

## Effects of Some Medicinal Plants Mixture on Milk Performance and Blood Components of Egyptian Dairy Goats

<sup>1</sup>Galbat S. A., <sup>2</sup>A. El-Shemy, <sup>3</sup>Madpoli A.M., <sup>4</sup>Omayma M.A.L. Maghraby and <sup>4</sup>Eman I. El-Mossalami

<sup>1</sup>Department of Animal Medicine, Faculty of Vet. Med. Assiut University, Egypt

<sup>2</sup>Department of Parasitology and Animal Disease, National Research Center, Egypt

<sup>3</sup>Department of Animal Reproduction National Research Center, Giza, Egypt

<sup>4</sup>Department of Food Hygiene Animal Health Research Institute, Egypt

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### ABSTRACT

This study was carried out to evaluate the effect of dried mixture from seeds of four herbal plants as natural additives on milk yield and its constituents in Egyptian dairy goats. The herbal plants are Cumin (*Cuminum cyminum*), *Trigonella foenum graecum* seeds, *Carum carvi* and *Nigella sativa* in equal ratio. Eight lactating goats after two weeks of kidding were divided into 2 groups (four animals each) using complete random block design to evaluate the effect of herbal mixture supplement on the productivity of lactating goats, the 1st group (G1) was supplemented with polyherbal combination at the rate of 250 mg/kg-1 body weight, the 2nd group (G2) was served as Control. Animals in each group were fed on 40% concentrate feed mixture and green fodder ad libitum. Individually, milk, serum and blood samples were collected weekly along the experimental period (12 weeks). Results obtained indicated that. Milk composition showed milk protein, TS and SNF contents were higher ( $p > 0.05$ ) in animals fed experimental additives than control. Milk yield in the present study was slightly higher ( $p < 0.05$ ) in supplemented group compared to control group, animals fed supplemented rations had higher ( $p < 0.05$ ) glucose concentrations than control. Most of blood parameters are within the normal range that means the addition of such additive had no adverse effect on blood components.

**Key words:** Goat milk, poly herbal plants, natural additives

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### Introduction

Many studies had been focused on evaluating the potential use of plant extracts as alternatives to feed antibiotics to improve feed efficiency in ruminants. Plants produce an array of diverse secondary metabolites that when extracted and concentrated may exert antimicrobial activities against rumen microbes (Benchaar *et al.*, 2008). Plant secondary metabolites such as saponins and tannins (hydrolysable and condensed) have been extensively assessed for their antimicrobial effects and their potential to modulate ruminal fermentation and improve nutrient utilization in ruminants (Benchaar *et al.*, 2007). In contrast, information on essential oils is limited, but some reviews in this area (Calsamiglia *et al.*, 2007; Benchaar *et al.*, 2008) described the potential of some essential oils to favorably modify rumen microbial fermentation. Caraway (*Carum carvi*) seed is used in meat, food and distillery industries due to its pleasant flavor and intense taste. Its antibacterial and fungicidal properties are important in pharmaceutical applications and also in human and veterinary medicine (Sedlakova *et al.*, 2001). Inversely many synthesized chemicals caused many hazards to animals, plants and humans. The world health organization (WHO) encourages using medicinal herbs and plants (MH&P) to substitute or minimize the use of chemicals through the global trend to go back to nature (Allam *et al.*, 1999). Some studies indicated that such plants had beneficial effects on digestibility, live weight gain and feed efficiency with cow. Black seed (*Nigella sativa*) is used for medical purpose, where, it is well known as antibacterial, antifungal, antidiabetic and immune enhancing (Khodary *et al.*, 1996). Beneficial effects of herbs or botanicals in farm animals may arise from the activation of feed intake and the secretion of digestive secretions, immune stimulation and anti-bacterial effects. Herbs can also contribute to the nutrient requirements of the animals; stimulate the endocrine system and intermediate nutrient metabolism (Wenk, 2003). One of the most successful attempts accomplished in the last decade is using feed additives such as natural additives (medicinal plants as its seeds, leaves and roots). These supplements assist in improving animal productivity and milk production enhancement (Campanile *et al.*, 2008; Wang *et al.*, 2009). However, most studies have been conducted with lactating cows. In the last decade, natural additives such as *Asparagus racemosus*, *Trigonella foenum graecum* seeds, *Carum carvi*, *Nigella sativa* and chamomile flower have been increased the central concern of scientists as useful resource for treating diseases and improving animal productivity (Kholif and Abd-El-Gawad, 2001; Dalvi *et al.*, 1990). Medicinal plant seeds improved the productivity of lactating animals and its hormonal alert effect through increasing prolactin and growth hormone release, in addition to activating udder tissues in line with increasing glucose concentration (Abo El-Nor *et al.*, 2007; Drackley *et al.*, 2001).

