World Journal of Agricultural Sciences 4 (2): 149-156, 2008
ISSN 1817-3047

Adding Natural Juice of Vegetables and Fruitage to Ruminant Diets: (A) Lemon, Onion and Garlic Juice Supplement to Diets Fed to Suckling Buffalo Calves and its Effect on Digestibility, Growth Performance and Fungi Count

[1]A.M. Aiad, [3]Neamat I. Bassuony, [2]A.A. Afifi and [1]F.M. Abo-Donia

[1]Animal Production Research Institute (By-Product Utilization Department)
[2]Animal Production Research Institute (Buffaloes Research Department)
[3]Regional Center for Food and Feed (Microbiology Department)
Agriculture Research Center Ministry of Agriculture Dokki, Giza, Egypt

Abstract: Twenty four suckling buffalo claves average body weight 38.78±0.95. Calves divided into four groups (6 calves, each). Group one (G_1) was control while (G_2), (G_3) and (G_4) were supplemented with 2.5%,5%,and 7.5% natural juice / kg diet/day. The juice were consisted from lemon, onion and garlic (0.125 : 1 : 1) added for two litter clean water and squeeze in electric machine. Total counts of fungi and yeast were determined and aflatoxins estimation in the diet. The main results indicate that diets contain 5% and 7.50% natural juice showed significantly ($P<0.05$) better OM, CP, CF, EE and NFE digestibility coefficients than other diets. The nutritive value as TDN and DCP were increase significantly ($P<0.05$)with supplementetation of the natural juice. While the diet supplemented with 7.50 % natural juice showed increase significantly ($P<0.05$) for TDN and DCP as g/ kg $w^{0.75}$. Daily weight gain of calves fed diets supplemented with 2.50 and 5.00 %, respectively natural juice were increase significantly ($P<0.05$) than other diets while the diet supplemented with 7.50 % natural juice insignificantly increase by 10.91% than the control one. Feed conversion expressed as kg DM, TDN and DCP/kg gain indicated that supplementetation of Lemon, Onion and Garlic juice to suckling buffalo calves diets improved DM conversion by 31.05, 36.64 and 21.75 %, respectively ; over the control, the same trend was observed with TDN and DCP conversion. However diet D_3 tended to get better feed conversion with DM, TDN and DCP conversion. Diet supplemented with 7.5 % natural juice showed lower ($P<0.05$) pH value at 3 hrs. post feeding and higher NH3-N and TVFA's concentration than the control diet. The highest number of isolated fungi was obtained from milk $2x10^{-4}$ cfu / g. Isolated fungi were identified as *Aspergillus niger*, *Uleolodium consortiale*, *Penicillium mautanense* and *Speregillus aculeatus*. The determined total counts of fungi in the water was $77x10^{-3}$ and $7x10^{-3}$ from calf starter. The three level of natural additive to milk, water and calf starter inhibited the mycelial growth of various fungi species. On the other hand, yeast count was increased in milk by increasing the concentrations of natural juice, while the high values of yeast was recorded with D_4 ($230x10^{-4}$). The results of economic evaluation of the experimental diets showed decreasing in cost by 11.06 and 17.77 % of D2 and D3 than the control, while D4 showed increasing in cost by rate of 5.06 % than the control one.

Key words: Buffalo calves · lemon-onion and garlic juice · growth performance · digestibility · fungi count · aflatoxins

INTRODUCTION

Dietary natural additive to calve diets have the ability to enhance and stabilize fermentation and improve viscosity texture, moisture and overall yields involved in meat production [1]. Adding different amounts of natural additive to whole milk and rations as described by Sanz *et al.* [2] led to better utilization of the protein ingested in ruminants. Also, the observations of Quigley *et al.* [3] indicated that young claves given high additive (fat milk 40% on dry matter) improved their weight gain, feed efficiency and improvement of nutrients digestibility. Earlier research had led to the development of an early weaning program involving the use of a

Corresponding Author: Dr. A.M. Aiad, Animal Production Research Institute (By-Product Utilization Department), Agriculture Research Center Ministry of Agriculture Dokki, Giza, Egypt

pre-starter and natural additive to stimulate feed consumption and destroy the harmful bacteria [3].

Before weaning, sources of energy protein and additive are derived mainly form the intestinal absorption of milk, while after weaning is derived primarily from ruminal fermentation and subsequent absorption [4, 5].

Garlic, anion and lemonade juice is highly inhibitory to molds and fungi [6]. Also, Wangensteen *et al*. [7] and Khir *et al*. [8] showed that, addition natural additive to food well increase the antioxidant content and may have potentials a natural antioxidant and thus inhibit unwanted oxidation processes. Gupta *et al*. [9] found that improvement in the digestibility coefficients of different nutrients is probably due to improved gross activity of rumen micro flora.

