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Effect of Probiotic, Prebiotic and Synbiotic Supplementation on Haemato-Biochemical Profile in SVVU T-17 Grower Pigs

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ABSTRACT

The experiment was aimed to assess the influence of dietary supplementation with probiotic, prebiotic, and synbiotic on the haemato-biochemical profile of SVVU T-17 grower pigs. Twenty-four pigs, aged 2-3 months and with similar body weights, were randomly assigned to four treatment groups: Control (basal diet alone), T1 (basal diet with 0.1% multi-strain probiotic), T2 (basal diet with 0.1% mannan-oligosaccharide prebiotic), and T3 (basal diet with 0.1% synbiotic). Haematological parameters showed no significant differences among the groups ($P > 0.05$). However, serum albumin levels were significantly ($P < 0.01$) higher in the T3 group. Both serum cholesterol and triglycerides exhibited significant ($P < 0.01$) decreases in the treatment groups (T1, T2 and T3) compared to the control group, while total protein and serum glucose remained consistent. In conclusion, synbiotic supplementation demonstrated a positive effect on serum albumin, and all treatments led to a significant decrease in lipid profiles.

Key words: SVVU T-17 grower pigs, probiotic, prebiotic, synbiotic, haemato-biochemical profile

Pigs are attributed to its rapid growth and prolificacy, which causes the pigs to more prone for stress and leads to poor performance and high mortality rate. Renowned for its prolificacy and rapid growth, the pig has become a primary focus for meat production. Historically, antibiotics were extensively employed to modulate alimentary microbiota and amplify productivity and growth rates. This past reliance on antibiotics prompts a reconsideration of the risks associated with their extended usage. The emergence of drug-resistant microorganisms has underscored the need for alternative, natural substances that can maintain and enhance pig health without compromising human health or the environment.

Probiotics, prebiotics, and synbiotics emerge as non-antibiotic promoters in this pursuit, offering a potential strategy to mitigate the risks associated with antibiotic overuse and also contribute to enhance the meat quality, nutrient utilization, immune function, and growth performance in swine.

MATERIALS AND METHODS

Animal diets and Management: Twenty-four SVVU T-17grower pigs aged 2-3 months, and displaying consistent body weights, were randomly divided into four groups. Each group, consisting of six pigs, received different dietary treatments: the Control group received only the basal diet, T1 received the basal diet with 0.1% multi-strain probiotic (Spectra DFM^{GTH}, a commercial product containing *Pediococcus acidilactici, Enterococcus faecium, Bacillus licheniformis, Bacillus subtilis, Lactobacillus,* and *Bacillus amyloliquefaciens*), T2 received the basal diet with 0.1% mannan-oligosaccharide prebiotic, and T3 received the basal diet with 0.1% synbiotic. The experiment spanned 90 days and conducted at ICAR-AICRP on Pigs, SVVU,

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Haemato-biochemical Analysis: Blood samples were collected from the lateral saphenous vein of all the experimental pigs on both the 0th and 90th days. The samples were carefully preserved in EDTA-coated vacutainer tubes and clot activator vials to facilitate subsequent haematological and serum biochemical analyses. For haematological assessments, various parameters were measured using the Mindray BC-2800 vet fully automatic haematology analyser. These parameters included white blood cell (WBC) count, red blood cell (RBC) count, haemoglobin levels, packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), and platelet count. On the other hand, serum biochemical parameters were determined using the semi-automatic Mispa VIVA biochemistry analyser (Agappe), which utilized kits from Erba. The assessed serum biochemical parameters included total protein, albumin, glucose, cholesterol, and triglycerides. These analyses were carried out in strict accordance with industry standards to ensure the reliability and accuracy of the obtained results.

Statistical Analysis: The collected data was subjected to statistical analysis, employing One-way Analysis of Variance (ANOVA) to assess significance, followed by Duncan's multiple range test using SPSS Statistics Version 20.0 to ascertain the significance of treatment means. All the statistical procedures were performed as per [22].