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**Corresponding Author:** Galbat S. A., Department of Animal Medicine, Faculty of Vet. Med. Assiut University, Egypt  
E-mail: salahgalbt@yahoo.com

Therefore, the present study was undertaken to evaluate the effect of natural additives in combination with concentrate mixture and green fodder on milk yield and its constituents, in addition to hematological and serum biochemical parameters in lactating goats.

### Materials and Methods

This study was conducted at the Experimental Farm for goat in menofia governorate and an analysis of the samples was carried out in National Research center and animal Health Research Institute Giza, Egypt during July to October 2013.

#### *Preparation of herbal supplements:*

A mixture of 4 herbs was used in the present study; Cumin (*Cuminum cyminum*), *Trigonella foenum graecum* seeds, *Carum carvi* and *Nigella sativa*. The herbs were procured from local market (Esis herbal company), after assessing their quality in consultation with Ayurvedic practitioners and drug manufacturers. Each herb was pulverized separately. The Polyherbal biostimulator feed additives was prepared after mixing powdered herbs in equal ratio.

#### *Experimental design:*

Eight lactating Egyptian goats, after two weeks of kidding, aged 2-3 years and weighting. The animals were  $38 \pm 3.25$  kg/B.W at the 2nd-3rd season of lactation was used in the study. Randomly assigned into two equal groups. The experimental period were extended to 12 weeks. The first group (G1) was treated with 250 mg/kg B.W polyherbal supplement. The second group (G2) was used as normal without polyherbal supplement.

Experimental additives were mixed with 1 kg of concentrate mixture and were introduced to the animals of the first group as a daily morning meal. Diet was formulated to meet the animal's requirements nutrition as recommended by (NRC, 1981). Animals of the two groups were fed grouply with concentrate mixture and green fodder (Alfa Alfa) twice daily at 8:00 a.m. and 1:00 p.m., respectively. Fresh water was available to the animals' adlibetum.

#### *Sampling and analysis of milk:*

Milk samples were collected daily from each animal along the experimental period (12 weeks). The animals were handily milked (twice/day) and milk yield was recorded. Milk samples were analyzed for moisture, ash, total solids (TS), fat, solids not fat (SNF), protein, urea and lactose% according to the methods recommended by AOAC (2000) procedures.

Fat corrected milk (4% fat) was calculated by using the following equation according to (Gaines, 1928).  $4\% \text{ FCM} = 0.4 \times \text{milk yield (kg)} + 15 \times \text{fat yield (kg)}$ .

#### *Blood parameters:*

Five ml of blood samples were collected from the jugular vein of each animal at the zero time, 3rd, 6th, 9th and the 12th week of the experimental period each blood sample divided into two portions. The 1st portion (2ml) was anticoagulated by (EDTA) and was used for hemogram investigation (Feldman et al., 2000). The 2nd portion (3ml) were allowed to clot, then centrifuged at 3000 rpm for 10 minutes for serum separation and used for biochemical studies.

The following serum biochemical parameters were determined:

Serum total protein (henary et al., 1974), Serum albumin (Doumas et al., 1971), Serum globulin were determined by subtracting the value of serum albumin from the value of serum total proteins, A/G ratio, Total cholesterol (Allain et al., 1974), Serum glucose (Trincler., 1961), activities of AST, ALT (Reitman and Frankel., 1957), ALP (Tietz, 1986), urea (patton and crouch., 1977) and creatinine (Oliver, and Biochem. 1955), the reagents were supplied by biomerieux- France and randox-Co.