The objective of the present study was to evaluate of supplemented vegetable and fruitage juice as natural additive to diets of suckling buffalo calves on digestibility of nutrients, growth performance. Total count of fungi, yeast and aflatoxins were determine in milk, water and calf starter.

MATERIALS AND METHODS

This work has been conducted at Mahllet Mossussa Experimental Station, Animal Production Research Institute (APRI) (Kafer El Shaikh Governorate). Chemical analysis were conducted at Dokki Laboratory of By-Product Utilization Department. Animal Production Research Institute. The fungi, yeast count and aflatoxins estimation were conducted at Regional Center for Food and Feed (RCFF), Agricultural Research Center, Ministry of Agriculture, Egypt.

Twenty-four indigenous suckling buffalo calves average body weight of 38.78 ± 0.95 kg and one week of age. Calves were left with dams for three days nersing colstrum then divided randomly into four experimental groups after approximately similar weight and age. Four experimental diets were used from milk and calf starter. Calf starter consisted of 50 % yellow corn, 15 % barley, 25 % soybean meal, 8 % molasses, 0.50 % minerals mixture, 1.50 % limestone, 0.30 % antibiotic and 0.20 % vit. AD_3E. The juice were consisted from lemon, onion and garlic (0.125 : 1 : 1) added for two litter clean water and squeeze in electric machine. The mixed juice were filtered and kept in dark glass bottle at 4°C. The 1st diet D_1 without supplementetation (control). The 2nd (D_2) was supplemented with 2.5% mixed juice, 3rd (D_3) was supplemented with 5% mixed juice and 4th (D_4) was supplemented with 7.5 % mixed juice.

Feces and diets samples were daily collected and composite samples were prepared for chemical analysis according to conventional procedures of Aiad [10].

Calves were housed in four pens bedded with rice straw for the duration of the experiment. From the start of the experimental each calf suckled buffalo milk on 10 % of birth weight. Feeds were offered in two equal portions at 8.00 a.m and 4.00 p.m. as described by Salama and Mohy El-Deen [11] to over their nutritional requirements [12].

Berseem hay (BH)as a bulky roughage was offered *ad lib*. Fresh water and mineral mixture blocks were freely available to animals. The trial lasted 105 days and calves were biweekly weighed in the morning before offering any feed or water. Live body weight changes and feed intakes were recorded at biweekly intervals.

At the end of 8th week of the growth experiment, three calves were taken at random from each group to determine the digestibility and nutritive value of experimental diets. Acid insoluble ash (AIA) method was used as described by Van keulen and Young [13]. During feces grabbing period calves were fed chopped Berseem hay as 80 % from the average daily free choice intake. Feeding and rectum grabbed feces collection was practiced for 5 days. Feces samples were treated with 10 % sulfuric acid (H_2SO_4) and kept frozen at -18°C for further chemical analysis.

Rumen fluid samples were collected from three animals form each group using a rubber stomach tube at 0, 3 and 6 hrs after morning feeding. Ruminal pH was directly estimated by pH meter and ammonia-N was determined according to Conway [14]. Total volatile fatty acids (VFA's) were measured according to Warner [15]. Molar proportions of VFA's were determined according to Erwin *et al.* [16].

Determination of total count of fungi: Total counts of fungi were determined on potato dextrose agar (PDA) medium [17] plates were incubated at 25°C for 7 days and the counts of fungi (cfu/g) were determined as described in American Public Health, Association [18] and Oxpoid Manual [19].

Isolation and identification of fungi: Developed colonies on PDA medium were transferred to PDA slants and purified using the single spore technique [20] and /or hyphol tip technique [21]. Purified isolates were identified according to their morphological and microscopically characters as described by Jenes *et al*. [22] and confirmed by Plant Pathology Institute ARC., Egypt.

Mycotoxins analysis: All standards of Mycotoxins were purchased from sigma company, USA. All chemicals and solvents used were of ACS grade. Thin layer chromatography (TLC) was performed using 20x20 cm TLC aluminum plates recoated with 0.25 mm silica gel 60 (Merk). aflatoxins, zearalenon and funonisin were extracted by B.F. method as described in A.O.A.C. [23]. Extracts were dissolved in soul chloroform and vortexed, 20µl aliquot and 10µl of the standards were stopped on TLC plates and developed in dark room with ethyl ether : methanol : water (96 : 3 : 1). After drying the spots were examined with U.V at a wave length of 365 nm [24].

