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Effect of Supplementation of Vegetable Oils in feed of broiler Rabbits

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Abstract

A study was conducted on 48 weaned Soviet Chinchilla rabbits to evaluate the effect of supplementation of vegetable oils with respect to growth and reproductive performance. The rabbits were divided into four groups of twelve each. First group (T_1) fed on basal diet alone, second group (T_2) fed on basal diet supplemented with rice bran oil @ 2 per cent level, third group (T_3) fed on basal diet supplemented with palm oil @2 per cent level and fourth group (T_4) fed on basal diet supplemented with both rice bran oil and palm oil each @ one per cent level. The result of the study reveals that rabbits fed basal diet with 2 per cent palm oil group (T_3) had significantly ($P<0.01$) lower cumulative dry matter intake, better average daily and cumulative weight gain, and also feed conversion ratio as compared to other treatment groups. Rabbits supplemented with palm oil 2 per cent level (T_3) mated significantly ($P<0.01$) earlier than other groups. The mean litter size at birth was not significantly differed among treatment groups. The litter size at weaning was significantly higher in T3 and T4. Similarly, litter weight at weaning was significantly ($P<0.05$) higher in T3 and T4 groups. Higher net income (Rs. 618.29 per animal) was recorded in rabbits supplemented with palm oil alone (T_3) group than other groups.

Key words: Broiler Rabbits, Oil Supplementation, Performance, Economics

Introduction

Supplementation of diets with palm oil or rice bran oil or both are essential in ensuring adequate utilization of nutrients for growth and reproduction (Sell and Owings, 1981). Fat supplementation in rabbit feed especially vegetable oil, has demonstrated better growth and reproductive performance and have also been shown to have carry over effect to their progeny (Pascual *et al.,* 1999). Few studies have been conducted on the use of rice bran oil and palm oil on the performance of rabbits (Vidjannagni *et al.,* 2017). Comparatively rice bran oil and palm oil are the cheapest and most readily available oils than other vegetable oils in our country. Therefore, the present study was carried out with the objective to evaluate the effect of supplementation of vegetable oils on performance and economics of broiler rabbits.

Materials and Methods

The study was conducted at the rabbit unit of Instructional Livestock Farm Complex (ILFC), Veterinary College and Research Institute, Namakkal, Tamil Nadu. Forty eight Soviet Chinchilla weaned rabbits of the age group of six weeks were selected and randomly divided into four groups consisting of twelve rabbits each (six male and six female rabbits). First group (T_1) fed on basal diet alone, second group (T_2) fed on basal diet supplemented with rice bran oil @ 2 per cent level, third group (T_3) fed on basal diet supplemented with palm oil @2 per cent level and fourth group (T_4) fed on basal diet supplemented with rice bran oil and palm oil each @ one per cent level. All the animals were reared under uniform management conditions.The growth trial was conducted from the date of weaning (6 weeks) to slaughter age (16 weeks). At the end of growth trial about 16 weeks of age, a total of sixteen male rabbits, four from each group were selected randomly and slaughtered to evaluate the carcass characteristics and the remaining two males from each group were utilized for breeding purpose in the respective group. Reproduction trial was conducted with remaining 24 female rabbits of the four groups. The feeding trial was continued for remaining breeding females up to weaning of their off springs to assess the effect of vegetable oils on reproductive performance of broiler rabbits. The growth and reproductive parameters were studied and economics of supplementation of vegetable oils was calculated. The data during the course of the study were analysed statistically as per Snedecor and Cochran (1996).

Results and Discussion

Growth performance:

Palm oil alone supplemented group and both palm oil and rice bran oil supplemented group registered higher final body weight, 2039.00 ± 46.75 and 2033.50 ± 37.34 g respectively, than rice bran oil supplemented group and basal diet group (Table 1). The increase in weight gain with oil added groups (T_2, T_3 and T_4) was due to an increase in the energy level of the diet which increased protein and fat utilization. Beynen (1988) also 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 ratio. Fat supplementation resulted in better growth due to a higher energy intake in fat added diet (Cervera *et al.,* 1997).