#### *Statistical analyses*

Statistical differences were calculated according to the Student t-test with significance level at  $P < 0.05$ . All results were analyzed using the procedure of (SAS, 2004).

## Results and Discussion

Results obtained with polyherbal biostimulants indicate the stimulation of rumen micro-flora activity through saving some micro factors to rumen micro-flora such as micro elements, vitamins, hormones and enzymes which are required to the efficient digestion, absorption and metabolism (Aboul-Foutouh *et al.*, 2000) and/or minimizing effectively hazards of mycotoxins by inhibition of fungi growth and aflatoxins production (Allam *et al.*, 1999), (Mohamed *et al.*, 2003), (Aboul-Foutouh *et al.*, 2000), Ali *et al.* (2005) and (El-Ashry *et al.*, 2006). Similar results were observed when polyherbal supplements or other medicinal plants were added to dairy buffaloes or growing lambs.

Results of milk composition analysis showed that milk protein, TS and SNF contents were higher ( $p < 0.05$ ) in animals fed experimental additives than control Table (1) (Kholif and Khorshed, 2006) Found that rations supplemented with medical herbs significantly increased milk protein and lactose contents compared with control. In other studies, milk fat, protein and lactose contents were not affected by polyherbal supplementation (Erasmus *et al.*, 2005; Campanile *et al.*, 2008) fed lactating goats on polyherbal supplemented rations and found that treatments slightly increased milk TS and SNF contents.

**Table 1.** Milk composition analysis of control and treated groups during 12 weeks post treatment (Mean±SE)

Time post treatment		0 time	3 week	6 week	9 week	12 week
Moisture%	G1	88.85	88.77	88.79	88.51	88.37
	G2	86.58	87.60	87.62	87.57	87.64
Ash%	G1	0.84	0.831	0.83	0.824	0.82
	G2	0.74	0.70	0.72	0.70	0.70
Total solid%	G1	11.15	13.23*	14.23*	13.49*	13.63*
	G2	13.42	12.40	12.40	12.42	12.35
Fat%	G1	4.26	4.23	4.077	3.93	3.93
	G2	3.90	4.05	4.04	4.05	4.08
Solid not fat%	G1	8.88	9.01	10.15*	10.56*	11.70*
	G2	9.52	8.35	8.35	8.37	8.27
Protein%	G1	4.19	4.15	4.40	4.90*	5.14*
	G2	4.15	4.37	4.38	4.34	4.37
Urea mg/100ml	G1	21.54	19.83	19.43	17.17	17.27
	G2	21.27	23.20	23.05	23.15	23.20
Lactose%	G1	4.43	4.58	4.60	4.86	4.87
	G2	4.50	4.60	4.49	4.59	4.60

G1= Treated group. G2= Control group. \* = Significant at  $p < 0.05$ .

Milk yield: Data presented in Table (2) showed the effect of different lactation periods (week) on milk yield Milk yield were increased ( $p < 0.05$ ) gradually with periods advancement up to 12th week of lactation period. Milk constituents were significantly affected by different lactation periods in different groups. The higher dry matter utilization of treated goats provided enough energy to support the increased milk production (Stella *et al.*, 2007).

The obtained results were in agreement with (Kholif and Khorshed, 2006), (Abo El-Nor *et al.*, 2007) and (Campanile *et al.*, 2008). The addition of polyherbal combination increased the net energy of milk for dairy goat, according to higher organic matter digestibility, thus leading to an increase in milk yield.

The relative improvement of milk production of group 1 might be due to the healthy effect of polyherbal additives and the associated effect between acetate and succinate on rumen microflora which lead to improvement of feed efficiency and milk production (Abo El-Nor and Kholif, 2005). In this study, levels of serum energy indicators (glucose) of treated goats was higher

**Table 2.** Milk yield of control and treated groups during 12 weeks post treatment (Mean±SE)

Time post treatment	0 time	3 week	6 week	9 week	12 week
Experimented group (G1)	0.825	0.830	0.870	0.935*	0.935*
Control group (G2)	0.820	0.825	0.835	0.830	0.835

G1= treated group. G2= control group. \* = significant at  $p < 0.05$ .

