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ABSTRACT

The present study was carried out to evaluate the effect of dietary supplementation of soybean oil (SBO) to increase neutral detergent fiber (NDF) contents on growth performance (GP), nutritive values (NV) and carcass quality of growing New Zealand White (NZW) rabbits. A total sixty, 5 weeks old male weaned rabbits of mixed breeds with a mean body weight of 774.42g were randomly allocated to four dietary groups of 15 rabbits each. Experimental groups were fed diets supplemented with 0, 1, 2 &3% fat. The feeding trial lasted for 6 weeks. Growth performance parameters as body weight (BW), feed intake (FI) and feed conversion ratio (FCR) were determined every week. At the end of the experiment (8 weeks), 6 rabbits from each group were randomly taken, weighted and slaughtered to complete bleeding. The rabbits from each treatment were dressed, eviscerated samples taken for determination of moisture, CP, EE and ash contents.

The obtained results revealed that supplementation of SBO in diets NZW rabbits up to 2% improve BW and FCR and didn't significantly affect the feed intake. However, supplementation of 3% SBO in diets of NZW rabbits did not significantly increased the BW and weight gain (BWG), FI and FCR. Fat supplementation didn't affect the dressing carcass percent & internal organs weight. The present study concluded that supplementation of SBO in diets NZW rabbits up to 2% significantly improve the growth performance and body composition.

INTRODUCTION

Nowadays, a number of entrepreneurs and youth project owners start small or medium enterprises for raising rabbits, to produce a good source of animal protein and to provide job opportunities. Rabbit meat has a good nutritional value and is highly valued because of its dietary properties, since it is a lean meat with a low-fat content , less saturated FAs and cholesterol than other meats and a source of B vitamins (B2, B3, B5, B12) **(Combes, 2004 & Hernández, 2008).**

The use of fats and oils in diets for nonruminants is becoming more common. Moreover, in recent years fat and oil producers have increased pressure on the compound feed industry to incorporate these raw materials into animal diets. The addition of fat to diets of growing rabbits increases digestible energy content and feed conversion efficiency **(Santoma et al., 1987).** Fats are added to rations for several reasons. Nutritionally, fat are exclusively energy sources and are highly digestible (especially by monogastric animals). Digestible fat supplies about 2.25 times as much energy as digestible starch or sugar, thus

fat can be used to increase energy density of a ration. Fats generally increase absorption of fat soluble nutrients, such as fat soluble vitamins (**Mc Donald et al. 1987).**

Beynen (l988) stated that there was a need to raise the fat content of diets for rabbit fryers to enhance body weight gain and improve feed conversion and that carbohydrate can be replaced by fat on calorie for caloric basis. Because fat has high efficiency of conversion of the metabolizable energy into retained energy and supplies essential fatty acids, the fat was often used in commercial meat rabbit production. **NRC (1977)** recommended that the dietary fat requirement of growing rabbits was 2-5%.

Fiber is one of the main components of rabbit diets which usually contain 35 to 40% NDF. Alfalfa hay and berseem hay is the most common source of fiber used in Egypt, accounting for approximately one-third of the commercial feeds. However, the use of hay is not exempt from problems, mainly because of variations in chemical composition, microbial contamination or price (**Mateos and Rial, 1989**).

Dietary fibers are the main constituent of a rabbit feed and sufficient dietary fiber supply is essential to prevent digestive troubles in rabbits (**Chao and Li, 2008**). High fiber intake favoured high fibrolytic activity and improved health status of rabbits (**Gidenne et al., 2004; Oso et al., 2011**). Dietary NDF was as crucial factor regulating microbial activity within the caecum of rabbits (**De Blas et al., 1999**). So the present study was conducted to investigate the effect of dietary supplementation of soybean oil (SBO) to increase neutral detergent fiber (NDF) contents on growth performance (GP), nutritive values (NV) and carcass quality of growing New Zealand White (NZW) rabbits.

