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RESPONSE TO BY-PASS SOYBEAN MEAL IN GROWING RABBIT DIET

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ABSTRACT

By-pass soybean meal (BPSM) is a protein source commonly used in ruminant diets. The current study aimed to evaluate the effect of replacing 25% or 50% of soybean meal (44% CP) with BPSM having comparable proximate analyses on growth performance, dressing out percentage and nutrients digestibility coefficients of rabbits. All the experimental diets were formulated to be nearly iso-nitrogenous and iso-caloric. The growth trial lasted for 6 weeks. Rabbits were kept under the same management conditions. Results obtained for growth performance indicated that the highest replacement level of BPSM (50%) surpassed the other two treatments in terms of higher final live weight and improved feed conversion ratio (P=0.001). Hot dressing out percentage and digestibility of DM, crude protein and crude fiber were not affected by dietary treatments.Digestibility coefficient of EE improved with BPSM inclusion in the diet (P=0.001), and only the 50% replacement diet improved the NFE digestibility compared to the control (P=0.05).It is suggested that by-pass soybean meal could replace up to 50% of conventional soybean meal to improve the growth performance of rabbits.

Key words: Rabbit, By-pass soybean meal, Growth performance, Nutrients digestibility.

INTRODUCTION

It is clear that soybean is a source of high protein content and quality as well as energy with little anti-nutritional factors. It appears the quality of soybean proteins improves when subjected to multiple processing procedures.

Protected or by-pass soybean meal is widely used in ruminant diets. It is not degraded in the rumen and reaches the small intestine unmodified. Supplementation of this type of protein can improve productivity in terms of improved efficiency of meat, milk and wool production (Anonymous, 2019). Various methods have been used for protecting proteins from rumen degradation, such as heat treatment and formaldehyde treatment. These methods are thought to act either by inhibiting proteolytic activity or by modifying protein structure in such a way that the number of protease specific bonds that can be cleaved by microbial enzymes is decreased (Walli, 2005). Obeidat *et al.* (2010) evaluated the effect of replacing 50% or 100% soybean meal (SM) by by-pass soybean meal (BPSM) on performance of fattening lambs. Feed intake, average daily gain and feed conversion ratio of lambs did not differ between diets. Patel *et al.* (2012) reported significant increased daily weight gain in growing buffalo heifers fed protein protected diet compared to the control. El-Ayek*et al.* (2019) reported that average daily gain and NFE digestibility coefficient of growing Rahmani lambs increased using replacing 100% of SM of the diet by BPSM.

This study aimed to investigate the effect replacing of 25% or 50% of dietary soybean meal with by-pass soybean meal on growth performance, dressing out percentage and nutrient digestibility coefficients of the growing rabbits.

MATERIALS AND METHODS

The current research work was carried out at rabbit experimental station and laboratories of Animal Production Research Institute, Egypt.

Treatments, feeding, management, slaughtering, and digestion trial measurement protocol
Sixty, 5-6 weeks old New Zealand White rabbits with an average live body weight 523g were randomly divided into three groups to study the effect of replacing 25% or 50% of soybean meal (44% CP) with by-pass soybean meal (BPSM) on growth performance, dressing out percentage and nutrients digestibility coefficients of rabbits. As both soybean meal had nearly the same proximate chemical composition and feeding value, the diets were formulated to be nearly iso-nitrogenous and iso-caloric. The basal diet was formulated to meet the de Blas and Mateos(2010) requirements. Rabbits were kept under the same management routine. By-pass soybean meal (Soy B Plus dgums) was kindly granted byAlethad for Feed, Oil and Soap (Elgabry Group), Egypt.According to the manufacturer, by-pass soybean meal is prepared by a unique, all-natural, mechanical-extraction process. Currently, the manufacturing process includes addition of gums, with naturally occurring soy nutrients; called lecithin, phosphatidyl-choline and phospholipids – derived from whole soybeans.
For assessment of hot dressing percentage, six rabbits of each treatment were assigned according to Blasco and Ouhayoun (1996). The proximate chemical analyses ofcrude protein, crude fiber and ether extract for soybean meal, BPSM, experimental diets and feceswere carried out according to AOAC (2000) using 6 samples of each treatment. Digestion trial was performed in 5 rabbits per treatment following the European reference method described by Perez *et al*. (1995). The cages were equipped with a wire net under the floor to collect individually and totally the hard feces during a 4-day period. Feces were stored daily in polyethylene bags at –20 ºC until chemical analysis.

Statistical analysis
Data were subjected to a one-way ANOVA using SAS (2001). Variables having significant differences were compared using Duncan's Multiple Range Test (Duncan, 1955).

