3.86^{a}	1.13
	*+C.B	59.62	41.03	13.11	1.97^{ab}	2.63^{b}	0.86
	*+N.B	56.26	41.60	15.28	2.26^{a}	3.51^{a}	1.03
	*+C.B+N.B	59.48	42.65	14.21	1.61^{b}	3.59^{a}	0.99

*= Salt plants mixture + Molasses

C.B = Celluletic bacteria

N.B = Nitrogen bacteria

Values with the different superscripts on the same column differ at ($p \leq 0.05$).

Table (2): Effect of different treatments on chemical composition (%, DM basis), fiber fractions (%, DM basis) and some anti-nutritional factors (mg %, DM basis) of SPM ± standard error.

	Treatment effect			Bacterial treatments effect			
	Silage	Wilted	dry	*	* +CB	*+NB	*+CB +NB
DM	43.14± 0.26	43.56± 0.26	42.75± 0.26	44.24^{a}± 0.30	42.24^{b}± 0.30	42.77^{b}± 0.30	42.95^{b}± 0.30
OM	75.87± 0.09	76.02± 0.09	75.96± 0.09	76.34^{a}± 0.10	76.09^{a}± 0.10	75.46^{c}± 0.10	75.90^{ab}± 0.10
CP	13.57^{a}± 0.10	13.36^{ab}± 0.10	13.13^{b}± 0.10	12.55^{b}± 0.12	12.59^{b}± 0.12	14.18^{a}± 0.12	14.10^{a}± 0.12
CF	21.02^{c}± 0.23	22.11^{b}± 0.23	29.69^{a}± 0.23	25.77^{a}± 0.27	22.83^{b} 0.27	25.79^{a}± 0.27	22.70^{b}± 0.27
EE	2.78± 0.15	2.48± 0.15	2.57± 0.15	2.45± 0.17	2.86± 0.17	2.67± 0.17	2.45± 0.17
NFE	39.84^{a}± 0.42	37.90^{b}± 0.42	30.55^{c}± 0.42	35.67^{b}± 0.49	38.18^{a}± 0.49	33.71^{c}± 0.49	36.84^{ab}± 0.49
Ash	23.95± 0.09	23.87± 0.09	23.83± 0.09	23.44^{c}± 0.10	23.76^{b+}± 0.10	24.38^{a}± 0.10	23.94^{b}± 0.10
NDF	53.88^{c}± 0.20	55.24^{b}± 0.20	56.27^{a}± 0.20	52.11^{a}± 0.23	49.07^{b}± 0.23	52.64^{a}± 0.23	49.78^{b}± 0.23
ADF	34.61^{c}± 0.18	$35.21+^{b}$± 0.18	41.91^{a}± 0.18	36.46^{a}± 0.21	34.29^{b}± 0.21	37.08^{a}± 0.21	34.75^{b}± 0.21
ADL	10.07^{c}± 0.06	12.44^{b}± 0.06	14.35^{a}± 0.06	13.27^{a}± 0.06	11.49^{d}± 0.06	12.43^{b}± 0.06	11.94^{c}± 0.06
Tannins	3.06^{c}± 0.08	3.60^{a}± 0.08	3.19^{b}± 0.08	3.84^{a}± 0.09	2.63^{c+}± 0.09	3.28^{b}± 0.09	3.37^{b}± 0.09
Saponin	2.03^{b}± 0.04	1.88^{c}± 0.04	2.66^{a}± 0.04	2.65^{a}± 0.05	2.08^{b}± 0.05	2.00^{b}± 0.05	2.02^{b}± 0.05
Flavonids	1.01^{c}± 0.01	1.10^{b} 0.01	1.21^{a}± 0.01	1.20^{a}± 0.02	1.00^{c}± 0.02	1.10^{a}± 0.02	1.11^{a}± 0.02

*= Salt plants mixture + Molasses, C.B. Cellulolytic bacteria

NB = Nitrogen bacteria , Mols = Molasses

Values with the different superscripts on the same row differ at ($P \leq 0.05$).

lower values of CF (17.85, 17.31), respectively. These findings attributed to the incorporation of nitrogen in cellulytic bacteria. Agreed results were reported by Shakweer (2003), who treated rice straw and sugar can bagasse by bacteria. Also, the present data showed that S_4 and S_2 had lower values of NDF, ADF, and ADL, however, the highest was recorded for S_1, which untreated biologically (Table 3). These results are in harmony with those reported by Shakweer (2003).