MATERIALS AND METHODS

a) Experimental diets and Management

The study was carried out at the Rabbit Unit of the Faculty of Veterinary Medicine of Mansoura University, Egypt. Four experimental (isocaloric and isonitrogenous) diets (Table 1) were formulated having four levels of fiber components (16.30 – 18.34 %), NDF (32.86 - 36.30%), ADF (20 – 23%) and fat (0 – 3 %). Crude protein and digestible energy levels of diets similar or close to values recommended for maximum rabbit meat production was considered as optimum (**Lebas, 1991**).

b) Experimental rabbits:-

A total sixty 5-weeks old weaned Newzealand rabbits of mixed breeds with a mean body weight of 774.42 g were randomly allocated to 4 dietary groups of 15 rabbits each to study the influence of dietary fat supplementation on growth performance, carcass quality and proximate chemical analyses of whole body. The feeding trial lasted for 6 weeks. A total of 27 fabricated wired rabbit hutches (each of dimension 200 cm × 80 cm × 80 cm (LWH)) were used in all for the study. Each hutch was partitioned into 5 equal cage units. A total of 3 hutches were assigned to a treatment. Feed intake and live weight were recorded per rabbit housed in each cage unit. The total feed intake, weight gain and feed conversion ratio were also computed.

c) Samples collection:-

At the end of the feeding trial, 6 rabbits per treatment was randomly taken, weighted, slaughtered, eviscerated and the following parameters were determined:

- Dressed carcass% = Carcass weight/ live weight x 100.
- Abdominal fat weight and percent in relation to the live body weight.
- Liver, kidney and heart weight and their relative weight to the live body weight.
- Samples from muscles were taken.

d) Statistical Analysis

The results were subjected to one way ANOVA to test the effect of dietary fat supplementation on growth performance and carcass quality of early weaned rabbit. Data were analyzed using statistical SPSS v14 as described by **Snedecor and Cochran (1967).** Differences between means were compared using Duncan's multiple range tests at significance of differences ($p < 0.05$) among dietary treatments.

Table (1): Ingredient and nutrient composition of the experimental diets.

Feed ingredients	Dietary treatments			
	Control	Dietary fat percentages		
		1%	2%	3%
Alfalfa hay	45.22	45.97	47.32	47.10
Straw	1.26	2.60	3.96	6.50
Wheat bran	20.00	20.80	21.00	18.72
Yellow corn	7.27	3.14	1.65	1.28
Barley	17.80	17.80	15.00	13.00
Soybean meal	7.70	7.94	8.33	9.66
Soybean oil	0.00	1.00	2.00	3.00
Common salt	0.30	0.30	0.30	0.30
Vitamin mineral premix*	0.30	0.30	0.30	0.30
Methionine	0.15	0.15	0.14	0.14
Nutrient composition				
Crude protein	16.01	16.00	16.00	16.00
Digestible energy	2521	2520	2520	2520
Crude fiber	16.30	17.00	17.72	18.34
ADF	20.00	21.00	22.00	23.00
NDF	37.67	39.03	39.51	39.81
Hemicelluloses	17.67	18.03	17.51	16.81
Calcium	0.68	0.69	0.71	0.70
Total phosphorus	0.49	0.49	0.49	0.46
Lysine	0.71	0.71	0.72	0.73
Methionine	0.60	0.60	0.60	0.60

*Trace minerals & vitamins premixes were prepared to cover the levels of the microminerals &vitamins for growing rabbit as recommended by **(NRC, 1977).**Vitamins premix (IU or mg/kg diet); vit. A 15000, Vit. D3 3000, vit. E 20, vit. k3 2, vit. B1 2, vit. B2 5, vit. B6 1.5, vit. B12 0.02, Pantothenic acid 10, Folic acid 1, Biotin 0.15, Niacid 30.Mineral mixture(mg/kg diet); Fe 40, Mn 80, Cu 4, Zn 50, I 0.5, Co 0.2 & Se 0.2.

Table (2): Effects of dietary fat supplementation on growth performance of early weaned rabbit

