PERFORMANCE OF LACTATING BUFFALOES FED ON RATIONS CONTAINING EITHER RAW OR HEATED SOYBEAN SEEDS AT EARLY LACTATION PERIOD

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SUMMARY

Eighteen lactating buffaloes at the second lactation season were used to evaluate the effect of feeding rations containing raw or heated soybean seeds on their productive performance at early lactation. The buffaloes were assigned to three similar groups (six animals each) where they fed rations containing similar ingredients with the same proportions of concentrate feed mixture, berseem, yellow corn and rice straw. The control group received a ration containing no supplementary soybean, the second group received ration containing raw soybean seeds (RSB) and the third group received ration containing heated soybean seed (HSB). The total mixed rations with added soybean seeds (SBS) had higher content of EE and CP; however, NFE and fatty acid (FA's) were lower compared with the control ration. Both RSB and HSB rations cause improvement of rumen parameters. Added soybean seeds resulted in significantly ($P<0.05$) higher of fat corrected milk (FCM). Milk fat, protein and total solids contents and yield were higher with added soybean seeds (SBS) in buffalo's rations. As results of feed SBS in early lactating buffalos, fed conversion and economical cost were improved. The cost of producing 1.0 Kg milk was reduced.

Finally, feeding rations containing RSB or HSB improved the production performance of lactating buffaloes in early lactation. It is recommended to use RSB or HSB as sources of essential fatty acids and energy in early lactation of lactating buffaloes.

***Keywords:** raw soybean, heat soybean, lactating buffaloes*

INTRODUCTION

Dietary protein requirements are greatest during the first 12 weak of lactation; therefore, the greatest response to resistant protein would be expected during this time (Voss *et al.*, 1988). High quality feed proteins may be utilized more efficiently for milk production and reproductive traits if larger proportions of proteins are less soluble in the rumen (Mielke and Schingoethe, 1981). This may allow proteins to be degraded more slowly or to by pass degradation in the rumen and be digested in the lower digestive tract (Abo-Donia *et al.*, 2003).

Roasted or extracted oil seeds were used to improve the nutritive value of other components (Chillioard, 1993). Full fat soybeans contain approximately 19% fat and 42% CP on dry matter basis (NRC, 1988). The protein in raw soybean is readily degraded by rumen microbes (Stern *et al.*, 1985). For this reason, various methods of processing soybean, like heat treated, has bean used to reduce microbial protein degradation (Faldet and Satter, 1991). Heat treatment also, destroys antinutritional factors (Chouinard *et al*, 1997).

Fats are often added to diets for lactating cows during early lactation to reduce negative energy balance, and to prevent body weight loss (Palmquist and Jenkins, 1980), and to increase milk production (Coppock and Wilks, 1991 and Abo-Donia *et al.*, 2003).

This study was undertaken to evaluate the response of buffaloes in early lactation stage to diets containing raw or heated soybean seeds as source of protein and fat.

MATERIALS AND METHODS

Whole soybean seeds were heated at 120°C to 30 min at Cairo Oil and Soap Co. then ground every week through a 6.35 mm screen.

Feeding trials were conducted at Mehallet Moussa Experimental Station and chemical composition was analyzed in the laboratory of By-product Utilization Department affiliates Animal Production Research Institute (APRI). Eighteen buffaloes at 2nd season of lactation were weighed in average 456.83±11.416Kg after two weeks of parturition were assigned to three balanced groups according to their body weight (six animals each). Animals were individually fed and adapted (after parturition directly) on their experimental rations for 15 days before starting the feeding trial which lasted 90 days. Fresh water was offered twice daily before milking. The concentrate feed mixture (CFM), either ground raw or heated soybean seeds, yellow corn and soybean meal were well mixed and offered two times daily just before milking at 8.00 a.m. and at 4.00 p.m. The amount of rice straw was divided into two equal parts and offered at 7.00 a.m. and 3.00 p.m. The animals of the 3 groups were assigned at random to one of the three diets. The control group received diet containing no supplementary soybean seeds, 2nd group received a diet containing 25% raw soybean seeds (RSB) and 3rd group received a diet containing 25% heated-soybean seeds (HSB) of the total mixed ration. The diets were formulated according to NRC, (1988). Amount of diets offered were adjusted biweekly according to body weight, milk production and butter fat percentage.

