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EFFECT OF FEEDING RATION CONTAING RAW OR HEATED SOYABEAN SEEDS ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF BUFFALOES AT EARLY LACTATION.

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ABSTRACT

Eighteen lactating buffaloes at the second lactation were used to evaluate the effect of feeding rations containing raw or heated soyabean seeds on productive and reproductive performance of buffaloes at early lactation. The buffaloes were assigned to three similar groups (six animals each). The buffaloes were fed ration 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 soyabean, the second group received ration containing raw soyabean seeds (RSB) and the third group received ration containing heated soyabean seed (HSB).

The total mixed rations with added soyabean seeds (SBS) had higher content of ethe extract (EE) and crud protein (CP); however, nitrogen free extract (NFE) and fatty acid (FA's) were lower compared with the control ration. The magnitude of changes in body weight during the experimental period was greater in group had rations containing either raw soyabean or treated soyabean than control group. Both RSB and HSB rations cause improvement of rumen parameters. Feed ration containing soyabean seeds improved circulating progesterone (P_4), cortisol and prostaglandin (PG $F_2\alpha$) in blood. These hormones caused safety parturition. Added soyabean seeds resulted in significantly ($P<0.05$) high of fat corrected milk (FCM). Milk fat percentage and yield, protein percentage and yield and total solids and yield were higher with added soyabean seeds (SBS) to buffaloes rations. Added RSB or HSB improved the reproductive performance of lactating buffaloes. Number of service per conception and days open were reduced. Eating behavior clearly showed that supplemented (SBS) had significant ($P<0.05$) effect on diurnal behavior activity of total eating time and decrease ruminating time. The total eating time and ruminating period /Kg DM intake expressed the greatest when the buffaloes fed HSB followed by RSB. Ration containing both raw or heated caused improvement of sexual behavior and a good sings of estrus than control groups. The hormone pattern (cortisol and PG $F_2\alpha$) of treated groups was higher than that of control groups. This profile eased management at parturition and placenta fall-down. As results of feed SBS to early lactating buffalos, fed conversion and economical cost were improved. The cost of producing 1.0 Kg milk was reduced, reproductive traits were improved.

Finally, fed RSB and HSB improved both the production and reproduction performance of lactating buffaloes at early lactation. It is recommended to use RSB or HSB as sources of fat and energy in early lactation of lactating buffaloes to reduce loss of body weight and the negative effect of adding natural fat to the rations.

Abbreviations: RSB: Row soyabean - HSB: Heated soyabean - SNF: solids not fat - TS: Total solids - DMD: Dry matter degradability -TPN: True protein nitrogen DO: Days open. SBS: soyabean seeds (either heated or raw)

Keywords: Raw soyabean, Heat soyabean, productive, reproductive performance, sex hormones and 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 soyabean contain approximately 19% fat and 42% CP on dry matter basis (NRC, 1988). The protein in raw soyabean is readily degraded by rumen microbes (Stern *et al* 1985). For this reason, various methods of processing soyabean, 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), improvement of days open and sex hormones (Palmquist 1984) and to increase milk production (Coppock and Wilks 1991 and Abo-Donia *et. al.*, 2003).

Feeding of treated or untreated soyabean cause remarkable improvement of different sign of estrus (Owen and Edionwe 1986), and cause improvement of detectable of estrus (Woclawek-Potocka *et. al.* 2005)

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

MATERIALS AND METHODS

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

Feeding trails were conducted at Mehallet Moussa experimental station and chemical composition was analyzed in the laboratory of By-product Utilization Department belonging to APRI. Eighteen buffaloes at 2nd season of lactation and weighting an average 456.83±11.416Kg after 2 weeks of parturition were used in this study. The experimental animals 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 trail which lasted 90 days. Fresh water was offered twice daily before milking. The concentrate feed mixture (CFM), either ground raw or heated soyabean seeds, yellow corn and soyabean 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 three diets. The control group received diet containing no supplementary soyabean seeds, 2nd group received a diet containing 25% raw soyabean seeds (RSB) and 3rd group received a diet containing 25% heated-soyabean 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 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.