RESULTS AND DISCUSSION

In the present study, the obtained results are tabulated in Table 1 and Table 2 which represents the haematological and serum biochemical profile of the experimental grower pigs, respectively. In our study, none of the treatment groups exhibited significant ($P > 0.05$) differences in haematological parameters compared to the control group. The values obtained in the treatment groups were similar to those in the control group and fell within the normal physiological range. This aligns with previous research, where dietary probiotic supplementation showed no significant impact on the haematological profile of pigs [1]. Consistent with other studies, we found no significant effects on red blood cell and white blood cell counts in pigs treated with probiotics [2,3,4]. Similar results were reported by various authors on treating the pigs with dietary prebiotics [7,8]. However, there were contrasting findings in a study where the RBC and WBC counts remained stable in probiotic-fed pigs even when combined with different nutrient density diets [5], and another study reported inconsistencies with stable haemoglobin levels [6]. Our study partially agrees with previous research, indicating some variations. Specifically, we observed partial alignment with studies that reported higher significance in haemoglobin levels with no changes in RBC, WBC, and packed cell volume in pigs treated with synbiotic milk powder [9]. Additionally, synbiotic effects on pigs were studied, with no notable changes in Hb, PCV, and RBC, except for a higher total leucocyte count in the probiotic group, suggesting a potential immune-stimulating effect [10]. In contrast, our findings differ from a study that reported elevated RBC count, increased haemoglobin, elevated mean corpuscular volume and reduced mean corpuscular haemoglobin concentration upon supplementation of Bifidobacterium spp. as a probiotic in pig diets [11].

In our current study, we observed an increase in total protein among the four experimental groups from Table2, although this increase was not statistically significant ($P>0.05$), consistent with findings from [12, 13, 14]. Serum albumin, indicating improved protein utilization, was notably higher in the T3 group with higher significance ($P < 0.01$) according to [14]. On the other hand, serum glucose did not show significance among the groups ($P>0.05$), aligning with observations in [21]. Notably, cholesterol and

Table 1. Effect on haematological profile of experimental groups (90th day)

Parameter	Control	T_1	T_2	T_3
WBC ($x10^3/mm^3$)	20.27 ± 0.36	20.30 ± 0.33	20.44 ± 0.28	20.41 ± 0.29
RBC ($x10^6/\mu l$)	6.20 ± 0.15	6.36 ± 0.24	6.20 ± 0.20	6.23 ± 0.18
Hb(g/dl)	12.07 ± 0.30	12.17 ± 0.35	12.24 ± 0.20	12.21 ± 0.38
PCV (%)	36.97 ± 0.72	37.11 ± 1.20	36.95 ± 0.72	36.67 ± 0.75
MCV (fL)	58.38 ± 3.05	58.87 ± 2.66	58.81 ± 1.80	57.41 ± 1.25
MCH (pg)	19.58 ± 0.20	18.63 ± 0.47	18.43 ± 0.40	18.52 ± 0.33
MCHC(g/dl)	33.05 ± 0.57	31.77 ± 0.48	31.97 ± 0.35	32.15 ± 0.82
PLT ($x10^5/\mu l$)	3.83 ± 0.26	3.66 ± 0.20	3.7 ± 0.24	3.62 ± 0.27

Values bearing different superscripts in a row differ significantly (P < 0.05)

Table 2. Effect on serum biochemical profile of experimental groups (90th day)

Parameter	Control	T_1	T_2	T_3
Total protein (g/dl)	10.02 ± 0.51^c	10.87 ± 0.64^b	10.92 ± 0.43^b	12.28 ± 0.46^a
Albumin (g/dl)*	4.23 ± 0.18^b	4.50 ± 0.15^b	4.22 ± 0.95^b	5.12 ± 0.18^a
Glucose (mg/dl)	102.83 ± 6.47	106.83 ± 8.41	106.5 ± 5.16	104.83 ± 4.63
Cholesterol (mg/dl)*	88.17 ± 2.14^a	75.33 ± 1.84^b	76.83 ± 3.15^b	77.5 ± 2.13^b
Triglycerides (mg/dl)*	47.83 ± 2.06^a	32.33 ± 1.23^b	35 ± 1.57^b	32.83 ± 2.85^b

Values bearing different superscripts in a row differ significantly (P < 0.01) *

triglycerides exhibited a significant reduction in the treatment groups compared to the control group (P < 0.01) in our current study.

Contrary to our results, a study [15] reported a significant effect on total protein in treated pigs. While serum albumin remained consistent in some studies [12, 13, 17], our findings were not supported by investigators who observed significant variations in glucose levels among pigs treated with dietary probiotics [2, 11, 16, 17]. Our study is partially in contrast with the results of [4], who found no significance of dietary probiotics on total protein, albumin, glucose, and cholesterol. