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EFFECT OF USING *ECHINACEA PURPUREA*, *NIGELLA SATIVA* AND *CHICORIUM INTYBUS* IN DAIRY GOATS' DIET ON MILK PRODUCTION AND QUALITY: 2- EFFECT ON DIGESTIBILITY, SOME BLOOD PARAMETERS AND MILK PRODUCTION AND QUALITY

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SUMMARY

Twenty Damascus lactating goats weighting 29.2 ± 1.96 Kg LBW (2.5 – 3 years old) were used in this experiment which randomly divided into five groups. Control group (G1) was fed basal diet, G2 was fed the basal diet mixed with 4g/h/d *Echinacea purpurea,* G3 was fed basal diet mixed with 8g/kg *Echinacea purpurea,* G4 was fed 7.5 g/h/d *Nigella sativa* and G5 was fed 10 g/h/d *Cichorium intybus* for 98 days. The results showed that rumen parameters (pH – TVFA's and ammonia) tend to increase significantly ($P \leq 0.05$) in basal diet mixed with 4g/h/d *Echinacea purpurea* (G2). Nutrient digestibilities (DM, OM, EE, CP and CF) tend to increase in treated groups when compared with the control group. Using medicinal plants lead to improve milk production in treated groups than control group, where the milk production values were 1345.4, 1718.4, 1516.8, 1363.3 and 1380.0 g/h/d for G1, G2, G3, G4 and G5, respectively. Regarding to milk composition, milk fat % in the treated groups was slightly higher than the control group, but total protein % in milk was lower in G3, G5 and G4 compared with G2 and G1.The values of total protein percent were 2.89, 2.93, 2.77, 2.52 and 2.57 %, respectively for G1, G2, G3, G4 and G5. Using *Echinacea purpurea* effectively decreased somatic cells count (SCC) in G2 and G3, also adding *Nigella sativa* and *Cichorium intybus* to the lactating goats' diets tend to decrease SCC. The obtained values of SCC were 608.1, 64.3, 96.7, 179.0, and 105.2*103 CFU for G1, G2, G3, G4 and G5, respectively. Total microbial count was affected by adding *Echinacea purpurea* and *Nigella sativa*, where G2 recorded the lowest count followed by G3 then G4 (5.17, 5.18 and 5.38, respectively). Also, G2 and G3 recorded the lowest count of *Staphylococci* count and St. auraus count than G5, G4 and G1. The results indicated that using *Echinacea purpurea, Nigella sativa* and *Cichorium intybus* as additives in the dairy goats' diets tend to improve nutrient digestion coefficient also increase milk quantity and quality.

Keywords*: Echinacea purpurea, Nigella sativa, Chicorium intybus, dairy goats and milk production.*

INTRODUCTION

Recently, goats are considered an important aspect of animal production in Egypt. A large number of rural households raise goats with a herd size varying from 3 to 5 heads. These herds represent more than 90% of total goat population in Egypt. Therefore increasing productivity of goats will contribute to improve the standard of living of the rural people.

Milk is the most important food, which has a high nutritional value either been fed directly or after manufacturing processes. Most of goats' milk is used by dairy industry for cheese making to cover the little demand of the domestic market (El-Saied *et al.*, 2003). Consumers do not only look for fresh and tasty milk or cheese, but also safe and healthy. The overuse of antibiotics in human and animals led to rapid rise in the number of bacteria strains resistant to majority of antibiotics, which makes infection harder to control (Tan *et al.,* 2000). The withdrawal of antibiotics from animal production is the reason to seek for alternative solutions. One of these solutions is concerned with making use of the organisms own defense system. Depending on this fact, the use of officinal plants to enhance the immune system has been studied in goats.