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

Items	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
GE Mcal/kg	3.552	4.034	4.019	4.240	4.440	3.351

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-soyabean bean seeds, HSB = Heat-treated soyabean bean seeds, SBM = Soyabean bean meal, Y. Corn = Yellow corn, RS = Rice straw.

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 samples were withdrawn from all animals every 6 hours daily 3 days before of expected calving day and during the first three days after calving to determine cortisol, prostaglandin (PGF2α) and progesterone by radioimmunoassay using solid phase tube (PGF2α ; lutalyse ; Upjohn co.). After that samples were collected monthly from the jugular vein before offering morning ration throughout the experimental period and centrifuged at 4000 r.p.m for 20 minutes and the serum was frozen (-20 C°) until analysis. 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 were determined colorimetrically using (Biomeriex Lab. Kits 69280 Marcy-1, Etoile, France®). Globulin was calculated as the difference between total protein and albumin. Albumin / Globulin ratio was also calculated.

Eating behavior:

To study the effect of treated (HSB) and untreated (RSB) soyabean seed meal on the diurnal ingestion behavior, nine lactating buffaloes were taken randomly (3 from each experimental group). The buffaloes were color marked on their back for specific behavioral observations. The eating behavioral at all periods (total time) and frequency of total eating time, ruminating periods and frequency, total time spent ruminating were recorded. Also, standing time and its frequency, lying and resting time and their frequency, percentages of total time spent eating and ruminating were also recorded.

Sexual behavior:

All animals in the experimental groups were observed and recorded during the expected estrous cycles by well trained man at morning and evening. The duration of all estimates in the estrous cycle were recorded.

Statistical analysis :

Data were statistically analyzed using the general linear model program of SAS, (1999). 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 the 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).

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

Items	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.

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

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

Items	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
GE kcal / kg	3.796	3.737	3.733

Data of this table were calculated according to feed intake.

Dry matter intake and bodyweight changes:

Data in Table (4) shows 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.

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

Items	Control	RSB	HSB	±SE
Feed intake on DM basis (kg).				
Concentrate feed mixture	4.68	4.45	4.43	---
Raw soyabean bean seeds	0.00	3.59	0.00	---
Heated soyabean bean seeds	0.00	0.00	3.57	---
Soyabean 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

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 soyabean seeds compared with the control group, which recorded reduction in live body weight (-6 kg). These results are agreement with Mohy El-Deen and Afify (2003), they found increased body weight when increased concentrate in buffalo ration.

Digestibility:

Apparent digestibility data in Table (5) showed that, no significant differences were found among all tested experimental rations for DM, OM, CP, CF and NFE. Crude fiber was not affected by added fat, which could indicate that added 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 (2003) who found that fat addition (as full fat) did not affect the digestibility of DM and OM.

Feeding diets containing soyabean seed had significantly ($P<0.05$) higher digestibility of EE and gross energy compared with the control rations. Ruminant animals absorb fats with a high degree of efficiency: digestion or absorption coefficients of 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 digestibility of DM and OM. On the other hand, hemi-cellulose digestibility was not affect with treatments.

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

Items	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

^{ab} Means in the same raw having different superscripts significantly differ (p<0.05).

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 fat supplemented group 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 amino acids, which found in soyabean seeds. Fat increasing in the ruminant ration improved TDN, but DCP values were not improved (El-Bedawy *et. al.* 1994)

Blood parameters:

Results in Table (6) show that plasma 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 HSB significantly (P<0.05) increased total protein and globulin concentration compared with the control group. Globulin and albumin/globulin ratio were not significantly different (P<0.05) with feeding (SBS) 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 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 feed 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 soyabean seeds, while, feeding RSB significantly increased cholesterol concentration compared to HSB. Animals fed RSB and HSB had significantly ($P<0.05$) lower plasma glucose content than that of the control group. *Moallem et al. (1997)* reported that there were negative correlation coefficients between the interval from calving to the first behavioral estrus with plasma glucose and cholesterol concentration

