
بسم الله الرحمن الرحيم

EFFECT OF DIFFERENT DIETARY PROTEIN SOURCES ON PROUDICTIVE PERFORMANCE OF FARAFRA SHEEP

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Introduction

- Protein and energy are the two major components of feed that influence performance of the growing and fattening lambs.
- Protein is one of the critical nutrients for young growing and fattening animals. Being more expensive than the other nutrients, optimal use of protein is necessary .
- Provision of the quality of protein in the lambs diets does not only improve the animal performance but also ensures profitable animal production.

Introduction

- Protein sources differ in their chemistry as far as amino acid profile and availability of CP in rumen and post ruminal level.
- Different protein sources have varying effect on ruminant's performance and their serum biochemistry.
- This varied response in performance may be due to changes in rumen ecology and their different amino acid profiles .

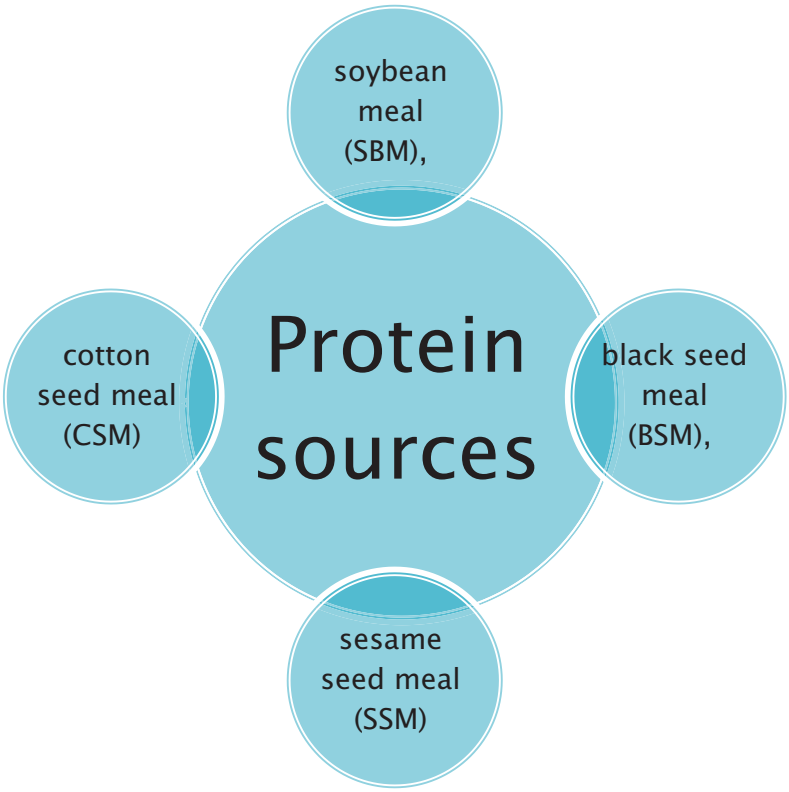
Introduction

- Different protein sources in lamb diets like soybean meal (SBM), black seed meal (BSM), cotton seed meal (CSM) and sesame seed meal (SSM) provide the condensed nutrients that may be efficiently utilized at ruminal level .

- Protein source with a higher by-pass value have been reported to have more intense effects on N-balance, growth and muscle mass accretion than those which are lower in by-pass protein.

- Inclusion of protein sources with amino acid profiles matching closely to the amino acid needs of the growing lambs results in better growth performance and nitrogen utilization by the animal .

Protein sources



Objective

- The present study aimed to investigate the benefit from the residues after oils extraction (BSM, CSM and SSM) as substitutes for soybean meal in animal feeds. The effect of including these protein sources in the ration on nutrients digestibility, feeding value, nitrogen utilization, live body weight, some ruminal parameters and economical efficiency of Farafra sheep was studied. Amino acids assay and the solubility of the different tested protein sources were also done.

