J. Agric. Sci. Mansoura Univ., 30 (6): 3047 - 3058,2005

THE REPLACEMENT VALUE OF CANOLA MEAL FOR SOYBEAN MEAL IN GROWING BUFFALO CLAVES RATIONS

Aiad, A. M.

Department of By-products Utilization, Animal Production Research Institute, Agricultural Research Center, Dokki, Giza, Egypt.

ABSTRACT

This work was undertaken at Seds Experimental Station, Animal Production Research Institute during (2004) to study the effect of total or partial substitution of soybean meal (SBM) by canola meal (CM) as protein supplementation in rations of growing buffalo calves. Three isonitrogenous concentrate feed mixtures (CFMs) were formulated by using 100% SBM, 50% SBM+ 50% CM and 100% CM as main protein sources. These CFMs were fed to three similar groups of growing buffalo calves of an average body weight of 116.38 ± 0.28 kg and of 3-4 months of age. Calves were fed a daily ration as 2.25% of the body weight CFM + 1% brseem hay (BH). Rice straw (RS) was offered *ad lib*. The experiment lasted for 140 days.

Digestibility trials using acid insoluble ash (AIA) method were conducted at the middle of the experimental period to evaluate the consumed rations, using three calves for each group. Animals were biweekly weighed and the average daily gain (ADG) was calculated.

The results showed that CM was lower in CP and higher in CF and EE than SBM, being 38.2% *vs* 42.2%, 13.07 *vs* 3.4% and 8.24% *vs* 2.4%, respectively. The ration which contained 50% SBM plus 50% CM as protein supplements (R_2) showed better DM, OM and CF digestibility coefficients than the other two rations containing either 100% SBM (R_1) or 100% CM (R_3). This ration also resulted in better ADG (1.026kg) and feed conversion (DM intake/kg gain), 5.688 kg than the other two rations (R1 and R2) which showed 0.980, 0.978 kg ADG and 5.912, 5.762 kg feed conversion respectively. Utilization of R_2 was also better than the other rations since it significantly ($P<0.05$) showed better NH_3-N and VFA's in the rumen fluid than the other two rations. These results might be due to a complementary effect between SBM and CM. Blood serum and rumen fluid parameters showed that feeding CM was nutritionally adequate safe on growing buffalo calves performance and health. Using CM as protein supplement was cheaper than SBM and decrease the dependence on soybean meal importation. Moreover CM can decreased the gap of CP shortage in Egypt.

Keywords: Canola meal, Soybean meal, Buffalo calves, Feed intake, Digestibility, Rumen fluid, Blood parameters.

INTRODUCTION

Rape is a member of the *Brassica* genus. There are both forage and oilseed rapes. Rapeseed meal is produced from oilseed varieties. Much of the work on the development of rapeseed as a major crop has been conducted in Canada (Bell, 1993) to give desirable agronomic, industrial and nutritional properties. The term rapeseed is now used for the high erucic acid and glucosinolates toxic materials. Canadian researchers have developed rapeseed varieties that are low in both erucic acid and glucosinolates. These "double zero" varieties have been named Canola to distinguish them from

toxic rapeseed (The term canola was derived from Canadian low acid). Canola meal is a protein supplement derived from zero glucosinolate rapeseed.

Canola meal contains 38 to 46% crude protein and 10 to 13% crude fiber. Its amino acid balance is less favorable than that of soybean meal in poultry feeding and a mixture of canola and soybean meal usually give better performance than that obtained with canola meal alone. Bowman (1977) found that canola meal can replace 50% of the SBM in pig starter rations. Moreover, Fisher (1980) and Claypool *et al* (1985) reported that canola meal can completely replace soybean meal in calf starters with no adverse effects. Therefore, canola meal is an effective protein supplement for growing calves and finishing cattle (Lardy and Anderson, 2002). Leeson *et al* (1987) found that canola meal could be used as a complete replacement for soybean meal in poultry diets with no adverse effects.

Because of the unfavorable results originally obtained with rapeseed meal as feed ingredient, there was resistance to the use of the nontoxic canola meal Cheeke (2005). Rapeseed meal is dark in color but canola meal has a yellow color. Canola production is expanding in many parts of the world and recently introduced in Egypt as a winter oil crop to extract oil for human consumption. The stretching of cultivated area by canola in Egypt produce a large amount of canola meal as a by-products of oil extraction (Abdel-Salam and Deraz, 2005). Therefore, the feasibility of using canola meal as a feed ingredient should be thoroughly investigated.

This work was conducted to study the nutritional value of partial or complete replacement of soybean meal by canola meal as protein supplementation in weaned buffalo calves rations.

