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INFLUENCE OF PROTECTED LINSEED MEAL AND COTTON SEED MEAL BY TANNINS ON ZARAIBI DAIRY GOATS AND THEIR OFFSPRING PERFORMANCE

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ABSTRACT

This study aims to evaluate the effect of treated linseed meal or cotton seed meal with different levels of condensed tannins (quebracho tannins, QT; Unitan, Argentina) on Zaraibi dairy goats and their offspring performance. Both protein sources were treated with four levels of tannin (1, 2, 3 and 4 %) on dry matter basis. An *in situ* experiment was conducted to study the effect of treatment on the rate of disappearance of DM, OM and CP in the rumen using a pair of cannulated buffalo mature bulls where they were fed on clover hay by 1/3 of their daily requirements while concentrate feed mixture given by 2/3 of the animal requirements. According to the results of *in situ* degradation trial, two better CFM's in addition to the two untreated meal were fed to thirty two Zaraibi goats (BW 51.5± 1.75 Kg). They were randomly divided into four similar groups (8 does/ each) where the untreated groups (R1 and R3) fed 60% CFM contained untreated linseed meal or cotton seed meal respectively, and 40% rice straw. The two treated groups were fed 60% CFM contained treated linseed meal or cotton seed meal by quebracho tannin (QT) at the rate of 2% plus 40% rice straw (R2 and R4, respectively) on DM basis for all rations. Nutrients requirements were calculated according to NRC (1994). At the end of the experiment digestibility trails were conducted to estimate the digestibility and feeding values of the experimental rations using acid insoluble ash technique (using 3/g goats) for each trial.

Results indicated that *in situ* degradability of DM and OM were significantly decreased with increasing the level of tannin up to 4% and also, crude protein degradability values followed similar trend to that of DM and OM among treatments. In other words, the UDP was increased as increasing tannin levels into the highest level (4%). Insignificant differences among different experimental treatments were showed for digestibility coefficients of all nutrients expect of CP which was significantly higher for R2 and insignificantly higher with R4 than that ofcroesponding untreated group R1 which had lower value of digestion coefficient of CP and there is no significant difference between R1 and R3. No significant differences were observed between R2, R3 and R4 in DCP values, however, R4 had higher significant differences with R1. While TDN values were quite similar among treatments. Daily milk yield for R2 and R4 rations were significantly (P<0.05) higher as compared with that of R1 and R3 with the highest value occurred with R4. No significant differences were noticed among experimental rations in all milk constituents except for fat percentage which reduced significantly with R4 vs R3. In matching with milk yield, protein yield for R2 and R4 were significantly higher (P<0.05) than those of untreated groups (R1 and R3), while fat yield was insignificant increased by dietary treatments. Daily gain for kids from birth up to weaning was significantly (P<0.05) higher for treated rations than kids fed untreated ones by tannins (R1 and R3). Also, results indicated that the untreated rations (R1 and R3) gave the lowest conception rate (25.0%), while groups fed R2 and R4 gave 75.0 and 87.5%, respectively, conception rate with significant differences due to QT treatments for both kind of protein sources. Based on these results, it could be concluded that the protection process of linseed meal and cotton seed meal with 2% QT can improved the CP utilization and dairy goats performance.

Keywords: Dairy goats, linseed meal, cotton seed meal, condensed tannins, degradation kinetics, digestibility, milk production and reproduction.

INTRODUCTION

Protein degradation rate and high portion of soluble protein affect the amount of ammonia that escapes microbial capture, depending on degradability rate and availability of readily fermentable carbohydrate sources. Microbial protein and efficiency of microbial synthesis are thought to be maximized by synchronization of crude protein and organic matter fermentation in the rumen (Ørskov1999 and Chumpawadee *et al*. 2006). When the microbial protein is inadequate in pregnant does specially in case of multi twin does at the last two months of pregnancy when the size of rumen becomes less related to increasing embryos size, one of the effective ways to cover does needs to protein is adding protected protein which gives does true amino acids and improves digestibility because by-pass protein is digested better in the lower gut (Limin and Rode 1996). Most proteins have the ability to bypass the rumen partially (Klopfenstein 1985) but some other protein sources are featured as protected protein than the others such as corn gluten. Some studies have shown an increase of amino acids flow to the duodenum and amino acids absorption when tannins are included in diets (Egan and Ulyatt 1980 and Waghorn *et al.* 1987). Protecting high-quality protein sources, such as legumes and seed meals from ruminal fermentation positively affects animal performance. Various methods for treating proteins have been used to reduce their degradation in the rumen. These can be broadly categorized as chemical and physical treatments (Mir *et al.* 1984).

Linseed (*Linum usitatissimum*) meal is the by-product of extracting the oil from seeds. The meal contains 350-380 g/kg CP that is low in protein quality, being deficient in lysine. It has been a favorite protein source for horses and ruminants in the past. The meal fed in large amounts is laxative, and excess amounts in rations have undesirable softening effects on butterfat and give milk a rancid taste. The recommended maximum intake for cattle is 3 kg per day, because of this softening property of the oil (FAO 2001b). Oil cake contains approximately 30% protein and is used in feed for sheep, horses, and dairy and beef cattle. Linseed meal is comparable to soybean meal in composition but energy and protein digestibility are lower than for most other oilseeds.

