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INFLUENCE OF FEEDING PROBIOTICS ON GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY IN RABBITS.

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ABSTRACT : During a 84 days trial, growth performance and nutrient utilisation were studied on 33 New Zealand White (NZW) rabbits (initial age 42 ± 3 days and average body weight 633 ± 21g), divided into three groups of 11 animals each. All the rabbits were given a common pelleted ration. Animals of group 2 were provided a supplemental daily dose of lactic acid producing bacteria (Lacto) $5x10^8$ cells/animal and group 3 received a mixed with equal quantity dose $5x10^8$ cells/animal/day of lactic acid bacteria and *Saccharomyces cerevisiae* (Lacto + Sacc). There were no differences in feed intake, body weight gain (average 8.1g/day), feed conversion efficiency (average 4.71g feed intake/g gain) and digestibility of dry matter, neutral detergent fibre, acid detergent fibre, cellulose and hemicellulose among the groups. Only crude protein digestibility was significantly improved ($P<0.05$) in the animals given mixed culture (Lacto + Sacc).

RÉSUMÉ : Influence de la consommation de probiotiques sur les performances de croissance et la digestibilité des aliments chez le lapin.

Au cours d'un essai de 84 jours, la croissance et l'utilisation des aliments ont été étudiées sur 33 lapins Néo-zélandais Blancs (NZW) âgés en moyenne de 42 ± 3 jours et d'un poids corporel moyen de 633 ± 21g, repartis en 3 groupes de 11. Tous les lapins ont reçu le même aliment granulé. Les animaux du groupe 2 ont reçu en plus quotidiennement une dose de bactéries productrices d'acide lactique (Lacto) $5x10^8$ cellules/animal et le groupe 3 a reçu un mélange contenant la même dose de bactéries productrices d'acide lactique ($5x10^8$ cellules/animal/jour) plus un nombre équivalent de cellules de Saccharomyces cerevisiae *(Lacto+Sacc). Aucune différence entre les groupes n'a été enregistrée concernant la consommation, le gain de poids vif (8.1g/jour en moyenne), l'efficacité alimentaire (en moyenne 4.71g aliment/g gain de poids) et la digestibilité de la matière sèche, d'ADF, de la cellulose et de l'hemicellulose. Seule la digestibilité des protéines brutes a été significativement améliorée ($P<0.05$) pour les animaux du lot 3.*

INTRODUCTION

Rabbit breeding is growing enterprise in most of the developing countries (CHEEKE, 1987). Since long antibiotics and many other chemicals have been used as growth stimulators in animals. But the use of antibiotics in feeding of animal being discouraged and the use of certain live micro-organisms (*Saccharomyces cerevisiae*, *Aspergillus oryzae* and lactic acid producing bacteria) either alone or in combination as probiotics is gaining importance (LEBAS *et al.*, 1988 ; CHEEKE *et al.*, 1989 ; WILLIAMS and NEWBOLD, 1990). Administration of probiotics resulted in higher live weight gain and nutrient digestibility in ruminants (WEIDMEIR *et al.*, 1978 ; WILLIAMS *et al.*, 1991 ; MIR and MIR, 1994 ; PANDA *et al.*, 1995). On the other hand the reports on probiotic feeding in rabbit are quite inconsistent and studies are restricted only on weight gain, feed intake and enteritis mortality (CHEEKE *et al.*, 1989 ; HOLLISTER, 1990 ; MAERTENS, 1992). A very few reports are available on nutrient digestibility (EL-GAAFARY *et al.*, 1992 ; CHAUDHARY *et al.*, 1995).

The aim of the proposed experiment was to study the effect of probiotics on growth performance and nutrient utilization in NZW rabbits.

MATERIALS AND METHODS

Animal and diet

Thirty three male NZW rabbits of same lot (average age 42 ± 3 days and average body weight 633 ± 21g) were divided randomly into three groups of 11 animals each. All the rabbits were given common pelleted ration. Details of ingredients and chemical composition of diet are shown in Table 1.