MATERIALS AND METHODS

This work was conducted to study the effect of replacement of soybean meal by canola meal in the rations of growing buffalo calves. Experimental was carried out at Seds Experimental Station, Animal Production Research Institute, Bany-Swaif Governorate during (2004).

Eighteen indigenous growing buffalo calves of 3-4 months age and average body weight of 116.4 ± 0.28 kg. were used. They divided into three similar group.

Three experimental rations were used. The concentrate feed mixtures (CFMs) was formulated from the same ingredients except soybean meal and/or canola meal were the major protein supplements. Canola meal was obtained from Nobaria, oil extracting factory, Ministry of Agriculture. The 1st CFM contained only soybean meal 100%, while the 2nd CFM contained 50% soybean meal + 50% canola meal, while the 3rd ration contained 100% canola meal as presented in Table (1). The concentrate feed mixtures (CFMs) were manufactured at El-Marge animal feed factory, Ministry of Agriculture, being almost similar protein and energy content as shown in Table (2).

Table (1) : Formulation of concentrate feed mixtures (%).

Item	Concentrate Feed Mixtures		
	CFM1 (SBM)	CFM2 (SBM + CM)	CFM3 (CM)
Yellow corn	41	40.5	40
Wheat bran	18	18	18
Linseed meal	15	15	15
Soybean meal (SBM)	14	7	-
Canola meal (CM)	-	7.5	15
Rice bran	4	4	4
Molasses	4	4	4
Limestone	3	3	3
Common salt	1	1	1

CFM1= contain 100% SBM as protein supplementation
CFM2 = contain 50% SBM + 50% CM as protein supplementation
CFM3 = contain 100% CM as protein supplementation

Table (2): Chemical composition of experimental concentrate feed mixtures, canola meal, soybean meal, roughages and experimental daily rations consumed.

Item	Moisture %	DM composition%					
		OM	CP	CF	EE	NFE	Ash
Concentrate feed mixtures:							
CFM_1 (SBM)	9.53	93.55	17.63	6.37	2.60	66.95	6.45
CFM_2 (SBM+CM)	9.64	92.05	17.53	7.20	2.86	64.46	7.95
CFM_3 (CM)	9.32	91.80	17.44	7.90	3.48	62.98	8.20
Canola meal (CM)	8.50	94.49	38.20	13.07	8.24	34.98	5.51
Soybean meal (SBM)	10.00	96.23	42.20	3.40	2.40	48.23	3.77
Roughages:							
Berseem hay (BH)	9.71	87.50	12.30	28.50	2.70	44.00	12.50
Rice straw (RS)	7.00	87.20	3.50	40.50	1.30	41.90	12.80
Experimental daily rations consumed (calculated)*							
R1	8.98	91.09	14.32	16.82	2.45	57.50	8.91
R2	8.90	90.19	14.26	17.32	2.61	56.00	9.81
R3	9.01	90.04	14.21	17.74	2.98	55.11	9.96

*** Digestibility trial rations were formulated from CFM (2.25% of BW), BH (1% of BW) and RS as 80% of average estimated intake during the whole experimental period.**

Calves were housed in three open shaded paddocks. Calves were daily offered the experimental rations. These rations were offered as 2.25% CFM + 1% brseem hay (BH) of their body weight. Feeds were offered in two equal portions at 8.00 a.m. and 4.00 p.m. which cover their nutritional requirements (NRC, 1984). Rice straw as a bulky roughage was offered *ad lib*. Fresh water and mineral mixture blocks were freely available to animals. The growth trial lasted 140 days. Calves were biweekly weighed in the morning before offering any feed or water. Live body weight changes and feed intakes were recorded at biweekly intervals. At the middle of the growth experiment, three calves were taken at random from each group to determine the digestibility and nutritive value of the experimental rations. Acid insoluble Ash (AIA) method was used as described by Van keulen and Young (1977). During

feces grabbing period calves were fed 2.25% CFM, 1% BH and chopped rice straw as 80% from the average daily free choice intake. Feeding and rectum grabbed feces collection was practiced for 5 days. Feces samples were treated with 10% sulfuric acid (H_2SO_4) and kept frozen at -18 °C for further chemical analysis. Chemical analysis were conducted at Dokki Laboratory of By-Products Utilization Department, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

At the end of digestibility trial, rumen fluid samples were collected from three animals form each group using a rubber stomach tube at 0,3 and 6 hr. after morning feeding. These samples were filtered through three layers of surgical gauze without squeezing. Ruminal pH was directly estimated by pH meter and ammonia-N was determined according to Conway (1957). Total volatile fatty acids (VFAs) were measured according to Warner (1964). The synthesized microbial protein in the rumen was calculated by multiplying the truly digested organic matter (DOM) by 19.30% according to Czerkawski (1986). True DOM was calculated assuming that 0.65 of the apparently DOM was fermented in the rumen (ARC, 1984).