### Blood parameters:

Table (3 and 4) showed no significant changes in Aspartate amino transferase, Alanin amino transferase and Alkaline phosphatase activities', also Creatinine and Urea levels, that indicated the healthy effect of poly herbal medicinal plants mixture supplementation to goat's diets. Data in Table (5) showed that animals fed supplemented rations had higher ( $p < 0.05$ ) glucose concentrations than control. These results may be due to the improvements occurred in metabolic process as a response to the experimental additives. The concentrations of glucose were in the normal range for healthy animals and were higher in supplemented groups than control, these results are parallel with values obtained by (Ali *et al.*, 2005) whose found that chamomile supplemented

goats ration increased blood glucose values ( $p < 0.05$ ). (Stella *et al.*, 2007) found no significant effect of yeast culture supplementation on plasma glucose of lactating goats, these results indicated that tested additives to lactating goat's rations did not negatively affected liver activity or animal's health. Serum cholesterol increased in animals fed poly herbal medicinal plants mixture than control. These results indicated the healthy effect of poly herbal medicinal plants mixture supplementation to goat's, Oils supplementation is known to increase blood cholesterol (Garcia-Bojalil *et al.*, 1998), although the types of fatty acids in poly herbal medicinal plants mixture would seem to differ resulting the increase of cholesterol concentration.

In Table (6) Serum total protein values increased while serum albumin, globulin and A/G ratio showed no significant increase in group 1 supplemented with poly herbal medicinal plants mixture compared to control. These results may be due to the improvements of ruminal microbial protein synthesis.

**Table 3.** Serum enzymes of control and treated groups during 12 weeks post treatment (Mean±SE).

Time post treatment		Zero day	3 week	6 week	9 week	12 week
AST (IU/L)	G1	98.13±2.69	78.26±3.90	67.57±2.49	83.36±5.40	62.1±3.87
	G2	92.55±3.21	95.15±4.20	88.2±2.55	101.06±3.52	93.97±3.60
ALT(IU/L)	G1	32.15±3.26	29.66±2.33	22.25±2.05	27.4±3.07	21.85±2.62
	G2	33.9±2.80	41.23±5.04	36.49±1.76	42.05±3.95	37.45±3.79
ALP (IU/L)	G1	68.32±1.99	60.08±2.86	65.5±3.63	59.22±3.88	69.89±1.70
	G2	65.1±2.60	75.5±3.07	73.15±1.75	79.73±4.05	80.18±2.92

G1= treated group. G2= control group. \* = significant at  $p < 0.05$ .

**Table 4.** Serum creatinine and urea of control and treated groups during 12 weeks post treatment (Mean±SE).

Time post treatment		Zero day	3 week	6 week	9 week	12 week
Total creatinine (mg/dl)	G1	1.42±0.33	1±0.10	0.95±0.80	1.03±0.07	0.89±0.03
	G2	1.3±0.25	1.53±0.06	1.75±0.13	1.66±0.19	1.42±0.66
Urea (mg/dl)	G1	22.58±2.50	20.04±4.14	16.88±3.06	14.36±2.77	17.54±3.80
	G2	23.3±3.00	22.56±3.93	20.92±3.40	18.86±3.59	22.9±3.44

G1= treated group. G2= control group. \* = significant at  $p < 0.05$ .

**Table 5.** Serum total cholesterol and glucose of control and treated groups 12 weeks post treatment (Mean±SE).

Time post treatment		Zero day	3 week	6 week	9 week	12 week
Total cholesterol (g/dl)	G1	105.1±3.95	110.52±2.45	118.36±2.74*	122.36±1.40*	119.78±2.06*
	G2	92.55±1.82	100.33±1.65	105.03±2.12	96.58±2.98	89.18±1.53
Glucose (mg/dl)	G1	72.08±2.06	80.77±3.15	89.14±2.44*	90.82±1.90*	92.12±2.79*
	G2	62.15±1.77	72.06±0.99	79.18±2.57	69.8±1.36	71.1±3.15

G1= treated group. G2= control group. \* = significant at  $p < 0.05$ .

