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Role of feed additives on growth performance of rabbit at different ages

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ABSTRACT - The rabbit farming is emerging as an important enterprise in many countries of the world. In addition to better nutritional status of rabbit meat, it has no racial and religious restriction for consumption. Cholesterol creates several health problems in human being. In view of this now a days people avoid to take more cholesterol rich content food like red meat and prefer white meat. Rabbit meat has high biological value, high in protein (21%), good quality white meat with low % of cholesterol and sodium (Chakrabarti *et al.* 1995). Probiotic that contain yeast, live bacteria or bacterial spores can also prevent enteric diseases of rabbits. Instead of growth promoters with antibiotics that kill some of the rabbit's own gastrointestinal flora, Probiotic promote gut colonization and stabilize eubiosis by competitive growth against harmful microorganisms, reducing the intestinal pH with production of lactic acid and encouraging digestion by producing enzymes and vitamins. The role of minerals in living organisms is an emerging area of strong interest for producers, feed manufactures and scientists because trace elements unquestionably play an important role in Pathology and Physiology of biological system. Therefore, effect of feed additives (minerals and probiotic) individually or in combination was studied in 18, weaned rabbits of 6 weeks of age for a period of 7 weeks. All the rabbits were randomly divided into three groups. Group G_1 was considered as control group maintained on basal diet without probiotic and mineral mixture. Group G_2 was supplemented with 60g probiotic along with basal diet whereas G_3 group was supplemented with 60g probiotic and 2% mineral mixture along with basal diet. The effect of feed additives on body weight in the rabbit was found to be non-significant however, the rabbits of G_3 groups had higher body weight than the rabbits of G_1 and G_2 groups during whole experimental period. At 12th week of age, the average body weight of the rabbits of G_3 (1447.00±88.22 g) group maintained on 2% mineral mixture and 60g probiotic along with basal diet was observed to be higher followed by the rabbit of G_2 (1370.67±74.64 g) and G_1 (1258.00±76.20 g) groups. At the end of experiment (i.e. 13th week) the average body weight of the rabbits of G_3 group (1514.67±75.91 g) was also observed to be higher followed by the rabbits of G_2 (1447.33 ± 73.64 g) and G_1 (1296.67 ± 71.99 g) groups. During 6 – 12th weeks of age, overall body weight gain of the rabbits of G_3 (813.67±41.73 g) group was observed to be significantly higher than the rabbits of G_1 (623.67±48.93 g) group. However, the difference between G_3 and G_2 was observed to be non-significant. During 6 - 13th week of age, the same pattern of body weight gain was observed in the rabbit of different groups. The overall feed conversion ratio during 6 – 12th week of age in the rabbits of G_3 (3.87) group was observed to be better than the rabbits of G_2 (4.50) and G_1 (5.28) groups. At the end of experiment (i.e. 6 – 13 week of age), the overall feed conversion ratio in the rabbits of G_3 (4.35) group was observed to be better than G_2 (4.91) and G_1 (6.01) groups. The above findings indicated that the rabbit may be fed 2% mineral mixture and 60 gm probiotic as feed additives along with basal diet to boost up rabbit growth and better feed conversion ratio. Further it is also suggested that the rabbits may be sold in the market at the age of 12th week for better return.

Key Words: Feed Additive, Probiotic, body weight, minerals

I. INTRODUCTION

The rabbit farming is emerging as an important enterprise in many countries of the world. The rabbit farming has great potentials in the economy of high hilly areas (Sharma & Prasad, 1980, Tripathi and Pandey, 1986 and Tripathi and Kumar 1992) because it provides additional income to

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small and marginal farmers which may be a source of their livelihood and increasing opportunity for employment to weaker section of rural community in tribal belt of Jharkhand. In addition to better nutritional status of rabbit meat, it has no racial and religious restriction for consumption.

Cholesterol creates several health problems in human being. In view of this now a days people avoid to take more cholesterol rich content food like red meat and prefer white meat. Rabbit meat has high biological value, high in protein (21%), good quality white meat with low % of cholesterol and sodium (Chakrabarti *et al.* 1999). Rabbit meat is suggested because of inter-relationship between cholesterol saturated and poly saturated fatty acid and caloric content. The actual cholestromic effects of rabbit meat may be lower than that of red meat. Hence in many countries of the world particularly in European and Asiatic countries rabbits are domesticated for meat.

The digestive process is very complex and fragile in rabbits due to caecal microbial fermentation in them because of great variation in adoptability in such microflora. That is why rabbits are rather sensitive to enteric diseases and especially when they are exposed to negative impacts, e.g. weaning or heat stress, causing high losses. To get rid of this problem, antibiotics were used to check growth of harmful organisms which cause inhibition of these innocuous useful micro floras through competitive inhibition. However, because of the general intention to limit antibiotics in animal feed as growth promoter concerning side-effects, resistance and recent public perception about healthy food, new alternatives to antibiotics are needed (Marzo, 2001).

Probiotic that contain yeast, live bacteria or bacterial spores can also prevent enteric diseases of rabbits. Instead of growth promoters with antibiotics that kill some of the rabbit's own gastrointestinal flora, Probiotic promote gut colonization and stabilize eubiosis by competitive growth against harmful microorganisms, reducing the intestinal pH with production of lactic acid and encouraging digestion by producing enzymes and vitamins. These functions strengthen the animal's own non-specific immune defense (Fortun-Lamothe and Drouet-Viard, 2002). Dietary administered probiotic bacteria decreased the frequency of *E. coli* translocation (Lee *et al*., 2000) and were effective in preventing the growth of *E. coli* O157:H7 in the intestine of neonatal rabbits (Tachikawa *et al*., 1998). Hamrany *et al*., (2000) found a dose dependent positive effect of a probiotic bacterium on *E. coli* occurrence in the caecum and small intestine in young rabbits.

The role of minerals in living organisms is an emerging area of strong interest for producers, feed manufactures and scientists because trace elements unquestionably play an important role in Pathology and Physiology of biological system. Mineral supplementation strategies quickly become complex because of differences in trace mineral status of all livestock. Sub clinical mineral deficiencies pose greater economic threat than acute mineral deficiency. Interference in absorption through intestine is a major cause of sub clinical mineral deficiency if there is no dietary insufficiency.

Therefore, effect of feed additives (minerals and probiotic) individually or in combination was studied in 18, weaned rabbits of 6 weeks of age.

II. MATERIALS AND METHODS

A feed trial was conducted on 18 apparently healthy weaned rabbits of 6 weeks of age for a period of 7 weeks under farm system of management. At 6th week of age, all the rabbits were randomly divided into three groups. Each group was having 6 rabbits. The differences among groups were non-significant.

Group G_1 was considered as control group maintained on basal diet without probiotic and mineral mixture. Group G_2 was supplemented with 60g probiotic along with basal diet whereas G_3 group was supplemented with 60g probiotic and 2% mineral mixture along with basal diet. Composition of rations of different treatment groups of rabbit is presented in Table-1. The compositions of mineral mixture and probiotic are presented in Table-2 and Table-3 respectively.

The rabbits were fed *ad lib* given in the morning after weighing and subsequently the consumptions of feed were recorded after subtracting the left over feed in the feeder and wastage from the total feed given daily in the morning.

The individual body weight at weekly interval and body weight gain both were recorded during the experimental period and accordingly the analysis was done by using standard statistical methods described by Snedecor and Cochran (1994). On the basis of actual feed intake and gain in body weight, the feed conversion ratio was calculated by using the following formula:

$$\text{Feed conversion ratio} = \frac{\text{Feed consumed in a particular period}}{\text{Body weight gain during the same period}}$$

Table-1. Composition of rations of different treatment groups given to the rabbits.

Ingredients	G1	G2	G3
Maize (%)	30	30	30
Groundnut cake (%)	26	26	26
Wheat bran (%)	43	43	43
Common salt (%)	1	1	1
Mineral mixture (%)	-	-	2
Probiotics (g/100 kg)	-	60	60

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Table-2. Composition (per kg) of mineral mixture (Agrimin high power powder) given to the rabbits.

Sl. No.	Ingredients	Amount
1.	Cobalt	150mg
2.	Copper	1200mg
3.	Iodine	325mg
4.	Iron	5000mg
5.	Magnesium	6000mg
6.	Manganese	1500mg
7.	Potassium	100mg
8.	Selenium	10mg
9.	Sodium	5.9mg
10.	Sulphur	0.922%
11.	Zinc	9600mg
12.	DL-methionine	1920mg
13.	L-Lysine Mono-hydrochloride	4400mg
14.	Phosphorus	12%
15.	Calcium	24%

Table- 3. Composition of probiotic powder (Biovet YC powder) given to the rabbits.

Sl. No.	Ingredients	Amount
1.	Lactobacillus sporogenes	30,000 million c.f.u.
2.	Live yeast culture Saccharomyces cerevisiae SC-47	125,000 million c.f.u.
3.	Alpha amylase	5g

III. RESULTS AND DISCUSSION

The effect of feed additives (minerals & probiotic) on body weight in the rabbit was found to be non-significant (Table 4) however; the rabbits of G_3 groups had higher body weight than the rabbits of G_1 and G_2 groups during whole experimental period. At 12^{th} week of age, the average body weight of the rabbits of G_3 (1447.00±88.22 g) group maintained on 2% mineral mixture and 60g probiotic along with basal diet was observed to be higher followed by the rabbit of G_2 (1370.67±74.64 g) and G_1 (1258.00±76.20 g) groups. At the end of experiment (i.e. 13^{th} week) the average body weight of the rabbits of G_3 group (1514.67±75.91 g) was also observed to be higher followed by the rabbits of G_2 (1447.33 ± 73.64 g) and G_1 (1296.67 ± 71.99 g) groups (Table 4).

The effect of feed additives (mineral and probiotic) was observed to be significant on body weight gain during different periods of growth (Table 5). During 6 – 12^{th} weeks of age, overall body weight gain of the rabbits of G_3 (813.67±41.73 g) group was observed to be significantly higher than the rabbits of G_1 (623.67±48.93 g) group. However, the difference between G_3 and G_2 was observed to be non-significant. During 6 - 13^{th} week of age, the same pattern of body weight gain was observed in the rabbit of different groups. Overall body weight gain in the rabbits of G_3 (881.33±38.09 g) group was observed to be significantly higher than the rabbits of G_1 (662.33±53.46 g) group. The overall body weight gain in the rabbits of G_3 group was higher than the rabbits of G_2 (805.00±53.70 g) group, however the difference was observed to be non-significant.

The present findings are in conformity with the findings of Ayyat *et al.* 1996, Amber *et al.* 2004, Paulius *et al.* 2004, Guo-Xian *et al.* 2004, Marai *et al.* 2006, Eiben *et al.* 2008 and Zerrouki *et al.* 2008. Increase in body weight and body weight gain in the rabbits fed with mineral mixture and probiotic suggest increased digestion of protein, carbohydrate and fat and their absorption through intestine which might be due to more fermentative action of microflora present in probiotic. This may also be attributed to supplemented level of minerals particularly of Zn in the feed because it plays an important role in the synthesis of proteins in the body. The positive effect of mineral addition in respect of growth of rabbit may be due to deficiencies alteration such as calcium, copper, cobalt, iodine, magnesium, manganese, phosphorus etc. The more growth of rabbits fed with the mineral and probiotic also suggests enhanced metabolism and transport of fat from liver to different parts of the body.

More weight gain in rabbits treated with mineral and probiotic may also be due to live microorganisms mainly lactic acid bacteria & spore forming organisms which help in the establishment of the intestinal population which are beneficial to the animals and antagonistic to the harmful microbes. They act mainly by producing acids such as acetic acid & lactic acid and other compound which inhibit the growth of pathogenic bacteria which produce toxins.

The weekly feed consumption (Table 6) in the rabbits of G_3 group was observed to be minimum followed by G_2 and G_1 groups during whole experimental period (i.e. 6 -13^{th} week). The feed conversion ratio in the rabbits of G_3 group was observed to be better followed by the rabbits of G_2 and G_1 groups. The overall feed conversion ratio during 6 – 12^{th} week of age in the rabbits of G_3 (3.87) group was observed to be better than the rabbits of G_2 (4.50) and G_1 (5.28) groups. At the end of experiment (i.e. 6 – 13 week of age), the same trend of feed conversion ratio was observed. The overall feed conversion ratio in the rabbits of G_3 (4.35) group was observed to be better than G_2 (4.91) and G_1 (6.01) groups (Table 7). The above findings indicated that the rabbits of all three groups consumed maximum feed during 12 – 13^{th} week of age but body weight gain during the same period was lower as compared to other periods. These findings suggest that the optimum age for the sale of rabbit in the market may be considered as 12^{th} week of age.

The present findings are in conformity with the findings of Ayyat *et al.* 1996, Amber *et al.* 2004, Eiben *et al.* 2004, Fonseca *et al.* 2004, Kustos *et al.* 2004, Liang *et al.* 2004, Maurao *et at.* 2004, P. Matusevicius and H. Jeroch 2009 who reported improved feed conversion ratio in the feed additive supplemented groups. The better feed conversion ratio in the rabbits fed with mineral mixture and probiotic might also be attributed to better growth and higher weight gain observed in present study during experimental periods.

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The above findings indicated that the rabbit may be fed 2% mineral mixture and 60 gm probiotic as feed additives along with basal diet to boost up rabbit growth and better feed conversion ratio. Further it is also suggested that the rabbits may be sold in the market at the age of 12th week for better return.

Table-4. Average body weight (g) of rabbit at various ages maintained on different types (composition) of feed.

Time Periods	G_1 Average body weight (g)	G_2 Average body weight (g)	G_3 Average body weight (g)
6th wk	634.33±51.41	642.33±42.61	633.33±56.89
7th wk	719.33±43.72	789.00±46.00	797.67±66.45
8th wk	811.33±42.53	890.67±48.93	921.67±69.80
9th wk	925.00±58.30	988.33±50.69	1043.00±78.33
10th wk	1028.00±66.56	1102.33±55.82	1166.33±86.96
11th wk	1136.67±73.64	1228.33±58.70	1281.33±92.56
12th wk	1258.00±76.20	1370.67±74.64	1447.00±88.22
13th wk	1296.67±71.99	1447.33±73.64	1514.67±75.91

Each value is the average of 6 observations.

Mean under the same superscript in a row did not differ significantly.

Table-5. Average body weight gain (g) of rabbit during various periods of growth maintained on different types (composition) of feed.

Time Periods	G_1 Body weight gain (g)	G_2 Body weight gain (g)	G_3 Body weight gain (g)
6-7th wk	85.00±23.37[a]	146.67±7.46[b]	164.33±15.11[b]
7-8th wk	92.00±14.77	101.67±15.62	124.00±6.99
8-9th wk	113.67±15.90	97.67±7.18	121.33±17.74
9-10th wk	103.00±12.43	114.00±10.32	123.33±9.60
10-11th wk	108.67±12.25	126.00±18.27	115.00±8.64
11-12th wk	121.33±9.39	142.33±21.76	165.67±12.61
12-13th wk	38.67±8.53[a]	76.67±8.54[b]	67.67±6.44[b]
6-10th wk	393.67±41.18[a]	460.00±26.87[ab]	533.00±41.64[b]
10-12th wk	230.00±11.03	268.33±24.58	280.67±16.37
10-13th wk	268.67±16.79[a]	345.00±31.72[b]	348.33±18.34[b]
6-12th wk	623.67±48.93[a]	728.33±46.87[ab]	813.67±41.73[b]
6-13th wk	662.33 ±53.46[a]	805.00 ±53.70[ab]	881.33 ±38.09[b]

Each value is the average of 6 observations.

Mean under the same superscript in a row did not differ significantly.

Table 6. Total feed consumption (g) during various periods of growth in rabbits maintained on different types (composition) of feed.

Period (Week)	G_1 feed consumption (g)	G_2 feed consumption (g)	G_3 feed consumption (g)
6-7th	2436 (406.00)	2420 (403.33)	2220 (370.00)
7-8th	2770 (461.67)	2724 (454.00)	2620 (436.67)
8-9th	3108 (518.00)	3090 (515.00)	3042 (507.00)
9-10th	3698 (616.33)	3666 (611.00)	3422 (570.33)
10-11th	3810 (635.00)	3850 (641.67)	3708 (618.00)
11-12th	3952 (658.67)	3916 (652.67)	3878 (646.33)
12-13th	4112 (685.33)	4062 (677.00)	4092 (682.00)
6-10th	12012 (2002.00)	11900 (1983.33)	11304 (1884.00)
10-12th	7762 (1293.67)	7766 (1294.33)	7586 (1264.33)
10-13th	11874 (1979.00)	11828 (1971.33)	11678 (1946.33)
6-12th	19774 (3295.67)	19666 (3277.67)	18890 (3148.33)
6-13th	23886 (3981.00)	23728 (3954.67)	22982 (3830.33)

Figures under parenthesis are average weekly feed consumption per rabbit.

Table 7. Feed Conversion Ratio (FCR) during various periods of growth of rabbit maintained on different types (composition) of feed.

Period (Week)	G_1 Feed Conversion Ratio	G_4 Feed Conversion Ratio	G_5 Feed Conversion Ratio
6-7th	4.78	2.75	2.25
7-8th	5.02	4.47	3.52
8-9th	4.56	5.27	4.18
9-10th	5.98	5.36	4.62
10-11th	5.84	5.09	5.37
11-12th	5.43	4.59	3.90
12-13th	17.72	8.83	10.08
6-12th	5.28	4.50	3.87
6-13th	6.01	4.91	4.35

Each value is the average of 6 observations.

IV. CONCLUSION

On the basis of present findings, the following conclusions may be drawn:

- That the rabbit may be fed 2% mineral mixture and 60 gm probiotic as feed additives along with

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basal diet to boost up rabbit growth and feed conversion ratio.

- That the rabbit may be sold in the market at the age of 12th week for better return.
- That the use of probiotic is better than antibiotics for the growth of rabbit.
- That the recommendation may be made for feed producers to use 2% mineral mixture and 60 gm probiotic along with basal diet for better growth and return from rabbit farming.

REFERENCES

[1] Amber K. H., Yakout H. M. and Hamed Rawya S. (2004). Effect of feeding diets containing yucca extract or probiotic on growth, digestibility, nitrogen balance and caecal microbial activity of growing new zealand white rabbits. Proceedings - 8th World Rabbit Congress – September 7-10, Puebla, Mexico page: 737-745.

[2] Ayyat M.S., Marai I.F.M., EL-Aasar T.A. (1996). New zealand white rabbit boes anad their growing offspring's as affected by diets containing different protein level with or without lacto-sacc supplementation. World Rabbit Science. 4(4), 225-230.

[3] Chakrabarti, A.; Biswas, S. and Goswamy, A. (1999). Rabbit Farming Kalyani Publishers, Rajendra Nagar, Ludhiana-8, Hariana.

[4] Eiben Cs., Gippert T., Godor-Surmann K. and Kustos K. (2008). Feed additives as they affect the fattening performance of rabbits. 9th World Rabbit Congress – June 10-13, 2008 – Verona – Italy.

[5] Eiben CS., Mezes M., Szijarto N., Kustos K., Godor-Surmann K. and Erdelyi M. (2004). Dose-dependent effect of cellulase supplementation on performance of early-weaned rabbit. 8th World Rabbit Congress - September 7-10, Puebla, Mexico.

[6] Fonseca A. P., Falcao L., Kocher A. and Spring P. (2004). Effects of dietary mannan oligosaccharide in comparison to oxytetracyclin on performance of growing rabbits. Proceedings - 8th World Rabbit Congress – September 7-10, 2004 – Puebla, Mexico Page 829-833

[7] Fortun-Lamothe L., Drouet0Viard F. Review (2002): II.-Diet and immunity: current state of knowledge and research prospects for the rabbit. World Rabbit Sci. 2002. T. 10 (1). P. 25-39.

[8] Guo-Xian Z., Zhi-Hua F., Yu-Ding W., Yun-Qi L., Guan-Zhong L. (2004). The effects of supplemental microbial phytase in diets on the growth performance and mineral excretion of rex rabbits. In: Proc. 8th World Rabbit Congress, 2004 September, Puebla, Mexico, 1114-1120.