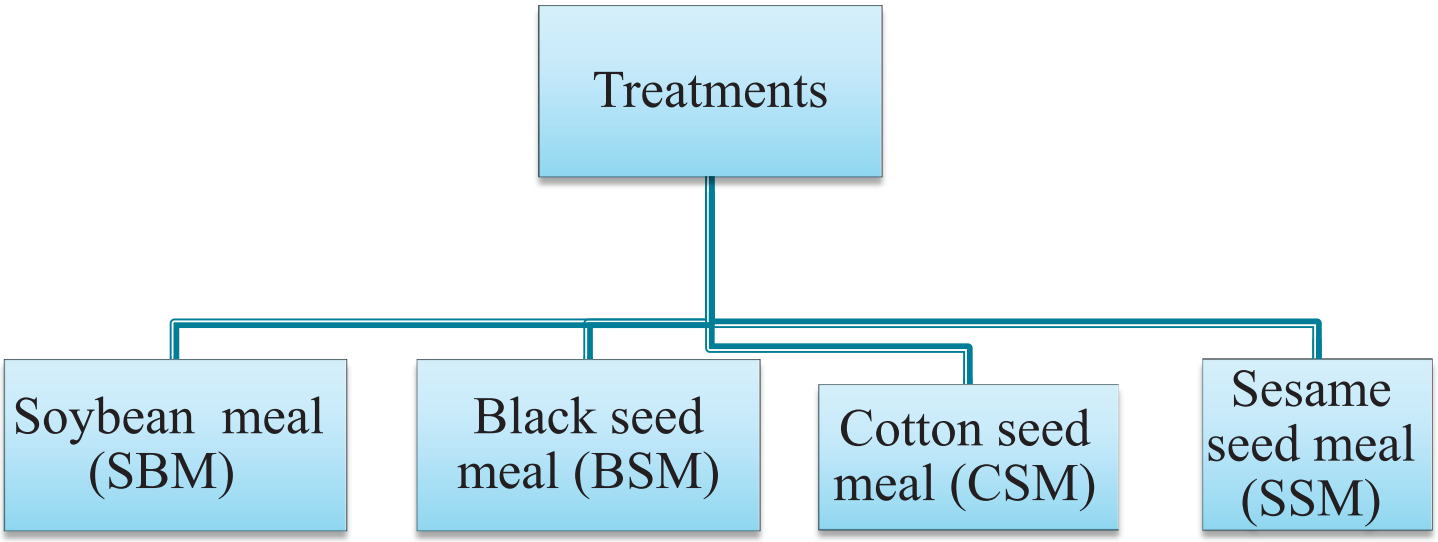
Materials and Methods

This study was carried out at the Animal Production Department, National Research Centre, Dokki, Giza, Egypt.

Feeding trial

Expermintal animals and feeds

- Twenty fattening mature male Farafra sheep averaged 43.50± kg live body weight ; 9 months old were divided into four groups (5 animals in each) according to LBW in fattening trial for 66 days. Animals were fed the experimental concentrate feed mixtures (CFM) at 3% of LBW, animals were offered wheat straw *ad-lib*.. Black seed meal (BSM), cotton seed meal (CSM) and sesame seed meal (SSM) were incorporated into of the experimental concentrate feed mixtures (CFM) to replace 100% of the soybean meal (SBM) as a different sources of protein.


Treatments
Soybean meal (SBM)
Black seed meal (BSM)
Cotton seed meal (CSM)
Sesame seed meal (SSM)

Digestibility trials

Digestibility trials

- At the end of feeding trial, twelve animals were used in digestion trials (3 for each group) for 21 days, 14 days at preliminary period and 7 days as collection period.

Parameters

- Proximate chemical analysis
- Cell wall constituents
- Nitrogen fractions
- Soluble and insoluble protein
- Amino acids assay
- Digestibility and nitrogen balance
- Average daily gain
- Water intake
- Ruminal parameters
- Feed intake and feed conversion
- Economic evaluation

Results

Table (1): Chemical composition, cell wall constituents and gross energy of tested protein sources.

Item	Protein sources, meal			
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal
Moisture :	10.15	8.63	9.62	8.92
Component, % on DM basis				
OM	92.55	92.47	94.49	91.86
CP	44.50	30.09	26.24	30.66
CF	7.33	10.21	29.92	9.60
EE	5.01	21.08	8.39	15.90
NFE	35.71	31.09	29.94	35.70
Cell wall constituents,%				
NDF	33.74	35.63	48.58	35.23
ADF	16.12	18.74	36.72	18.19
Gross energy, Kcal/kg DM	4771	5396	4756	5107

Table (2): Protein fraction and solubility of soybean meal, Black seed meal, cotton seed meal and sesame meal as a protein source.

Item	Protein sources, meal			
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal
Protein fraction:				
Total protein	44.50	30.06	26.24	30.69
True protein, g	39.[illegible]	25.37	23.12	23.13
True protein, g % of total protein	88.63	84.40	88.11	75.37
NPN, g	5.06	4.69	3.12	7.56
NPN, g% of total nitrogen	11.37	15.60	11.90	24.63
Protein solubility:				
Insoluble protein, g	41.88	15.75	22.81	24.25
Insoluble protein % of total protein	94.11	52.40	86.93	79.02
Soluble protein, g	2.62	14.31	3.43	6.44
Soluble protein %of total protein	5.89	47.60	13.07	20.98

Table (3): Amino acids content of tested protein source g/100g sample.