Three major species, Echinacea purpurea, Echinacea angustifolia and Echinacea pallida, have been studied for their possible pharmacological and immunological effects (Nieri *et al.,* 2003; Rininger *et al.,* 2000). They contain biologically active factors such as polyphenols, polysaccharides and alkamides which stimulate the immuno system. Reklewska *et al.* (2004) reported a significantly lower SCC in goat's milk after the addition of Echinacea extract to the feed. Echinacea extract can stimulate mammary epithelial cell physiology and may be considered a candidate to support mammary gland activity during a mammogenetic and lactogenetic state. It also, effectively eliminates bacterial and fungal pathogens in vitro.

Nigella sativa (blackseed) seeds contain 40% fixed oil, a saponin (melantin) and up to 1.4% volatile oil (Chevallier, 1996). N. sativa seeds have a considerable antioxidant activity which probably related to their high phenolic content. It is also, known as an herb that possesses galactopoietics action (I.C.M.R, 1987). Galactagogues are believed to assist in the initiation, maintenance, or augmentation of milk production (Gabay, 2002 and Abascal and Yarnell, 2008).

Cichorium intybus contains saccharides, organic acid, alkaloid, triterpenes, sesquiterpenes, coumarins, ect. It has a function of lowering the blood glucose and lipid, decreasing uric acid, and hepatoprotection. Therefore, it is evacuant and appetitive with better cardiovascular effect. Furthermore, it can be sorbefacient calcium, enhancing immunity via antiallergic, antibacterial and antivirus. (Wang and Cui, 2009).

So that, this study was designed to investigate the effect of Echinacea purpurea, nigella sativa, and Cichorium intybus as additives to dairy goats' diet on milk production, milk composition, and milk content of SCC and microbes especially those affect the udder health and induce clinical or sub-clinical mastitis (Staphylococci spp. and Staphylococcus aureus).

MATERIALS AND METHODS

The experimental work was carried out in El-Fayroz farm located in El-Nobaria city, El-Behera government, and Lab of Dairy Production, Dairy Department, National Research Center, El-Dokki, Geza government. Twenty Damascus lactating goats weighting 29.2 ± 1.96 Kg LBW (2.5 – 3 years old) were randomly divided into five groups (four goats / each) after 7 days of parturition using completely randomized block design to fed one of the experimental diets. Goats were fed individually according to recommendations of NRC (1981). The basal diet consists of berssem (Egyptian clover) and concentrate feed mixture (CFM) at the rate of 40:60 respectively. The concentrate feed mixture consisted of grounded corn (39%), wheat bran (5.1%), DDG (9.12%), sun flower meal (4.92%), minerals and vitamins mixture (1.86%). Chemical composition of the experimental diets is shown in Table (1).

Table (1). Chemical composition of the experimental diets (on DM, basis).

Item	% DM	% OM	% Ash	% Silica	% EE	% CP	% CF	% NFE
Berssem	93.7	87.6	12.4	2.40	7.90	15.6	41.8	22.3
C.F.M.	91.6	91.3	8.7	1.57	9.80	23.6	6.8	51.7
Basal Diet	92.4	89.8	10.2	1.90	9.0	20.4	20.8	39.6

The experimental animals of the control group (G1) were fed on the basal diet, while those of the other groups were fed daily on the basal diet in addition to 4 g Echinacea purpurea / animal (G2); 8 g Echinacea purpurea / animal (G3); 7.5 g *Nigella sativa* / animal *(G_4) or 10 g cichorium intybus* / animal. (G5).

Grab sample method was applied to determine nutrients digestion coefficients, where, acid insoluble ash (AIA) was used as an internal marker according to Gallup *et al*. (1945) and Forbes *et al*. (1948). Fecal grab samples were collected at 12 p.m., for three successive days every month for three months from each animal. Feed and feces samples were analyzed according to A.O.A.C. (1995) procedures. The digestion coefficient of a certain nutrient was calculated according to the following formula:

Digestion co-efficient = $$100 - \left[100\ x\ \frac{\%\,indicator\ in\ feed}{\%\,indicator\ in\ feces}\ x\ \frac{\%\,nutrient\ in\ feces}{\%\,nutrient\ in\ feed} \right]$$

Milk samples were obtained biweekly along the experimental period (98 days), where, goats were milked at 9 a.m., part of the sample was kept on -20˚C for microbiology test latterly, while the other part was transferred at the same day in cooling bag to determine SCC and milk composition. Chemical composition (total solids, fat, protein, solid-non-fat, lactose, ash and urea) and somatic cell count of milk samples were determined by using Bentley[150] infrared milk analyzer (Bentley Instruments, Chaska, MN, USA) calibrated for goats' milk. Total count and *staphylococci* were counted in the frozen milk samples where total bacterial counts were enumerated using plate count agar medium according to APHA, (1978).