Yeasts count: Total counts of yeast were determined on Ruse-bengl chloramphenicol agar according the methods described in Oxpoid Manual [19]. Plates were incubated at 22-25°C for 7 days.

Diets and water pH values: The value of pH was measured according to Ling [25]. pH values of samples were estimated by means of an electric pH-metr (Wissens chaftlish tehcnisch werkstatten D 8/20 weitheim pH 40).

An economical study of supplement the natural juice of lemon, onion and garlic the diets of suckling buffalo calves was under taken using the current feed purchase prices to find out the feed cost of producing one kilogram live bodyweight.

The chemical analysis of feeds and feces were carried out according to A.O.A.C. [23]. The collected data were statistically analysis according to Snedecor and Cochran [26]. The differences among means were tested using Duncan's multiple range test [27]. The following model was used:

$$Y_{ij} = \mu + Ti + e_{ij}$$

Where: Y_{ij} = observed trait, μ = overall mean, Ti = effect of treatment, e_{ij} = random error.

RESULTS AND DISCUSSION

Chemical composition: The chemical composition of feed ingredient and experimental diets are presented in Table 1. Data indicated that the experimental diets were iso- nitrogenous iso-caloric. The chemical composition of the BH and calf starter were within the normal published ranges for CP, CF and DE [28]. The chemical composition of buffalo milk were nearly similar reported by EL-Ashry *et al.* [29].

DM intake, Digestibility and Nutritive Values: Nutrient consumed during digestibility evaluation trial were calculated according to feeds consumed and their chemical composition. The composed diets showed comparable nutrients as shown in Table 1.

Nutrient digestibility of these diets are presented in Table 2. The diets contain 5% and 7.50% natural juice of lemon, onion and garlic supplementation showed significantly ($P<0.05$) better OM, CP, CF, EE and NFE digestibility coefficients than those control and diet contain 2.50 % experimental natural juice. The present results agree with those of Khir and Ibrahim [8], Moawd *et al.* [31] and Zaki *et al.* [32]. The nutritive value as TDN for the four diets showed comparable results and ranged between 65.53 and 71.26 %. the low digestibility of CP (67.67 %) for the control diet tended to significantly ($P<0.05$) the lowest digestible crud protein (DCP), being 13.80% while those of D2, D3 and D4 were 14.07, 14.51 andl 4.55 % respectively. The total DM intake kg /head /day appeared to higher with animals fed diet (D4) containing 7.5% natural juice of lemon, onion and garlic as supplementation than those of the others. Consequently, the TDN intake was higher with animals fed same diet when expressed as kg /100kg BW or g/kg $W^{0.75}$ being 1.337 and 38.79 respectively. These results were agreement with those obtained by Khir and Ibrahim [8] and El-Ashry *et al.* [29] and Zaki *et al.* [32].

Table1: Chemical composition of the experimental diets, buffalo milk, berseem hay and calf starter

Items	D1	D2	D3	D4	Milk	BH	Calf starter
Moisture	8.86	8.64	8.55	7.75	84.90	9.71	11.07
			DM composition %:				
CP	20.39	20.49	20.59	20.51	25.52	12.30	18.60
CF	7.90	7.88	7.82	7.95	-	28.50	3.25
EE	3.51	3.53	4.00	4.60	43.17	2.70	2.93
NFE	59.34	59.61	59.04	58.19	25.41	44.00	68.68
OM	91.14	91.51	91.45	91.25	94.10	87.50	93.46
Ash	8.86	8.49	8.55	8.75	5.90	12.50	6.54
DEkcal/kg*	2.69	2.94	2.69	2.69	2.94	2.03	2.83

*DE= 4.36-0.049 x NDF NDF = 28.924 + 0.657 (CF%) according to Cheeke [30].

Table 2 : Effect of experimental diets fed to suckling calves during feces grabbing period on daily dry matter intake, nutrient digestibility and nutritive values