Cotton seed (*Gossypium spp*.) meal is palatable and commonly used in cattle rations, low in rumen degradable protein, and as such it is a suitable source of bypass protein (FAO 2001a). Cottonseed meal contains less available protein and energy than peanut meal or soybean meal. This is especially true for available protein and for this reason rations containing cottonseed meal need to contain a little more protein (1 to 2%) to be equal to rations containing soybean or peanut meal (Harris and Staples 2003).

Tannins are a complex group of polyphenolic compounds found in a wide range of plant species commonly consumed by ruminants. Tannins appear to cause cross linkages between proteins and their molecules. Tannins treatment usual as a method for protein protection. Tannins are tentatively classified into two classes: hydrolysable and condensed tannins. The major anti-nutritive effect of tannins is depend on their ability to combine with dietary protein and forming the protein-tannin complexes, thus reducing ruminal digestion and degradation (Makkar 2003 and Frutos *et al.* 2004). So, addition of tannins to ruminant diets may improve efficiency of nitrogen utilization. Differences in results among trials may be related to the nature and concentration of tannins used. Some reports have demonstrated that tannins reduced intake of protein and dry matter digestibility, thereby, decreasing animal performance (Reed *et al*. 1990 and Dawson *et al*. 1999). The higher animal performance observed when the diet contained low levels of tannins had generally been attributed to the protection of feed protein from degradation in the rumen, leading to an increase in the flux of essential amino acids to small intestine and increase the absorption of essential amino acids to blood (Waghorn and Shelton 1997).

This study was planned to investigate the effect of protected protein by quebracho tannin on digestibility, milk yield for Zaraibi dairy goats and their offspring performance.

MATERIALS AND METHODS

The present study was carried out at Sakha Animal Production Research Station, Kafer El-Sheikh Governorate, belonging to Animal Production Research Institute (APRI), Agriculture Research Center, Ministry of Agriculture, Dokki, Giza, Egypt. The experimental work was carried out during the last month of does pregnancy (January) up to next mating season (September).

Method of protein protection for linseed meal and decorticated cotton seed meal:

Protein of linseed meal (LSM) and cotton seed meal (CSM) used in the different experimental concentrate feed mixtures (CFM_1 and CFM_2) in the present study were protected by 1, 2, 3 or 4% condensed tannins (quebracho tannins, QT; Unitan, Argentina). Quebracho tannin was dissolved with a little amount of water then the tested feeds were spread in a thin layer, then sprayed with QT with continuous mixing of the tested feeds. The treated linseed meal and cotton seed meal were air dried before being and mixed with other ingredients to make tested CFM's.

Protein protection and in situ trial:

Ten concentrate feed mixtures (CFM′s) were formulated to contain unprotected linseed meal or cotton meal (0%) or protected by 1, 2, 3 or 4% QT. Two fistulated mature male buffaloes were assigned to carry out the *in situ* trial. Animals were fed on clover hay at a rate 1/3 of the daily requirements while the concentrate at a rate of 2/3 of their daily requirements, in order to find out the effect of protection on DM, OM and CP ruminaly degradation. Nylon bags technique (Mehrez and Ørskov 1977) was used to determine the degradability of DM, OM and CP of CFM's. Four/tested material polyester bags (7 X 15 cm) with pore size of 45 µm were used for each incubation timel. Approximately 6 g of air-dried CFM (ground to 2 mm) were filled in each bag. All bags were incubated in the rumen of the fistulated animals, for 3, 6, 12, 24, 48, 72 and 96 h, then they were withdrawn and rinsed in tap water until the water became clear and partly squeezed gently. Microorganisms attached to the residual sample were eliminated by freezing at -20°C (Kamel *et al*. 1995). Zero-time washing losses (a) were determined by washing 2 bags in running water for 15 min. The degradation kinetics of DM, OM and CP were estimated (in each bag) by fitting the disappearance values to the equation P = a + b (1- e-Ct) as proposed by Ørskov and McDonald (1979), where P represents the disappearance after time t. Least-squares estimated of soluble fractions are defined as the rapidly degraded fraction (a), slowly degraded fraction (b) and the rate of degradation (c). The effective degradability (ED) for tested rations were estimated from the equation of McDonald (1981), where ED = a + bc/ (c + k), k is the out flow rate (5%). Chemical analysis of CFM, LSM, CSM, rice straw and experimental rations (on DM basis, %) are shown in Table (1).

Digestibility trials:

At the end of experiment digestibility and nutritive values of experimental rations were determined by using acid insoluble ash technique (Van Keulen and Young 1977) on the same animals of the feeding trial. Feces samples were collected twice daily for 7 successive days from three Zaraibi dairy goats for each ration at the end the feeding experimental period. Subsamples (20%) of feces was taken once daily then stored at -18ºC until analyses. Feces samples were dried at 60ºC for 72 hrs. Feed and feces samples were ground through 1 mm screen on a Wiley mill grinder and a sample of 50 gm/ (ration/ does) was taken for analysis. Representative samples of feed and feces were analyzed for crude protein (CP), crude fiber (CF), ether extract (EE) and ash according to A.O.A.C (2000). The experimental Zaraibi dairy goats (does) were healthy and free from external and internal parasites and kept in pens under similar condition. Water and mineral salts were permanently available throughout the entire experimental period to provide their requirements.