Exp. period (W)		Dietary treatments			
		Control	Dietary fat percentages		
			1%	2%	3%
0 - 1	G	228.29^{c} ± 5.95	294.13^{b} ± 10.20	328.75^{ab} ± 4.67	337.50^{a} ± 12.40
	F	588.86 ± 7.54	573.13 ± 5.36	629.13 ± 6.04	510.88 ± 7.70
	FCR	2.58 ± 0.07	1.95 ± 0.08	1.91 ± 0.03	1.81 ± 0.07
1 - 2	G	299.57^{b} ± 5.40	322.25^{ab}± 10.95	347.63^{a} ± 7.78	348.13^{a} ± 14.42
	F	665.43 ± 7.97	693.75 ± 6.70	716.25 ± 6.62	727.40 ± 9.21
	FCR	2.22 ± 0.03	2.15 ± 0.06	2.06± 0.05	2.09 ± 0.07
2 - 3	G	265.86^{b} ± 6.51	271.63^{b} ± 7.01	312.50^{a} ± 7.23	312^{a} ± 9.00
	F	730.71 ± 8.52	834.38 ± 8.56	880.21 ± 9.99	888.50 ± 8.85
	FCR	2.75 ± 0.07	3.07 ± 0.09	2.82 ± 0.07	2.85 ± 0.08
3 - 4	G	215.57^{b} ± 8.77	225.38^{b} ± 4.18	255.38^{a} ± 14.26	268.88^{a} ± 13.39
	F	795.64 ± 9.10	908.75 ± 10.88	963.75 ± 8.70	988.13 ± 9.02
	FCR	3.69 ± 0.14	4.03 ± 0.07	3.77 ± 0.24	3.68 ± 0.16
4 - 5	G	265.43 ± 6.74	261.88 ± 11.33	276.88 ± 10.58	245.38 ± 15.60
	F	923.57 ± 6.01	953.75 ± 10.06	981.88 ± 13.86	996.13 ± 16.32
	FCR	3.48 ± 0.08	3.64 ± 0.15	3.55 ± 0.13	4.05 ± 0.34
5 - 6	G	198.29 ± 7.70	183.88 ± 4.80	208.75 ± 10.63	175.38 ± 14.60
	F	1029.57± 24.41	1000 ± 17.19	1062.5 ± 16.13	1079.63 ± 23.07
	FCR	5.19 ± 0.23	5.44 ± 0.16	5.09 ± 0.27	6.16 ± 0.69
0 - 6	G	1403.00 ± 18.85	1559.12 ± 17.61	1729.89 ± 19.58	1687.27 ± 25.36
	F	4733.75 ± 92.39	4963.76 ± 85.46	5233.72 ± 96.16	5190.67 ± 91.12
	FCR	3.38 ± 0.42	3.18 ± 0.37	3.03 ± 0.41	3.08 ± 0.48

G= gain (g), F= feed consumed (g)/rabbit, FCR= feed conversion ratio

^{a,b} Means ± standard error in the same row with different letters are significant ((P < 0.05).

Table (3): Effects of dietary fat supplementation on carcass quality of early weaned rabbit

	Control	Dietary fat %		
		1	2	3
Parameters				
Body weight,g	2282.67^{b} ±11.80	2341.0^{b} ± 13.80	2506.50^{a} ±13.69	2488.29^{a} ±24.23
Dressed carcass, g	1264.67^{b} ±12.06	1290.33^{b} ± 12.58	1385.0^{a} ± 11.69	1382.86^{a} ±15.48
Dressed carcass%	55.16 ± 0.37	55.12 ± 0.25	55.26 ± 0.32	55.58 ± 0.49
Liver weight, g	71.33 ± 2.51	72.67 ± 1.99	74.17 ± 3.08	74.14 ± 2.34
Liver%	5.64 ± 0.23	5.56 ± 0.16	5.36 ± 0.24	5.36 ± 0.11
Kidney weight, g	17.67 ± 0.33	17.16 ± 0.73	18.70 ± 0.73	17.43 ± 0.40
Kidney%	1.35 ± 0.03	1.33 ± 0 .06	1.35 ± 0.06	1.26 ± 0.03
fat weight, g	22.33 ± 1.38	42.00 ± 2.58	43.17 ± 1.99	46.57 ± 1.90
Fat%	1.71^{b} ± 0.10	3.25^{a} ± 0.19	3.12^{a} ± 0.15	3.37^{a} ± 0.15

^{a,b} Means ± standard error in the same row with different letters are significant ((P < 0.05).

RESULTS & DISCUSSION

a) Effects of dietary fat supplementation on growth performance of early weaned rabbit

The data concerning growth performance (Table 2) showed that final live weight and WG increased with increasing dietary fiber level (increasing the dietary fat supplementation). Improved growth response obtained in the current study with rabbits fed diet containing high fiber. These results agreed with that of **Tao and Li, 2006** which indicated that rabbits can be sustained on high fiber diets. In addition, **Pinheiro et al. (2009)** found improved growth performance of growing rabbits fed diets containing 23.3 g/kg ADF and 73 g/kg ADL.