	Experimental Diets				
Item	D_1	D_2	D_3	D_4	SE
Animal weight, kg	69.92	72.82	74.25	70.75	±1.90
Body weight, kg $W^{0.75}$	24.18	24.93	25.29	24.39	±0.25
DMI intake, kg /head /day:					
Milk	0.515	0.504	0.492	0.510	±0.48
Calf starter	0.612^{b}	0.541^{a}	0.585^{a}	0.621^{b}	±0.39
Brseem hay	0.229	0.224	0.219	0.227	±0.42
Total DMI kg /head /day	1.356	1.269	1.296	1.358	±0.26
Nutrient digestibility %:					
DM	64.22^{b}	66.17^{b}	68.45^{a}	66.85^{a}	±0.61
OM	66.83^{b}	67.80^{b}	71.36^{a}	68.37^{a}	±0.68
CP	67.67^{b}	68.67^{b}	70.50^{a}	70.94^{a}	±0.39
CF	51.82^{b}	52.24^{b}	56.64^{a}	56.46^{a}	±1.42
EE	65.23^{c}	66.27^{c}	75.19^{a}	73.29^{b}	±1.26
NFE	71.60^{c}	72.23^{c}	77.16^{a}	74.06^{b}	±2.21
Nutritive value:					
TDN	65.53^{b}	70.10^{b}	71.26^{b}	69.70^{a}	±0.25
DCP	13.80^{b}	14.07^{b}	14.51^{a}	14.55^{a}	±0.22
TDN intake:					
Kg DM /head / day	0.8886^{b}	0.8896^{b}	0.9235^{a}	0.9465^{a}	±0.03
Kg / 100 kg body weight	1.2709^{b}	1.2190^{b}	1.2430^{b}	1.3370^{a}	±0.30
g / kg $W^{0.75}$	36.7500^{b}	35.8800^{b}	36.5200^{a}	38.8100^{a}	±1.48
DCP intake:					
Kg DM /head / day	0.1871^{b}	0.1785^{b}	0.1881^{b}	0.1976^{a}	±0.02
Kg / 100 kg body weight	0.2676^{b}	0.2452^{b}	0.2533^{b}	0.2793^{a}	±0.42
g / kg $W^{0.75}$	7.3800^{b}	7.1600^{b}	7.4300^{a}	8.1000^{a}	±0.05

$^{a, b, c}$ Means in the some row having different superscripts are significantly different at ($p< 0.05$)

Table 3: Growth parameter of suckling calves fed the experimental diets

	Experimental Diets				
Item	D_1	D_2	D_3	D_4	SE
Duration period / days	105	105	105	105	
Number of suckling calves	6	6	6	6	
Average body weight (kg):					
Initial body weight, kg	39.67^{a}	38.82^{a}	37.88^{a}	39.30^{a}	±2.11
Final body weight, kg	88.86^{a}	94.90^{b}	98.34^{b}	91.08^{c}	±3.20
Total weight gain, kg	49.19^{a}	56.08^{bc}	60.46^{b}	51.78^{ac}	±0.29
Av. Daily Gain (ADG), kg	0.469^{a}	0.534^{bc}	0.576^{b}	0.493^{ac}	±0.15
DMI intake, kg /head /day:					
Buffalo Milk	0.464^{a}	0.454^{a}	0.443^{a}	0.460^{a}	±0.28
Calf starter	0.651^{a}	0.693^{ab}	0.696^{ab}	0.732^{b}	±0.38
Berseem hay	0.297^{a}	0.332^{ab}	0.332^{ab}	0.347^{b}	±0.18
Total DM intake	1.594^{a}	1.469^{b}	1.461^{b}	1.539^{a}	±0.83
Feed conversion:					
Kg DMI/kg gain	3.990^{a}	2.751^{bc}	2.536^{b}	3.122^{c}	±1.11
Kg TDN/kg gain	2.227^{a}	1.928^{ac}	1.807^{c}	2.176^{ab}	±1.11
Kg DCP/kg gain	0.469^{a}	0.387^{b}	0.368^{b}	0.454^{a}	±0.23

$^{a, b, c}$ Means in the some row having different superscripts are significantly different at ($p< 0.05$)

Table 4: Rumen fluid parameter of suckling calves fed the experimental diets

Item	Time (hrs)	Experimental Diets				SE
		D_1	D_2	D_3	D_4	
pH	0	6.05[a]	5.83[b]	5 .65[b]	5.93[a]	0.06
	3	5.69[a]	5.64[a]	5.58[a]	5.44[b]	0.07
	6	5.82[a]	5.71[a]	5.69[a]	5.56[b]	0.05
NH3-N (mg/dl)	0	13.96[a]	14.12[a]	13.64[a]	13.81[a]	1.10
	3	18.20[a]	18.62[a]	18.72[a]	18.75[a]	0.20
	6	14.21[a]	14.35[a]	14.40[a]	14.60[a]	0.49
VFA`s (meq/dl)	0	7.45	7.51	7.71	7.85	0.75
	3	9.46	10.58	10.79	10.83	0.65
	6	8.35	5.53	8.82	8.85	0.12
Acetate %	0	48.2	48.00	49.70	49.80	0.43
	3	45.3	45.20	47.10	46.35	0.57
	6	45.3	45.75	46.35	46.85	0.40
Propionate %	0	39.35	41.25	38.90	40.90	0.53
	3	40.45	41.30	39.80	40.85	0.72
	6	40.85	41.55	39.95	39.35	0.57
Butyrate %	0	12.45	10.15	11.40	9.30	0.04
	3	14.25	13.50	13.10	12.80	0.05
	6	13.50	12.10	13.70	13.20	0.04