Experimental animals and feeding:

According to the results of the *in situ* trial, two better treated of CFM's in addition to the untreated ones were fed to thirty two late pregnant Zaraibi dairy goats (last 4-6 weeks of gestation period) at 2nd and 3rd seasons with an average body weight 51.5± 1.75 kg and 3-4 years old. They were randomly assigned into four similar groups (8 does/ each); in a comparative feeding trial using a randomized complete block design, group (R1) fed 60% CFM_1 contained untreated linseed meal and 40% rice straw and group (R3) fed 60% CFM_2 contained untreated cotton seed meal and 40% rice straw. The other two treated groups fed 60% CFM_1 or CFM_2 contained treated linseed meal or cotton seed meal by quebracho tannin at the rate of 2% of linseed meal or cotton seed meal DM plus 40% rice straw (R2 and R4, respectively). (Using the treated linseed meal or cotton seed meal by 2% tannins according to the results of the *in situ* trial, where there is no significant differences between 2, 3 , 4% treatment in UNP,) Nutrients requirement were calculated according to NRC (1994). Water and minerals salt were permanently available throughout the entire experimental period to cover the does requirements.

After kidding, does and kids were weighed directly after 15hr and weighed at 15, 30, 45 and 60 days of age and kids were weaned at 60 days of age. Kids were isolated out of their dams after the second meal of the day at 3.0 pm till the next day morning. Kids were stayed 8 hr daily apart from their dams, then they weighed before suckling and after suckling, in order to find out the amount of suckled milk, then the does completely hand milk till stripping and milk yield was recorded. The does were milked at 15, 30, 45 and 60 days from kidding and the suckled milk samples were taken and analyzed for fat, total solid (TS), solid not fat (SNF), protein (P) and ash % according to the methods of Ling (1963), lactose was calculated by difference.

Estrus detection:

Estrus incidence was monitored to confirm the onset of estrus three times daily with 6 hours as the interval by teaser buck to evaluate estrus numbers through lactation period. The estrus signs observed included: searching for the male, restlessness, vocalization, frequent urination, tailing, contraction, hyperemia and edema of the vulva, vaginal mucous discharge and immobility on mounting. At the end of the experimental study, an economical evaluation was calculated for tested rations according to the prevailing prices of ingredients during the time of the experiment.

Statistical analyses:

All data were analyzed using the general linear models procedure of SAS (1999), data of percentages were subjected to arc-sin transformation to approximate normal distribution before being analyzed and means were separated using Duncan's multiple range tests (Duncan, 1955) for the comparison among means of the experimental diets when the main effects were significant.

The model used was: $Y_{ij}= \mu + T_i + e_{ij}$

Where: Y_{ij} = the observation of ij,

μ=overall mean of Y_{ij},

T_i = Effect of i (treatments),

e_{ij} = the experimental random error.

RESULTS AND DISCUSSIONS

Chemical composition of feeds

The proximate chemical analysis of concentrate feed mixtures (CFM_1 and CFM_2), linseed meal (LSM), cotton seed meal (CSM), rice straw (RS) and experimental rations are shown in Table (1). The chemical composition of CFM_1 and CFM_2 are closely comparable to those using commonly in practical field of ruminant feeding. Also, the nutrient content values of LSM, CSM and rice straw are within the normal range that widely recorded in the literature. Results of the chemical composition of the experimental rations indicated that protection process of LSM and CSM did not cause clear differences in the chemical composition. These results are in agreement with those of Dhiman *et al.* (1997), El-Reweny (2006) and Abd Elmoty *et al.* (2010), they found that proximate analysis of protected protein in soybean meal, linseed meal and canola meal are not affected significantly by different methods applied for protecting protein.

Table (1): Chemical composition of feed ingredients and experimental rations (on DM basis, %).

Item	DM	CP	CF	EE	NFE	Ash
CFM_1	88.38	17.36	7.31	3.53	67.16	4.64
CFM_2	88.51	17.98	7.82	3.57	66.26	4.37
LSM	90.00	37.78	10.56	1.67	43.32	6.67
CSM	91.00	45.05	15.39	1.65	31.32	6.59
RS	90.00	4.44	44.44	1.11	32.24	17.77
Experimental rations:						
R1	89.04	11.98	22.77	2.52	52.61	10.12
R2	89.18	11.79	22.60	2.47	53.11	10.03
R3	89.13	12.35	23.05	2.55	52.10	9.95
R4	89.27	12.16	22.88	2.50	52.54	9.92

***Ingredients calculated according MOA (2001).**

CFM1: 40.0 yellow corn, 22.0 linseed meal, 31.5 wheat bran, 3.0 molasses, 0.5 mineral premix, 1.0 salt and 2.0 % limestone (as fed).