Data of Table (4) represented the tannins, saponin and flavonoids values. These values showed that S_1 (control) had highest values of tannins, saponin, flavonoids and ADL, however, the lowest one was S_2.

Digestibility trials:

Results of the digestibility trials presented in Table (5) showed that the animals fed S4 had significant ($P \leq 0.05$) higher values of apparent digestibility coefficients of OM, CP, CF, EE, NDF, ADF and ADL and non significant higher values of DM, NFE. These data may be due to such silage contained the lowest percentage of ADL (8.00 %) compared with other silages . These findings agreed with those reported by Fayed *et al.* (1999), who found that the greatest values of apparent digestibility coefficients were recorded for silage contained the lowest percentage of ADL. Silages 4 and 2 had comparable values of NFE, NDF and ADL digestibility coefficients. The maximum values of TDN and DCP intakes were observed for animals fed S_4 (15.61 and 2.4 g/kg B.W.), respectively. Also, S_3 and S_2 had comparable values of TDN , DCP and ME, however, the lowest one was found for S_1, which untreated biologically. These findings agreed with those reported by Mahrous and Abou Ammou (2005).

Water and nitrogen balances of sheep fed the experimental silages are presented in Table (6). The data indicated that nitrogen intake was higher for S_3 followed by S_4, which contain NB. However, S_1 was the lowest. Concerning faecal nitrogen (as mg/kg B.W.), S_3 had the highest value followed by S_1, S_2 and S_4 in descending order. Urinary nitrogen as a percent of intake was higher for S_4 (67.83%) , whereas S_2 and S_3 had comparable values of urinary nitrogen as a percent of intake. Nitrogen retention as a percent of intake was higher of silage contain NB.

The greatest values of drinking water, total water intake, urinary water, total water excretions (ml/head/day) and water balance were achieved with animals fed S_4, which contains NB+CB followed by S_3, which contains NB alone, whereas the differences were not significant. This finding may be due to increase the nitrogen intake, which need to more water to excrete it. Also, Khamis (1988) found that sheep and goats consumed different amount of free water when fed silage of some salt plants.

Results of Table (7) illustrated some rumen parameters of sheep fed the experimental silage. All experimental groups had similar values of rumen pH values and TVFA's. pH values were significantly ($P \leq 0.05$) lower at 6 hrs. post feeding. This finding attributed to significant ($P \leq 0.05$) higher level of TVFA's at 6hrs. after feeding. These results are in agreement with those reported by Khattab *et al.* (1999).

Table (3): Chemical composition of experimental feeds (% DM basis).

Item	DM	OM	CP	CF	EE	NFE	Ash
TM	54.18	74.5	7.88	22.0	2.03	42.67	25.50
AS	44.30	86.57	9.58	23.76	2.47	50.76	13.43
AN	37.77	76.07	12.06	21.27	2.96	39.78	23.93
Silage 1 (S1)	42.28	77.23	12.86	22.85	2.46	39.06	22.77
Silage 2 (S2)	42.64	75.40	12.90	17.85	2.51	42.34	24.60
Silage 3 (S3)	42.11	75.32	14.87	23.19	2.77	34.49	24.68
Silage 4 (S4)	43.06	76.30	14.32	17.31	2.36	42.31	23.70
CFM	95.27	90.81	14.11	12.75	2.90	61.05	9.19
Berseem hay	93.0	85.50	11.60	23.61	2.60	47.69	14.5
Molasses	74.28	90.05	3.65	-	0.10	86.40	9.95

(S1) Salt Plant Mixture (SPM) + Molasses, (S2) SPM+ Molasses + CB
(S3) SPM + Molasses + NB, (S4) SPM + Molasses + CB + NB
CB= Cellulolytic bacteria, NB= Nitrogen bacteria, TM = *Tamarix mannifera*, AS= *Acacia saligna*, AN= *Atriplex nummularia*, CFM = Concentrate feed mixture

Table (4): Fiber fraction (%) and some anti- nutritional factors (mg%) of experimental feeds (on DM basis)