**Table 6.** Total protein, albumin, globulin and A/G ratio of control and treated groups during 12 weeks post treatment (Mean ± SE).

Time post treatment		Zero day	3 week	6 week	9 week	12 week
Total protein (g/dl)	G1	6.78±0.54	7.25±0.76	8.33±0.98*	7.95±1.35*	9.25±0.70*
	G2	6.55±.73	6.98±0.23	7.12±0.16	6.29±0.92	7.33±0.31
Albumin (g/dl)	G1	3.69±0.88	4.18±0.55	4.82±0.18	4.95±0.75	6.2±1.18
	G2	3.43±0.73	3.66±0.42	4.1±0.21	3.98±0.52	4.52±0.48
Total globulin (g/dl)	G1	3±0.12	3.05±0.06	3.49±0.20	3.02±0.17	3.06±0.33
	G2	3.1±0.03	3.3±0.27	3±0.16	2.32±0.05	2.82±0.42
A/G ratio	G1	1.25±0.73	1.35±0.09	1.38±0.62	1.64±0.08	1.89±0.65
	G2	1.2±0.02	1.15±0.21	1.35±0.34	1.71±0.25	1.6±0.02

G1= treated group. G2= control group. \* = significant at  $p < 0.05$ .

**Table 7.** Leukogram of control and treated groups during 12 weeks post treatment (Mean + SE).

Time post treatment		Zero day	3 week	6 week	9 week	12 week
TLC(x103/Ul)	G1	7.15±0.14	7.55±1.56	6.85±0.41	7.66±0.32	8.12±1.33
	G2	6.77±1.24	7.21±0.56	7.55±0.50	6.98±0.62	7.83±1.09
Neutrophil(x103/ul)	G1	2.86±0.29	3.17±0.13	2.82±0.48	3.21±1.63	3.24±0.13
	G2	2.42±0.26	2.88±0.39	3.01±1.12	2.78±0.20	3.22±0.51
lymphocyte(x103/ul)	G1	3.93±0.32	4.07±0.09	3.76±0.22	4.21±0.62	4.38±0.75
	G2	3.65±0.44	3.82±1.51	3.96±0.92	3.76±0.54	4.30±0.33
Monocyte (x103/ul)	G1	0.18±0.070	0.20±0.11	0.24±0.12*	0.23±0.08*	0.25±1.00*
	G2	0.17±0.03	0.18±0.10	0.19±0.00	0.17±0.01	0.19±0.09
Esinophile (x103/ul)	G1	0.19±0.00	0.23±0.05	0.23±0.09	0.26±0.08	0.42±0.13
	G2	0.20±0.10	0.22±0.07	0.20±0.10	0.22±0.11	0.19±0.06
Basophil (x103/ul)	G1	0.00±0.00	0.00±0.0	0.00±0.00	0.07±0.00	0.00±0.00
	G2	0.06±0.01	0.00±0.0	0.07±0.00	0.00±0.00	0.00±0.00

G1= treated group. G2= control group. \* = significant at  $p < 0.05$ .

In Table (7 and 8) there is a significant increase monocytic count of group 1 observed may be due to improvement in immune system responsiveness. Black seed (*Nigella sativa*) contain Zn, Cu, Mn, Mg, Se, vit. C, vit. A, vit. E and folic acid which have a role in enhancing immune system. Folic acid, Fe and vitamin C have roles in red blood cell formation, maturation, and in hem biosynthesis, absorption and utilization. These results

are in harmony with those reported by (Ismail *et al.*,2003), while the other data are within the normal range which are in line with the normal values of those obtained by many authors(El-Ashry *et al.*,1982; Youssef, 1992; Weld Abd El-Kader.,2000; El-Wafa,2002; Ragheb,2003). that means the addition of such additives had no adverse effect on such addition on liver function where these values are in line with the normal values of those reported by. (Blinco and Dye., 1958) and (Merek, 1991).