The count of Staphylococci generally and Staphylococcus aureus specially were carried out by using Barid-parker agar base medium (Barid-parker, 1962), where, a selective and diagnostic medium for the isolation and enumeration of Staphylococcus aureus were used. Staphylococci and Staphylococcus aureus were enumerated using Baird Parker agar with egg yolk according the method of Barid-parker (1962).

The data obtained was statistically analyzed by using the ANOVA procedures of *SAS Institute (2004)* according to procedures outlined by *Snedecor and Cochran (1982).* Repeated measurements for nutrients digestibility, yield and composition were used with the following models:

$$Y_{ijk} = \mu + T_i + A\ (T)_{ijk} + W_j + (WT)_{jk} + E_{ijk}$$

Where, Yijk: observations, µ: overall mean, Ti: effect of different basal diets, Lj: effect of different levels of Echinacea purpurea, (T*L)ij: the fixed effect of the interaction between the different basal diets and different levels of Echinacea purpurea, Eijk: experimental error. Separation among means was carried out by using Duncan multiple tests, (1955).

RESULTS AND DISCUSSIONS

Nutrients Digestibility:

Results of nutrients digestibility when using sun dried plant additives in dairy goats' diet (Table 2) showed that differences among the groups for nutrient digestibilies were significant ($P \leq 0.05$). The highest value of DM (64.5%) was recorded for G_2 (which fed on 4 g *E. purpurea*) followed by G_3 (63.2%) which received 8 g *E. purpurea* /h/d. While the lowest value (59.6 %) was reported for G_1 (control group). The same trend was observed for the other nutrient (OM, EE, CP and NFE) digestibilities where values of nutrients digestibilies for animals fed on the basal diet supplemented with 4g E. purpurea daily, were superior comparable to the other groups, followed by those fed supplemented diet with 8g E. purpurea daily (G_3). While the control group had the lowest values.

Data of Table (2) clearly indicated that using *E. purpurea* in both G_2 (4 g *E. purpurea*) or G_3 (8 g *E. purpurea*) significantly ($P \leq 0.05$) enhanced the entire nutrients digestibility coefficients especially in G_2. This result may be due to the antioxidant activity of the polyphenolic components which a component of *E. purpurea* (Cervellati *et al.,* 2002), and or to the antibacterial and antiviral effect of *E. purpurea* and its protectants against reactive oxygen species (Bergeron *et al*., 2000). Which provide a suitable environment for the growth of beneficial microflora in the rumen, therefor increasing its viability and its ability to utilize the diet ingredients and enhancing the nutrients digestibility coefficients.

Table (2). Effect of using sun dried plant additives on nutrients digestibility.

Item	Groups					± SE
	G_1	G_2	G_3	G_4	G_5	
DM digestibility	59.6^d	64.5^a	63.2^b	61.2^c	61.7^c	0.27
OM digestibility	60.5^c	66.4^a	62.7^b	61.4^{cb}	62.5^b	0.46
EE digestibility	53.0^c	62.1^a	60.4^b	60.6^b	61.3^b	0.26
CP digestibility	68.7^c	74.0^a	70.5^b	68.6^c	71.2^b	0.45
CF digestibility	52.0^b	61.1^a	59.3^a	53.0^b	52.6^b	0.82
NFE digestibility	62.3^c	69.0^a	66.3^b	63.0^c	63.6^c	0.70

a, b & c Means of parameters within the same row with different superscript letters are differ significantly (P<0.05).