[a, b, c] Means in the some row having different superscripts are significantly different at ($P<0.05$)

Growth performance: The average daily body weight gain values were 0.469, 0.534, 0.576 and 0.493 kg for D_1, D_2, D_3 and D_4, respectively as presented in Table 3. Daily weight gain of calves fed diets supplemented with 2.50 and 5.00 % natural juice were increase significantly ($P<0.05$) than other diets while no significant differences were found with group fed diet supplemented with 7.5% natural juice. These results indicated that the use of lemon, onion and garlic juice as feed supplement to suckling calves diets had no adverse effect on average daily gain. Results obtained in this study are in line of the finding of Khir and Ibrahim [8], Salama and Mohy El-Deen [11], El-Ashry *et al.* [29], Mowad [31], Zaki *et al.* [32] and Roy *et al.* [33].

Feed conversion expressed as kg DM, TDN and DCP/kg gain indicated that supplementetation of Lemon, Onion and Garlic juice to suckling buffalo calves diets improved DM conversion by 31.05, 36.64 and 21.75%, respectively; over the control, the same trend was observed with TDN and DCP conversion. However diet D_3 tended to get better feed conversion with DM, TDN and DCP conversion. These results agree with those of Khir and Ibrahim [8] EL-Ashry *et al.* [29], Mowad [31], Zaki *et al.* [32], Roy *et al.* [33], Parasd *et al.* [34], Ali *et al.* [35] and Safaa Nadi [36].

Ruminal parameters: Results of pH values; ammonia nitrogen concentrations (NH_3-N); volatile fatty acids concentrations are (VFA's) presented in Table 4. Diet supplemented with 7.5% juice D_4 showed lower ($P<0.05$) pH value at 3 hrs post feeding and higher NH3-N and TVFA's concentration than the control diet. Increasing TVFA's with increasing juice level in diet may by related to better fermentation of the soluble carbohydrate within 3.00 hrs post feeding. These results of rumen parameters were within the normal range of suckling calves. The results of molar proportion (%) as acetate; propionate and butyrate were not affected with supplementation of natural juice of lemon, onion and garlic compared with the control diet. These results are in agreement with those found by White *et al.* [37], Williams [38], Dawson *et al.* [39] and Robinson and McQeen [40].

Bacteriological results: The occurrence of isolated fungi strains varied from milk, water and calf starter are shown in Tables 5 & 6. The highest number of isolated fungi was obtained from milk $2x10^{-4}$ cfu / g. isolated fungi were identified as *Aspergillus niger*, *Uleolodium consortiale*, *Penicillium mautanense* and *Speregillus aculeatus* from milk. The determined total counts of fungi in the water was $11x10^{-3}$ and $7x10^{-3}$ from calf starter.

From the above general the most common species were *Aspergillus niger*, *Penicillium* spp and *Fusarium* spp. These findings are almost in agreement with those reported by Gherbawy [41] during study on the atmosphere at Hurghada city. In the present study all

Table 5 : Effect of natural juice supplementation to experimental diets on total fungal and yeast counts and pH values of milk, water and calf starter.

Test samples	Supplementation %	fungi Count cfu/g	yeast Count cfu/g	pH
Milk	Without	2×10^{-4}	45×10^{-3}	7.02
	2.5	1×10^{-3}	120×10^{-3}	4.44
	5	nil	120×10^{-3}	3.96
	7.5	nil	230×10^{-4}	3.83
Water	Without	11×10^{-3}	35×10^{-3}	6.96
	2.5	8×10^{-2}	nil	3.33
	5	nil	nil	3.19
	7.5	nil	nil	3.50
Calf starter	Without	$7x10^{-3}$	nil	5.12
	2.5	4×10^{-2}	nil	4.52
	5	1×10^{-2}	nil	4.20
	7.5	nil	nil	4.18

Table 6: Isolated fungi from milk, water and calf starter

Test samples	Isolated Fungi	Total count before supplementation
Milk	*Aspergillus niger*	2×10^{-4}
	Ulcoladium consortiale	
	Penicillium montaneuse	
	Spergillus aculeatus	
Water	*Apserigllus spp.*	11×10^{-3}
	Penicillium spp.	
	Apserigllus niger	
	Apserigllus versicolor	
	Apserigllus carneus	
Calf starter	*Apserigllus niger*	7×10^{-3}
	Aspergillus aculeatus	
	Aspergillus syndowii	
	Aspergillus tamari	
	Fusarium emitectium	
	Fusarium pallidoro serum	
	Aspergillus falvus	