CFM_2: 45.0 yellow corn, 20.0 cotton seed meal, 28.5 wheat bran, 3.0 molasses, 0.5 mineral premix, 1.0 salt and 2.0 % limestone (as fed).

R1, ration with LSM, R2, with treated LSM with 2% tannin, R3, ration with CSM and R4, with treated CSM with 2% tannin.

Degradation kinetics of experimental concentrate feed mixtures:

Degradation kinetics of DM, OM and CP of CFM are presented in Tables (2 and 3). The rapidly degraded fraction (a) of DM, OM and CP were significantly decreased along the increasing protection levels of QT. Also, the slowly degradable fraction (b) of DM, OM and CP were slightly decreased when LSM or CSM treated with 1, 2, 3 and 4% of QT. The rate constant of ruminal degradation rate (c) was numerically declined for all treatments comparing with the untreated groups as shown in Tables (2 and 3). Effect of QT on degradation kinetics of CP was obviously noticed. Treated CFM_1 and CFM_2 with 2% of QT had a minor effect on degradation constants. Increasing tannin level was associated with extent of clear effect on ruminally CP disappearance. The ED for all treated CFM_1 and CFM_2 (Table1) were significantly decreased comparing with CFM1 and CFM6 (untreated) presented in Tables (2 and 3). The UDP was increased with increasing the QT level based on QT0 with no significant differences between levels of 2, 3 and 4% treatment, however CFM1 had lower value of UDP and differ significantly than other CFM"s expect CFM2 rations which treated. The reduction in DM, OM and CP degradation as QT treatment of linseed meal and cotton seed meal were in agreement with those reported by Khazaal *et al.* (1993) and Kamel and Al-Dobaib (2007), who observed a negative relationship between ruminal degradatibility and concentration of tannin. Similar results were demonstrated by (Hoffmann *et al.* 2008) who proved the same relationship between OM degradability and condensed tannins in acacia spp.

Table (2):Degradation kinetics of DM, OM and CP for experimental concentrate feed mixtures containing linseed meals treated with different levels of QT.

Item	Experimental concentrate feed mixtures					
	CFM1	CFM2	CFM3	CFM4	CFM5	±SE
DM						
a	13.94[a]	13.46[ab]	12.52[bc]	12.02[c]	11.41[c]	±0.45
b	63.51[a]	62.35[ab]	60.93[b]	58.90[c]	58.25[c]	±0.65
a+b	77.45[a]	75.81[a]	73.45[b]	70.92[c]	69.66[c]	±0.75
c	0.064[a]	0.063[a]	0.058[ab]	0.056[b]	0.052[b]	±0.002
Ed	57.08[a]	55.67[a]	52.66[b]	50.34[c]	48.31[c]	±0.71
OM						
a	9.84[a]	9.74[a]	8.53[b]	7.83[bc]	6.96[c]	±0.38
b	76.89[a]	76.00[ab]	75.60[b]	74.96[bc]	74.10[c]	±0.40
a+b	86.73[a]	85.74[ab]	84.13[bc]	82.79[cd]	81.06[d]	±0.66
c	0.049[a]	0.047[a]	0.042[ab]	0.037[b]	0.035[b]	±0.002
Ed	57.29[a]	56.00[a]	52.29[b]	49.04[bc]	46.70[c]	±1.24
CP						
a	11.80[a]	11.02[a]	9.77[b]	9.00[b]	8.86[b]	±0.35
b	68.28[a]	67.55[a]	66.95[ab]	65.52[bc]	64.18[c]	±0.57
a+b	80.08[a]	78.57[ab]	76.72[b]	74.52[c]	73.04[c]	±0.71
c	0.041	0.040	0.036	0.035	0.0.34	±0.002
Ed	51.07[a]	49.69[ab]	46.06[bc]	44.25[c]	42.75[c]	±1.24
Udp	48.93[c]	50.30[bc]	53.94[ab]	55.75[a]	57.24[a]	±1.24

[a, b, c and d] Means in the same row with different superscripts are significantly ($P \leq 0.05$) different.

SE=Standard error. a= soluble fraction (%).b=potentially degradable fraction (%).c=rate of degradability (%h-1).

ED= effective degradability (%).UDP=undegradable protein (%).UDP=100-ED (Ørskov and McDonald, 1979).

***CFM1, with untreated LSM, CFM2, with treated LSM with 1% tannin, CFM3, with 2% tannin, CFM4, with 3% tannin, and CFM5, with 4% tannin.**

Digestion coefficients and feeding values of the experimental rations:

According to the results of the degradation trial, the best two CFM's treatments were 2% tannin in compared to CFM1 (untreated LSM) and CFM6 (untreated CSM). The previously mentioned treatments were considered the best, because the results indicated that the ED of DM, OM and CP were actually and significantly occurred decreasing at 2% QT treatment and increasing the level of QT up to 4% had insignificant effect on the ED. On the other, the UDP was found that increased with increasing level QT treatment with insignificant differences between 2, 3 and 4% treatment which were higher than those 0 and 1% level.