Microbial culture

Mixed strains of lactic acid producing bacteria (*Lactobacillus acidophillus*, *L. casei*) were grown on skim milk for 48h at 37°C to obtain around 10^8 cells/ml of fermented product and was given @ 5×10^8 cells/animal/day to group 2 animals. *Saccharomyces cerevisiae* ITCCF 2094 grown in laboratory on YEPD agar (yeast extract 3g, peptone 5g, dextrose 10g, agar 20g and water 1 litre). After 72h of incubation at 25°C, the cells were washed in normal saline and a daily dose of 5×10^8 cells/animal mixed with equal quantity of lactic acid bacteria were

Table 1 : Ingredients and chemical composition of pelleted diet

Ingredients (g/kg)	
Wheat bran	700
Maize	100
Fish meal	80
Groundnut cake	60
Molasses	40
Mineral mixture *	15
Salt	5
Vitamin additive *	1
Chemical composition (%)	
Dry matter	91.0
Organic matter	84.0
Crude protein	17.6
Ether extract	3.6
Crude fibre	8.9
Neutral detergent fibre	33.7
Acid detergent fibre	11.2
Acid detergent lignin	2.4
Cellulose	8.9
Hemicellulose	22.5
Ash	16.0

* Mineral mixture and vitamin additive contains : Vit. A 100,000 IU ; Vit. D_3 1500 IU ; Vit. B_2 5mg ; Vit. E 40 mg ; Niacin 5mg ; Folic acid 2mg ; Ca 4.2g ; P 0.75g ; Mg 0.004g ; Fe 0.09g ; Cu 0.001g ; Mn 0.04g ; Zn 0.03g ; Co 0.0007g ; I 0.0001g.

administered orally to group 3 animals with the help of a graduated dropper. Group 1 served as control.

Feeding and digestion trial

A growth study of 84 days started on 6 weeks old rabbits was conducted in which all the animals were kept in individual metallic cages having arrangements for feeding, drinking and faeces collection. The rabbits were individually offered weight quantity of diet at 10:00h and residue was weighed next morning to record daily feed intake. Animals were weighed at weekly interval during the feeding period. A digestion trial of 6 days collection was conducted at the end of feeding trial using 6 animals in each group.

Chemical analyses

Representative samples of feed residue and faeces were analysed for dry matter (DM), crude protein (CP) ash and ether extract (EE) as per AOAC (1985) and neutral detergent fibre (NDF), acid detergent fibre (ADF), acid detergent lignin (ADL), cellulose and hemicellulose by GOERING and VAN SOEST (1970) method. Gross energy (GE) was calculated as per NRC 1977).

Statistical analysis

Data were analyzed by one way analysis of variance as per SNEDECOR and COCHRAN (1968).

RESULTS AND DISCUSSION

Chemical composition of the pelleted diet showed that the fibre and crude protein were normal as per the recommendation of NRC (1977). The diet was palatable and average intake of DM during 84 days of growth study was 37.1, 38.5 and 39.6g/d per animal in group 1, 2 and 3 respectively (Table 2). During digestion trial also similar trend on nutrient intake was found. This suggests that probiotics did not affect the intake of DM in rabbits and was within the range of earlier report on the same strain of the NZW rabbits (DESHMUKH and PATHAK, 1991).

The average daily gain (ADG) was 7.96, 8.12 and 8.24g in control, Lacto and Lacto + Sacc. group respectively (Table 2) and the differences were non significant. CHEEKE *et al.* (1989) and MAERTENS (1992) have reported similar results on body weight gain. However, HOLLISTER (1990) reported higher weight gain in rabbits given mixed culture of Lacto + Sacc. The reason for differences in results are not clear. The low growth of rabbits in all the groups may be due to slow growing strain of NZW rabbits and high environmental temperature (40-44°C) and relative humidity (60-90%). Similar growth rate in NZW rabbits under similar geographical conditions were reported by DESHMUKH and PATHAK (1991).