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

Items	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
Progesterone (ng/dl)	1.81^{c}	2.16^{b}	3.1^{a}	0.221
Prostaglandin (ng/dl)	1.10^{c}	1.82^{b}	1.96^{a}	0.076
Cortisol (ng/dl)	3.52^{c}	3.80^{b}	3.91^{a}	0.22

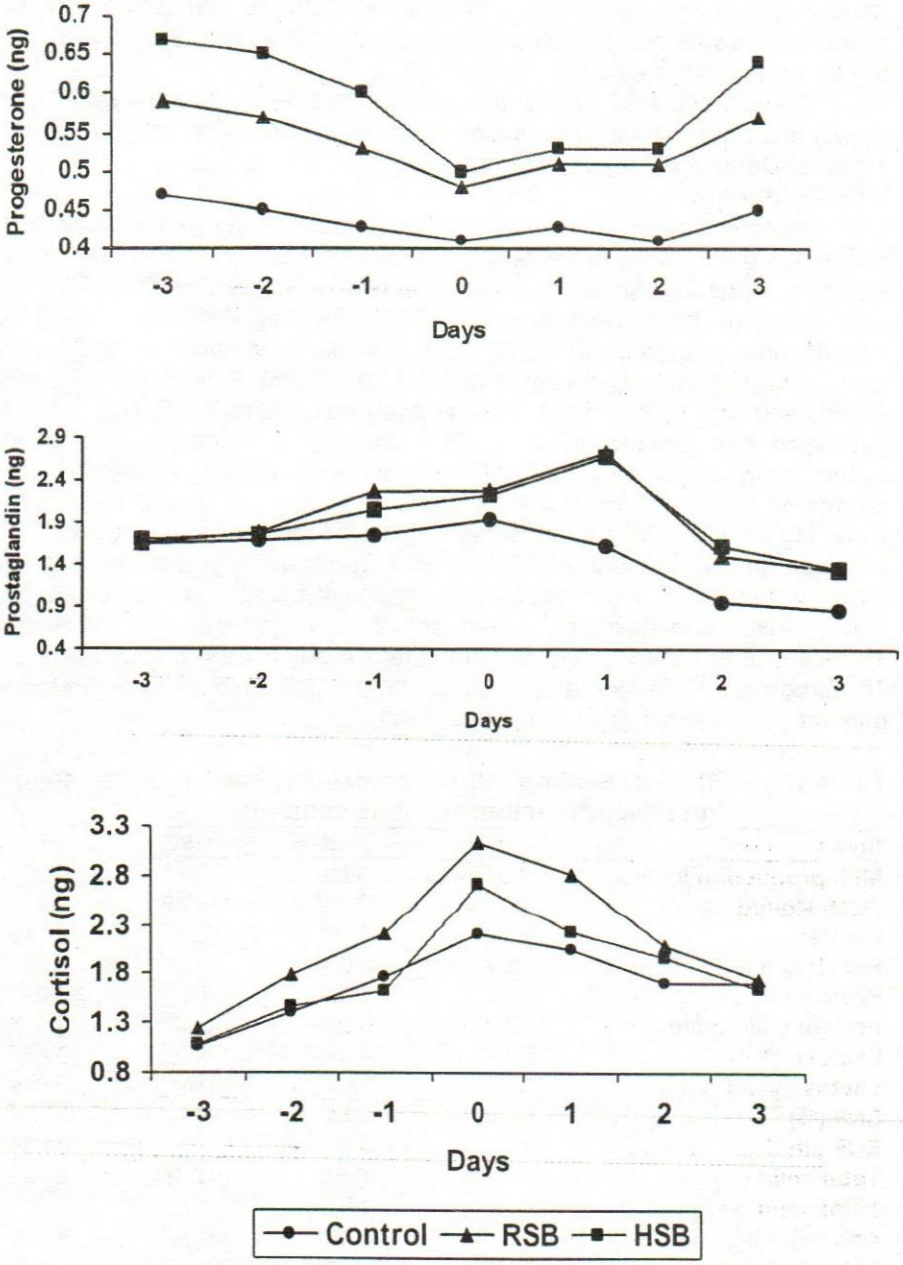
[a b] Means in the same raw having different superscripts significantly differ ($p<0.05$).