Animals were machine milked twice daily at 8.00 a.m. and 4.00 p.m. and individual morning- and evening-milk yield were daily recorded. Every two weeks, composite milk samples were taken from composited evening and morning samples and were stored at -20°C for analysis. Milk samples were analyzed for percentages of fat, protein, lactose; solid not fat (SNF), total solids (TS) and ash by milk SCAN 133 BN Foss Electric, Denmark. Methyl esters of fatty acids of milk lipids were analyzed according to the method described by Chouinard *et al.*, (1997).

Fecal samples were collected from three animals of each group at the end of the feeding trial during 10 days twice daily at 5:00 and 17:00. Nutrient digestabilities were estimated by acid insoluble ash (AIA) method (Van Keulen and Young, 1977).

Composite feed and fecal samples were analyzed according to A.O.A.C., (1990). Chemical composition of ingredients and the experimental rations are presented in Table (1). Soluble nitrogen was measured according to Crooker *et al.*, (1978). True protein nitrogen in ingredients was analyzed according to (A. O. A. C., 1990) and non-protein nitrogen values were calculated by subtracting the values of true protein nitrogen from the corresponding values of total nitrogen.

Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined according to Goering and Van Soest, (1970). Hemi-cellulose and cellulose were calculated as the difference between NDF and ADF, ADL orderly. Gross energy value (GE) was determined for both feed and feces using Gallen Kump ballistic bomb calorimeter (Catalog No. CBB: 330-1010).

Blood serum samples were withdrawn from all animals at the end of feeding trials to determining total protein, albumin, glucose, urea-N, total lipids (g/dl), triglycerides (mg/100 ml), free fatty acids (µM/100 ml) and cholesterol mg/100 ml colorimetrically using (Biomeriex Lab. Kits 69280 Marcy-1, Etoile, France®). Free fatty acids (Itaya and Ui, 1965) Globulin was calculated as the difference between total protein and albumin. Albumin / Globulin ratio was also calculated.

Statistical analysis:

Statistical analysis was carried out using SAS (199٦). Digestibility, blood and performance data were analyzed as one-way analysis of variance according to the following model:

$Y = \mu + x_i + e_{ij}$

Where:

Y = observation, μ = mean, x_i = the effect of treatment, e_{ij} = experimental error

The differences among means were tasted using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition:

Chemical composition of concentrate mixture, RSB, HSB, SBM, Yellow corn, rice straw (RS) and the whole experimental rations are presented in Tables (2,3). The chemical compositions of different ingredients were within the normal published ranges for CP, CF, and CWC (Ministry of Agriculture and Land Reclamation, 1997; Abo-Donia *et al.*, 2003 and El-Banna *et al.*, 2005).

Soluble nitrogen in RSB was very highly compared with HSB. This result is mainly due to heat treatment (Stern *et. al.* 1985 and NRC, 1988). Unsaturated fatty acids were higher in RSB, HSB than saturated fatty acids compared with other ingredients. These data are in agreement with the results obtained by Kim *et al.*, (1993).

Table (1): Chemical composition of ingredients used to formula tested rations (% DM basis).