Table (3): Degradation kinetics of DM, OM and CP for experimental concentrate feed mixtures containing decorticated cotton seed meal treated with different levels of QT.

Item	Experimental concentrate feed mixtures					
	CFM6	CFM7	CFM8	CFM9	CFM10	±SE
DM						
a	14.17[a]	13.87[a]	13.42[ab]	13.05[ab]	12.52[b]	±0.41
b	65.79[a]	65.35[a]	63.93[ab]	62.90[bc]	61.64[c]	±0.73
a+b	79.96[a]	79.34[a]	77.35[ab]	75.95[bc]	74.16[c]	±0.87
c	0.061[a]	0.059[ab]	0.049[bc]	0.040[cd]	0.034[d]	±0.003
Ed	58.00[a]	57.11[ab]	52.94[b]	48.70[c]	44.87[c]	±1.42
OM						
a	10.05[a]	9.35[a]	8.00[b]	7.26[b]	6.83[b]	±0.38
b	70.30[a]	66.22[ab]	62.29[b]	60.14[b]	59.62[b]	±2.55
a+b	80.35[a]	75.57[ab]	70.29[bc]	67.40[c]	66.45[c]	±2.55
c	0.049[a]	0.044[ab]	0.040[ab]	0.039[ab]	0.034[b]	±0.003
Ed	53.46[a]	48.46[ab]	43.26[bc]	41.42[bc]	38.22[c]	±2.40
CP						
a	8.01[a]	7.82[a]	7.00[b]	6.45[bc]	5.90[c]	±0.27
b	63.70[a]	63.19[ab]	61.09[bc]	59.97[c]	59.02[c]	±0.80
a+b	71.71[a]	71.01[a]	68.09[b]	66.42[bc]	64.92[c]	±0.89
c	0.046[a]	0.042[a]	0.025[b]	0.024[b]	0.023[b]	±0.003
Ed	46.38[a]	44.44 [a]	34.18[b]	32.78[b]	30.83[b]	±1.69
Udp	53.62[b]	55.56[b]	65.82[a]	67.22[a]	69.17[a]	±1.69

[a, b, c and d] Means in the same row with different superscripts are significantly ($P \leq 0.05$) different.

***CFM6, with untreated CSM, CFM7, with treated CSM with 1% tannin, CFM8, with 2% tannin, CFM9, with 3% tannin, and CFM10, with 4% tannin.**

Digestion coefficients and nutritive values experimental rations are presented in Table (4). Insignificant differences were found among dietary treatments for digestibility of DM, OM, CF, EE and NFE. Significant difference between R1 and R2 groups but vice versa between R3 and R4 ones respecting of CP digestibility were found. Probably the significant improvement in CP digestibility with 2% tannin treatment ration (R2 and R4) is due to the higher enzymatic digestion of UDP in the lower gut in relation to the CP portion that ruminally degradable. Tannins mainly exert this effect on proteins, but they also affect other feed components to different degrees (Kumar and Singh, 1984). Min *et al.* (2005) concluded that condensed tannin reduced the rate of proteolysis and inhibited the growth of proteolytic rumen microorganisms and these negative effects were correlated to the level of condensed tannin. Concerning TDN, there were no significant differences among experimental diets, while DCP for R4 group were significantly higher ($P<0.05$) than that of R1, but insignificantly higher than that of R2 and R3. These results are in agreement with the findings of Kamal and Dobaib (2007), Abd Elmoty *et al.* (2010) and Khayyal and Ashmawy (2013) who reported that treatment of protein sources in ruminant rations with QT improved CP digestibility and nutritive values of these rations.

Table (4): Digestibility and feeding values of the experimental rations.

Item	Experimental rations				± S.E
	LSM		CSM		
	R1	R2	R3	R4	
Digestibility %					
DM	63.43	63.72	63.47	63.76	±4.36
OM	69.28	69.91	70.22	70.52	±2.29
CP	66.91[b]	77.88[a]	68.41[ab]	78.21[a]	±2.89
CF	57.16	57.06	57.68	57.59	±5.54
EE	70.74	70.97	69.13	69.66	±3.72
NFE	71.05	73.55	70.74	74.41	±3.82
Feeding values , %					
TDN	62.42	65.09	62.57	65.70	±3.31
DCP	8.02[b]	9.18[ab]	8.45[ab]	9.51[a]	±0.347

[a and b] Means in the same row with different superscripts are significantly ($P \leq 0.05$) different.
SE=Standard error
R1, ration with LSM, R2, with treated LSM with 2% tannin, R3, ration with CSM and R4, with treated CSM with 2% tannin.