At the end of the experiment, oil supplementation increased the cumulative weight gain and average daily gain of rabbits than basal diet group. This indicated that palm oil alone @ 2 per cent level or combination of rice bran oil with palm oil each @ 1 per cent level could be used as a potential supplement by the rabbit farmers as it is easily available, relatively cheaper compared to imported fats and it possess many good qualities and also easy for feeding .

At the end of the experiment among the oil supplemented groups, cumulative dry matter intake was significantly ($P<0.01$) lower in 2 per cent palm oil supplemented group (4917 g) compared to basal diet where the dry matter intake was highest (5117 g). This might be due to dietary fat addition increased energy level of the diet and decreased the dry matter intake (DMI) of rabbits. Fat could reduce dry matter intake but at the same time increase the weight gain.

Among the supplemented groups, T_3 group (Palm oil) had better feed conversion ratio followed by combination of rice bran oil and palm oil group (T_4) than T_2 (Rice bran oil) and T_1(only basal diet). These results indicate that addition of vegetable oils to the broiler rabbit diet may improve the digestion of feed, absorption of nutrients in the gastrointestinal tract and in turn improves feed conversion ratio (FCR). These findings suggest that oil supplementation improved weight gain and feed efficiency in broiler rabbit by improving digestibility of protein and fat, whereas fibre digestibility was reduced.

Table 1. Mean (± SE) of growth and reproductive performance (g) of Soviet Chinchilla rabbits supplemented with vegetable oils

Period (days)	T_1 (Basal diet)	T_2 (Basal diet with 2 % rice bran oil)	T_3 (Basal diet with 2 % palm oil)	T_4 (Basal diet with 1 % rice bran oil and 1 % palm oil)	P-value
Initial Body weight (g) 6 weeks	796.17 ± 37.41	796.42 ± 34.83	796.83 ± 35.59	794.75 ± 34.04	1.00^{NS}
Final body weight (g) at 16 weeks	1943.25 ± 21.41	1971.25 ± 33.87	2039.00 ± 46.75	2033.50 ± 37.34	0.18^{NS}
Cumulative weight gain(43 – 112 days)	1147.08 ± 45.80	1174.83 ± 39.22	1242.17 ± 37.09	1238.75 ± 41.23	0.28^{NS}
Average daily weight gain (g)	16.39 ± 0.65	16.78 ± 0.56	17.75 ± 0.53	17.70 ± 0.59	0.28^{NS}
Cumulative dry matter intake (g)	5117.89^{c} ± 40.94	4955.07^{ab} ± 9.84	4917.35^{a} ± 12.14	4997.43^{b} ± 16.13	0.00**
Overall FCR	4.54 ± 0.19	4.27 ± 0.14	3.99 ± 0.12	4.09 ± 0.15	0.08^{NS}
Age at first mating in does (days)	183.00^{b} ± 2.31	178.33^{b} ± 1.23	167.17^{a} ± 1.74	169.67^{a} ± 1.28	0.00**
Litter size at birth (Nos)	3.67 ± 0.21	3.83 ± 0.48	4.83 ± 0.31	4.50 ± 0.43	0.12^{NS}
Litter size at weaning (Nos)	2.67^{a} ± 0.21	3.17^{ab} ± 0.48	4.33^{b} ± 0.42	4.00^{b} ± 0.37	0.02*
Litter weight at birth (g)	213.33 ± 7.81	214.50 ± 25.34	258.00 ± 13.89	226.17 ± 15.92	0.24^{NS}
Litter weight at weaning (g)	1750.50^{a} ± 167.07	1873.33^{ab} ± 191.92	2512.33^{c} ± 234.42	2407.33^{bc} ± 195.73	0.03*
Pre-weaning mortality (%)	26.38 ± 6.60	18.05 ± 6.24	10.83 ± 4.90	10.27 ± 4.72	0.19^{NS}

* Significant (P< 0.05), ** Highly significant (P< 0.01), NS Non-significant, Mean with different superscript within a row differ significantly.