Item	CFM	RSB	HSB	SBM	Y. Corn	RS
Chemical composition (%)						
DM	91.50	90.28	94.61	89.86	90.08	89.53
OM	88.46	88.95	89.42	91.70	89.42	87.43
CP	17.74	36.61	36.57	47.97	9.99	3.35
CF	9.02	5.06	4.84	4.80	4.44	43.53
EE	3.30	22.42	21.40	0.56	4.50	1.13
NFE	58.40	24.86	26.61	38.52	70.49	39.42
Ash	11.54	11.05	10.58	8.15	10.58	12.57
Cell wall constitutes (%)						
NDF	38.94	22.39	21.37	42.47	32.59	74.44
ADF	29.86	17.68	16.91	29.98	25.34	63.70
ADL	4.62	2.13	2.11	4.08	2.26	5.90
Cellulose	25.23	15.55	14.80	25.90	23.08	57.80
Hemi Cellulose	9.08	4.71	4.46	12.49	7.25	10.75

CFM = concentrate feed mixture composed of cottonseed meal (29%), yellow corn (26%), wheat bran (35%), molasses (6%), limestone (3%) and common salt (1%).
RSB = Raw-soybean bean seeds, HSB = Heat-treated soybean bean seeds, SBM = Soybean bean meal, Y. Corn = Yellow corn, RS = Rice straw.

Table (2): - Nitrogen fractions, and fatty acids fractions in different ingredients.

Item	CFM	RSB	HSB	SBM	Y. Corn
Nitrogen Fraction on DM basis (%).					
Total nitrogen	2.24	5.86	5.85	7.68	1.60
Non protein nitrogen	0.19	0.16	0.11	0.16	0.09
True protein nitrogen	2.05	5.7	5.74	7.52	1.51
Soluble nitrogen (%)	27.48	33.25	9.04	21.5	12.37
Total protein / EE	5.38	1.63	1.71	85.66	2.22
Fatty acids fractionations (%).					
$C_{14:0}$	26.30	4.09	4.54	18.01	11.39
$C_{16:0}$	22.40	12.35	11.91	34.30	18.33
$C_{18:0}$	14.51	4.13	4.12	12.63	8.89
$C_{18:1}$	22.73	26.06	25.89	11.05	21.32
$C_{18:2}$	10.22	48.10	48.21	20.01	31.61
$C_{18:3}$	3.84	5.27	5.33	4.00	8.46
Saturated fatty acids (S)	63.21	20.57	20.57	64.94	38.61
Unsaturated fatty acids (U)	36.79	79.43	79.43	35.06	61.39
S / U ratio	1.72	0.26	0.26	1.85	0.63

Soluble nitrogen = Calculated as percentage of total protein nitrogen.

Table (3): Chemical composition, cell wall constituents and energy of tested rations.

Item	Control	RSB	HSB
Chemical composition (%).			
DM	90.36	90.41	91.49
OM	88.78	88.41	88.53
CP	15.10	17.06	17.05
CF	17.72	17.74	17.69
EE	2.62	7.60	7.34
NFE	53.34	46.01	46.45
Ash	11.22	11.59	11.47
Cell wall constituents (%).			
NDF	48.43	44.56	44.31
ADF	38.90	36.33	36.14
ADL	4.35	4.05	4.05
Cellulose	34.55	32.28	32.09
Hemicellulose	9.53	8.23	8.17

Data of this table were calculated according to feed intake.

Table (4): Effect of feeding rations containing raw or heated soybean on feed intake, body weight and feed conversion.

Item	Control	RSB	HSB	±SE
Feed intake on DM basis (kg).				
Concentrate feed mixture	4.68	4.45	4.43	---
Raw soybean bean seeds	0.00	3.59	0.00	---
Heated soybean bean seeds	0.00	0.00	3.57	---
Soybean bean meal	1.70	0.00	0.00	---
Yellow corn	3.54	2.01	2.00	---
Rice straw	4.25	4.31	4.28	---
Total concentrate intake	9.92	10.05	10.00	---
Total DMI	14.17	14.36	14.28	---
Roughage / concentrate ratio	0.43	0.43	0.43	---
Body weight (kg).				
Initial body weight	457.5	457.8	455.2	11.416
Final body weight	451.2	460.2	458.7	11.616
Duration	90	90	90	---
Changed	-6.33	+2.33	+3.50	3.426

Ruminant animals absorb fats with a high degree of efficiency: digestion or absorption coefficients between 80% and 90% have been reported for unsaturated fatty acids in oils (Moore and Christie, 1984).