Rabbits fed with high fiber recorded the highest FI, final live weight and WG. However, rabbits fed with low fiber had the worst feed to gain ratio. Highest FI obtained with rabbits fed high fiber diet could be due to the ability of rabbits to adjust its voluntary intake in response to changes in dietary energy concentration (**Patridge et al., 1989**). Rabbits fed diet containing low fiber had the least final live weight, weight gain. Highest apparent NDF digestibility was obtained with rabbits fed diets containing optimum fiber + optimum DE while highest ADF digestibility obtained with rabbits fed with high fiber + high DE.

Improved FCR obtained with rabbits fed high fiber diet. Our finding is agreement with that of reported by **Nguyen and Nguyen (2008)** who concluded that dietary inclusion of up to 410 g/kg NDF in rabbits gave higher growth rates and better benefits for rabbit producers. Rabbits fed high fiber diets tend to consume more to meet its energy requirement. Poor growth noticed with rabbits fed low fiber diets in this study agreed with previous findings obtained with (**Bennegadia et al., 2001**).

(b) Effects of dietary fat supplementation on carcass quality of early weaned rabbit

Effect of feeding the growing rabbits on diets containing different levels of fat on the carcass traits at the end of experiment are present in table 3. The differences in live weight between the rabbit groups are due to differences in BW of the individual rabbits taken from each group for slaughtering. The present results indicating that feeding growing rabbits on diets containing different levels of fat did not affect the dressed carcass or organ percentage of the growing rabbits slaughtered at 84 d of age.

From the present study it could be concluded that supplementation of rabbit diet with 2% soybean oil could improve growth performance and carcass quality.

REFERENCES

A.O. A. C. (1990). Official Methods of Analysis (15th Ed.). Association of Official Analytical Chemists, Arlington, VA.

Bennegadia, N., Gidenne, T. and Licois, D. (2001). Impact of fibre deficiency and sanitary status on non-specific enteropathy of the growing rabbit. *Animal Research*. 50: 401–413.

Beynen, A, C. (1988). Growth performance by rabbits fed diets containing various

levels of corn oil. 8th World Rabbit Congress, Budapest 3:230-234.

Chao, H.Y.and Li, F.C. (2008). Effect of level of fibre on performance and digestion traits in growing rabbits. Anim. Feed Sci. Technol., 144 (3–4) : 279–291.

Combes, S. (2004). Valeur nutritionnelle de la viande de lapin. Prod. Anim., 17: 373–383.

De Blas, C., Garcia, J. and Carabaño, R. (1999). Role of fibre in rabbit diets. A review. Ann. Zootech. 48, 3-13.

Gidenne, T., Mirabito, L., Jehl, N., Perez, J. M., Arveux, P., Bourdillon, A., Briens, C., Duperray, J. and Corren, E. (2004). Impact of replacing starch by digestible fibre, at two levels of lignocellulose, on digestion, growth and digestive health of the rabbit. Animal Science 78, 389–398.

Hernandez, P. (2008). Enhancement of nutritional quality and safety in rabbit meat. In: Proc. 9th World Rabbit Congress, Verona, Italy, 1287–1299.

Lebas, F. (1991). Alimentation pratique des lapins en engraissement. Cuniculture, 18, 273- 281.

Mateos, G. G. and Rial, E. (1989). Tecnologia para la fabricacion de piensos compuestos para Conejos. En: Alimentacion del conejo. Ed. Mundi-Prensa. PP 101-132.

McDo ald, P., Edward, R. A and Grenhaigh., F. D. (1987). Animal Nutrition. Singapore: Longman Limited.

NRC 1977. Nutrient Requirements of Domestic Animals, No. 9 .Nutrient requirements of rabbits. Second Revised Ed. National Academy of Sciences-National Research Council, Washington, DC, USA.

Nguyen, V.T. and Nguyen, T. D. (2008). Effect of water spinach and sweet potato vine associated with 2 other natural plants, on growth performance, carcass values and economic return of growing crossbred rabbits in the Mekong delta of Vietnam. Proc. 9th World Rabbit Congress, Verona, Italy, 763-768.

