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GROWTH PERFORMANCE, CRUDE PROTEIN, ETHER EXTRACT AND TOTAL ASH IN THE BREAST MUSCLE OF BROILER CHICKENS SUPPLEMENTED WITH PROBIOTICS

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Abstract: An experiment was conducted to study the effect of dietary inclusion of *Saccharomyces cerevisiae* (0.1%), *Lactobacillus sporogenes* (0.1%), their combination (0.05% and 0.05%) and Provilacc® (0.1%) for different groups, on nitrogen retention in the form of crude protein, the ether extract and total ash in the breast muscle sample as the indicators of growth in broiler chickens. The weight gain, crude protein, ether extract and total ash were estimated at weekly intervals up to six weeks. There was significant ($P < 0.05$) difference in the body weight gain between probiotic supplemented groups and the control group from 21 day and onwards. But, there were no significant ($P > 0.05$) differences in the per cent of crude protein, ether extract and total ash in the breast muscle sample between different groups of broiler chickens suggesting that the chemical composition per unit mass was not evident for enhanced growth but it was suggestive that the gain in weight was due to increased length and mass.
Keywords: Broiler Chickens, Probiotics, Crude Protein, Ether Extract, Total Ash.

INTRODUCTION

Among the growth promoters, the probiotics are the safe, economical and eco-friendly growth promoters that gained considerable biotechnological importance in promoting growth. Probiotics are bacterial or yeast or fungal cultures that serve as beneficial microbial flora of the alimentary tract. The ways in which the physiological status of an animal may be affected by the microflora of the digestive tract are many and complex. It is proposed that the probiotics have all-in-one effect such as providing many essential nutrients (vitamins, minerals and proteins of high biological value), digestive enzymes, growth factors, antibacterial substances, stimulate the immune system of body, competitively exclude pathogenic bacteria and act as feed savers (Rowland, 1992; Vranesic, 1992 and Jin *et al*.,

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1997). Overall, the use of probiotics in broilers causes better digestibility, higher feed conversion and better growth.

The information on the physiological parameters of growth such as nitrogen retention or protein content, ether extract and total ash when *Sac. cerevisiae* and *L. sporogenes* cultures are used singly or in combination as probiotic growth promoters is scanty. Therefore, the present study was considered to investigate into the effects of supplementation of probiotics on these parameters.

MATERIALS AND METHODS

One hundred and eighty unsexed day old broiler chicks were randomly divided into five groups, consisting of 36 chicks in each group. Standard managemental practices were followed with *ad libitum* feed and water. Commercial broiler starter and broiler finisher feeds were procured from a poultry feed mill. The basal portion of the reference diet for broiler starters contained (parts/100 kg) : Maize, 57; Soybean meal, 25; Sun flower extraction, 07; Jowar, 05; Deoiled Rice Bran, 2.5; Mineral and vitamin mixture, 2.5 and Dicalcium Phosphate, 1, that was fed from first day of the experiment to the end of third week. The basal portion of the reference diet for broiler finisher was Maize, 67; Soybean meal, 23; Sun flower extraction, 02; Jowar, 05; Mineral and vitamin mixture, 2 and Dicalcium Phosphate, 1, that was fed from fourth week to sixth week. The birds were vaccinated with Newcastle disease vaccine (F_1 strain) on day seven and the infectious bursal disease vaccine (intermediate strain) on day 14 by oculonasal route. The supplemented groups were as described below.

Group – I: Control diet, without any probiotic.

Group – II: *Saccharomyces cerevisiae*, with 5 billion viable cells per g, @ 0.1% in the diet.

Group – III: *Lactobacillus sporogenes*¸ with 1000 million spores per g, @ 0.1% in the diet.

Group – IV: *Saccharomyces cerevisiae,* with 5 billion viable cells per g, @ 0.05% and *Lactobacillus sporogenes*, with 1000 million spores per g, @ 0.05% in the diet.

Group – V: Provilacc®, @ 0.1% in the diet, a commercial product of probiotic mixtures, containing ***Lactobacillus acidophillus***, 2340 million viable cells, ***Lactobacillus sporogenes,*** 14040 million spores, ***Saccharomyces cerevisiae,*** 5855 billion spores and ***Streptococcus faecium***, 2340 viable cells per Kg, procured from M/s. Vetcare, Bangalore,

Body weights of individual birds from each group were recorded at weekly intervals using electronic digital balance. Six birds from each group were randomly selected at the end of each week up to six weeks. The birds were killed by cervical dislocation to collect the breast muscle sample for the estimation of the per cent of crude protein, ether extract and total ash (AOAC, 1995). Among these crude protein depicts the extent of nitrogen retention or positive nitrogen balance, which is the chemical indicator of growth of the muscular system.