Using *N.sativa* in G_4 as addition to the dairy goats' diet tend to increase the digestibility of the diet ingredient comparable to control group, These results are in agreement with those obtained by *Abo El-Nor et al. (2007),* who supposed that, Nigella sativa stimulate anaerobic fermentation of organic matter that improve efficiency of utilization of nutrients by its contain of saponins. In addition, it increased bacterial number in the rumen of lactating cows *(Valdez et al., 1986; Ali et al., 2005).*

The results of G_5 (10 g *C. intybus*) showed that this group utilized the diet better than the control group in entire nutrient ingredients (DM, OM, EE, CP, CF, and NFE), which may be due to the ability of the *C. intybus* herb to purification of the digestion track from parasites that may affect the balance of the rumen environment and therefore adversely affect the process of digestion of different nutrients, (Molan *et al* (2003) and Athanasiadou *et al*. (2007).

Blood serum parameters:

Data of Table (3) showed that animals of G_2 (4 g *E. purpurea*) had the highest ($P<0.05$) total blood serum protein (7.49 mg/dl), whereas, the lowest value (7.02 mg/dl) was found in control group (G_1). On the other hand, the data showed insignificant differences among G_3, G_4 and G_5, where the obtained values were 7.40, 7.27 and 7.13, respectively. The values of serum total protein were within the normal range (6.1-7.5 g/dl) as reported by Boyd (2011). The increase of total protein in treated groups may attribute to the increase of CP digestibility (Table 3). Youssef and Zaki (2001), Shahen *et al.* (2004) and Kassab (2007) reported that the increase protein digestibility might be the reason of increasing serum total protein and its fraction. In addition, the present results are in agreement with those found by El-Ekhnawy *et al.* (1999) and Mohamed *et al.* (2003) in sheep. Furthermore, the increase of serum total protein, as a result of *Nigella Sativa* seeds supplementation could be due to its positive effect on thyroid hormones secretion (Zanouny *et al.*, 2013).

Animals of G2 (4g *E. purpurea*) had slightly the highest ($P\leq0.05$) albumin and globulin values followed by G_3 (8g *E. purpurea*). According to Boyd (2011), the present values of serum albumin are slightly higher ($P\geq0.05$) than the normal range (2.3-3.6 g/dl) while values of serum globulin are within the normal range (2.7- 4.4 g/dl). Increasing of serum albumin of G_2, G_3 and G_5 may be due to the higher organic matter and CP digestibility (Table, 2). The data clearly indicated no pathological lesion in the liver, since the liver is the main organ of serum albumin synthesis. Serum albumin has been shown to be a good indicator of nitrogen status, especially in small ruminants (Ingraham and Kapple, 1988; Gaskins *et al.*, 1991 and Laborde *et al.*, 1995).

Table (3). Effect of using sun dried plant additives on some blood serum parameters in dairy goats.

Item	Groups					± SE
	G_1	G_2	G_3	G_4	G_5	
Total Protein (mg/dl)	7.02^{b}	7.49^{a}	7.40^{ab}	7.27^{ab}	7.13^{ab}	0.11
Albumin (mg/dl)	3.71	3.81	3.76	3.64	3.63	0.06
Globulin (mg/dl)	3.31	3.68	3.65	3.63	3.50	0.13
A/G ratio	1.16	1.05	1.09	1.02	1.05	0.06
Glucose (mg/dl)	77.8	81.0	80.2	80.0	78.9	1.30
Cholesterol (mg/dl)	185.5^{a}	176.9^{ab}	177.0^{ab}	175.5^{b}	181.6^{ab}	2.67
Triglycerides (mg/dl)	236.5	241.8	238.2	239.7	240.3	1.92
Urea (mg/dl)	67.6^{a}	65.8^{a}	66.2^{a}	59.2^{b}	65.1^{a}	1.15
AST (U/l)	69.8^{a}	72.0^{a}	64.6^{b}	65.9^{b}	69.1^{a}	0.91
ALT (U/l)	63.6^{a}	59.1^{b}	61.5^{ab}	58.5^{b}	61.2^{ab}	1.09
Creatinine (mg/dl)	2.83^{a}	1.51^{b}	1.76^{b}	1.69^{b}	1.74^{b}	0.09

a, & b Means of parameters within the same row with different superscript letters are differ significantly (P<0.05).