Data presented in Table (6) shows that progesterone, prostaglandin and cortisol were significantly affected ($P<0.05$) by supplemented soyabean bean seeds to lactating buffaloes rations. The highest concentrations of all previous parameters were recorded when feeding animals HSB or RSB respectively; while the lowest values were observed with the animals feed the control ration.

Adding SBS in main rations of cows improved circulating progesterone, cortisol and prostaglandin in blood (Driver *et. al.* 1990 and El-Banna *et. al.* 2005). These hormones are responsible estrus cycle and pregnancy in most ruminants.

Blood hormones levels during parturition:

Fig. (1) show that level of serum progesterone, prostaglandin and cortisol were significantly ($P< 0.05$) differences among treatment groups, were animal fed HSB had greater values of progesterone. Analysis of variance showed significant effect ($P<0.05$) among treatments groups.



0 = parturition time

Fig. (1): Effect of supplemented soyabean seeds on some hormones of lactating buffaloes

Prostaglandin and Cortisol levels in group feed (RSB) were higher than that in group feed either control or ration containing HSB. Cortisol level

increased during the first and second days of parturition, thereafter, a sharp decline of the two hormones was observed. In the contrary, the level of progesterone was appreciably low before calving but slightly increased during the three days after calving.

Cortisol and PGF2α help the ruminant to safely calve and repair uterus during and after calving .The present data are in conformity with the results of Mohy El-Deen and Afify (2003) and Afify *et. al.* (2003).

Milk Production:

Data in Table (7) shows that, milk production (kg/h/d) was unaffected with feeding either raw or heated soyabean seeds compared with control one. However, feeding soyabean seeds cause significantly ($P<0.05$) higher production of fat corrected milk (FCM). Feeding RSB decreased 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 soyabean 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).

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

Items	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 significantly differ ($p<0.05$).**

These results are in good agreements with Schingoethe *et al.*, (1988) and Casper *et al.*, (1988), who reported that milk fat percentage decreased with feeding RSB.

Protein percentage and protein yield were higher with added HSB by (7.401: 11.38%) and (13.51: 35.48%) compared with RSB and control, respectively. The improvement of milk protein content with added HSB 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 soyabean seeds, however lactose yield was increased compared with the control ration. Although, feeding soyabean seeds significantly (P<0.05) decreased lactose percentage compared with the control group. Lactose yield significantly (P<0.05) increased with adding soyabean seeds except RSB was insignificantly different from the control or HSB. The decrease of lactose percentage in milk might be due to the decrease in plasma glucose by feeding RSB and HSB. It is known that glucose is the precursors for lactose in milk (Cronje *et. al.*, 1991).

Reproductive performance:

Data in Table (8) indicate that day open (DO) was decreased by 14.0 days in the group which received ration containing RSB and 26.6 days in the group which received ration-containing HSB compared with the control group. The differences were significant (P<0.05) between control and the other groups, however, the differences between the groups feed (RSB) or (HSB) were not significant. The buffalos feed HSB took less No of S/C (0.4) than RSB group and the control (1.7), but animals feed RSB required less No of S/C than the control group (1.3). The differences of No of S/C and days of uterine return to natural place among treatments groups were significantly (P<0.05) difference. The present results indicate that DO, No of S/C and uterine retrain data tend to decrease with feeding row soyabean and heated soyabean seeds. This finding was probably due to increased intake of protein and intake of nutrients, which stimulated the endocrine system to manifest of the reproductive potential of females. Moreover, with feeding soyabean the lactation was increased donating greater activity of milk secretion in mammary gland in response to the feeding content. Mohy El-Dean and Afify (2003) studied that effect of feeding frequency on productive and reproductive of lactating buffalo and they found that DO, No of S/C tended to decrease with increasing of frequency of feeding.