Blood samples were collected after 4 hours of morning feeding from the jugular vein of each animal at the last day of the collection period. Collected blood samples were centrifuged at 4000 r.p.m. for 20 min. and serum was stored in glass vials at -18 °C till analysis. The serum parameters were determined which included total protein (Armstrong and carr, 1964), albumin (Doumas *et al.*, 1971), glucose (Siest *et al.*,1981), creatinine, (Husdan, 1968). Activities of serum enzymes (SGOT , SGPT) were determined by the method of (Reitman and Frankel, 1957) and alkaline phosphates ALP (Ratliff and Hall, 1973). Globulin was obtained by subtracting the Albumen value from total protein value.

An economical study of using either SBM and/or CM as protein sources was under taken using the prevailing feed prices of these two protein sources to find out the feed cost of producing one kilogram live body weight. The chemical analysis of feeds and feces were carried out according to (AOAC, 1996). The collected data were statistically analyzed according to Snedecor and Cochran (1982). The following model was used:

$Y_{ij} = \mu + T_i + e_{ij}$

Where : Y_{ij}= observed trait, μ= overall mean, T_i= effect of treatment and e_{ij}= random error.

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

RESULTS AND DISCUSSIONS

Chemical Composition:

The chemical composition of canola meal (CM) and soybean meal (SBM) appeared to low CP with CM 38.20% *vs* 42.20% with SBM, higher crud fiber and ether extract 13.07 & 8.24% for CM versus 3.40 & 2.40% for SBM, respectively as shown in Table (2). These results were nearly similar to those reported by Kendall *et al* (1991) Bell (1993), Zinn (1993) and Abdel-

salam and Deraz (2005). The CP content of the three CFMs were similar and ranged between 17.44 to 17.63%. Corresponding values of experimental rations ranged between 14.21 to 14.32%. The other nutrients of CFMs and their rations as CF, EE and ash contents showed not appear significant different (Table 2). The chemical composition of the offered roughages, berseem hay (BH) and rice straw (RS), was comparable to those reported by Central Lab for food and feed (CLFF, 2001) and Aboul-Fotouh *et al* (2005).

Dry Matter Intake, Digestibility and Nutritive Values:

Nutrients consumed during digestibility evaluation trials were calculated according to the feeds consumed and their chemical composition. The composed rations showed comparable nutrients as shown in Table (2).

Nutrients digestibility of these rations are presented in Table (3). The ration contained 50% SBM + 50% CM as protein supplement (R2) showed significantly (P<0.05) better DM, OM and CF digestibility coefficients than those contained 100% SBM (R1) or 100% CM (R3).

Table (3): Daily intake, digestibility and nutritive values of the experimental rations fed to growing Buffalo calves during feces grabbing period.

Item	Experimental Rations			SE
	R_1	R_2	R_3	
Animals weight, kg	159.83	164.40	158.74	± 4.95
Dry matter intake, g/head/ day				
CFM	3596.18	3699.00	3571.65	± 39.01
BH	1598.30	1644.00	1587.40	± 17.33
RS	479.50	493.20	476.22	± 5.20
Total DM intake, g/head/ day	5673.98	5836.20	5635.27	± 61.55
Nutrients digestibility, %				
DM	69.72^{b}	71.43^{a}	69.11^{b}	± 0.69
OM	71.16^{b}	72.25^{a}	71.07^{b}	± 0.38
CP	66.47^{a}	66.63^{a}	62.23^{b}	± 1.44
CF	61.73^{b}	65.66^{a}	61.92^{b}	± 1.28
EE	80.9^{a}	82.81^{a}	81.14^{a}	± 0.60
NFE	75.39^{a}	75.59^{a}	75.32^{a}	± 2.28
Nutritive value, %				
TDN	67.71^{a}	67.39^{a}	66.84^{b}	± 0.25
DCP	9.52^{a}	9.50^{a}	8.84^{b}	± 0.22
TDN intake:				
Kg/head/day	3.84^{ab}	3.93^{a}	3.77^{b}	± 0.05
Kg/100 kg BW	2.291^{a}	2.296^{a}	2.252^{b}	± 0.01
g/ kg $W^{0.75}$	81.46^{ab}	82.22^{a}	79.95^{b}	± 0.67
DCP intake:				
Kg/head/day	0.540^{a}	0.554^{a}	0.498^{a}	± 0.02
g/100 kg BW	337.96^{a}	337.25^{a}	313.82^{b}	± 7.93
g/ kg $W^{0.75}$	12.02^{a}	12.08^{a}	11.14^{b}	±0.30

a & b means in the same row with different superscripts differ (P<0.05) significantly.