Addition of E. purpurea to goat's diet tend to improve the immune status (Table 3), where the changes of serum γ-globulin levels took the same trend as those of total protein and globulin levels, which reflects animal immune status and support the results that Echinacea extract stimulate goat’s own defense system (Doaa, Teleb *et al.*, 2009).

The increase in serum globulin concentration in G_4 (7.5g *N. sativa*) may also due to an immuno stimulant effect of *Nigella Sativa* seeds. These results are in good agreement with Mohamed *et al.* (2003). Also, it has been reported that *Nigella Sativa* seeds increased thyroid hormones which led to increase the production of gammaglobulin (Sanad, 2000 and Sanad, 2010).

Data of Table (3) showed non-significant increase of the supplementation ($P \geq 0.05$) on blood serum glucose level. It ranged between 81.0 mg/dl (for G_2) and 77.8 mg/dl) (for G_1).It may due to that medicinal plant seeds increase NFE digestibility. These results are in good agreement with those found by Nazar (1994) and El-Ashry *et al*. (2006) who reported that the mean values of blood glucose were higher in treated animals with medicinal herbs than control. Also, El-Ekhnawy *et al.* (1999) found that *Nigella Sativa* oil seed led to increase glucose concentrations in Barki ewes fed the maintenance ration supplemented with 150 and 250 g *Nigella Sativa* meal. On the other hand, Zanouny *et al.* (2013) found that, supplementation of *Nigella Sativa* seeds led to decrease ($P \geq 0.05$) glucose concentration in blood serum. Similar findings were reported by El-Saadany *et al.* (2008) in goat and Sanad (2000) in sheep.

It is of interest to notice that treated groups (G_2, G_3 and G_5) had on-significant lower blood serum cholesterol than control group, whereas, G_4 recorded significantly lower value (Table 3). The highest level was recorded in control group (185.5 mg/dl) while the lowest one found in G_4 (175.5 mg/dl). These results are in agreement with El-Saadany *et al.* (2008) who worked on lactating Zaraibi goats. The decrease of cholesterol concentration as a result of *Nigella Sativa* seeds supplementation may be due to the high content of unsaturated fatty acids in *Nigella Sativa* seeds. Same results were reported by, Mostafa (1998) on dose and kids, and Randa (2007) on Zaraibi goats In addition, El-Saadany *et al.* (2008) reported that supplementation of Nigella Sativa seeds in the ration led to significant decrease of cholesterol concentration in blood plasma.

Concentrations of serum triglycerides were 241.8, 240.3, 239.7, 238.2 and 236.5 mg/dl for G_2, G_5, G_4, G_3 and G_1, respectively. The differences among the treatments were not significant.

The concentrations of blood serum urea ranged between 59.2 to 67.6 mg/dl being lower significantly for G_4 tha the other groups. These values are higher than the normal range (10-50 mg/dl) as reported by Kaneko (1989); it may be related to the difference between the species. The differences among groups for AST concentration were significant ($P \leq 0.05$), where, G_2 showed the highest AST level (72.0 U/I). On the other hand, there were insignificant ($P \geq 0.05$) differences among G_3, G_5, G_2 and G_4 in blood serum ALT level (61.5, 61.2, 59.1 and 58.5 U/I, respectively). Chicory tend to decrease both AST and ALT numerically but not significantly in G_5 when compared with the control group. These results were in contrast with those observed by Ahmed *et al*. (2008) who found that seeds of *Cichorium intybus L.* (Asteraceae) reduced the elevated levels of liver enzymes such as serum glutamate oxaloacetate transaminase (SGOT) by 52 units/ml; SGPT 38 units/ml.