Oso, A.O., Sobayo, R. A., Jegede, A.V., Fafiolu, A.O., Iyasere, O.S., Dele, P., Bamgbose, A.M. and Cecilia, A. (2011). Effect of dietary inclusion of sorghum milling waste on growth response, nutrient utilisation, gut characteristics and cecal microflora of weaner rabbits. Animal Science Journal (Japan) 82, 468-474.

Partridge, G. G., Garthwaite, P. H. and Findlay, M. (1989). Protein and energy retention by growing rabbits offered diets with increasing proportions of fiber. Journal of Agricultural Science 112, 171-178.

Pinheiro, V., Guedes, C. M., Outor-Monteiro, D.and Mourão, J. L. (2009). Effects of fiber level and dietary mannanoligosaccharides on digestibility, caecal volatile fatty acids and performances of growing rabbits. Anim. Feed Sci. Technol., 148, 288–300.

Santoma, G., De Blas, J. C., Carabano, R. and Fraga, M. J. (1987). The effects of different fats and their inclusion level in diets for growing rabbits. Anim. Prod., 45: 291-300.

Snedecor, G. W. and Cochran, W. G. (1967). Statistical Methods 6th ed., Oxford and IBN Publishing Co., PP. 344- 346.

Tao, Z. Y. and Li, F.C. (2006). Effects of dietary neutral detergent fibre (NDF) on production performance, nutrient utilization, caecum fermentation and fibrolytic activity in 2–3 month New Zealand rabbits. J. Anim. Physiol. Anim. Nutr.;90:467–473.

الملخص العربي

تأثير اضافة زيت الصويا في عليقه الارانب النيوزيلاندي على معدلات النمو وموصفات الذبيحة

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قسم التغذية وأمراض سوء التغذية - كلية الطب البيطري - جامعة المنصورة

أجرى هذا البحث لدراسة أثراستخدام مستويات مختلفة من زيت فول الصويا في علائق الارانب النيوزيلاندي حديثة الفطام على معدلات النمو(وزن الجسم – والزيادة في الوزن كذلك كفاءة التحويل الغذائي- صفات الذبيحة – نسبة الدهن في الجسم) ٠

أجريت التجربة على ٦٠ أرنب نيوزيلاندي أبيض حيث تم تغذيتهم لمدة ٨ أسابيع علي ٤ علائق تحتوى على نسب مختلفة من زيت الصويا (١-٢-٣%) مع الاختلاف في نسبة الأليـاف. ثم تقسيمهم إلى٤ مجموعات غذيت على علائق متساوية في الطاقة (٢٥٠٠كيلو كالورى طاقة مهضومة لكل كجم) والبروتين (١٦%) تم وزن الارانب عند نهاية كل أسبوع من العمر لمتابعة النمو مع تسجيل العلف المستهلك .عند نهاية التجربة (عمر ١٢ أسبوع) ذبح ٦ أرانب من كل مجموعة لقياس صفات الذبيحة.

وقد خلصت نتائج الدراسة الي:-

- استخدام زيت فول الصويا في علائق الارانب النيوزيلاندي حديثة الفطام لنسبة تصل الى ٢% أدى الى تحسين معدل التحويل الغذائي ووزن الجسم .
- استخدام زيت فول الصويا في علائق الارانب النيوزيلاندي حديثة الفطام بنسبة ٣% لم يؤدي الي زيادة كبيرة في (وزن الجسم- كفاءة التحويل الغذائي و كذلك لم يؤدي الي زيادة كبيرة في كمية العلف المستهلك).
- استخدام زيت فول الصويا في علائق الارانب النيوزيلاندي حديثة الفطام بهذه النسب المختلفة (٠-١-٢-٣%) أدى الي زيادة محتوي الجسم من الدهون - لم يؤثر علي نسبة التصافى ولم يكن له تأثير واضح علي وزن الأعضاء الداخلية ونسبتها الى نسبة الوزن الكلى.

ينصح باستخدام زيت فول الصويا في علائق الارانب النيوزيلاندي حديثة الفطام بنسبة تصل الي ٢% حيث أدت الى زيادة معدلات النمو وحسنت من صفات الذبيحة.