Crude protein digestibility of(R3)was significantly (P<0.05) lower than the other two rations.

The present results agree with those of Seoane *et al* (1992). Ether extract and NFE digestibility's showed comparable results for the three rations. This results might be due to the fact that EE is a small fraction and NFE is estimated by difference. These result are in agreement with Zinn (1993), Khorasani *et al* (1990) and Abdel-Salam and Deraz (2005).

The nutritive value as TDN for the three rations showed comparable results and ranged between 66.84 and 67.71%. The low digestibility of CP (62.23%) for R3 containing 100% CM tended to significantly (P<0.05) the lowest digestible crud protein (DCP), being 8.84% while those of R1 and R2 were 9.52 and 9.50% respectively. These results were agreement with those obtained by Abdel-Salam and Deraz (2005).

The total DM intake/head/day appeared to higher with animals fed ration R_2 containing 50% SBM + 50% CM as protein supplements than those of the others. Consequently, the TDN intake was higher with animals fed the same ration when expressed as kg/100 kg LBW or g/kg $W^{0.75}$, being 2.296 and 82.22, respectively. These results agreed with those obtained by Stedman and Hill (1987) and Abdel-Salam and Mousa (2003).

Rumen fluid parameters:

Ruminal pH values were slightly higher with (R3)than the other two rations but lacked any significance as shown in Table (4). All values were above pH 6.00 which indicated favorable conditions for fermentation (Mertens 1978). Generally, the overall mean of ruminal pH value was not affected by source of protein supplementation (SBM or CM).

Table (4): Rumen fluid parameters of growing buffalo calves fed different experimental rations.

Parameter	Time after feeding (hours)	Experimental Rations			SE
		R_1	R_2	R_3	
pH	0	7.17	7.11	7.34	± 0.07
	3	6.24	6.21	6.65	± 0.14
	6	6.75	6.38	6.83	± 0.14
Overall mean		6.72	6.57	6.94	± 0.11
Ammonia.N (mg/L)					
	0	233.90^{b}	283.30^{a}	269.20^{a}	± 14.69
	3	242.70^{b}	296.30^{a}	253.60^{b}	± 16.36
	6	242.70^{b}	246.40^{ab}	253.60^{a}	± 3.20
Overall mean		239.76^{a}	275.33^{a}	258.80^{a}	± 11.13
TVFA,s (Meq / L)					
	0	68.86^{ab}	75.97^{a}	61.44^{b}	± 5.24
	3	76.61^{ab}	83.56^{a}	67.97^{b}	± 4.51
	6	79.60^{ab}	81.27^{a}	71.72^{b}	± 2.94
Overall mean		80.76^{a}	86.60^{a}	72.16^{b}	± 4.19
Microbial protein (g/h/d)		553.23^{b}	600.91^{a}	567.03^{b}	± 14.17

A & b means in the same row with different superscripts differ (P<0.05) significantly.

Ammonia nitrogen concentration (NH3-N) was significantly (P<0.05) increased in the rumen fluid of calves fed (R2) than the other two rations at 0 hr. and 3 hr. after feeding. However the overall mean was not affected by the protein supplement applied in this study. This indicated that the degradability of both proteins are similar. Similar trend was observed by Leontowicz *et al* (1983) and Abou Hussein *et al* (2003) using different protein supplements.

Total VFAs concentrations were 68.86,75.97 and 61.44 meq/Liter rumen fluid before feeding for R1, R2 and R3, respectively as shown in Table (4). In general, VFAs increased in all treatment groups after 3 hr.after feeding. The higher (P<0.05) values were reported for R2 while the lowest (P<0.05) values were reported for the R3. Similar results were noticed by Leontowicz *et al* (1983).

The synthesized microbial protein in the rumen was significantly (P<0.05) higher with calves fed R_2 than that for calves fed the other two rations. This is a reflection of more on being truly digested with rumen and hence better efficiency of utilization. Similar result were obtained by Ha *et al* (1985) with diets containing SBM and CM.

Blood Serum parameters:

Blood serum parameters as affected by different rations fed to calves are shows in Table (5). The present data indicated that there were no significant effects on serum parameters. All serum parameters were within the normal range as reported by William (1997). The estimated values of investigated serum parameters might show that there was no depressing effect of canola meal relative to soybean meal. The serum enzymes as SGOT, SPOT and ALP values which are used as an indication of liver activities did not show any adverse effect of CM against SBM. Accordingly, Creatinine showed similar results. The total protein and albumin ranged between 58.6 - 61.10 g/L and 31.77- 32.54 g/L respectively. These result within the normal range which found by Baraghit *et al* (2003) and Abd-Salam and Deraz (2005) with native buffalo calves.