Creatinine level in blood clearly presents animal kidney status, so it can be a good indicator on the animal health. Data of Table (3) showed that the control group (G_1) had significantly the highest creatinine level (2.83 mg/dl) when compared with the other groups. In same time, there was no significant differences among the treated groups

Milk yield and composition:

Data in Table (4) showed that using 4 g/h/d of Echinacea parpurea (G_2) as sun dried plant additive to dairy goats' diet tend to increase ($P \leq 0.05$) milk production and fat corrected milk (1718.4 and 1613.4 g/h/d, respectively). In same time, there was no significant differences among the other groups. Mean milk production were 1516.8, 1380.0, 1363.3 and 1345.4 g/h/d for G_3, G_5, G_4 and G_1, respectively. The obtained results were in harmony with those of Azadi *et al.* (2011) who found that daily milk production was improved after treatment with Nigella sativa extract and no significant difference was observed between the treatments. Vihan *et al.* (1987) found that the use of Nigella sativa medication resulted in substantial increase and sustained milk in clinical cases in goats.

The slight increase in milk production due to adding nigella sativa compared with the control group may be due to that Nigella sativa increased the secretary epithelial cells number and mammary weight (El-Komey, 1996). Also, the galactopoietics effect of Nigella sativa may be due to its estrogenic activity which was noticed by Agrawal *et al.* (1990).

Data in Table 4, showed insignificant differences in % milk fat, although values of G_2 slightly was the highest (3.57%) followed by G_5 (3.33%), but animals of contron group (G_1) recorded the lowest percentage (3.00%). These results agreed with those found by Abo El-Nor *et al.* (2007) who recorded slightly increase in % milk fat when adding Nigella sativa in buffaloes' diet.

The results of Table (4) showed, also, that there was no effect to the treatment on milk protein levels although there was slightly increase in G_2 and G_1 than the other groups. The values were: 2.89, 2.93, 2.77, 2.77 and 2.77 for G_1, G_2, G_3, G_4 and G_5, respectively. These results disagreed with those stated by Abo El-Nor et al. (2007) who recorded slight increase in milk protein percentage when using Nigella sativa as addition to buffaloes' diet.

Data of Table 4, showed significant ($P \leq 0.05$) differences among experimental groups in % lactose level. The values were 4.56, 4.54, 4.52, 4.40 and 4.35 % for G_2, G_3, G_5, G_4 and G_1, respectively. These results disagree with those found by Abo El-Nor *et al.* (2007) who recorded significant ($P \leq 0.05$) increase in milk lactose when adding Nigella sativa in buffaloes' diet.

Data of Table (4) showed that there were no significant differences in milk urea content. The values were 27.5, 26.9, 26.1, 22.6 and 21.4 for G_1, G_3, G_2, G_5 and G_4, respectively. However, there were significant differences among the groups in ash, TS and SNF contents. The values of ash were 0.93, 1.05, 1.00, 0.96 and 0.92 for G_1, G_3, G_2, G_5 and G_4, respectively.

Table (4). Effect of using different sun dried plant additives on milk yield and composition.