No significant effect on the feed required per unit gain was observed among the groups (Table 2). This is

Table 2 : Body weight gain and feed conversion efficiency of rabbits given with or without probiotics from 6 to 18 weeks of age.

Item	Group 1 Control	Group 2 Lacto	Group 3 Lacto + Sacc.	Significance level
No. of animals	11	11	11	
Initial body weight (g)	630.0 ± 38.4	637.0 ± 41.3	634.5 ± 36.5	NS
Body weight gain in 84 days (g)	668.9 ± 14.6	682.2 ± 30.4	692.2 ± 32.8	NS
Body weight gain (g/d)	7.96 ± 0.17	8.12 ± 0.36	8.24 ± 0.38	NS
Dry matter intake (g/d)	37.1 ± 1.6	38.5 ± 1.0	36.9 ± 1.4	NS
Feed/gain	4.66 ± 0.17	4.74 ± 0.19	4.72 ± 0.20	NS
Mortality (No. rabbits)	1	2	1	

NS : non significant

Table 3 : Digestibility of nutrients and nutritive value of diet in rabbits given with or without probiotics.

Item	Group 1 Control	Group 2 Lacto	Group 3 Lacto + Sacc.	Significance level
No. of rabbits	6	6	6	
Body weight during digestion trial (g)	1422 ± 69	1366 ± 72	1416 ± 73	NS
Digestibility coefficients				
Dry matter	74.8 ± 1.6	73.9 ± 1.2	71.8 ± 2.0	NS
Organic matter	75.0 ± 1.5	74.6 ± 1.1	72.9 ± 2.0	NS
Crude protein	64.2 ± 1.7^{a}	66.3 ± 1.4^{ab}	68.0 ± 1.7^{b}	*
Ether extract	85.5 ± 1.4	82.4 ± 1.1	82.1 ± 3.4	NS
Neutral detergent fibre	50.4 ± 3.8	48.2 ± 1.1	47.3 ± 3.5	NS
Acid detergent fibre	28.0 ± 2.6	25.4 ± 2.9	24.1 ± 1.7	NS
Cellulose	35.8 ± 4.3	33.2 ± 5.5	40.1 ± 2.7	NS
Hemicellulose	61.9 ± 2.7	65.2 ± 1.3	60.1 ± 3.9	NS
Nutritive value of diet				
Digestible crude protein (%)	11.3 ± 0.8	11.7 ± 0.6	12.0 ± 0.7	NS
Digestible energy (Kcal/g)	3.01 ± 0.05	2.98 ± 0.04	2.95 ± 0.07	NS

$^{a, b}$ values bearing different superscripts in a row differ significantly ; * : P<0.05; NS : non significant.

in agreement with the results of MAERTENS (1992) and CHAUDHARY *et al.* (1995). However, in other studies an improvement in feed gain ratio have been reported due to feeding of probiotics (CHEEKE *et al.*, 1989 ; HOLLISTER, 1990 ; HOLLISTER *et al.*, 1990). No definite trend on the mortality of rabbits was found among the groups (Table 2). However, majority of the published results showed that probiotics reduce enteritis and mortality in rabbits (CHEEKE *et al.*, 1989 ; HOLLISTER, 1990 ; MAERTENS, 1992).

Digestibility coefficients of nutrients and nutritive value of diet are presented in Table 3. No significant difference in digestibility of OM, EE, NDF, ADF, cellulose and hemicellulose was found among the groups. However, CP digestibility was significantly increased (P<0.05) in the animal where mixed culture of Lacto + Sacc. was given compared to the other groups. EL-GAAFARY *et al.* (1992) have reported higher crude protein and crude fibre digestibility in rabbits fed Lacto + Sacc culture. The nutritive value of the diet also remained unaffected by probiotic supplementation.

It is inferred from the results that feeding of probiotics have no significant effect on the growth performance and nutrient digestibility in NZW rabbits under Indian hot climate environmental conditions.

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