Milk yield and composition:

Daily milk yield (DMY) and milk composition for lactating does fed the experimental rations are presented in Table (5). Daily milk yield of the two treated rations (R2 & R4) were significantly higher (P<0.05) compared with untreated groups (R1 and R3), being the highest value was occurred with R4 (2.50 kg) that also significantly differ with R2. Concerning milk composition, no significant differences were noticed among experimental rations in all milk constituents except for fat and total solids percentages. Milk fat percentage was significant declined with R2 &R4 in comparison with R3, respectively, while total solids content did not affected significantly by QT treatment. Milk fat yield did not significant affected by QT treatment (R1 vs R2 and R3 vs R4). Inversely milk protein yield was significant higher for R2 and R4 vs R1 and R3. These increases may due to an increase in protected protein that reach to small intestine as well as microbial protein produced in the rumen (Anonymous 1984). These results are in agreement with those of Dosky *et al.* (2012) who reported that protection process of soybean meal by chemically treated with formaldehyde increased milk yield, fat and protein contents in lactating Meriz does. Also, El-Shabrawy (2006), reported an increase in milk yield in goats fed formaldehyde treated soybean meal compared to those fed untreated one. Moreover, Dosky (2007), Kassem *et al.* (2007) and Salih (2009) noticed an increase in milk yield of ewes fed formaldehyde protected soybean meal. Also, Khayyal and Ashmawy (2013) reported that the treatment with QT increased in milk yield of Zaraibi dairy goats.

Table (5): Effect of experimental rations on daily milk yield, and its composition.

Item	Experimental rations				± S.E
	R1	R2	R3	R4	
Body weight (kg)	52.35	52.40	52.75	53.35	±0.72
Daily milk yield (kg)	2.10[c]	2.35[b]	2.20[c]	2.50[a]	±0.04
Milk composition:					
Fat %	3.65[ab]	3.44[b]	3.81[a]	3.55[b]	±0.09
Fat yield (g)	76.74[b]	80.83[b]	84.75[ab]	90.64[a]	±2.85
Protein %	2.71	2.80	2.80	2.86	±0.08
Protein yield (g)	56.86[c]	66.96[ab]	61.76[bc]	71.49[a]	±2.21
Lactose %	3.50	3.42	3.47	3.54	±0.05
Total solids %	10.50[ab]	10.33[b]	10.75[a]	10.58[ab]	±0.13
Solid not fat (SNF), %	6.75	7.05	6.62	7.15	±0.19
Ash %	0.64	0.67	0.66	0.68	±0.097

[a, b and c] Means in the same row with different superscripts are significantly ($P \le 0.05$) different.

SE=Standard error

R1, ration with LSM, R2, with treated LSM with 2% tannin, R3, ration with CSM and R4, with treated CSM with 2% tannin.

Birth weight and average daily gain:

Data concerning the birth weight and daily gain for kids from birth up to weaning are shown in Table (6). Slightly differences were observed among treatments in respect of birth weight with the highest value was associated with R4. Regarding the body weight during the first month, marked significant differences among treatments were recognized with the superior value being with R2 and R4.Similar trend was observed at the second month with positive significant effect due to QT treatment of LSM and CFM in rations R2 and R3, respectively. Also, the highest daily gain for kids from birth up to weaning was occurred with R2 followed by R4. In addition, the daily gain significant superior with R2 and R4 in comparison with R1 and R3. No significant differences between male and female from birth up to weaning was noticed. Khattab *et al.* (2004) obtained similar results.

Table (6) Effect of experimental rations on body weight and daily gain of kids.

Item	Birth weight (kg)	1st month weight (kg)	2nd month weight (kg)	Daily gain (g)		
				From birth to 1st month	From1st month to 2nd month	From birth to 2nd month
Experimental rations:						
R1	2.84	7.34[ab]	11.12[b]	150.0	125.9[b]	137.9[b]
R2	2.83	7.90[a]	13.52[a]	172.9	187.5[a]	180.2[a]
R3	2.68	7.13[b]	11.13[b]	147.9	137.5[b]	142.7[b]
R4	3.08	7.65[ab]	13.14[a]	152.1	183.3[a]	167.7[a]
±SE	±0.19	±0.23	±0.33	±10.18	±13.78	±6.44
Sex:						
Male	2.94	7.61	12.30	155.7	158.6	157.2
Female	2.78	7.40	12.15	155.7	158.5	157.1
±SE	±0.14	±0.16	±0.23	±6.95	±9.98	±4.50

a and b Means in the same column with different superscripts are significantly ($P \le 0.05$) different. SE=Standard error

R1, ration with LSM, R2, with treated LSM with 2% tannin, R3, ration with CSM and R4, with treated CSM with 2% tannin.

Estrus parameters and fertility:

Data in Table (7) showed the effect of dietary treatments on early (1-15 September) and late (16-30 September) estrus appearance. Does showed earlier estrus during the period from 1-15 September (12.5, 37.5, 12.5 and 50.0% for R1, R2, R3 and R4, respectively). While, the corresponding values were 25.0, 37.5, 25.0 and 50.0% for number of estrus during the period from 16-30 September. The total numbers of estrus showed by does during September mating season were 37.5, 75.0, 37.5 and 100.0% for the same treatments, respectively. It is interest to note that the conception rate were 25.0, 75.0, 25.0 and 87.5%. The results indicated that the meals untreated with tannins (R1 and R3) gave the lowest conception rate (25.0%), while groups R2 and R4 gave 75.0 and 87.5%. The highest conception rate was associated with group R4 (cotton seed meal treated with 2% tannin). From these results, tannins may play an important role in the early estrus appearance in does during the pollination season and this may be due to their impact on the secretion of reproductive hormones. The estrus behavior was dependant on blood components such as glucose, total protein, hormones and minerals which increase the activation in ovary when offered R2 and R4 rations. Blood protein increases the gonadotropin realizing hormone (GnRH) secretion and thereby increases circulating gonadotropin levels (LH and FSH) and that in turn increases ovulation rate (Hess *et al*., 2005, Patton *et al*., 2007, Shahneh *et al*., 2008, Ismail *et al*., 2010 and Khayyal and Ashmawy, 2013).