Table (8): Effect of feeding rations containing raw or heated soybean on some physiological aspects of milking buffaloes

Item	Experimental Groups		
	Control	RSB	HSB
Weight of placenta (kg)	4.45 ± 0.6.	4.55 ± 0.45.	4.05±0.81
Time of placenta fell down (hrs)	4.6 ± 0.1	2.9 ± 0.08	2.2 ± 0.23
Days open (days)	129.8 ± 12.2^{a}	115.8 ± 7.5^{b}	103.2 ± 11.1^{b}
NO. of S/C	2.4 ± 0.4^{a}	1.6 ± 0.07^{b}	1.4 ± 0.1^{b}
Uterine involution time (days)	55 ± 2.1^{a}	46 ± 3.4^{b}	45.6 ± 1.4^{b}

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

Data in Table (8) concerned that placenta in control group had a longer time to fall down than other groups. Animals in group 3 which fed ration containing heated soyabean had a shorter time than group 2 which fed ration

containing of RSB. Increased of cortisol and prostaglandin concentration are helping to placenta full down (El-Banna *et al* 2005).

Eating Behavior:

The diurnal eating behavior of lactating buffaloes is shown in Table (9). It clearly appears that feeding soyabean seed significantly ($p<0.05$) affected on the diurnal behavior activities under consideration. The pattern of responses resulted from add soyabean to the ration were remarkably different among the various diurnal digestive behavioral activities. As shown in Table (9) added soyabean to the ration resulted in progressive significant increase of the total eating time and decrease ruminating time. The total eating time, mean time /ruminating period and eating time /Kg D M intake expressed the greatest, when the buffaloes were fed heated soyabean (HSB) fallowed by those fed ration contained row soyabean (RSB) seed meal and the least values were found for buffaloes fed the control ration which did not contain soyabean seed meal. Percentage of time spent eating, ruminating and standing and lying varied with various rations. Resting behavior was maximum when the lactating buffaloes were fed ration contained heated soyabean followed by animals in (G 2) and (G1) was minimum. Standing behavior was maximum for the animals fed ration which did not contain soyabean (control). The opposite was true in lying. The present results are in agreement with those reported by Kaufman *et. al.*, (1980), Macloed *et . al* ,(1993) and Afify (2000)

Table (9) Effect of feeding rations containing raw or heated soybean on digestive behaviors

Items	Experimental Groups		
	RSB	HSB	Control
Eating Frequency	14.7 ± 0.9^{a}	10.3 ± 0.9^{b}	14.0 ± 0.6^{a}
Total eating time (min)	257.7 ± 1.8^{a}	221.0 ± 9.5^{b}	255 ± 2.9^{a}
T/F %	17.53^{b}	21.46^{a}	18.21^{b}
Ruminating Frequency	4.7 ± 0.9^{b}	7.0 ± 0.6^{a}	5 ± 0.6^{b}
Total ruminating time (min)	193.3 ± 7.3^{b}	194.7 ± 6.1^{a}	151.7 ± 6.0^{b}
R I F %	41.13^{a}	27.81^{b}	30.34^{b}
T E /T R %	-	-	1.6
Resting	268.0 ± 5.72^{b}	304.33 ± 6.74^{ab}	336.7 ± 29.49^{a}
Standing frequency	6.0 ± 0.6^{a}	6.7 ± 0.9^{a}	4.3 ± 0.33^{b}
Standing time (min)	423.3 ± 27.29^{a}	421.0 ± 4.93^{a}	410.0 ± 20.82^{b}
Lying(min)	296.7 ± 27.29^{a}	299.0 ± 4.93^{a}	310.0 ± 20.81^{b}

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

Sexual behaviour:

A total of (63) estrous were observed for the experimental groups of lactating buffaloes confirmed. The common signs of estrus are illustrated in Table (10)

Unfortunately data available in the literature regarding the effect of supplemented soyabean bean seed meal treated or not treated on sign of estrus seems to be completely lacking. Frequency percent, age and duration

(hrs) of different estrus signs of lactating buffaloes are presented in Table (10). Length of duration from the beginning to the end of estrous sign appearances in the same table indicated that the highest percentage was recorded for isolation , restlessness walking along side the wall and bellowing, while highest value for G3 because that a short duration than G2 and G1 respectively.