[9] Hamrany M., Balherby M., Bepro H. (2000). Use of Lactobacillus plantarum,, BJ 0021" in growing local rabbit rations, under Algerian conditions. Abstracts of the Ist Intern. Conf. on Indigenous versus Acclimatized Rabbits: El-Arish-North Sinai (Egypt). World Rabbit Sci., T. 8 (1) P. 48.

[10] Kustos K., Kovacs D., Godor-Surmann K. and Eiben Cs. (2004). Effect of probiotic bioplus 2B® on performance of growing rabbit. Proceedings - 8th World Rabbit Congress – September 7-10, 2004 – Puebla, Mexico Page 874-879.

[11] Lee, D. J., Drongowski, R. A., Coran, A. G. and Harmon, C. M. (2000). Evaluation of probiotics treatment in a neonatal animal model. Ped. Surg. Internat., 16 (4), 237-242.

[12] Liang Q. Z., Ren K. L., Xiao B. Y., Ren J. L., Wang F. and Zhang L. J. (2004). Effect of dietary saccharicterpenin to rabbit production performance. Proceedings - 8th World Rabbit Congress – September 7-10, 2004 – Puebla, Mexico Page 880-884.

[13] Marai, I.F.M.; Ayyat, M.S. and El-Monem, U.M.Abd. (2006). Growth performance, blood components and slaughter traits of New Zealand White male growing rabbits as affected by dietary supplementation calcium, sodium or potassium, in sub- tropical egypt. Tropical and Subtropical Agroecosystem 6: 149-155.

[14] Marzo I. 'New Strategies in Rabbit Feed : Additives and Alternatives to Antibiotic Use' 26th Symp. ASE-SCU: Aveiro (Portugal), 51- 68 (2000 & 2001).

[15] Mourao J. L., Alves A. and Pinheiro V. (2004). Effects of fructo-oligosaccharides on performances of growing rabbits. Proceedings - 8th World Rabbit Congress – September 7-10, 2004 – Puebla, Mexico. Page 915-921.

[16] P. Matusevicius and H. Jeroch. (2009). Efficacy of probiotic "ToyoCerin®" and phytobiotic "Cuxarom Spicemaster" on growing rabbits. Lohmann Information. Vol. 44 (2), Page 38.

[17] Paulius Matusevicium, Raimonda Sliaudaryte, Zofia Antoszkiewicz, Annan Bednarska. (2004). A natural way to improve productivity of rabbits using probiotic yeasture. Veterinarija IR Zootechnika. T. 26(48).

[18] Sharma, A.N. and Prasad, B. (1980). Base line survey of Chamba block ofTehri Garhwal district. Research Report, Department of Agricultural Economics, G.B. Pant University of Agriculture Economics, G.B. Pant University of Agriculture & Technology, Pantnagar, pp. 26 – 73.

[19] Snedecor, G.W. and Cochran, W.G. (1994). Statistical Methods, 8th edn., lowa State Univ. Press, Ames, U.S.A.

[20] Tachikawa, T.; Seo, G.; Nakazawa, M.; Sueyoshi, M.; Ohishi, T. and Joh, K. J. (1998). Japanese Association Infectious Diseases T, 72 (12), 1300 – 1305.

[21] Tripathi, R.S. and Kumar, J. (1992). Apple production and marketing in U.P. Hiills. Research Report, Department of Agriculture Economics, G.B. Pant University of Agriculture & Technology Ranichauri, Tehri Garhwal, pp. 32 – 42.

[22] Tripathi, R.S. and Pandey, V.K. (1986). Perspective of agriculture development in Tehri district. Research Report, Department of Agriculture Economics, G.B. Pant University of Agriculture & Technology, Ranichauri, Tehri Garhwal, pp. 3 – 5.

[23] Zerrouki N., Lebas F., Davoust C. and Corrent E. (2008). Effect of mineral blocks addition on fattening rabbit performance. 9th World Rabbit Congress – June 10-13, V.

 DOI : 10.35291/2454-9150.2020.0696