Item	Groups					± SE
	G_1	G_2	G_3	G_4	G_5	
Production g/h/d	1345.4^{b}	1718.4^{a}	1516.8^{ab}	1363.3^{b}	1380.0^{b}	85.1
Fat, %	3.00	3.57	3.16	3.21	3.33	0.18
Total protein, %	2.89	2.93	2.77	2. 57	2. 52	0.06
Lactose, %	4.35^{c}	4.56^{a}	4.54^{a}	4.40^{bc}	4.52^{ab}	0.04
Urea (mg/dl)	27.5^{a}	26.1^{a}	26.9^{a}	21.4^{b}	22.6^{b}	0.46
Ash, %	0.93^{ab}	1.05^{a}	1.00^{ab}	0.96^{ab}	0.92^{b}	0.04
Total Solids, %	11.2^{b}	12.1^{a}	11.5^{b}	11.1^{b}	11.3^{b}	0.19
SNF, %	8.16^{b}	8.55^{a}	8.31^{b}	7.88^{c}	7.95^{c}	0.06
SCC 10^3	608.1^{a}	64.3^{c}	96.7^{bc}	179.0^{b}	105.2^{bc}	28.8
SCC Log	5.68^{a}	4.69^{c}	4.81^{c}	5.02^{b}	4.77^{c}	0.05
TC. (cfu)	5.60^{a}	5.17^{c}	5.18^{c}	5.38^{b}	5.54^{a}	0.03
St. (cfu)	1.50^{a}	0.33^{b}	0.42^{b}	0.58^{b}	0.46^{b}	0.20
St. aureus (cfu)	0.58^{a}	0.00^{b}	0.00^{b}	0.04^{b}	0.04^{b}	0.11

a, b & c Means of parameters within the same row with different superscript letters are differ significantly (P<0.05).
SCC: somatic cells count

The obtained result demonstrated significant ($P \leq 0.05$) differences in milk content of TS and SNF, where G_2 recorded the highest percentage followed by G_3 (12.1 and 11.5 %, respectively) and SNF (8.55 and 8.31 %, respectively). However, the lowest percentages were returned to G_4 in both TS and SNF (11.1 and 7.88 %, respectively). Abo El-Nor *et al.*, (2007) recorded slightly increase in SNF when adding *Nigella sativa* in buffaloes' diet.

Adding sun dried plant additives significantly ($P \leq 0.05$) decrease somatic cells count (SCC) in produced milk (Table 4). Using *Echinacea parpurea* in G_2 and G_3 was the most effective treatments on SCC, where the overall means for the experimental groups were 608.1, 179.0, 105.2, 96.7 and 64.3 $*10^3$ cfu for G_1, G_4, G_5, G_3 and G_2, respectively. These results are in agreement with Reklewska *et al.* (2004) who reported that *Echinacea purpurea* extract reduced mammary infections and SCC in goats' milk by increasing lactofferin secretion, which is anti-bacterial, anti-viral and immuno-stimulating compound. Similar results were obtained by Doaa, Teleb *et al.* (2009) when used *Echinacea purpurea* extract in infected goats and by Azadi *et al.* (2011) when add the *Nigella sativa* to cows diets. In contrast, Dymnicka *et al.* (2003) observed no significant changes in milk SCC in cows given 300 g/ animal of dried whole *Echinacea purpurea* plant over 3 weeks.

Data of microbial content in milk (Table 4) revealed that the highest significant ($P<0.05$) counts were recorded in the control group (G_1, 5.60) followed by those fed on 10 g/h/d cichorium intybus (G_5. 554). However, the lowest counts were found in G_2 followed by G_3 (5.17 and 5.18 cfu).

The obtained results clearly showed that *Echinacea parpurea* tend to decrease *staphylococci* count in milk samples significantly ($P \geq 0.05$) in G_2 and G_3 (0.33 and 0.42 cfu), On the other hand, control group (G_1) recorded the highest *staphylococci* count followed by G_4 then G_5 (1.58, 0.58 and 0.46, respectively). With the same trend the experimental groups differed in the *St. auraus* count, where *Echinacea parpurea* groups (G_2, and G_3) recorded the lowest *St. auraus* count (0.00 cfu) in milk samples followed by (G_4 and G_5) which recorded 0.04 cfu in each. The control group (G_1) differed significantly ($P \leq 0.05$) with the other groups where, G_1 recorded the highest *St. auraus* count (0.58 cfu).

The present results of SCC, total microbial count, *Staphylococci* count and *St. auraus* count, are in agreement with Azadi *et al.* (2011) who found that, the daily milk production improved and reduced the bulk milk SCC from 245,000-218,000 cells mL^{-1} in the treated groups with *Nigella sativa* extract.