Table (10): Effect of feeding rations containing raw or heated soybean on sexual behavior of lactating buffaloes

Item		Control	RSB	HSB
Blowing	F%	68.57±5.1^{a}	48.86±8.5^{b}	46.67±3.9^{b}
	D	6.9±0.5^{a}	5.8±0.5^{b}	5.0± .4^{b}
Tail raising	F%	75.0±2.7^{a}	66.4±4.8^{b}	66.43±4.84^{b}
	D	7.7±0.3^{a}	6.86±0.5^{a}	5.29± .5^{b}
Restless	F%	73.6±3.4^{a}	64.29±6.7^{b}	48.57±3.4^{c}
	D	7.6±0.4^{a}	6.7±0.7^{b}	5.14±0.3^{c}
Isolation	F%	82.9±3.9^{a}	76.4±5.1^{b}	66.43±5.4^{c}
	D	8.6±0.4^{a}	7.8±0.6^{b}	6.71± .6^{c}
Walking along side the wall	F%	54.3±3.8^{a}	47.1±3.9^{b}	42.14±3.9^{b}
	D	5.6±0.4^{a}	5.0± .4^{a}	4.43±0.4^{b}
Boating	F%	38.6±4.5^{a}	32.7±2.2^{b}	27.14±5.76^{c}
	D	4.1±0.4^{a}	3.4± .2^{b}	3.14±0.5^{c}
Frequency urination	F%	77.1±7.5a	62.86^{b}	51.43±8.0^{c}
	D	7.1±0.5^{a}	6.29± .8^{b}	50± .9^{c}
Valvual swelling	F%	1.6±0.6a	1.0± .4^{b}	.86± .3^{c}
	D	1.14±0.6^{a}	0.9± .4^{a}	.5± .2^{b}
Milk decline	F%	-	.6±	1.0±
	D	-	-	-
Smelling of the female vulva	F%	22.1±1.8^{b}	25.7±3.8^{b}	20.71±3.35^{a}
	D	2.4±0.4b	2.7± .4^{b}	2.29± .3^{a}
Mounting others	F%	22.1±1.8^{a}	20.0±2.9^{a}	9.43±1.9^{b}
	D	2.4±0.2^{a}	2.4± .3^{a}	1.86± .6^{b}
Standing behavior	F%	50.5±4.5^{a}	41.4±4.7^{b}	35.71±4.29^{c}
	D	5.1±0.4^{a}	4.29±0.5^{b}	3.86± .3^{b}

F%= frequency of signs percentage D= duration (hours)
$^{a\,b}$ Means in the same raw having different superscripts significantly differ ($p<0.05$).

Isolation followed by tail raising and followed by restlessness (82.9± 3.9 ; 76.40±5.1 and 66.43±5.4), (75.0±2.7 ; 66.40 ± 4.8 and 66.43±4.8) and (73.60 ± 3.4 ; 64.29 ± 6.7 and 48.57 ±3.4 for control, RSB and HSB respectively) of total estrus periods in the present study similar results obtained by Singh *et. al.*, (1984), Barkawi *et. al.*, (1993) and Afify *et. al.*, (2003). Tail raising has bean observed in 80 to 90 of total estrus periods in this investigation. Tail raising was the major sign of estrus in buffaloes. Walking along side the wall, boating and frequent urination was higher in G3 than G2 and G1 in the present study. Vulvae swelling, sniffing the female vulva, mounting others and standing is a major signs of estrous for lactating

buffaloes. These phenomena of estrus signs are agreement with Afify *et. al.*, (2003) who reported that valuval swelling, singing and mounting a good signs of estrus for buffaloes heifers. Milk decline was not recorded in all lactating buffaloes.