Table (7): Effect of experimental rations on early, late estrus and fertility during breeding season.

Item	Experimental rations			
	R1	R2	R3	R4
No. of does	8	8	8	8
No. of does showed	1	3	1	4
Estrus (1-15 September), %	12.5^{b}	37.5^{a}	12.5^{b}	50.0^{a}
No. of does showed	2	3	2	4
Estrus (16-30 September), %	25.0^{b}	37.5^{ab}	25.0^{b}	50.0^{a}
No. of does showed	3	6	3	8
Estrus during Sept. mating season, %	37.5^{b}	75.0^{a}	37.5^{b}	100.0^{a}
No. of does kidding	2	6	2	7
Fertility (conception rate), %	25.0^{b}	75.0^{a}	25.0^{b}	87.5^{a}

[a and b] Means in the same row with different superscripts are significantly (P ≤ 0. 05) different.

R1, ration with LSM, R2, with treated LSM with 2% tannin, R3, ration with CSM and R4, with treated CSM with 2% tannin.

Feed intake, feed conversion and economic evaluation:

Feed intake, feed conversion and economic evaluation of the experimental rations are presented in Table (8). Results revealed that the values of DMI and TDNI were typically similar among experimental rations. Fat corrected milk was higher in both R2 and R4 than the untreated groups (R1 and R3), being the highest significantly with R4. The feed conversion was significant better for R2 and R4 compared with R1 and R3, respecting both DM and TDN intake/ FCM. The protected linseed meal and cotton seed meal at 2% resulted in better economic evaluation expressed as economic return, being the lowest value was recorded for R1 and R3 groups. So, this beneficial effect could be attributed to protected linseed meal and cotton seed meal. Khayyal and Ashmawy (2013) obtained similar results with soybean meal treatment by QT.

Table (8): Feed intake, feed conversion and economic evaluation of dairy goats fed experimental rations

Item	Experimental rations				±SE
	R1	R2	R3	R4	
Feed intake (kg /head/day):					
DMI	1.514	1.516	1.515	1.518	
TDN intake	0.943	0.932	0.954	0.943	
4% FCM, kg	1.99^{b}	2.15^{b}	2.13^{b}	2.36^{a}	±0.05
Feed conversion (kg/kg):					
DMI / FCM	0.763^{a}	0.706^{b}	0.711^{b}	0.645^{c}	±0.016
TDNI / FCM	0.475^{a}	0.434^{b}	0.448^{ab}	0.400^{c}	±0.010
Economic evaluation:					
Daily feed cost, L.E	2.72	2.75	2.72	2.75	
Price of daily milk yield, L.E	6.30	7.05	6.60	7.50	
Economic return, L.E	3.59	4.30	3.89	4.75	
Economic efficiency	100	120	108	132	

[a, b, and c] Means in the same row with different superscripts are significantly (P ≤ 0. 05) different. SE=Standard error

Calculation based on the following price in Egyptian pound (L.E.) per ton at 2011, concentrate feed mixture (CFM) =2400 L.E/ton, rice straw= 450 L.E/ton, one kg of tannin16 L.E and one kg of raw milk 3.00 L.E/kg.

Fat correct milk (4%) was calculated according to Gaines (1923) using the following equation: FCM = 0.4 M + 15.0 F, Where M = milk yield and F = fat yield , R1, ration with LSM, R2, with treated LSM with 2% tannin, R3, ration with CSM and R4, with treated CSM with 2% tannin.

CONCLUSION

In conclusion the present results indicated that extent effect of tannin on the rumen degradability of DM, OM and CP of linseed meal and cotton seed meal is dependent on level of tannin treated. Linseed meal and cotton seed meal treated with 2% of tannin could be enhanced the utilization of linseed meal and cotton seed meal, rations which in turn positively increasing the productive performance of Zaraibi goats.