Dry matter intake and bodyweight changes:

Data in Table (4) show that concentrate feed mixture, whole ration, and roughage/concentrate ratios were almost similar among all experimental feed rations. Previous research (Voss *et al*., 1988 and Faldet and Satter, 1991) reported that, DMI was not affected by supplementation of RSB or HSB compared with SBM.

Average body weights at the beginning and at the end of experimental period as well as DM intake are summarized in Table (4). Body weight during experimental period was slightly increased with added either row or heated soybean seeds compared with the control group, which recorded reduction in live body weight (-6 kg). These results are in agreement with Mohy El-Deen and Afify, (2003), who recorded an increase in body weight when increased concentrate in buffalo ration.

Digestibility:

Apparent digestibility data in Table (5) showed that, no significant differences were found among tested experimental rations for DM, OM, CP, CF and NFE. Crude fiber was not affected by fed full fat soybean, which could indicate that full fat was protected and did not affect the cellulolytic activity in the rumen. Similar results were recorded by Kim *et al.*, (1993) and Abo Donia *et al.*, (2003) who found that, fat addition (as full fat) did not affect the digestibility of neither DM nor OM.

Feeding diets containing soybean seed had significantly ($P<0.05$) higher digestibility of EE compared with the control rations. Ruminant animals absorb fats with a high degree of efficiency: digestion or absorption coefficients range between 80% and 90% have bean reported for a variety of fats, oils and fatty acids (Moore and Christie 1984). This high efficiency was maintained even when the dietary intake of fatty acids was greatly increased. The same trend was found for digestibility of NDF, ADF and cellulose, also, DM and OM. On the other hand, hemi-cellulose digestibility was not affected with treatments.

The values of TDN were significantly ($P<0.05$) increased with feeding rations containing RSB and HSB compared with the control rations. The fat content will be the major factor causing differences ($P<0.05$) in energy of various food and feeds (Czerkawski and Clapperton, 1984). Increased digestibility might be the main reason of elevated TDN values.

The values of DCP were significantly ($P<0.05$) higher with added either RSB or HSB compared with control ration. These data are in good agreement with those of Kim *et al*., (1993). Digestible protein conversion to gain was better in the full fat supplemented seed groups than the un-supplemented one. It could refer to that dietary fat could compensate and save dietary protein (Wu *et al*., 1991). Also, might be due to kind of amino acids, which found in soybean seeds. Fat increasing in the ruminant ration

Table (5): Effect of feeding rations containing raw or heated soybean on digestibility coefficients, cell wall constituent and nutritive values.

Item	Control	RSB	HSB	±SE
Nutrient digestibility %.				
DM	67.59	70.64	73.61	1.705
OM	69.25	72.11	74.61	1.713
CP	65.83	67.92	70.19	2.571
CF	63.32	65.24	67.31	3.156
EE	72.39^{b}	82.59^{ab}	88.79^{a}	4.188
NFE	72.06	74.63	76.75	3.488
Energy	79.36^{b}	90.72^{a}	92.34^{a}	1.717
Cell wall constituent %.				
NDF	65.66^{b}	67.62^{a}	68.02^{a}	0.433
ADF	60.58^{b}	63.79^{a}	65.23^{a}	0.898
ADL	3.68	4.32	4.33	0.272
Cellulose	67.96^{b}	71.37^{ab}	73.05^{a}	1.007
H-Cellulose	86.42	84.48	80.32	2.921
Nutritive value %.				
TDN	63.77^{b}	71.92^{a}	74.74^{a}	1.536
DCP	9.89^{b}	12.08^{a}	12.65^{a}	0.391

a b Means in the same raw having different superscripts are significantly differed ($p<0.05$).

Table (6): Effect of feeding rations containing raw or heated soybean seeds on some blood serum parameters.