Based on the results of this be study it can *concluded* that adding sun dried medical plants as *Echinacea purpurea, nigella sativa,* and *Chicorum Intybus* can enhance nutrients digestibilities and milk production of dairy goats and improve dairy animal's health status by increasing the animal resistance to harmful microbes.

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تأثير استخدام الإخناسيا (***Echinacea Purpurea***)، حبة البركة ***Nigella Sativa*** و والشيكوريا (***Chicorum Intybus***) فى علائق الماعز الحلابة على معاملات الهضم وبعض خصائص الدم وإنتاج اللبن وجودته

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قسمت عشوائيا عشرون من الماعز الدمشقي الحلابة عند الولادة (متوسط وزنها 29.2 ± 1.96 كجم ومتوسط عمرها 2.5 – 3 سنة) إلى خمس مجموعات لدراسة تأثير استخدام كل من الإخناسيا، (*Echinacea Purpurea*)، حبة البركة *Nigella Sativa* والشيكوريا و *Chicorum Intybus* على إنتاج اللبن و جودته. حبث تم تغذية مجموعة المقارنة (G_1) على العليقة الأساسية، G_2 تم تغذيتها العليقة الأساسية مع إضافة 4 جم إخناسيا / رأس .يوم، G_3 تم تغذيتها العليقة الأساسية مع إضافة 8 جم إخناسيا / رأس .يوم، أما G4 فتم تغذيتها على العليقة الأساسية مع إضافة 7.5 جم حبة البركة / رأس .يوم ، بينما G_5 تم تغذيتها العليقة الأساسية مع إضافة 10 جم شيكوريا / رأس .يوم لمدة 98 يوما . أوضحت النتائج تحسن معاملات هضم جميع العناصر الغذائية (DM - OM - EE - CP CF) في المجموعات المعاملة بالمقارنة بالمجموعة المقارنة. وأيضا تحسن فى إنتاج اللبن في المجموعات المعاملة بالمقارنة بالمجموعة المقارنة، حيث كان إنتاج اللبن 1718.4 ، 1516.8 ، 1380.0 ، 1363.3 و1345.4 جم / رأس .يوم لـ G_2 ، G_3 ، G_5 ، G_4 وG_1، على التوالي. أما عن تركيب اللبن ، فوجد أن ٪ دهون اللبن في المجموعات المعاملة زاد زيادة طفيفة بالمقارنة بالمجموعة المقارنة، بينما مالت ٪ البروتين الكلي في اللبن إلى الانخفاض في G_3، G_5 و G_4 بالمقارنة مع G_2 وG_1، حيث بلغ المتوسط العام لـ % البروتين (2.93 ، 2.89 ، 2.77 ، 2.57 و 2.52 ٪ ، على التوالي) . أدى استخدام الإخناسيا بشكل فعال إلى إنخفاض العدد الكلي للخلايا الجسمية (SCC) في اللبن في المجموعتين G_2 و G_3، أيضا أدت إضافة حبة البركة و الشيكوريا إلى إنخفاض SCC ، وكانت النتائج التي تم الحصول عليها 608.1 ، 179.0 ، 105.2 ، 96.7 و 64.3 * 10^3 خلية للمجموعات G_1، G_4، G_5، G_3 و G_2، على التوالي. وقد تأثر العد الكلي للميكروبات كذلك بإضافة الإخناسيا و حبة البركة ، حيث سجلت G_2 أقل عد تلتها G_3 ثم G_4 (5.17 ، 5.18 و 5.38 cfu ، على التوالي) . أيضا ، سجلت G_2 و G_3 أقل عدد من *Staphylococci* و *St. auraus* عند المقارنة بالمجموعات G_5، G_4 وG_1. أشارت النتائج المتحصل عليها إلى أن استخدام بعض النباتات الطبية مثل الإخناسيا، حبة البركة، والشيكوريا كإضافات إلى علائق الماعز الحلابة يؤدى إلى تحسين معامل هضم المواد الغذائية كما يؤدي إلى زيادة كمية اللبن المنتج ويحسن من جودته.