IAmino acids	Protein sources, meal			
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal
Essential amino acids:				
Thereonine	1.814	1.45	1.073	1.160
Valine	2.588	0.04	1.627	1.407
Methionine	0.683	0.55	0.235	0.384
Isoleucine	2.052	1.42	1.016	4.412
Leucine	5.880	2.44	3.006	4.235
Phenylalanine	5.419	1.69	2.973	2.713
Histidine	2.319	1.42	1.253	0.827
Lysine	4.450	1.48	2.181	1.509
Arginine	2.856	3.24	1.754	5.481
Proline	1.799	1.359	1.107	1.251
Non essential amino acids:				
Aspartic acid	4.826	2.97	2.621	3.335
Serine	2.701	1.35	1.466	1.883
Glutamic acid	11.792	6.22	6.683	10.842
Glycine	0.943	1.28	0.716	2.582
Alanine	4.014	1.74	2.879	3.511
Cystin	1.6	5.28	1.5	2.1
Tyrosine	2.752	1.69	1.103	1.164

Table (4): Formulation, chemical composition, cell wall constituents and gross energy of the experimental rations.

Item	Protein sources, meal			
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal
Formulation :				
Yellow corn	50	50	50	50
Soybean meal	16	-	-	-
Cumin seeds	-	23	-	-
Cotton seeds	-	-	28	-
Sesame meal	-	-	-	21.5
Wheat bran	31	24	19	25.5
Limestone	2	2	2	2
Common salt	1	1	1	1
Total	100	100	100	100
Chemical composition:				
Moisture	10.00	9.77	10.29	9.26
Component, % on DM basis				
Organic matter (OM)	94.89	95.23	93.89	93.16
Crude protein (CP)	14.03	13.99	14.06	14.10
Crude fiber (CF)	10.40	11.30	12.84	11.20
Ether extract (EE)	3.11	6.84	4.61	5.66
Nitrogen free extract (NFE)	67.35	63.10	62.38	62.20
Ash	5.11	4.77	6.11	6.84
Cell wall constituents,%				
NDF	35.76	36.35	37.36	36.28
ADF	18.92	19.74	21.14	19.65
Gross energy k, cal/kg DM*	4312	4521	4349	4375

Table (5): protein fraction and solubility of experimental rations .

Item	Protein sources, meal			
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal
Protein fraction:				
Total protein	14.03	13.99	14.06	14.10
True protein, g	13.63	13.56	13.13	12.31
True protein, g % of total protein	97.15	96.93	93.39	87.30
NPN, g	0.40	0.43	0.93	1.79
NPN, g% of total nitrogen	2.85	3.07	6.61	12.70
Protein solubility:				
Insoluble protein, g	13.94	8.44	12.69	10.94
Insoluble protein % of total protein	99.36	60.33	90.26	77.59
Soluble protein, g	0.09	5.55	1.37	3.16
Soluble protein %of total protein	0.64	39.67	9.74	22.41

Table (6): Feed intake, nutrients digestibility and feeding value of Farafra sheep fed different protein sources.

Item	Experimental rations (%) on DM basis				
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal	Sig.
No. of animals	3	3	3	3	
Av. body weight, kg	58.17	52.17	51.58	54.00	
DM intake, g/h/days					
Total	1070.08	1084.85	1137.00	1154.17	NS
DM intake, g/ kg B $W^{0.75}$:					
Total	18.49	21.02	22.29	21.40	NS
Nutrients digestibility, % :					
DM	69.18 ^{A}	62.14 ^{B}	70.58 ^{A}	71.49 ^{A}	*
OM	72.20 ^{A}	64.85 ^{A}	75.05 ^{A}	74.12 ^{A}	*
CP	66.20 ^{B}	59.28 ^{C}	77.24 ^{A}	71.09 ^{AB}	**
CF	54.14 ^{A}	49.46 ^{B}	56.82 ^{A}	48.73 ^{B}	*
EE	51.90 ^{C}	61.84 ^{B}	70.18 ^{A}	56.37 ^{BC}	*
NFE	80.89	79.42	83.47	83.36	NS
Feeding value, %					
TDN	69.27	65.82	73.51	71.91	NS
DCP	8.05 ^{B}	7.58 ^{B}	9.67 ^{A}	8.93 ^{AB}	*

Table (7): Nitrogen balance of Farafra sheep fed different protein sources.

Item	Experimental rations (%) on DM basis				
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal	Sig.
Nitrogen balance, g/h/d:					
Nitrogen intake	20.80	22.19	22.70	23.08	NS
Fecal nitrogen	7.01 ^{B}	9.02 ^{A}	5.19 ^{C}	6.69 ^{B}	*
Urinary nitrogen	12.32 ^{A}	9.31 ^{B}	5.46 ^{C}	10.37 ^{B}	**
Digestible nitrogen	13.79 ^{C}	13.17 ^{C}	17.51 ^{A}	16.39 ^{B}	*
N retention	1.47 ^{C}	3.86 ^{BC}	12.05 ^{A}	6.02 ^{B}	**
N retention/ N intake,%	7.07 ^{C}	17.40 ^{B}	53.08 ^{A}	26.08 ^{B}	**
N retention/ N digestible ,%	10.66 ^{C}	29.31 ^{B}	68.82 ^{A}	36.73 ^{B}	**

Table (8): Water balance of Farafra sheep fed different protein sources.