Item	Control	RSB	HSB	±SE
Total protein (g/dl).	5.68^{b}	5.88^{b}	6.22^{a}	0.072
Albumin (g/dl)	2.53	2.58	2.76	0.079
Globulin (g/dl)	3.15^{b}	3.30^{ab}	3.45^{a}	0.078
A / G ratio	0.80	0.79	0.80	0.038
Blood urea nitrogen (mg/dl)	25.33^{a}	24.59^{a}	21.40^{b}	0.452
Total lipids (g/dl)	6.03^{b}	6.30^{a}	6.08^{b}	0.054
Triglycerides, (mg/100 ml)	66.30^{c}	98.80^{a}	92.85^{b}	1.520
Free fatty acids (μM/100 ml)	17.22^{b}	30.58^{a}	28.98^{a}	0.753
Cholesterol mg/100 ml	192.98^{c}	270.87^{a}	255.95^{b}	4.914
Glucose (mg/dl)	58.65^{a}	54.63^{b}	51.40^{b}	1.087

a b Means in the same raw having different superscripts are significantly differed ($p<0.05$).

improved TDN, but DCP values were not improved (El-Bedawy *et. al.* 1994)

Blood serum parameters:

Results in Table (6) show that serum constituents were increased ($P< 0.05$) for total protein with added (HSB) compared to (RSB) and control group. Feeding (HSB) and (RSB) had no significant effect on the albumin concentration, while, feed containing HSB significantly ($P<0.05$) increased total protein and globulin concentration compared with the control group. Globulin and albumin/globulin ratio did not significantly differ ($P<0.05$) with feeding (RBS) and the control ration. It is of interest to observe that, feeding HSB significantly ($P<0.05$) decreased urea nitrogen concentration in serum compared with feeding RSB and control groups. Decreased urea concentration with feeding HSB might be due to the low degradability in the rumen compared to RSB and protein in the control ration. The depression in serum urea in the groups, which received ration containing RSB or HSB, may attribute to either low NH_3-N nitrogen concentration in the rumen or less nitrogen was absorbed across the rumen as well as ammonia (El-Sayed 1991). The present results are in good agreement with that reported by (Abo-Donia *et at.*, 2003) when they fed lactating cows both HSB and control rations. Total lipids and TG were significantly ($P<0.05$) decreased in blood group fed HSB or control one than group fed RSB. Free fatty acids concentrations were significantly ($P<0.05$) higher with feeding RSB and HSB compared to control group. Cholesterol concentration was significantly ($P<0.05$) increased with feeding soybean seeds, while, feeding RSB significantly increased cholesterol concentration compared to HSB. Animals fed RSB and HSB had significantly ($P<0.05$) lower serum glucose content than that of the control group.

Milk Production:

Data in Table (7) show that, milk production (kg/h/d) was unaffected with feeding either raw or heated soybean seeds compared with control one. However, feeding soybean seeds cause significantly ($P<0.05$) higher production of fat corrected milk (FCM). Feeding RSB resulted less FCM significantly compared with HSB. Similar results were observed by Palmquist and Jenkins, (1980), Ruegsegger and Schultz, (1985), Chalupa and Ferguson, (1990) and Kim *et al.*, (1993), who reported that added 2 -3% fats to the diet increased milk production by 2 - 15%.

Milk fat percentages and fat yield (g/h/d) were significantly ($P<0.05$) higher with feeding soybean seeds compared with the control diet. At the same time, fat % and milk fat yield were higher ($P<0.05$) for buffaloes fed HSB than those fed the RSB. The increase in fat content of RSB and HSB might be due to increasing digestibilities of EE and increasing absorption of fatty acids (Abo-Donia *et al.*, 2003). Also, enhancing of rumen activity and stimulating high amounts TVFA's in the rumen, β-hydroxy butyrate are precursors of fatty acids up to 16 carbon atoms in length, indicating that the acetate was incorporated into milk fat (Czerkawski and Clapperton, 1984). These results are in good agreements with Schingoethe *et al.*, (1988) and

Table (7): Effect of feeding rations containing raw or heated soybean on milk production and milk contents.

Item	Control	RSB	HSB	±SE
Milk production kg/h/d	8.08	9.43	9.87	0.312
FCM. Kg/h/d	10.71^{c}	13.81^{b}	15.30^{a}	0.451
Fat (%)	6.16^{c}	7.10^{b}	7.68^{a}	0.149
Fat yield g/h/d	0.50^{c}	0.67^{b}	0.76^{a}	0.023
Protein (%)	3.78^{b}	3.92^{b}	4.21^{a}	0.072
Protein yield g/h/d	0.31^{b}	0.37^{a}	0.42^{a}	0.016
Lactose (%)	5.11^{a}	4.87^{b}	4.79^{b}	0.067
Lactose yield g/h/d	0.41^{b}	0.46^{ab}	0.47^{a}	0.019
SNF (%)	9.70	9.59	9.77	0.118
SNF g/h/d	0.78^{b}	0.91^{a}	0.96^{a}	0.036
Total solid (%)	15.87^{c}	16.68^{b}	17.45^{a}	0.128
Total solid g/h/d	1.28^{b}	1.57^{a}	1.72^{a}	0.054
Ash (%)	0.81^{a}	0.80^{a}	0.77^{b}	0.005
Ash g/h/d	0.066^{b}	0.075b^{a}	0.077^{a}	0.003

$^{a\,b}$Means in the same raw having different superscripts are significantly differed ($p<0.05$).

Table (8): Feed conversion and economic evaluation of tested rations.

Item	Control	RSB	HSB	±SE
Feed conversion (kg intake / kg FCM)				
Kg DMI / kg FCM	1.36^{a}	1.04^{b}	0.93^{b}	0.084
Kg TDN / kg FCM	0.87	0.75	0.70	0.055
Kg DCP / kg FCM	0.86^{a}	0.10^{b}	0.12^{b}	0.049
Economical evaluation				
Average of total intake as fresh kg	15.69	15.89	15.61	
Price of kg ration, LE	0.84	0.97	0.98	---
Price of total intake kg /day, LE	13.18	15.41	15.30	
Price of kg FCM, LE	1.25	1.25	1.25	---
Price of FCM produced, LE	13.39	17.26	19.13	
Cost of intake / price of FCM produced	0.98	0.89	0.80	---
Total revenue	١٣,٣٩	17.2٦	19.1٣	---
Net revenue	٠,٢١	1,٨٦	3.8٣	---

Price of kg CFM=0.930 LE, price of kg RSB= 2.05LE, price of kg HSB=2.15 LE, price of kg SBM= 2.10, price of kg yellow corn= 1.00 LE and price of kg rice straw=0.10 LE

Price of kg TDN = price of total intake / (% of TDN * kg TDMI /100).

Price of kg DCP = price of total intake / (% of DCP * kg TDMI /100).

Total revenue = Price of kg FCM

Net revenue = price of FCM kg, LE – price of total intake, LE

Casper *et al.*, (1988), who reported that milk fat percentage decreased with feeding RSB.

Protein percentage and protein yield were higher for animals fed HSB ration by (7.401: 11.38%) and (13.51: 35.48%) compared with group fed RSB and control ration, respectively. The improvement of milk protein content with HSB ration might be due to stimulation of rumen microbes, that cause a change in microbial protein synthesis, increased protein passage and protein yield as explained by Nagel and Broderick, (1992), El-Ashry *et al.*, (2003) and Salem, (2003).

Lactose percentage was significantly (P<0.05) decreased with added soybean seeds, however lactose yield was increased compared with the control ration. Although, feeding soybean seeds significantly (P<0.05) decreased lactose percentage compared with the control group. Lactose yield significantly (P<0.05) increased with adding soybean seeds except RSB ration which was insignificantly different from the control or HSB ration. The decrease of lactose percentage in milk might be due to the decrease in serum glucose by feeding RSB and HSB. It is known that glucose is the precursors for lactose in milk (Cronje *et al.*, 1991).