**Table 8.** Erythrogame of control and treated groups 12 weeks post treatment (Mean± SE).

Time post treatment		zero day	3 week	6 week	9 week	12 week
RBCs(x10 <sup>6</sup> /ul)	G1	14.31±0.77	13.98±1.29	13.65±0.90	12.7±1.53	12.66±0.52
	G2	13.29±1.50	14.32±0.35	13.33±0.75	12.13±0.31	14.18±1.20
Hb ( g/dl )	G1	10.22±0.53	10.55±1.71	9.33±1.32	12.29±0.92	10.77±0.35
	G2	9.89±0.60	10.21±1.30	8.78±0.79	11.53±1.73	9.25±0.15
PCV (%)	G1	32.66±1.90	31.93±0.65	36.88±1.24	35.56±0.98	33.9±1.60
	G2	32.2±2.82	31.33±1.95	35.72±1.36	33.21±0.22	31.69±1.40
MCV (fl)	G1	23.14±0.28	21.89±2.31	25.64±1.94	26.98±1.32	27.03±1.55
	G2	23.92±1.30	22.25±1.07	24.88±1.65	26.13±0.85	27.43±1.97
MCH (pg)	G1	7.03±0.78	7.55±0.32	6.80±0.24	9.77±0.93	8.5±0.68
	G2	7.32±0.55	7.13±1.20	6.52±0.95	9.30±1.57	8.63±0.39
MCHC (g/dl)	G1	30.9±0.33	33.25±0.28	25.71±0.93	34.98±0.61	31.40±1.13
	G2	30.66±0.41	32.78±0.68	25.12±0.55	34.6±0.79	28.8±0.06

G1= treated group. G2= control group. \* = significant at  $p < 0.05$ .

### Conclusions

It could be concluded that ratio of lactating goats rations supplemented with polyherbal supplements showed best improvement of nutrients digestibility, milk production, and milk composition compared with animals fed on the control diet. Also, no deleterious effects were observed on the general health of the treated animals. However, polyherbal supplementation of diet improved their milk production and that both positive and negative relationships existed between milk constituents of cross bred dairy goat which implies that it is possible to use the regression equations to predict one constituent from the other, also the results of blood parameters clarified the positive effect on general health of lactating goats supplemented with polyherbal ration. Further studies are needed to determine the exact ratio of these combinations and respective mechanisms that elicit these positive effects on milk production of high yielding goats.

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### References

- Abo El-Nor, S.A.H. and S.M. Kholif, 2005. Impact of sodium acetate and sodium succinate supplemental to rations of lactating goats on milk production, milk composition and some ruminal and blood parameters. Egypt. J. Nutr. Feeds, 8: 15-23.
- Abo El-Nor, S.A.H., H.M. Khattab, H.A. Al-Alamy, F.A. Salem and M.M. Abdou, 2007. Effect of medicinal plant seeds in the rations on the productive performance of lactating buffaloes. Int. J. Dairy Sci., 2: 348-355.
- Aboul-Foutouh, G.E., S.M. Allam, E.I. Shehata and S.N. Abd El-Azeem, 2000. Effect of some medicinal plants as feed additives on milk production and composition of lactating buffaloes. Egypt. J. Nutr. Feeds, 3: 31-41.
- Ali, M.F., M.S. Saleh, N.M. Eweedah and S.A. Mohmoud, 2005. Effect of using chamomile (*Mtricaria chamomilla*) flowers as feed additives on performance of growing lambs under desert farming systems. Egypt. J. Nutr. Feeds, 8: 127-137.
- Allain, C.C., L.S. Poon, C.S. Chan, W. Richmond and P.C. Fu, 1974. Enzymatic determination of total serum cholesterol. Clin. Chem., 20: 470-475.
- Allam, S.M., Hoda, M. El Hosseiny, A.M. Abdel Gawad, S.A. Elsaadany and A.M.M. Zeid, 1999. Medicinal herb's and plants as feed additives for ruminant. 1. Effect of using some medicinal herbs and plants as feed additives on zaraibi goat performance. Egypt. J. Nutr. Feeds, 1: 349-365.
- AOAC, 2000. Official Methods of Analysis of AOAC INTERNATIONAL 17th Edn., Gaithersburg, MD, USA.
- Benchaar C, H.V. Petit, R. Berthiaume, D.R. Ouellet, J. Chiquette, P.Y. Chouinard, 2007. Effects of essential oils on digestion, ruminal fermentation, rumen microbial populations, milk production, and milk composition in dairy cows fed alfalfa silage or corn silage. J. Dairy Sci.,90:886–897.