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 soyabean seeds. However no significant differences were found between groups received raw soyabean seeds or fed heated soyabean 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 added either raw or heated soyabean seed, however, No significant difference was found between raw or heated soyabean 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 soyabean seeds.

Table (11): Feed conversion and economic evaluation of tested rations.

Items	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	13.39	17.26	19.13	---
Net revenue	0.21	1.86	3.83	---

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

The cost to produce 1kg milk decreased when feeding RSB 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 are indicating that, using soyabean seed as a good source of energy and protein in the ration of lactating buffalos to

improve productive and reproductive performances at early lactation. In this respect, a buffalo fed soyabean seeds was more efficient than that fed ration without soyabean bean seeds. Moreover, most physiological response of the animals occurred during the first week after calving, the adaptability response in those physiological changes might be reached. On the other hand, the hormonal response seemed to need than one week for the adaptability to new conditions in uterus as indicated from lower progesterone and higher cortisol and PGf2α obtained at the first week after calving than other months.

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تأثير التغذية على العلائق المحتوية على بذور فول الصويا المعامل او غير المعامل على الأداء الانتاجى والتناسلى فى الجاموس الحلاب

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استخدم فى هذه الدراسة ١٨ جاموسةمتوسط اوزانها ٤٥٦,٨٣ كجم في موسم الحليب الثانى وقسمت عشوائيا إلى ثلاث مجموعات متساوية وزعت عشوائيا على المعاملات الاتية :

المجموعة الأولى : مجموعة المقارنة وغذيت على عليقة لاتحتوى 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 بالتسخين

وكانت أهم النتائج المتحصل هي :

١- اظهرت نتائج التركيب الكيماوى المحسوبة للعلائق المحتوية على فول الصويا ارتفاع محتواها من مستخلص الاثير والبروتين الخام عن العليقة المقارنة وذلك لزيادة الماكول طبقا لاحتياجات الوزن والانتاج.

٢- العلائق التي أضيف لها فول الصويا المعامل وغير المعامل أحدثت تحسن معنويا في صفات قياسات الدم وكذلك الهرمونات الجنسية

٣- الحيوانات التي غذيت على فول الصويا المعامل وغير المعامل ذاد بها محصول اللبن ونسبه الدهون ومحصوله كذلك البروتين وكميته

٤- التغذية على علائق تحتوى على فول الصويا المعامل وغير المعامل أحدثت تغيرا كبيرا في السلوك الغذائي للحيوانات حيث قللت من وقت التغذية وكذلك عدد مرات الاجترار وتكراره وكذلك سلوك الراحة حيث كانت الفروق بين المجموعات معنوية

٥- الحيوانات التي غذيت على علائق محتوية علي فول الصويا المعامل وغير المعامل كانت أقل في دورات الشياع وعدد مرات التلقيح و الفترة المفتوحة عن مجموعة المقارنة وكانت الفروق معنوية بين المجموعات

٦- حسنت أضافة فول الصويا إلي العلائق من الهرمونات التى تفرز قبل وأثناء الولادة مثل الكرتيزول والبروجسترون والبروستاجلاندين حيث كانت الفروق معنوية بين المجموعات وأدت إلي الإسراع في نزول المشيمة

٧- أظهرت النتائج أن التكلفة الاقتصادية لانتاج كيلو جرام لبن اقل في المجموعات التي تغذت علي فول الصويا عن المقارنة ولذلك يجب رعاية الجاموس الحلاب رعاية جيدة من ناحية التغذية علي علائق متزنة تحتوى على مصادر دهون وخاصة خلال فترة الولادة وبعدها حتى يمكن أن تواجه احتياجات الحليب وذلك مثل فول الصويا الغنى بالبروتين والدهون