Statistical analysis of the data was carried out using computerized software programme, GraphPad Prism (GraphPad Prism, 2004).

RESULTS AND DISCUSSION

As indicated in Table 1, it is observed that the body weight of broiler chicks on day 21, 28, 35 and 42 were significantly ($P < 0.05$) higher in all the live probiotic culture supplemented groups compared to the control group. The Group II supplemented with *Saccharomyces cerevisiae* showed significant ($P < 0.05$) improvement of body weight on day 21, 28, 35 and 42. These observations were in conformity with the findings of Bonomi *et al.* (1977), Krueger *et al.* (1990), McDaniel and Sefton (1991), Stanely *et al.* (1993), Bradley *et al.* (1994) and Kompiang (2002). However, Yadav *et al.* (1994) and Sarkar *et al.* (1997) did not observe significant increase in body weight in *Sac. cerevisiae* supplemented broiler chicks. Improvement in body weight gain in broiler chickens following supplementation of *L. sporogenes* (Group II) observed in this study on day 21, 28, 35 and 42 validated the findings of Dilworth and Day (1978), Takalikar *et al.* (1992) and Mohan *et al.* (1996). However, Jernigan *et al.* (1985), Mudalgi *et al.* (1993) and Maiolino *et al.* (1992) did not observe significant improvements in body weight gain in broiler chicks on supplementation with lactobacillus based probiotics.

In the present study, the improved body weight was also observed in the group supplemented with both *Sac. cerevisiae* and *L. sporogenes* on day 21, 28, 35 and 42. Similar observations have been made earlier by Burkett *et al.* (1977). However, Megharaja *et al.* (1996) did not observe significantly improved weight gain in broiler chickens in a biological trial of six weeks duration. In the Group V also, wherein the supplementation was with Provilacc®, a commercial probiotic with a mixture of four types of probiotic species, the body weight gain was significantly improved. Such observations in improvements of body weight when a mixture of probiotics were administered have been reported by Mishra and Khan (1994) with

Biovet® in grey patridge, Georgieva *et al.* (2000) with Lacto-Sacc® in broiler chickens and Bhat *et al.* (2003) in broiler chickens.

Significant increase in body weight gain on supplementation of probiotics in different groups observed in the present study could be possibly due to alleviation of stress in birds by providing necessary vitamins, release of unidentified growth factors, secretion of digestive enzymes by probiotics such as *Saccharomyces cerevisiae* and *Lactobacillus sporogenes* and release of high biological value protein (Stanely *et al.,* 1993) and improving protein digestibility (Bonomi *et al.,* 1977).

The crude protein per cent (Table 2), ether extract per cent (Table 3) and total ash per cent (Table 4) in breast muscle sample did not differ significantly ($P > 0.05$) between different groups at various days of observation. However, on day 42, there was numerically slight increase in crude protein and decrease in ether extract levels of probiotic fed groups. This observation of slight increase of crude protein per cent was in agreement with Buche *et al.* (1992) who reported maximum retention of nitrogen in broilers supplemented with probiotics.

The non – significant ($P > 0.05$) ether extract and total ash were in accordance with Bhatti *et al.* (2003) who reported non significant levels of these components in breast muscle of Fayoumi and Rhode Island Red birds. However, the information on changing pattern of proximate components, if any, in probiotic fed broiler chicken is not available.

It may be concluded that the feeding of probiotics was having a growth promoting effect. Whereas, the per cent of crude protein, ether extract and total ash in the breast muscle sample did not differ significantly when compared to control and also within the probiotics supplemented groups. This has suggested that during the phase of growth promotion the prominent changes that occur were with respect to increase in mass and length of the broiler chickens but not with the significant chemical changes such as alterations of nitrogen retention in the form of crude protein content, deposition of fat as reflected by ether extract and deposition of minerals as indicated by total ash content.

Table 1. Body weight (g) in different Groups of Broiler Chickens supplemented with *Sac. cerevisiae*, *L. sporogenes*, their combination and Provilacc® at different days of observation (n = 6)