Table (5) : Blood serum parameters at 4 hours after feeding rations fed to growing buffalo calves.

Item		Experimental Rations			SE
		R_1	R_2	R_3	
Serum Proteins :					
Total protein	g/L	58.60[a]	61.10[a]	59.93[a]	± 0.72
Albumin	g/L	31.77[a]	32.54[a]	32.40[a]	± 0.24
Globulin	g/L	26.83[a]	28.56[a]	27.53[a]	± 0.50
Alb/ Glob	*ratio*	1.18[a]	1.14[a]	1.18[a]	± 0.01
Serum Enzymes:					
Alkaline phosphates (ALP)	units/L	5.31[a]	5.56[a]	5.61[a]	± 0.09
SGOT	units / L	48.60[a]	49.12[a]	49.80[a]	± 0.35
SGPT	units / L	15.11[a]	15.83[a]	14.72[a]	± 0.33
Serum Chemistry :					
Glucose	mg/dl	79.31[b]	88.67[a]	75.83[b]	± 4.28
Creatinine	mg/dl	1.30[a]	1.66[a]	1.48[a]	± 0.10

a & b means in the same row with different superscripts differ (P< 0.05) significantly.

Growth performance:

The average daily body weight gain values were 0.980, 1.026 and 0.978 kg for R1, R2 and R3 respectively as presented in Table (6). The differences in body weight gain among experimental groups were not significant. These results indicated that the use of canola meal as a protein supplement had no adverse effect on average daily gain of growing buffalo calves. Because of unfavorable results originally obtained with rapeseed meal as a feed ingredient ,there was a resistance to use the nontoxic canola meal (Cheeke, 2005).Results obtained in this study are in line of the findings of Abdel-Salam and Mousa (2003) and Abdel-Salam and Deraz (2005). They reported that average daily gain of buffalo calves were 0.926 and 1.066 kg/h/d respectively. On the other hand, some investigators in Egypt reported different ADG of buffalo calves fed concentrate based rations along with roughages. EL-Shinnawy *et al* (1999) reported 0.890 kg/h/d, Etman *et al* (2001) reported 0.814 kg/h/d, Abdel-Baki *et al* (2003) reported 0.853 kg/h/d and Al-Basiony *et al* (2003) reported 0.969 kg/h/d. These differences in ADG reported by different investigators may be due to different plane of nutrition used.

Feed conversion expressed as kg DM, TDN and DCP/ kg gain was almost similar for different dietary treatments. However ration R_2 tended to get better feed conversion with DM and TDN, while R_3 was the best efficiency with CP conversion .These results agree with those of El-Shinnawy *et al* (1999), Barghit *et al* (2003), Etman *et al* (2001), Abdel Baki *et al* (2003) and Abdel – salam and Deraz (2005) with native buffalo calves.

Table (6): Growth parameters of growing buffalo calves fed the experimental rations.

Item	Experimental Rations			S.E
	R_1	R_2	R_3	
Number of animals	6	6	6	
Duration, (days)	140	140	140	
Initial body wt., kg	116.66[a]	116.66[a]	115.83[a]	± 0.28
Final body wt., kg	253.80[a]	260.30[a]	252.80[a]	± 2.35
Weight gain, kg	137.14[a]	143.64[a]	136.97[a]	± 2.20
Av. Daily gain (ADG), kg	0.980[a]	1.026[a]	0.978[a]	± 0.02
Daily Dry matter intake, kg:				
CFM	3.463[a]	3.491[a]	3.370[a]	± 0.04
BH	1.539[a]	1.547[a]	1.495[a]	± 0.02
RS	0.792[a]	0.798[a]	0.769[a]	± 0.01
Total	5.794[a]	5.836[a]	5.634[a]	± 0.06
Feed conversion:				
kg DM/kg gain	5.912[a]	5.688[a]	5.761[a]	± 0.48
kg DM/kg gain	4.003[a]	3.833[ab]	3.861[b]	± 0.05
kg DM/kg gain	0.563[a]	0.540[a]	0.509[a]	± 0.02

a & b means in the same row with different superscripts differ (P< 0.05) significantly.

Economic Evaluation:

The economic evaluation of the experimental rations for growing buffalo calves is presented in Table (7). Results showed that average costs in

L.E. for one kg. gain for R1, R2 and R3 were 4.89, 4.81 and 4.54 respectively showing decreasing in cost with rate of 7.16% with ration R_3. The feed cost/ kg. weight gain was in favor of R2 (50% SBM + 50% CM) and R3 (100%CM) respectively.