Item	NDF	ADF	ADL	Tannins	Saponin	Flavonid
TM	49.41	36.95	8.53	8.40	4.50	3.20
AS	45.15	32.60	12.86	4.70	3.10	0.364
AN	41.77	30.88	5.81	5.90	3.1	0.53
S1	54.31	36.33	11.00	4.00	3.30	1.20
S2	49.60	31.94	9.30	2.00	2.10	0.90
S3	52.11	34.62	9.69	2.90	1.90	1.05
S4	49.00	31.01	8.00	2.80	2.30	1.10
CFM	48.10	12.50	5.29	-	-	-
Berseem hay	53.44	39.09	9.72	2.30	-	0.29
Molasses	-	-	-	-	-	-

(S1) Salt Plant Mixture (SPM) + Molasses, (S2) SPM+ Molasses + CB
(S3) SPM + Molasses + NB, (S4) SPM + Molasses + CB + NB
CB= Cellulolytic bacteria, NB= Nitrogen bacteria, TM = *Tamarix mannifera*, AS= *Acacia saligna*, AN= *Atriplex nummularia*, CFM = Concentrate feed mixture

Table (5): Apparent digestibility (%) and nutritive values of different experimental silages.

Item	S1	S2	S3	S4
Digestibility coefficient (%)				
DM	46.76±5.75	50.15±3.23	47.69±3.51	51.50±3.23
OM	45.17^{b}±4.17	50.33^{b}±2.47	51.47^{ba}±2.62	61.13^{a}±2.46
CP	57.71^{b}±5.69	68.76^{ba}±2.88	69.81^{a}±0.99	74.57^{a}±2.07
CF	24.75^{b}±2.30	35.50^{ab}±2.80	25.50^{b}±3.59	49.94^{a}±2.19
EE	58.16^{bc}±6.56	56.67^{c}±0.45	71.49^{ba}±4.64	79.48^{a}±2.31
NFE	40.06±472	45.40±4.21	40.98±4.02	47.574±4.01
Ash	58.87±5.61	66.12±3.52	57.04±2.58	62.66±3.43
NDF	35.96^{b}±1.64	43.46^{a}±1.68	34.48^{b}±2.01	45.63^{a}±0.47
ADF	20.07^{c}±0.28	25.43^{ba}±1.16	22.22^{bc}±1.76	$28.66^{a=}$±0.34
ADL	5.31^{b}±0.45	7.07^{a}±0.63	6.29^{ba}±0.31	7.39^{a}±0.31
Nutritive values (%)				
TDN g/kg BW	10.60±0.41	12.58±1.53	12.55±1.09	15.61±0.71
TDN g/kg $BW^{0.75}$	5.87±0.20	6.68±0.69	6.67±0.52	7.85±0.34
DCP g/kg BW	1.92±0.05	2.13±0.19	2.35±0.17	2.40±0.12
DCP g/kg $BW^{0.75}$	1.63±0.03	1.76±0.12	1.90±0.11	1.93±0.07
ME cal /kg BW	38.37±1.31	45.54±1.46	45.43±1.65	56.51±0.68
ME cal/ kg $BW^{0.75}$	15.42±0.73	17.53±0.56	17.50±0.12	20.61±0.32

Values with the different superscripts on the same line differ at ($P \leq 0.05$).
(S1) Salt Plant Mixture (SPM) + Molasses, (S2) SPM+ Molasses + CB
(S3) SPM + Molasses + NB, (S4) SPM + Molasses + CB + NB
CB= Cellulolytic bacteria, NB= Nitrogen bacteria.
ME was calculated as 1 Kg TDN = 3.62 M cal (Kearl 1982). (3 animals each treatment).

Table (6): Water and nitrogen balance of sheep fed the experimental silages.