Table 7: Economic evaluation of the experimental diets for growth performance

	Experimental diets			
Item	D1	D2	D3	D4
Feed cost / kg gain , LE				
Milk [1]	13.12	11.26	10.19	12.35
Starter [2]	2.02	1.88	1.75	2.15
BH [3]	0.63	0.62	0.56	0.70
Mixed Juice 4	0.00	0.44	0.89	1.41
Total cost, LE / kg gain	15.77	14.20	13.39	16.61
Relative economic efficiency	100.00	111.06	117.77	94.94

1 - on the basis of a price of milk 2.00 LE / litter

2 - on the basis of a price of 1.45 LE kg

3 - on the basis of a price of Berseem hay 1.00 LE / kg

4 - on the basis of a price of lemon 50.0, onion 20.0 and garlic 20.0 PT/ kg

5 - Assuming that cost p of kg gain of the control equals 100.

tested fungi were sensitive to natural additive specially garlic and onion extracts. The three level of natural additive to milk, water and calf starter inhibited the mycelial growth of various fungi species. Aflatoxins not extract when the fungi not growth. The mycelial growth of *Aspergillus niger*, *Penicillium mantanese*, *Aspergillus falvus* and *Fusarium semitectium* and *Fusariun pallidoro* serum was significantly ($P<0.05$) retarded by medium and high doses.

On the other hand, yeast was increased in milk by increasing the concentrations of juice while the high values of yeast was recorded at 7.5 % supplemented juice concentration 230 x 10^{-4}. The present results are agree with Brufau [42] when use of essential oils in animal nutrition, yeast as on example of the mode of action of probiotics in mono-gastric and ruminant species, nutritional effects of organic acids acidification and other physiological additives, interactions of feed enzymes.

Natural additive cause pH reduction, organic acid profiles and fungi counts were determined. In juice added to calves diets citric acid and acetic acid were produced and the pH dropped to a value 4.0 and fungi products could not be detected in various materials tested.

After supplementation the juice to the water, milk and calf starter the of aflatoxins was nil in spite the fungi found in diets.

The results showed that the produced citric and acetic acid and the pH in the feed are responsible for fungi reduction in the ruminant feed. The present finding was agreement with Parasd *et al.* [34] and Gherbawy [41], they observed that the topical application of the crude extract of garlic at 1:0 concentration in distilled water could compact dermaphytosis produced in rabbits with Microsportin canis without causing any apparent side. Shekhawat and Proada [43] reported that boiled water extracts of onion caused inhibition to the growth of fungi. More recently Zohari *et al.* [44] noticed that onion

oil (200 ppm) completely inhibited the growth of *Asperigulls niger sp.* and *pencillium spp.*

Helen *et al.* [45] showed that the activity of glutathione reductase was decreased significantly ($P<0.05$) in all almost tissues studied from treated rats. With onion oil or garlic oil treatment, glutathione peroxidase activity was increased significantly ($P<0.05$) in almost all the tissues. In the present finding the antioxidant effect of this sulfur rich oils from *Allium* species is reflected by demonstrating an increase correlation between antioxidant enzyme and lipid peroxidation products in the milk, water and diet of suckling buffalo calves. These results suggest that garlic and onion (Natural additive) are useful antioxidants and their supplementation nullifies ill-effects caused by fungi and bacterial by affecting lipid peroxidation and the antioxidant defense system.

Economic evaluation: The economic evaluation of the experimental diets for suckling buffalo calves is presented in Table 7. Results showed that daily feed cost (L.E) was reduced in supplementation of garlic, onion and lemon diets with rate of 2.50 % (14.20 L.E) and 5% (13.39 L.E) compared to the control group (15.77 L.E). While the diet supplemented with 7.5 % juice show increase of daily feed cost (16.61 L.E) than the control. the high economic efficiency was recorded for the calves fed diet (D3) supplemented with 5 % juice. The economic efficiency was improved by the diet supplemented with 5 % juice of garlic, onion and lemon compared the control. This is in full agreement with the results obtained by Khir and Ibrahim [8], Salama *et al.* [11] and EL-Ashry *et al.* [29].