Table (7): Economic evaluation of the experimental rations for growth performance .

Item	Experimental Rations		
	R_1	R_2	R_3
Total weight gain obtained (k)	137.14	143.64	136.97
Consumed DM (kg) to produce total weight gain	8.11.16	817.04	788.76
Price of kg. DM of ration P.T	84.36	82.42	80.48
Feed cost (L.E) for total weight gain	670.32	690.91	621.17
Feed price (LE) to produce 1kg BW.	4.89	4.81	4.54

The price of one ton of CFM1, CFM2, CFM3 Brseem hay and Rice straw were 1095, 1065, 1035, 500 and 100 L.E, respectively.

Conclusion:

It is concluded that half or complete substitution of soybean meal in growing buffalo calves rations by canola meal as protein supplementation had no detrimental effect on their growth performance. Accordingly it could participate in covering the gap of protein supplements shortage. Combining both sources (50%SBM+ 50% CM) showed a complementary effect and better results than using any one of them alone for feeding buffalo calves. Canola meal feeding has another advantage since its market price is relatively lower than soybean meal. It reduces the cost of producing gain and improves the economical efficiency.

REFERENCES

Abdel-Baki, S.M.; S.M. Bassuny; H.M. Ghanem; R.I. Moawd and A.H Ghoneim (2003). Clays in animal nutrition. 2. study on using tafla in buffalo bull calves feeding. Egypt. J. Nut. and Feeds 6 (Special Issue): 703-708.

Abdel-Salam, O.H. and Kh. Mousa (2003). Effect of feeding various sources of nitrogen on the performance of calves. Egypt. J. Nutr. and Feeds, 6: 627.

Abdel-Salam, O.M. and T.A. Deraz (2005). The use of canola meal in concentrate feed mixtures for fattening buffalo calves. Egypt. J. Nutr. and Feeds, 8: 33-40.

Abou-Hussein, E.R.M.; E.A. Gihad; T.M. El-Bedawy and M.H. Abdel-Gawad (2003). Effect of dietary oilseed supplement on nutrient utilization, milk yield and composition of lactating buffaloes. Egypt. J. Nutr. and Feeds, 6 (Special Issue):537-538.

Aboul-Fotouh, G.E.; M.M.A. Abdou; N. Safaa Abdel Azeem and H.A.E. Ammar (2005). Effect of using lupine seed containing rations on sheep productive performance. Egypt. J. Nutr. and Feeds 8 (1): 25-32.

Al-Basiony, A.Z.; E.E. Ragheb; H.M. El-Nahas and G.A. Abdel Rahman (2003). A comparison among some growth promoters for fattening Egyptian buffalo calves. Egypt. J. Nut. and Feeds 6 (special Issue): 685-692.

AOAC, Association of Official Analytical Chemists (1996). Official Methods of Analysis 16th. Ed. Washington, D.C. USA.

ARC (1984). Report of the protein group of the Agricultural Research Council working party on the Nutrient Requirements of Ruminants. Commonwealth Agricultural Bureaux, Slough, England.

Armstrong, W.D. and C.W. Carr (1964). Physiological Chemistry: Laboratory Directions, 3rd Ed., Burges Publishing Co. Minneapolis, Minnesota, USA.

Baraghit, G.A.; M. Nazley El-kholy; S.S. Omar; B.M. Ahmed and kh.I. Zedan (2003). Effect of dietary fat on digestibility, rumen fermentation and blood parameters of buffalo calves. Egypt. J. Nut. and feeds 6 (special Issue): 663-674.

Bell, J.M. (1993). Factors affecting the nutritional value of canola meal: A review. Cand. J. Anim. Sci. 73: 679-697.

Bowman, G.H. (1977). Value of low glucosinolate rapeseed meal for growing and finishing pigs. Fifth Rep. Rapeseed Assoc. Can. Publ. 50: 178-180.

Central Lab for Food and Feed CLFF (2001). Feed composition tables for animal and poultry feedstuffs used in Egypt. P.O. BOX 588 ORMAN, Giza, Egypt. Published by The General Administration of Agrarian Culture.

Cheeke, P.R., (2005). Applied Animal Nutrition, Feeds and Feeding 3rd Ed. Pearson Prentice Hall, New Jersey. (Text Book). P 100.

Claypool, D.W.; C.H. Hoffman; J.E. Oldfield and H.P. Adams (1985). Canola meal, cottonseed and soybean meals as protein supplements for calves. J. Dairy Sci., 68: 67 – 70.