Reproductive performance:

Age at first mating:

The data presented in table 1 revealed that the does fed with palm oil (T_3) mated at an earlier age followed by rice bran oil with palm oil supplemented group (T_4). The 16 days reduction in age at first mating observed in palm oil supplemented does than the does fed with basal diet alone has obvious economic benefits. The improvement of 14 to 16 days in age at first mating in T_4 and T_3 than the T_1 group might be due to the better nutritional status and higher body weight gain of the oil supplemented does enabled them to attain earlier maturity and there by earlier age at first mating. Many studies showed that adding dietary fat to rations improved reproductive performance by altering both ovarian follicle and corpus luteum function (William and Stanko, 1999). Das and Nayak (1991) observed a 19 days increase, whereas Ghosh *et al.* (2004) observed a still lesser increase of 6 days in age at first mating of Soviet Chinchilla rabbits fed on basal diet alone.

Litter size at birth and weaning:

The average litter size at birth was numerically higher in palm oil supplemented group (4.83) followed by both rice bran oil with palm oil supplemented group (4.50). Compared to the litter size at birth, the litter size at weaning was reduced uniformly in all the treatment groups (Table 1). However, palm oil supplemented group (T_3) and both rice bran oil with palm oil supplemented groups (T_4) maintained a significantly ($P<0.05$) higher litter size at weaning than control group. It was inferred that supplementation of vegetable oils in the feed of breeding does both during gestation and lactation not only increased the litter size at birth, but also improved the survival rate of suckling bunnies. This might be due to the carry over effects of oil supplementation and weight gain of does during gestation on mothering ability and health status of the does.

Litter weight at birth and weaning:

Among the supplemented groups, does supplemented with palm oil @ 2 per cent level (T_3) had registered higher litter weight followed by T_4 group rabbits which was supplemented with both rice bran oil with palm oil each @ 1.0 per cent level. The results revealed that does supplemented with palm oil alone gained higher litter weight of 45 gram and 762 gram over the control groups at birth and weaning, respectively. Improved body weight of bunnies in palm oil and rice bran oil with palm oil supplemented groups could be attributable to superior body conditions of the does during gestation and also to better milk production. It may be due to the higher gestational weight gain and lactation weight loss in T_3 and T_4 groups. Further, the litter weight at weaning is an index of milk production in the doe. The higher weaning weights of rabbits resulted from the increased amount of milk available to the litter and from the modification of the milk's fatty acid profile. These results agreed with the previous studies of Pascual *et al.*(1999).

Pre-weaning mortality:

The pre-weaning mortality of the rabbits fed on basal diet was more than double of those fed with palm oil (26.38 per cent against 10.83 per cent), respectively which may be attributed to development of immune response by increasing antibody formations. Maertens *et al.* (2005) also reported that fat inclusion in diet stimulate development of immune response by increasing antibody formation. Such reduction in pre-weaning mortality of bunnies might be due to the fact that feeding of high energy diet by means of supplementing vegetable oils to doe's diet during the period of gestation and lactation may improve body condition, stimulates the development of immune system, improve the health and provision of antibodies to their progenies.

Economics

The economics of rabbits supplemented with vegetable oil is presented in Table 2. Highest net income was recorded bygroup T_3 and lowest by group T_1. Net income per animal was also highest in group T_3 followed by group $T_4$and T_2, lowest income was recorded by group T_1.

Table 2. Cost effectiveness of rabbits fed with vegetable oil supplementation

Particulars	T_1 (Basal diet)	T_2(Basal diet with 2% rice bran oil)	T_3 (Basal diet with 2% palm oil)	T_4 (Basal diet with 1 % rice bran oil and 1 % palm oil)
1. Expenditure				
Total expenditure (Rs.)	3557.19	3852.38	3701.78	3801.79
2. Receipt				
Total receipt (Rs.)	8299.44	9145.44	11121.25	10567.13
3. Net income (Total receipt - Total expenditure)				
Net income (Rs.)	4742.25	5293.06	7419.47	6765.34
Net income per animal (Rs.)	**395.19**	**441.09**	**618.29**	**563.78**

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