- Benchaar C, S. Calsamiglia, A.V. Chaves, G.R. Fraser, D. Colombatto, T.A. McAllister, et al., 2008. A review of plant-derived essential oils in ruminant nutrition and production. *Anim. Feed Sci. Technol.*;145:209–228.
- Blinco C. and W.B. Dye, 1958. Serum transaminase in white muscle disease. *J. Anim. Sci.* 17, 224-226.
- Calsamiglia S, M. Busquet, P.W. Cardozo, L. Castillejos, A. Ferret, 2007. Essential oils as modifiers of rumen microbial fermentation. *J. Dairy Sci.* 90:2580–2595.
- Campanile, G., F. Zicarelli, D. Vecchio, C. Pacelli and G. Neglia et al., 2008. Effects of *Saccharomyces cerevisiae* on in vivo organic matter digestibility and milk yield in buffalo cows. *Livest. Sci.*, 114: 358-361 .
- Dalvi, S.S., P.M. Nadkarni and K.C. Gupta, 1990. Effect of *Asparagus racemosus* (Shatavari) on gastric emptying time in normal healthy volunteers. *J. Postgraduate Med.*, 36: 91-94 .
- Doumas, B.T., W. A. Watson and H.G. Biggs, 1971. Albumin standards and the measurement of serum albumin with bromocresol green. *Clin. Chim. Acta.*, 31: 87-96.
- Drackley, J.K., T.R. Overton and G.N. Douglas, 2001. Adaptations of glucose and long-chain fatty acid metabolism in liver of dairy cows during the per parturient period. *J. Dairy Sci.*, 84: E100-E112.
- El-Ashry M.A., A.M. El-Serafy., H.M. Khattab and M. Mohy El-Deen, 1982. Effect of skim milk, dry matter concentration of milk replacer and the physical form of starter on buffalo calves. I- calf performance and blood serum nitrogen fraction. Sixth international conference on animal and poultry production Zagazig, Sep. 21-23 .1982.
- El-Ashry, M.A., N.E. El-Bordeny, H.M. Khattab and H.M. El-Sayed, 2006. Effect of dietary supplemented with medicinal herbs on nutrient digestibility and some blood metabolites of buffalo calves. *Egypt. J. Nutr. Feeds*, 9: 179-191.
- El-Wafa S.A., A.A. Sedki and A.M. Ismail, 2002. Response of growing rabbits to diets containing black seed, garlic or onion as natural feed additives. *Egypt. J. Rabbit. Sci.* 12, 69-83.
- Erasmus, L.J., P.H. Robinson, A. Ahmadi, R. Hinders and J.E. Garrett, 2005. Influence of prepartum and postpartum supplementation of a yeast culture and monensin, or both, on ruminal fermentation and performance of multiparous dairy cows. *Anim. Feed Sci. Technol.*, 122: 219-239 .
- Feldman, B.F., J.G. Zinkl, N.C.Jain, Schalm's, 2000. *Veterinary hematology*. 5.ed. Lippincott Williams & Wilkins, 787p.
- Gaines, W.L., 1928. The energy basis of measuring energy milk in dairy cows. University Illinois Agriculture.
- Garcia-Bojalil CM, C.R. Staples, C.A. Risco, J.D. Savio, W.W. Thatcher, 1998. Protein degradability and calcium salts of long-chain fatty acids in the diets of lactating dairy cows: Productive responses. *J Dairy Sci*, 81: 1374-1384.
- Henry, R.J., D.C. Cannon and J.W. Winkelman, 1974. *Clinical Chemistry, Principles and Techniques*, 2nd edition, Harper and Row, pp: 525.
- Ismail A.M., A.A. Sedki and A.G. Abdallah, 2003. Influence of black seed, garlic and onion supplementation on reproductive performance in rabbits. *Egyptian. J. Agr. Res.* 81, 1193-1207.
- Khodary R., M.H. El-Ezzawy and I.R. Hamdy, 1996. Effect of *Nigella sativa* on egg production, hatchability percentage and some biochemical values in laying hens with references to fertility in cockerels. *Proc. 7th Sci. Cong., Fac. Vet. Med., Assuit Univ.*, 17-19 Nov., Egypt
- Kholif, A.M. and M.A.M. Abd-El-Gawad, 2001. Medicinal plant seeds supplementation of lactating goat's diets and its effect on milk and cheese quantity and quality. *Egypt. J. Dairy Sci.*, 29: 139-150.
- Kholif, S.M. and M.M. Khorshed, 2006. Effect of yeast or selenized yeast supplementation to rations on the productive performance of lactating buffaloes. *Egypt. J. Nutr. Feeds*, 9: 193-205.
- Merek, 1991. *The Merek Veterinary Manual*. 7th Ed.
- Mohamed, A.H., B. El-Saidy and I.A. El-Seidi, 2003. Influence of some medicinal plants supplementation. 1. On digestibility, nutritive value, rumen fermentation and some blood biochemical parameters in sheep. *Egypt. J. Nutr. Feeds*, 6: 139-139.
- NRC, National Research Council, 1981. *Nutrient requirements of goats*. National Academy Press, Washington DC, USA. Oliver JT, *Biochem.J*, 61-116, 1955.
- Patton, C.J., and S.R. Crouch, 1977. Spectrophotometric and kinetics investigation of the Berthelot reaction for the determination of ammonia: *Analytical Chemistry*, v. 49, p. 464-469.
- Ragheb E.E., 2003. Effect of lacto-Sacc and acid pak additives on productive performance of Friesian calves under early weaning system. *Egypt. J. Nutr. Feeds*. 6, 127-137.
- Reitman, S., S. Frankel, 1957. Glutamic – pyruvate transaminase assay by colorimetric method. *Am. J. Clin. Path* 28: 56.
- SAS, 2004. *Statistical Analysis Systems*. Version 9.2. SAS Institute, Cary, NC.