Item	Experimental rations (%) on DM basis				
	Soybean meal	Cumin seeds meal	Cotton seeds meal	Sesame seeds meal	Sig.
Water balance, ml/h/d					
Drinking water	6604.33	6125.00	6550.00	6900.00	NS
Feed water	118.33	117.33	129.33	119.33	NS
Urinary water	1074.67 ^{A}	583.33 ^{C}	475.00 ^{C}	750.00 ^{B}	*
Fecal water	413.00 ^{A}	342.00 ^{B}	158.33 ^{C}	200.67 $^{B\,C}$	*
Water balance	5234.99	5317.00	6046.00	6068.66	NS
Water balance, ml /kg BW $^{0.75}$					
Urinary water	18.87 ^{A}	11.30 ^{AB}	9.30 ^{B}	13.90 ^{AB}	*
Fecal water	7.03 ^{A}	6.60 ^{AB}	3.03 ^{B}	3.70 ^{B}	**
Water balance	90.34	102.13	118.47	112.50	NS
Drinking water, L/Kg DM intake	6.17	5.65	5.76	5.98	NS

Table (9): Rumen liquor parameters of Farafra sheep fed different protein sources.

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Item	Experimental rations (%) on DM basis					
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal	Mean	Sig.
PH						
0 hr	6.60	6.67	6.70	6.17	6.54^{A}	**
3 hrs.	6.10	6.27	6.20	5.77	6.09 ^{B}	**
6 hrs.	6.40	6.47	6.40	5.83	6.28 ^{B}	**
Mean	6.36 ^{A}	6.47 ^{A}	6.43 ^{A}	5.92 ^{B}		**
Ammonia-NH_{3-} N (mg/100ml)						
0 hr	14.00	16.67	11.00	15.77	14.36 ^{C}	**
3 hrs.	25.70	36.67	23.53	35.26	30.29 ^{A}	**
6 hrs.	19.33	23.76	23.00	23.00	22.27 ^{B}	**
Mean	19.68 ^{B}	25.70 ^{A}	19.18 ^{B}	24.68 ^{A}		**
TVFA's (meq/100 ml)						
0hr	13.00	8.73	10.07	9.73	10.38 ^{C}	**
3 hrs.	45.33	29.00	31.33	30.67	34.08 ^{A}	**
6 hrs.	22.53	20.13	21.10	20.40	21.04^{B}	**
Mean	26.95^{A}	19.29^{B}	20.83^{B}	20.27^{B}		*

Table (10): Growth performance, feed intake and feed conversion ratio of Farafra sheep fed different protein sources.

L.E= Egyptian pound = 0.1399 US$

Item	Experimental rations (%) on DM basis				Net 1
	Soybean meal	Black seeds meal	Cotton seeds meal	Sesame seeds meal	Sig.
No. of animals	5	5	5	5	
Feeding period, day	66	66	66	66	
Initial body weight , Kg	43.50	41.50	41.50	39.00	NS
Final body weight , kg	55.40	55.40	57.00	52.60	NS
Body weight gain, g/period	11.90 ^{B}	13.90 ^{B}	15.50 ^{A}	13.60 ^{B}	*
Average daily weight gain, g/h	180.30 ^{C}	210.61 ^{B}	234.85 ^{A}	206.06 ^{B}	*
Feed intake, g DM/h/day:					
Total DM intake g/h/day	1343.57	1404.85	1458.20	1466.16	NS
Feed conversion ratio, kg feed/kg gain	7.54	6.76	6.21	7.12	NS
Economic evaluation:					
Income of gain /L.E./h	380.80	444.80	496.00	435.20	
Feed cost/ L.E./h	195.10	203.98	211.55	212.92	
Net feed revenue /L.E/h	185.70	240.82	284.45	222.28	
Economic feed efficiency , 100%	95.20	118.10	134.50	104.40	
Relative efficiency ,100%	100	124.00	141.0	110.00	

Conclusion

- From this study it could be concluded that :
- Cotton seed meal is the best protein source for lambs as compared to other sources of protein (SBM, BSM and SSM).
- It had better nutrients digestibility, nitrogen balance, daily gain, feed efficiency and economic feed efficiency followed by BSM and SSM which had nearly similar values . While, the lowest values were obtained with SBM. However , SBM can provide for monogastric animals and poultry feeding.
- Future studies are needed to investigate the effect of different combinations from these meals to identify the best results.


Thank
You!