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تأثير حماية كسب الكتان وكسب القطن بالتانينات على أداء الماعز الزرايبى الحلابة ونتاجها

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تهدف هذه الدراسة الى تقييم تأثير معاملة كسب بذرة الكتان وكسب بذرة القطن بالتانين الكابراتشو على أداء كل من الماعز الزرايبي الحلاب ونتاجها. حيث تم معاملة كسب الكتان وكسب بذرة القطن بخمس مستويات من التانين (٠، ١، ٢، ٣، ٤٪) من المادة الجافة وقد تم اجراء تجربه ال *in situ* لدراسة تأثير المعاملة على معدل اختفاء المادة الجافة ، والمادة العضوية والبروتين الخام بإستخدام زوج من العجول الجاموسى المزودة بفستيولا الكرش حيث تم تغذية الحيوانات على دريس البرسيم بمقدار ٣/١ من مقررات الحيوان اليومية بينما أعطى علف مركز بمعدل ٣/٢ مقررات الحيوان .وفقا لنتائج تجربه ال *in situ* تم اختبار أفضل مستوي للحماية (٠، ٢٪) لكل منهما وادخالها فى علائق مركزة (ع١،ع٢، ع٣ وع٤) ,أجريت تجربة الهضم لتقدير القيم الغذائية للعلائق التجريبية بإستخدام تكنيك الرماد غير الذائب في الحمض. وتم التغذية عليها خلال الفترة الأخيرة من الحمل ودراسة تأثيرها على الأداء الانتاجي والتناسلى للماعز الزرايبى الحلابة ونتاجها. تم إستخدام عدد ٣٢ عنزة زرايبي حلابه بمتوسط وزن الجسم الحي ٥١.٥±١.٧٥كجم عند عمر ٣-٤ سنوات وقسمت عشوائيا إلى أربع مجموعات متماثلة (٨ عنزات / معامله) لإختبار أربع معاملات غذائيه كالأتي:

* المعامله الأولي (ع١): عليقه تحتوي علي٦٠٪ من العلف المركز المحتوي علي كسب الكتان غير المعامل مع ٤٠٪ قش الأرز.
* المعامله الثانيه (ع٢): تحتوي علي٦٠٪ من العلف المركز المحتوي علي كسب الكتان المعامل ٢٪ تانين الكابراتشو مع ٤٠٪ قش الأرز.
* المعامله الثالثه (ع٣): عليقه تحتوي علي٦٠٪ من العلف المركز المحتوي علي كسب بذرة القطن غير المعامل مع ٤٠٪ قش الأرز.
* المعامله الثانيه (ع٤): تحتوي علي٦٠٪ من العلف المركز المحتوي علي كسب بذرة القطن المعامل ٢٪ تانين الكابراتشو مع ٤٠٪ قش الأرز.

أشارت النتائج إلى انخفاض معدل التكسير للمادة الجافة والمادة العضوية مع مستويات الحماية ١، ٢، ٣، ٤٪ تانين مقارنة بالمجموعتين غير المعاملة (ع١ و ع٣) مع تزايد قيمه الإنخفاض المعنوي مع زيادة مستوي التانين. كذلك بالنسبة لمعدل تكسير البروتين الخام كان هناك نفس الاتجاه بين المعاملات المختلفة. اي أن البروتين غير قابل للتكسير يزداد بزيادة مستوي التانين. وجد اختلافات ضئيلة بين المجموعات المعامله التجريبية لمعاملات هضم جميع المواد الغذائية ما عدا معامل هضم البروتين الخام للمجموعة (ع٢و ع٤) قد تحسن تحسنا معنويا مقارنة بالمجموعة غير المعاملة. أيضا، كانت القيم الغذائية للبروتين المهضوم للمجموعة ع٢ أعلى معنويا (P <0.05) من بالمجموعتين غير المعاملة (ع١ و ع٣)، بينما كانت قيم المركبات المهضومة الكلية متماثلة تماما بين المجموعات. ولقد انعكس ذلك على متوسط إنتاج الحليب اليومي للمجموعتين ع٢، ع٤ الذي كان أعلى معنويا (P <0.05) بالمقارنة مع بالمجموعتين (ع١ و ع٣). لم يلاحظ أي فروق إحصائية راجعة للمعملة بالتانينات لجميع مكونات اللبن باستثناء محتوي الدهن التي إنخفضت معنويا مع ع٤ مقارنة بالمعاملة ع٣. وتمشيا مع زيادة انتاج اللبن اليومي كان محصول البروتين في اللبن أعلي معنويا بالعلائق المعامله مقارنه بغير المعاملة بينما محصول الدهن كان مرتفع في مجموعات المعاملة ولكن كان الأرتفاع غير معنوي. ولقد أدى ذلك الى ارتفاع معدل الزيادة فى الوزن بالنسبة للجداء خلال الفترة من الميلاد حتى الفطام للمجموعتين ع٢، ع٤ ارتفاعا معنويا مقارنة بالمجموعتين (ع١ و ع٣) والتي أعطت أقل معدل الحمل ٢٥٪، مقابل (٧٥ ، ٨٧.٥٪) للمجموعتين ع٢، ع٤. أيضا، ظهور الشبق في وقت مبكر خلال موسم التلقيح للمجموعات المعماة قد يكون هذا راجعا إلى تأثير التانين على إفراز الهرمونات التناسلية.

ونستنتج من ذلك ان المعاملة بالتانين الكابراتشو بنسبة ٢٪ لكل من كسب الكتان وبذرة القطن المقشورة يفيد في زيادة الإستفاده من البروتين للعليقة المستخدمة مما يساعد على تحسين الكفاءة التحويلية وبالتالى الاداء الانتاجى والتناسلى للماعز الحلاب ونتاجها.