Conway, E.J. (1957). Micro-diffusion Analysis and Volumetric Error, Rev. Ed. Lockwood , London.

Czerkawski, J.W. (1986). An Introduction to Rumen Studies. Bergamo Press. Oxford. New York.

Doumas, B.; W. Wabson and H. Biggs (1971). Albumin standards and measurement of serum with bromocresol green. Clin. Chem. Acta, 31:87.

Duncan , D.B (1955). Multiple Range and Multiple F.test. Biometrics, 11 : 10.

EL-Shinnawy, M.M.; A.A. Gabr; E.A. EL- Ayouty and. F.H Abdel-Salam (1999). Effect of feeding different mixed ration (TMR) containing urea-ensiled maize stalks and supplemented with different sources of carbohydrates on buffalo and ballade bulls performance. Egypt. J. Nutr. and Feeds, 2: 409.

Etman, K.E.I.; A.M.M. Zeid and T.I .EL-Monayer (2001). Effect of feeding two carbohydrate sources in rations of buffalo calves on feed utilization and growth performance. Egypt. J.Nut. and Feeds, 4 : 633.

Fisher, L.J. (1980). A comparison of rapeseed meal and soybean meal as a source of protein and protected lipid as a source of supplemental energy for calf starter diets. Can. J. Anim. Sci. 60 : 359.

Ha, J.k; J.J. Kennelly; R. Berzins and C.Y. Yuk (1985). Effect of dietary nitrogen source on microbial protein synthesis, dietary protein degradation and nutrient digestion in steers. Korean, J. Anim. Sci. 27: 763-769.

Husdan, H. (1968). Chemical determination of creatinine with deproteinization. Clin. Chem., 14: 222.

Kendall, E.M.; J.R. Ingalls and R. J Boila (1991). Variability in the rumen degradability and post- ruminal digestion of the dry matter, nitrogen and amino acids of canola meal. Cand. J. Anim. Sci., 71: 739-754.

Khorasani, G.R; W.C. Sauer; L. Ozimek and J.J. kennelly (1990). Digestion of soybean meal and canola meal protein and amino acids in the digestive tract of young ruminants. J. Anim. Sci., 68: 3421 – 3428.

Lardy, G.P. and V. Anderson (2002). Canola and sunflower meal in beef cattle diets. Vet. Clinics of North America, Food Animal Practice 18: 327: 338.

Leeson, S.; J.O. Etteh and J.D. Summers (1987). The replacement value of canola meal for soybean meal in poultry diets. Cand. J. Anim. Sci., 67:151-158.

Leontowicz, H.; M. Leontowicz; G. Kulasek and R. Krzeminski (1983). The influence of using sugar beet silage and rapeseed ground on feeding calves on the physiological indices of the rumen contents and blood.

Mertens, D.R. (1978). Effect of buffers upon fiber digestion. Invited paper at Regulation of Acid-Base Balance Symposium. Tucson, Arizona, Nov., 8 : 65.

NRC. (1984). National Research Council. Nutrient Requirements of Domestic Animals. Nutrient Requirements of Beef Cattle 6th rev. Ed. NAS. NRC, Washington, DC., USA.

Ratliff, C.R. and F.F. Hall (1973). Direct colorimetric determination of alkaline phosphates in serum "Laboratory Manual of Clinical Biochemistry" Scott and White Memorial Hospital Publications Office Temple, T.X., USA.

Reitman, S. and S. Frankel (1957). Calorimetric method for the determination of serum glutamic-oxaloacetic and glutamic-pyruvate transaminase. Am. J – Clin. Path., 28: 56.

Seoane, J.R; A.M. Christen; D.M. Veira and J. Fontecilla (1992). Performance of growing steers fed quack grass hay supplemented with canola meal. Cand. J. Anim. Sci., 72: 329-336.

Siest, G.; J. Henny and F. Schiele (1981). Interpretation des examens de laboratoir, Karger ed., P 206.

Snedecor, G.W. and W.G. Cochran (1982). Statistical Methods. 7th Ed., Iowa State Univ. Press, Ames, Iowa, USA.

Stedman, J.A and R. Hill (1987). Voluntary food intake in a limited time of lambs and calves given diets containing rapeseed meal from different types and varieties of rape, and rapeseed meal treated to reduce the glucosinolate concentration. Anim. Prod. 44: 75- 82.

Van Keulen, J. and B.A. Young (1977). Evaluation of acid-insoluble ash as a natural marker in ruminant digestibility studies. J. Anim. Sci., 44: 282.

