VI. SUMMARY

One hundred and eighty day old commercial Cobb broiler chicks randomly divided into five groups, each comprising of 36 chicks, were used in the present study to evaluate the physiological effects of supplementing *Saccharomyces cerevisiae* (Group II), *Lactobacillus sporogenes* (Group III), their combination (Group IV) and Provilacc® (Group V) in the diet at 0.1% inclusion level. The Group I was the control group that did not receive any probiotic. The parameters of growth physiology considered were growth performance, relative organ weights, activity of digestive enzymes, serum biochemical components and deposition of nutrients in muscular and skeletal tissues in broiler chickens on days seven, 14, 21, 28, 35 and 42.

The significant increase (P<0.05) in body weight was observed on days 21, 28, 35 and 42 in probiotic treated groups compared to control group. In respect of feed conversion ratio, significantly improved (P<0.05) performance was observed in the probiotic treated groups on days seven, 21 and 28. The better results in these performance parameters were due to secretion of significantly higher (P<0.05) levels of probiotic source of digestive enzymes such as alpha amylase in the crop and alpha amylase, trypsin and lipase in intestines that could aid in better digestibility as was evident from the present study. There was no mortality in any of the groups which is attributed to competitive
exclusion of pathogenic organisms by probiotics and maintenance of
good health.

The relative crop weight was significantly lower (P<0.05) on day
seven of observation in probiotic treated groups indicating that the
alpha amylase secreted by the probiotics played a vital role in starch
digestion in the crop at the early age. The mean intestinal weight in
Provilacc® supplemented group on day 42 differed significantly from the
control group indicating that the allometric growth of alimentary tract is
the reflection of digestion of large amounts of feed. Also, the length of
small intestine in the probiotic fed groups was numerically higher on day
21, 28, 35 and 42 and showed parallelism between the slight increase in
the length of small intestine and body weight gain.

In the Provilacc® treated group, the mean relative spleen weight
was significantly (P<0.05) higher from Group IV that received both
Saccharomyces cerevisiae and Lactobacillus sporogenes on day 35 and
Group II on day 42 that received only Saccharomyces cerevisiae,
indicating that Provilacc® has immunostimulatory property. The mean
relative weight of pancreas in Group IV, supplemented with the
combination of Saccharomyces cerevisiae and Lactobacillus sporogenes
on day 42 was significantly higher (P<0.05) from Group I, II and III and
this was indicative of more demand for exocrine secretion from the
pancreas, which suggested that certain probiotics besides secreting their
own enzymes can also activate host enzymes or host tissues to secrete
enzymes. Among the relative organ weights, the proventriculus, gizzard,
liver, heart and kidney weights were not significantly different (P>0.05) at
different stages of observation in various groups in the present
investigation and they followed the property of physiological isometric growth.

Significantly increased (P<0.05) levels of crop alpha amylase and amylase, trypsin and lipase levels in the intestinal contents in the probiotic supplemented groups were observed. This finding indicated that the probiotics secrete digestive enzymes that aid in better digestion and absorption of nutrients, thereby contributing to promotion of growth. However, the disaccharidases such as maltase and sucrase in the intestinal brush border cells did not differ significantly (P>0.05) in probiotic fed groups indicating lower liberation of these enzymes from probiotics.

The mean serum glucose levels did not differ significantly (P>0.05) and it was considered to be due to higher metabolic rate in the avian species that regulates the blood glucose within normal limits maintaining homeostasis. The serum total protein, calcium, phosphorus, high-density lipoproteins and low-density lipoproteins did not differ significantly (P>0.05) between untreated Group I and probiotic supplemented groups is also suggestive of maintenance of constant milieu interior. However, on day 42, in the Group V that received Provilacc®, the numerically lower levels of triglycerides were found compared to control and other probiotic supplemented groups.

Also, on various days of observation, apparently lower levels of cholesterol were observed in all the probiotic supplemented groups. The serum VLDL levels were significantly lower (P<0.05) in Provilacc® fed group on day 14 with Group I, III and IV and on day 35 with Group I and II. Since the probiotics were found to reduce some lipid components, it is opined that biotechnologically low lipid chicken meat or low cholesterol
chicken meat similar to low cholesterol eggs or diet eggs is possible to derive and design in a near future.

Liver glycogen, the per cent of moisture, crude protein, ether extract, total ash and DNA content in breast muscle sample as well as total ash in tibial bone did not differ significantly (P>0.05) between different groups at various days of observation. The values of proximate components were unaltered per unit weight of the sample taken either from control or probiotic fed groups suggesting that enhanced growth did not significantly alter chemical composition but alters length and mass of the tissue. However, on day 42, there was numerically slight increase in crude protein per cent and slight decrease in the per cent of ether extract in breast meat sample of probiotic fed groups.

The qualitative study of bone density based on ultrasonographic technique indicated that the density was indirectly proportional to porosity of bones such that at younger age the bones were more porous and less dense and as the age advanced the bones became less porous and denser. The porous cartilaginous growth plate of the bone during early age facilitates further growth and non-porosity of the cartilaginous plate as the age advances signifies the deposition of minerals and cessation of skeletal growth.

CONCLUSIONS:

The following conclusions could be drawn from the present study.
1. Supplementation of probiotics in broiler chickens was useful as growth promoters and for improved feed conversion ratio.
2. During the first week of life the growth of crop was significantly lower as the probiotics themselves contributed to the amylase activity in the crop.

3. The mean intestinal length was higher in probiotic treated groups supporting the concept that the development of digestive tract has been an important aspect of growth and body weight gain.

4. The probiotics contributed to the secretion of digestive enzymes like amylase in crop and amylase as well as lipase and trypsin in intestines. These observations were responsible for better digestion and absorption of nutrients that reflected in terms of improved feed conversion and rapid growth rate.

5. The observations such as relative weights of proventriculus, gizzard, liver, heart and kidney were not differing significantly in probiotic fed groups compared to control that indicated isometric growth of these organs that were proportional to gain in body weight.

6. The blood serum biochemical parameters like glucose, total protein, calcium, phosphorus, triglycerides, HDL cholesterol and LDL cholesterol were not altered. However, in the probiotic supplemented groups there was an increase in body weight compared to control suggesting that the body homeostasis was in operation maintaining the values of various blood biochemical parameters within the normal range.

7. The per cent of proximate components in breast muscle *viz.*, moisture, crude protein, ether extract, total ash and total ash of
tibial bone as well as DNA content in breast muscle were not differing significantly in probiotic fed groups compared to control. The increased body weight in probiotic treated groups points to the fact that more nutrients were available for deposition in various body tissues, especially musculoskeletal system. The values of these proximate components were unaltered per unit weight of the sample indicating that more than changes in chemical composition it is alteration in mass and length of musculoskeletal system that contributes to growth.

8. The present study confirms the utility of probiotics as growth promoters in broiler chickens by acting on various aspects of physiology of growth. Further studies are required to evaluate the efficacy of growth promotion of probiotics in comparison with other growth promoters in broiler chickens.