Feed conversion and economical evaluation:

The results in Table (11) show that the average kg DMI/kg FCM for the control group was found to be (P<0.05) higher than groups fed soybean seeds. However no significant differences were found between groups received raw soybean or fed heated soybean bean seeds. However, No significant differences were observed among the three tested groups in total kg TDN/kg FCM The values of kg DCP/kg FCM was significantly higher with control ration compared with either raw or heated soybean seed ration, however, no significant difference was found between raw or heated soybean seeds. These results are in good agreements with (El-Bedawy et al., 1994; Wu et al, 1991) when feed cows diet containing full fat of either sunflower or soybean seeds.

The cost to produce 1kg milk decreased when feeding RSB rations and HSB by 9.18 and 18.37%, respectively, compared the control group. The highest return was shown when feeding HSB (3.84 LE/h/d) compared with the lowest return (1.90 and 0.30 LE/h/d) for RSB and control, respectively. It is therefore recommended that using HSB and RSB rich diets of energy and protein in early lactation of lactating buffalos would improve the net revenue and production efficiency.

In conclusion, these results indicate that, using soybean seed as a good source of energy and protein in the ration of lactating buffalo's improved productive performances at early lactation.

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أداء الجاموس الحلاب المغذى على علائق محتوية على أي من بذور الصويا الخام أو المعاملة حراريا في الفترة الأولى من الحليب

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أجريت هذه الدراسة بهدف دراسة تأثير إضافة بذور الصويا الخام أو المعاملة حراريا إلى علائق الجاموس الحلاب وتأثير ذلك على معاملات الهضم و إنتاج وتركيب اللبن والكفاءة الاقتصادية.
تم إجراء هذه الدراسة في محطة التجارب و البحوث الزراعية بمحلة موسى التابعة لمعهد بحوث الإنتاج الحيواني استخدم في هذه الدراسة ١٨ جاموسة متوسط أوزانها ٤٥٦,٨٣ كجم في موسم الحليب الثاني وقسمت عشوائيا إلى ثلاث مجموعات متساوية وذلك لاختبار تأثير استخدام بذور الصويا الخام أو المعاملة حراريا على كفاءة إنتاج الجاموس وكانت العلائق كالآتي:
المجموعة الأولى : مجموعة الشاهد وغذيت على عليقة لا تحتوى على بذور الصويا
المجموعة الثانية : غذيت على عليقة تحتوى على بذور فول الصويا غير معاملة حراريا
المجموعة الثالثة : غذيت على عليقة تحتوى على بذور فول الصويا المعاملة بالحراره
وقد أظهرت النتائج ما يلي:

١- العلائق المحتوية على بذور الصويا الخام أو المعاملة بالحرارة أعطت محتوى اكبر من الدهن الخام والبروتين الخام ومحتوى اقل من الكربوهيدرات الذائبة والأحماض الدهنية مقارنة بالعليقة الشاهد.
٢- ارتفع معامل هضم الدهن الخام وبصورة معنوية (٥%) كما ارتفعت معاملات هضم المادة الجافة والمادة العضوية والبروتين الخام والألياف الخام بصورة غير معنوية في العلائق المضاف إليها بذور الصويا مقارنة بمجموعة الشاهد.
٣- أظهرت العلائق المحتوية على بذور الصويا زيادة معنوية (٥%) في إنتاج اللبن والمواد الصلبة الكلية والدهن والبروتين مقارنة بمجموعة الشاهد.
٤- أظهرت العليقتين المختبرتين المحتوية على بذور الصويا زيادة في المردود الاقتصادي لكل كجم لبن منتج من الجاموس الحلاب.

مما سبق يتضح أن إضافة بذور الصويا الخام أو المعاملة حراريا هما الأفضل من حيث معاملات الهضم والقيمة الغذائية كما حسنت من انتاج اللبن نسب والمحصول اليومي لكل من دهن وبروتين اللبن وكذلك تحسنت الكفاءة الاقتصادية والعائد من محصول اللبن وبالتالي ينصح بإضافة بذور الصويا سواء معاملة او غير معاملة حراريا كمصدر للطاقة في علائق الجاموس الحلاب.