- Sedlakova, J., B. Kocourkova and V. Kuban, 2001. Determination of the essential oil content and composition of caraway (*Carum carvi* L.). *Czech J. Food Sci.*, 19: 31 - 36.
- Stella, A.V., R. Paratte, L. Valnegri, G. Cigalino and G. Soncini et al., 2007. Effect of administration of live *Saccharomyces cerevisiae* on milk production, milk composition, blood metabolites and faecal flora in early lactating dairy goats. *Small Rumin. Res.*, 67: 7-13.
- Tietz, N.W., 1986. *Textbook of Clinical Chemistry*. London W. B. Saunders Company, pp: 959-964.
- Trinder, P., 1961. Enzymatic colorimetric method for glucose determination. *Ann. Clin. Biochem.*, 6: 24- 39.
- Wang, C., Q. Liu, W.Z. Yang, Q. Dong and X.M. Yang et al., 2009. Effects of selenium yeast on rumen fermentation, lactation performance and feed digestibilities in lactating dairy cows. *Livest. Sci.*, 126: 239-244.
- Weld Abd. and El-Kader, 2000. Nutritional studies on rearing calves. M.Sc. Thesis, Fac. of Agric. Ain Shams Univ.
- Wenk, C., 2003. Herbs and botanicals as feed additives in monogastric animals. *Asian-Australasian J. Anim. Sci.*, 16: 282-289.
- Yossef M.M.M. (1992). Growth patterns of buffalo calves in relation to rumen development and growth promoters treatment. PhD Thesis. Fac. Of Agric. Cairo Univ.