REFERENCES

1. Mittal, G.S. and W.R. Usborne, 1985. Meat emulsion extenders. Food Technol., 39: 121.
2. Sanz, M.R., I.M. Ruiz, F.E. Gil and J. Boza, 1997. The effect of different concentrations of protein and fat in milk replacers on protein utilization in kid goats. Anim. Sci., 64: 486.
3. Quigley, J.D., J.J.R. Ejmna and K.R. Martin, 1994. Response of peripheral blood mononuclear cells to mutagenic stimulation in young calves. J. Dairy Sci., 77: 259.
4. Quigley, J.D. and J.K. Bernard, 1992. Efficacy of garlic (*Allium sativum*) therapy against experimental dermatophtosis in rabbits. Indian. J. Med. Res., 75: 465.
5. Metawlly, A.M., E.A. Omar and A.Y. Salem, 2000. Studies on some blood components, rumen fluids and growth as influenced by addition volatile fatty acids and age of suckling Friesian calves. J. Agric. Res. Tanta Univ., 25: 27-36.
6. Elgyyar, M., F.A. Draughon, D.A. Golden and J.R. Mout, 2001. Antimicrobial activity of essential oils from plants against selected pathogenic and saprophytic microorganisms. J. of Food Protection, 64(7): 1019-1024.
7. Wangensteen, H., A.B. Sanulsen and K.E. Malterud, 2004. Antioxidant activity in extracts from coriander. Food Chemistry, 88: 293-297.
8. Khir, A.A. and Nany S. Ibrahim, 2007. Effect of coriander and anise as feed additives on performance of buffalo calves. Egyptian J. Nutrition and Feed 10 (2): Special Issue, pp: 453-460.
9. Gupta, N., A. Kumar and D.P. Tiwar, 2005. Effect of herbs as feed additive on nutrient utilization and growth and growth in crossbred heifers fed paddy straw ration. Indian J. of Animal Sci., 75(1): 52-55.
10. Aiad, A.M., 2005.The replacement value of canola meal for soybean meal in growing buffalo calves ration. J. Agric. Sci., Mansoura Univ., (6): 3047-3058.
11. Salama, M.A.M. and M.M. Mohy El-Deen, 1996.Weaning buffalo calves on basis of dry matter intake as a percentage of birth weight. International symposium on buffalo resources and production systems. October 14-17, Animal Production Research Institute Cairo, Egypt.
12. N.R.C., 1984. National Research Council. Nutrient Requirements of domestic animals. Nutrient requirements of beef cattle 6th rev. Ed. NAS. NRC, Washington, DC., USA.
13. Van Keulen, J. and B.A. Young, 1977. Evaluation of acid-insoluble ash as a natural marker in ruminant digestibility studies. J. Anim. Sci., 44: 282.
14. Conway, E.J., 1957. Mcirodiffuon Analysis and Volumetric Error. 4th Ed. Crosby Lackwood and Sons. London.
15. Warner, A.C.I., 1964. Production of volatile fatty acids in the rumen. Methods of measurements Nut. Abst. and Rev., 3(4): 339.
16. Erwin, E.S., G.T. Marco and E.M. Emery, 1961. Volatile fatty acid analysis of blood and rumen fluid by gas chromatography. J. Dairy Sci., 44: 1768.
17. Christensen, G.M., 1957. Deterioration of stored grouius by fungi. Botan. Rev., 23: 108-134.
18. American Public Health Association, 1990. Standard Methods for the Examination of Dairy Products. 11ed APHA. Inc., New York.
19. Oxpoid Manual, 2000. Oxoid Manual of Culture Media Ingredients and other Laboratory Services. 4th edition oxoid Ltd.
20. Hansen, H.N., 1926. Simple of obtaining single spores culture. Science, 64: 387-1459.