Item	S1	S2	S3	S4
No. of animals	3	3	3	3
Nitrogen intake	1505.72±	1647.12±	1939.74±	1806.06±
(mg/kg B.W.)	51.54	122.12	244.16	108.25
Fecal nitrogen	568.33±	516.64±	585.25±	431.83±
(mg/kg B.W.)	29.91	72.36	72.94	34.07
% of intake	37.88^{a}±2.70	31.24^{ab}±2.88	30.19^{ab}±0.99	23.91^{b}±2.07
Urinary nitrogen mg/kg B.W.	894.61 ±65.30	1032.98 ±82.42	1206.62 ±137.54	1225.13 ±92.47
(% of intake)	59.32±2.97	62.98±4.37	62.38±0.79	67.83±1.49
Nitrogen retention	42.77^{b}	97.51^{ba}	147.86^{a}	149.10^{a}
(mg/kg B.W.)	±16.37	±32.59	±44.64	±15.97
% of intake	2.80^{b}±1.02	5.77^{ba}±1.58	7.62^{a}±1.59	8.26^{a}±0.79
Drinking water	1726.67	1966.67	2056.67	2210
(ml/head/day)	±153.44	±154.52	±243.61	±286.18
Combined water	201.5±62.8	206.79±14.57	217.57±30.94	184.16±29.19
Metabolic water	123.26	132.47	130.51	128.89
(ml/head/day)	±23.56	±13.02	±22.72	±8.74
Total water intake (ml/head/day)	2051.43 ±228.94	2305.93 ±159.33	2404.75 ±234.54	2523.05 ±312.37
Fecal water (ml/head/day)	74.89 ±11.38	85.59 ±7.55	88.32 ±6.16	73.22 ±12.13
Urinary water	910.00	1106.00	1178.00	1230.00
(ml/head/day)	±160.52	±67.20	±243.92	±210.79
Total water excretion (ml/head/day)	984.89 ±156.63	1191.59 ±70.99	1266.32 ±244.81	1303.22 ±222.81
Water balance	1066.54	1114.34	1138.43	1219.83
(ml/head/day)	±179.0	±160.1	±230.5	±215.0

Values with the different superscripts on the same line differ at (P≤o.o5).
(S1) Salt Plant Mixture (SPM) + Molasses, (S2) SPM+ Molasses + CB
(S3) SPM + Molasses + NB, (S4) SPM + Molasses + CB + NB
CB= Cellulolytic bacteria, NB= Nitrogen bacteria.

Table (7): Some rumen parameters of sheep fed the experimental silages.

Item	Hrs.*	S1	S2	S3	S4	Mean
pH	0	6.78±0.03	6.73±0.16	6.71±0.11	6.76±0.03	6.74^{a}±0.03
	3	6.67±0.03	6.64±0.05	6.56±0.14	6.73±0.08	6.65^{a}±0.03
	6	6.43±0.25	6.40±0.20	6.38±0.02	6.44±0.19	6.41^{b}±0.06
pH mean		6.62±0.07	6.58±0.65	6.54±0.06	6.64±0.60	6.60±0.06
VFA's	0	4.32±0.44	4.52±1.00	4.65±1.03	4.67±0.33	4.54^{c}±0.19
(meq./dl)	3	5.48±0.29	5.39±0.57	5.86±0.48	4.81±0.65	5.39^{b}0.17
	6	5.75±1.33	6.82±1.29	6.62±0.99	6.52±1.25	6.43^{a}±0.30
VFA's mean (meq./dl)		5.18±0.03	5.57±0.44	5.71±0.34	5.33±0.38	5.45±0.56
NH_3-N	0	22.6±2.49	20.5±1.37	25.3±1.76	26.6±3.25	23.73^{b}±0.83
(mg/dl)	3	24.9±4.65	25.4±1.38	25.9±0.66	27.88±5.5	26.01^{b}±0.98
	6	26.9±3.41	31.7±7.31	33.7±5.34	31.86±5.5	31.03^{a}±1.42
NH_3-N mean (mg/dl)		24.8±1.22	25.9±2.04	28.3±1.37	28.77±1.6	26.92±1.27
TN	0	81.57±9.1	96.6±4.85	101.3±1.5	100.3±6.5	94.94^{c}±2.66
(mg/dl)	3	100.1±13	102.6±3.9	110.4±5.3	112.47±8.	106.39^{b}2.34
	6	101.5±3.6	112.7±4.0	134.3±1.6	139.1±3.1	121.9^{a}±3.19
TN mean (mg/dl)		94.4^{c}±5.0	104.0^{b}±2.7	115.3^{a}±5.0	117.3^{a}±5.6	107.75±2.7
NPN	0	40.2±2.42	37.4±8.74	48.2±7.54	45.3±7.37	42.8^{c} + 2.09
(mg/dl)	3	49.6±8.32	53.93±2.9	66.4±9.61	56.3±2.08	56.57^{b}+2.47
	6	59.8±5.50	58.7±9.78	73.8±7.27	75.3±4.62	66.92^{a}+2.90
NPN mean (mg/dl)		49.9^{b}±3.3	50.0^{b}±3.9	62.8^{a}±4.5	59.0^{a}±5.3	55.42±2.56
True-PN	0	41.4±10.0	59.2±11.1	53.09±7.9	55.06±1.7	52.18+2.86
(mg/dl)	3	50.5±11.2	48.7±6.43	44.0±12.1	56.14±6.1	49.82+2.41
	6	41.73±8.6	53.97±8.1	60.53±8.4	63.8±7.46	55.00±2.28
True-PN mean (mg/dl)		44.5±3.19	53.95±3.0	52.5±3.67	58.3±1.92	52.33±2.38