Day	Group I	Group II	Group III	Group IV	Group V
1	45.17 ± 1.11[a]	46.33 ± 1.61[a]	44.33 ± 1.34[a]	45.83 ± 1.23[a]	44.50 ± 1.75[a]
7	136.00 ± 4.86[a]	145.80 ± 2.36[a]	148.30 ± 3.80[a]	145.80 ± 3.75[a]	147.30 ± 1.80[a]
14	302.50 ± 3.82[a]	332.50 ± 11.31[a]	322.20 ± 2.58[a]	331.70 ± 12.29[a]	334.20 ± 8.21[a]
21	609.20 ± 16.04[a]	758.30 ± 5.58[b]	725.80 ± 19.85[b]	707.5 ± 12.70[b]	703.30 ± 19.61[b]
28	991.70 ± 11.08[a]	1180.00 ± 37.77[b]	1192.00 ± 26.51[b]	1167.02 ± 48.42[b]	1152.00 ± 26.26[b]
35	1265.00 ± 37.93[a]	1472.00 ± 28.92[b]	1495.00 ± 50.91[b]	1465.00 ± 46.46[b]	1443.00 ± 35.56[b]
42	1759.00 ± 27.15[a]	2123.00 ± 52.32[b]	2086.00 ± 80.56[b]	2098.00 ± 77.52[b]	2082.00 ± 30.27[b]

The values are Mean ± SE.

Mean values bearing same superscript within rows do not differ significantly (P > 0.05) with each other.

Table 2: Crude protein per cent of pectoral major muscle on dry matter basis in different Groups of Broiler Chickens supplemented with *Sac. cerevisiae*, *L. sporogenes*, their combination and Provilacc® at different days of observation (n=3)

Day	Group I	Group II	Group III	Group IV	Group V
7	75.20 ± 2.14	76.00 ± 1.44	78.27 ± 0.69	76.50 ± 0.90	78.23 ± 0.62
14	71.37 ± 4.08	72.67 ± 1.26	75.17 ± 0.60	71.50 ± 1.31	75.10 ± 0.60
21	76.60 ± 1.08	77.27 ± 1.41	74.47 ± 2.87	74.93 ± 4.87	78.90 ± 0.40
28	79.90 ± 0.40	80.37 ± 0.31	81.03 ± 0.54	79.57 ± 0.32	80.10 ± 0.05
35	82.27 ± 0.37	82.63 ± 0.39	83.20 ± 0.66	82.03 ± 1.56	82.37 ± 0.32
42	85.67 ± 0.37	88.73 ± 0.85	86.40 ± 0.90	87.20 ± 0.64	88.77 ± 0.92

The values are Mean ± SE.

None of the values differed significantly between the groups (P > 0.05).

Table 3. Ether extract percent of pectoral major muscle on dry matter basis in different Groups of Broiler Chickens supplemented with *Sac. cerevisiae*, *L. sporogenes*, their combination and Provilacc® at different days of observation (n = 3)

Day	Group I	Group II	Group III	Group IV	Group V
7	20.56 ± 0.45	20.31 ± 1.70	18.30 ± 1.00	18.03 ± 0.80	18.08 ± 0.76
14	7.81 ± 0.11	9.20 ± 1.57	6.92 ± 0.12	7.57 ± 0.46	7.94 ± 0.28
21	2.52 ± 0.02	3.26 ± 0.06	3.31 ± 0.06	3.89 ± 0.78	3.36 ± 0.29
28	2.70 ± 0.02	2.15 ± 0.12	2.86 ± 0.14	2.92 ± 0.34	2.31 ± 0.11
35	2.23 ± 0.46	1.21 ± 0.22	1.68 ± 0.06	1.73 ± 0.31	1.64 ± 0.08
42	2.37 ± 0.19	2.01 ± 0.06	2.13 ± 0.03	2.08 ± 0.01	2.09 ± 0.05

The values are Mean ± SE.

None of the values differed significantly between the groups ($P > 0.05$).

Table 4. Total ash percent of pectoral major muscle on dry matter basis in different Groups of Broiler Chickens supplemented with *Sac. cerevisiae*, *L. sporogenes*, their combination and Provilacc® at different days of observation (n = 3)

Day	Group I	Group II	Group III	Group IV	Group V
7	6.42 ± 0.12	6.23 ± 0.07	6.23 ± 0.09	5.87 ± 0.31	6.05 ± 0.44
14	5.90 ± 0.10	5.73 ± 0.10	5.92 ± 0.04	5.77 ± 0.04	5.72 ± 0.04
21	6.12 ± 0.04	6.02 ± 0.05	6.08 ± 0.07	6.05 ± 0.07	6.18 ± 0.04
28	6.10 ± 0.05	5.94 ± 0.14	6.12 ± 0.07	6.10 ± 0.12	6.01 ± 0.11
35	7.14 ± 0.02	7.17 ± 0.08	7.16 ± 0.03	7.17 ± 0.08	7.17 ± 0.06
42	7.40 ± 0.03	7.35 ± 0.03	7.36 ± 0.02	7.29 ± 0.06	7.15 ± 0.13

The values are Mean ± SE.

None of the values differed significantly between the groups ($P > 0.05$).

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