Warner, A.C.I. (1964). Production of volatile fatty acids in the rumen. 1- Methods of measurement. Nut. Abst. and Rev., 34: 339.
William, O.R. (1997). Physiology of Domestic Animals. 2nd Ed. Iowa State Univ. Press., USA.
Zinn, R.A. (1993). Characteristics of ruminal and total tract digestion of canola meal and soybean meal in a high energy diet for feedlot cattle. J. Anim Sci., 71: 796- 801.

إحلال كسب الكانولا بديلاً عن كسب فول الصويا فى علائق العجول الجاموسي النامية

أحمد محمد عياد
معهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية – وزارة الزراعة

إستخدم فى هذه الدراسة ١٨ عجل جاموسي بعد الفطام عمر ٣-٤ شهور ومتوسط وزن ١١٦,٤ كجم وتم تقسيمها على ثلاث مجموعات تجريبية :
(١) المجموعة الأولى (مقارنة) : علف مركز به ١٤% كسب فول صويا + ٤١% ذرة صفراء
(٢) المجموعة الثانية: علف مركز به ٧% كسب فول صويا + ٧,٥% كسب كانولا + ٤٠,٥% ذرة صفراء.
(٣) المجموعة الثالثة: علف مركز به ١٥% كسب كانولا + ٤٠% ذرة صفراء
[باقي مكونات العلف المركز هى ١٥% كسب كتان ، ١٨% نخالة قمح ناعمة ، و٤% رجيع أرز ، ٤% مولاس ، ٣% حجر جيري ، ١% ملح طعام] .
جميع المجموعات تم تغذيتها على علائق تحتوى على ٢,٢٥% من وزن الجسم علف مركز + ١% دريس برسيم + قش أرز للشبع وأستمرت الدراسة لمدة ١٤٠ يوم وفى منتصف المدة تم اختيار ثلاث حيوانات عشوائيا من كل مجموعة لإجراء تجربة هضم والتى أستمرت لمدة ٥ أيام لجمع عينات الروث من المستقيم وفى نهاية تجربة الهضم تم أخذ عينات سائل الكرش بواسطة اللى المعدى قبل التغذية و ٣ ، ٦ ساعات من التغذية وأيضا عينات الدم بعد ٤ ساعات من التغذية فى آخر يوم من أيام التجميع .
النتائج المتحصل عليها كانت كالآتي:-
[١] أظهرت نتائج التحليل الكيماوى ارتفاع كل من الألياف والدهن فى كسب الكانولا عن كسب فول الصويا بينما كانت نسبة البروتين أقل (٣٨,٥% ، ٤٢,٢٠% على الترتيب) .
[٢] كان لأحلال كسب الكانولا محل ٥٠% من بروتين كسب فول الصويا زيادة فى المادة الجافة المأكوله وتحسن معنوى فى معاملات هضم كل من المادة الجافة والعضوية والألياف وأعلى معدل نمو يومى (١٠٢٦ جم / يوم) مقابل ٩٨٠جم/ يوم ، ٩٧٨جم / يوم للعليقة الأولى والثالثة وأفضل معامل تحويل غذائي ٥,٦٨٨ كجم (مادة جافة) / كجم نمو مقابل ٥,٩١٢ كجم (مادة جافة) ، ٥,٧٦٢ كجم (مادة جافة) / كجم نمو للعليقة الأولى والثالثة على الترتيب وكذلك تحسن معنوى (على مستوى ٥%) فى إنتاج البروتين الميكروبي فى الكرش .
[٣] لم تكن هناك فروق معنوية بين المجموعات فى النمو اليومي .
[٤] لم يكن هناك تأثير معنوي على إستبدال كسب الصويا بكسب الكانولا سواء بنسبة ٥٠% أو ١٠٠% على وظائف الكبد والكلي .
[٥] أظهرت نتائج الدراسة الاقتصادية أن تكلفة التغذية لإنتاج ١ كجم نمو كان ٤,٥٤ جنيه مع العليقة الثالثة (١٠٠% كسب الكانولا) وكان ٤,٨٩ جنيه العليقة الأولى (١٠٠% كسب فول صويا) . مع خفض فى تكلفة التغذية يقدر بحوالى ٧,١٦% عند إستخدام الكانولا فى العليقة (٣) .
من ذلك يتضح أنه يمكن إستبدال كسب فول الصويا بكسب الكانولا فى العلف البادئ للعجول الجاموسي الصغيرة دون أى اثر ضار على أداء الحيوان وذلك فى ظل ظروف أسعار السوق بغرض تقليل تكلفة التغذية وزيادة الكفاءة الاقتصادية وتقليل الاعتماد على إستيراد كسب فول الصويا .