Values with the different superscripts on the same line differ at (P≤o.o5)., (T.) Sampling time (hours after feeding), (TN) Total nitrogen, (NPN) Non protein nitrogen, True-PN True protein nitrogen.

(S1) Salt Plant Mixture (SPM) + Molasses, (S2) SPM+ Molasses + CB

(S3) SPM + Molasses + NB, (S4) SPM + Molasses + CB + NB

CB= Cellulolytic bacteria, NB= Nitrogen bacteria.

*Hours post feeding

Table (8): Body weight changes , voluntary feed intake and feed conversion for sheep during the feeding trial.

	S1	S2	S3	S4
No. of animals	6	6	6	6
Initial body weight, Kg	39.67	38.81	40.50	39.11
Body weight changes (Kg)	0.80^{c}	1.35^{bc}	1.89^{b}	2.65^{a}
% of initial body weight	2.02^{c}	3.48^{bc}	4.67^{b}	6.77^{a}
Average daily gain (g/head)	13.33^{c}	22.50^{bc}	31.50^{b}	44.17^{a}
Voluntary intake				
DM g/head /day	975.32	990.50	1027.10	1040.18
g/Kg B.W	24.59	25.52	25.36	26.60
CP g / head / day	125.43	125.79	152.73	148.95
g/ Kg B.W.	3.16	3.24	3.77	3.81
TDN g/ head /day	435.68	491.98	516.63	599.87
g/ Kg B.W.	10.98	12.68	12.76	15.34
DCP g/ head / day	72.39	86.49	106.62	111.07
g/ Kg B.W.	1.82	2.23	2.63	2.84
Feed conversion Kg TDN / Kg gain	32.68	21.87	16.40	13.58

Values with the different superscripts on the same line differ at ($P \leq o.o5$).
(S1) Salt Plant Mixture (SPM) + Molasses, (S2) SPM+ Molasses + CB
(S3) SPM + Molasses + NB, (S4) SPM + Molasses + CB + NB
CB= Cellulolytic bacteria, NB= Nitrogen bacteria.

Concerning to ammonia nitrogen (NH_3-N) (as mg/100 ml), S_4 and S_3 had non-significant higher values, whereas the lowest one was S_1. The data showed an increase ($P \leq 0.05$) of ruminal ammonia with advancing time after feeding to reach the maximum value at 6 hrs. after feeding. Similar trends were observed with ruminal total nitrogen and non-protein nitrogen (NPN). Thus, greatest ($P \leq 0.05$) values of total nitrogen and NPN were recorded for animals fed S_4 and S_3. This may be due to such silage contained nitrogen bacteria as a nitrogen source. Similar results were obtained by Hassan, *et al.* (2005). Also the results indicated total nitrogen and NPN increased ($P \leq 0.05$) after feeding time progressed to reach the highest values at 6 hrs. post feeding. Data of Table (7) indicated that S_4 had non significant higher values, (58.32 mg/100 ml) of true protein, whereas, the lowest was S_1 (44.53 mg/100 ml).