Table 1: Chemical composition (%) of SBM and BPSM

	Dry matter	Crude protein	Crude fiber	Ether extract	Nitrogen-free extract	Ash
Soybean meal	88.0	42.9	7.30	3.70	42.1	4.01
By-pass Soybean meal	88.1	43.0	7.19	4.91	40.7	4.11

Table 2: Ingredients and calculated chemical composition of the basal diet

Ingredients: clover hay 34.0%, wheat bran 24%, barley 20.0%, soybean meal (44%) 16.0%, molasses 3.0%, Di calcium Phosphate1.3 %, limestone 0.7%, NaCl 0.30%, vitamins & minerals premix* 0.30%, Dl- methionine 0.2%, anti-coccidiostat 0.10%, and anti-fungal 0.10%.

Chemical composition: DM, 89%; crude protein, 17.4%; calculated digestible energy (kcal/kg), 2450;crude fiber, 13.2%; ether extract, 2.24%; nitrogen free extract, 47.0%; Calcium,1.0%; P, 0.7; Lysine, 0.8%; methionine+cysteine, 0.56%

*Supplied per 1 kg diet: 6000 IU vit. A; 900 IU vit. D_3; 40 mg vit. E; 2.0 mg vit. K_3; 2.0 mg vit. B_1; 4.0 mg vit. B_2; 2.0 mg vit. B_6; 0.010 mg vit. B_{12}; 5.0 mg vit. PP; 10.0 mg vit. B_5; 0.05 mg B_8; 3.0 mg B_9; 250 mg choline; 50.0 mg Fe; 50.0 mg Zn; 8.5 mg Mn; 5.0 mg Cu; 0.20 mg I, and 0.10mg Se.

RESULTS AND DISCUSSION

Growth performance and dressing percentage
Results in Table 3 indicate that replacement of SBM with BPSM at 50% substitution level increased (*P*=0.001) final live body weight by 7% over the control that was comparable to the group on 25% BPSM substitution level. Also feed conversion ratio improved (*P*=0.001) with

50% substitution level (+10.8%) compared to the control group that did not differ from 25% substitution level. Treatmentsdid not significantly affect hot carcass percentage.Improvement ofgrowth performanceof the rabbits with BPSM in the current study is in agreementwith studies carried out in buffalo heifers (Patel *et al.* 2012) and lambs (El-Ayek*et al.* 2019). Feeding bypass protein to ruminant had reducing dietary amino acid loss as ammonia, energy conservation through less urea synthesis, efficient protein synthesis and improvement in reproductive efficiency (Tandon, 2008 and Kumar *et al.*2015). In the current study, 50% partial replacement of SBM by BPSM improved ether extract and nitrogen-free extract compared to the control which participates to contribute to the appreciable effect on BPSM feeding.

Table 3: Growth performance and dressing out percentage of rabbits as replacing SBM with BPSM (n=6)

Variable Supplement (per kg diet)	Initial live weight (g)	Final live weight (g)	Total feed intake (g)	Feed conversion ratio	Hot dressing percentage (%)
Control; SBM based diet	514	1649[b]	2931	2.59[b]	54.4
25% SBM replaced with BPSM	533	1683[b]	2824	2.48[b]	54.7
50% SBM replaced with BPSM	523	1771[a]	2863	2.31[a]	53.9
Pooled SE	22	15	44	0.04	1.03
P- value	0.83	0.001	0.16	0.001	0.90

[a, b] different superscripts within a column indicate significant differences.

Faecal digestibility

Results in Table 4 indicate digestion coefficients of dietary constituentsas BPSM substituted 25% or 50% of SBM of the control diet. Soybean meal source did not affect the digestibility coefficients of DM, OM, crude protein and crude fiber.BPSM inclusion level improved (*P*=0.001) ether extractdigestibility, while 50% BPSM improved (*P*=0.05) nitrogen free extract digestibility. In this turn, El-Ayek *et al.*(2019) reported that digestion coefficients of DM, CP, CF and EE were not affected by dietary soybean meal source (SM *vs.* BPSM), only digestibility coefficient of NFE was improved with BPSM inclusion of the diet as seen in the current study.

Table 4: Digestion coefficients of nutrients as replacing SM with BPSM (n=5)

Diet **Nutrient digestibility %**	**SBM baseddiet**	**SM replaced by BPSM**		**SEM**	**P value**
		25%	**50%**		
Dry matter (DM)	66.7	66.0	65.7	1.63	0.65
Organic matter (OM)	65.4	65.6	64.9	2.01	0.34
Crude protein (CP)	76.6	76.9	76.3	2.11	0.78
Crude fiber (CF)	30.8	33.9	32.8	4.10	0.24
Ether extract (EE)	56.0[b]	63.8[a]	64.9[a]	1.98	0.001
Nitrogen free extract (NFE)	70.8[b]	69.2[b]	72.3[a]	1.95	0.050

[a, b] different superscripts within a column indicate significant differences.

CONCLUSIONS

Inclusion of by-pass soybean meal up to 50% in expense of conventionally prepared soybean meal in the rabbit diet is promising as it could improve the growth performance.From economical point of view, the cost benefits of using BPSM soy by-pass protein at 50% expense of conventional soybean meal in the current study is estimated by 8-10% according to local Egyptian market.

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