21. Riker, A.J. and R.S. Riker, 1936. Introduction to research on plant disease jahon S. Swipt, Co. Inc. Sta. Lovis, Chicago, New York, pp: 117 (C.F. Osman, Y.A. Styadies on fungi association sorghum grains during storage Ph. D. Thesis. Fac. of Agric. Curio Univ., 1982).
22. Jenes, C.F., V. Thran and S.B. Mathur, 1991. An illustrated manual on identification of some seed-born *Aspergillus, Fusaria, Penicillia* and their Mycotoxins. Danish Government Institute of seed pathology for Developing countnires Ryvans Alle 78, DK 2000 Hellerue, Denmark.
23. A.O.A.C., 1998. Official methods of official analysis 17th ed Kenneth Helrich ed. Published by the Association of official analytical chemists, Inc. Virgiuia, USA.
24. A.O.A.C., 1996. Association of Official Analytical Chemists Official Methods of Analysis 16th. Ed. Washington, D.C., USA.
25. Ling, E.R., 1963. A Text Book of Dairy Chemistry Vol. 2 Practical Chapman Hal. LTD, London, 3rd ed., pp: 140.
26. Snedecor, G.W. and W.G. Cochran, 1982. Statistical Methods. 7th Ed., Iowa state Univ. Press, Ames, Iowa, USA.
27. Duncan, D.B., 1955. Multiple Ranges and Multiple F. test. Biometrics, 11: 10.
28. Regional Center for Food and Feed (RCFF), 2007. Feed composition Tables for animal and poultry feedstuffs used in Egypt. P.O. Box 588 Orman, Giza, Egypt. Published by The General Administration of Agrarian Culture.
29. El-Ashry, M.A., Zeba A. Motagally and Y.A. Maareek, 2002. Effect of live dried baker's yeast with or without acidification of milk and yeast culture on performance of suckling buffalo calves. Egyptian J. Nutrition and Feeds, 5(1): 31-41.
30. Cheeke, P.R., 1987. Rabbit Feeding and Nutrition. Academic press Orlando, Florida, USA.
31. Mowad, R.I., 1998. Nutripal studies on using some green forage in ruminant rations. Ph.D. Thesis, Fac. Agric Zagazig Univ., Egypt.
32. Zaki, A.A., M.R. Mostafa, R.T. Fouadj and Z.M. Marei, 2000. Teosint (zea Mexicanal.) farage productivity quality and its feeding effect on performance of buffalo calves. Proc. Conf. Anin. Growth Prod. IN the 21th century sakha 18-20 Ari. 1737-244.
33. Roy, J.H.B., I.G. Fistoubo and H.O. Gusiton, 1970. Influence of source amount of dietary fat on digestibility in young catues Bri. J. Nutria., 24: 442-457.
34. Parasd. G.S., V.D. Sharrma and A. Kumar, 1982. Efficiency of garlic (*Allium sativum*) therapy against experimental dermatophtosis in rabbits. Indian J. Med. Res., 75: 465.
35. Ali, M.F., M.S. Saleh, N.M. Eweedah and S.A. Mhmoud, 2005. Effect of using chamomile (*Mtricavia chamomilla)* flowers as feed additives on performance of growing lambs under desert farming system. Egyptian J. Nutrition and Feeds, 8(2): 121-131.
36. Safaa Nadi, 1999. The use of some medical plants in ruminant nutrition. Ph.D. Thesis, Fac. of Agric. Fayoum, Egypt.
37. White, T.W., L.O. Qunting, L.S. Sticker, F.H. Henbry and A.M. Saxton, 1992. Influence of fish meal and supplemental fat on finding stears exposed to moderate or high temperature. J. Anim. Sci., 70: 3286.
38. Williams, P.E.V., 1989. The mode of action of yeasts culture in Ruminal diets. A review of the rumen fermentation patterns. pp: 65 Biotechulogy in the feed industry. Alltech Tech. publ. Nicholasville.
39. Dawson, K.A., K.E. Newman and J.A. Boling, 1990. Effects of microbial supplements containing yeast and lactobacilli, on roughage-fed ruminal microbial activities. J. Anim. Sci., 63: 3392-3398.
40. Robinson, P.H. and R.E. McQueen, 1994. Influence of supplemental protein source and feeding frequency on rumen fermentation and performance in dairy cows. J. Dairy Sci., 77: 1340.
41. Gherbawy, Y.A.M.H., 1999. Kerationlytic and keruationphilic fungi of Graveyard's soil and Ari in the city of Qena and their response to garlic extract and onion oil treatments. Egypt. J. Microbial., 34(1): 1-21.
42. Brufau, J., 2000. Feed manufacturing in the Mediterranean region. Improving safety from feed to food proceedings of the conference of feed manufactures of the Mediterranean, organized by ASFAC, with the collaboration of TRTA, CES, CIHEAM, patronat catala pro Europa and fira de Rus and sponsored by port tarragona, Reus (spain), 22-24 March 2000.
43. Shekhawat, P.S. and R. Proada, 1971. Antifungal properties of some plant extracts 2-growth inhibition studies. Sci. Cult., 37: 40.
44. Zohari, A.A., M. Khayria, M. Abdel-Gawad and M.S. Sabah, 1992. Antibacterial antidermatophytic and antioxigenic activities of onion (*Allium cepa L.*) oil presented at the second regional mycological conference RMC2, 17-10 October 1992. Abstract 94-95 University of Al-Azhar, Cairo, Egypt.
45. Helen, A. and P.L. Vija Yamal, 1999. Vitamin supplementation on hepatic oxidative stress induced by cigarette smoking. J. Appl. Toxicol., 17: 289-295.