Average values of body weight changes; voluntary feed intake and feed conversion are illustrated in Table (8). The data showed that daily gain significantly ($P \leq 0.05$) varied between groups. The greatest value of daily gain was achieved with animal fed S_4, followed by S_3, S_2 and S_1 in descending order. The present data showed that the greatest DM intake was observed with sheep fed S_4 (26.60 g/kg B.W.), followed by animals fed S_2, S_3 and S_1 in descending order (25.52, 25.36 and 24.59 g/kg B.W). This indicated that S_4 was more palatable than other silages.

Results of crude protein intake illustrated that S_4, (which treated by celluletic and nitrogen bacteria) had the highest value (3.81 g/kg B.W.) of crude protein intake, whereas, the lowest value was recorded for S_1 (3.16 g/kg B.W.).

TDN and DCP intake (g/kg B.W.) and feed conversion (kg TDN/kg weight gain) had the same trends.

CONCLUSION

It could be concluded that SPM could be treated as silage using mixture of celluletic and nitrogen bacteria (S_4) to be used as animals feed.

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دراسات غذائيه على الاغنام المغذاه على بعض النباتات الملحيه المعامله بالبكتريا فى سيناء

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تعتبر النباتات الملحيه المنزرعه (الاكاسيا والقطف) و الطبيعيه (الطرفه) المصدر الرئيسى لغذاء حيوانات المناطق الجافه و الشبه جافه و هذة النباتات بها الكثير من المشاكل منها إنخفاض قيمتها الغذائيه و لذا كان هناك العديد من المحاولات لرفع قيمتها الغذائيه وتعتبر هذه الدراسه محاوله جديده لرفع القيمه الغذائيه لهذه النباتات و تمت هذه الدراسه على مرحلتين:

1_ دراسه معمليه

وفيها تم تجميع الاجزاء الغضه من الاوراق و السوق من نباتات التجربة و ثم خلطها بنسبه 50% طرفه ،25% أكاسيا ،25% قطف وكانت هذه النسب على أساس الماده الجافه و تم تقسيمها إلى ثلاث أقسام جزء جاف ،جزء مدبل و جزء تم تصنيعه سيلاج و تم معاملتها جميعا بالبكتريا و كانت المعاملات هى

1- مخلوط النباتات +10% مولاس
2- مخلوط النباتات +10% مولاس + بكتريا محلله للسليلوز
3- مخلوط النباتات +10% مولاس + بكتريا منتجه للنيتروجين
4- مخلوط النباتات +10% مولاس +بكتريا مخلله للسليلوز + بكتريا مثبتة للنيتروجين

2_ دراسه حقليه

تلى التجربه المعمليه تجربه حقليه اختير فيها السيلاج للتطبيق على كباش متوسط وزنها 39.5 + 1.19 كجم فى تجربه تغذيه تلتها تجربه هضم حيث تم تقسيم الحيوانات لاربع معاملات كما ذكرت فى التجربه المعمليه و تم تغذيتها على 200 جم علف مركز بالاضافه للسيلاج كتغذيه حره و كانت اهم النتائج ما يلى :

التجربه المعمليه : ارتفاع نسبه البروتين فى السيلاج بينما انخفض نسبه الالياف الخام و مكونات الالياف و من هذه النتائج اختير السيلاج كافضل شكل من النباتات للتطبيق على الحيوان .

و كانت اهم نتائج التجربه الحقليه : ارتفاع نسبه البروتين فى السيلاج رقم 3و4 بينما انخفضت نسبه الالياف الخام و مكونات الالياف فى السيلاج رقم 2 كما ارتفعت نسبه المواد المضاده للتغذيه مثل التانينات فى السيلاج الغير معامل بالكتريا .

كما اوضحت نتائج تجربه الهضم أن السيلاج رقم 4 كان الاكثر كفاءه فى الاستخدام و ارتفاع نسبه المهضوم منه فكان الاكفأ فى القيم الغذائيه و نسبه البروتين المحتجز بينما كانت الاحماض الدهنيه الطياره و نسبه حموضه الكرش متشابه فى كل المعاملات بينما ارتفعت نسبه الامونيا غير معنويا فى السيلاج رقم 3 ،4 و كذلك زياده البروتين الكلى و المواد الازوتية غير البروتينيه معنويا

الخلاصه : سيلاج رقم 4 و الذى يحتوى على البكتريا المحلله للسليلوز و البكتريا الازوتيه كان افضل معامله لتغذيه الاغنام خلال موسم الجفاف .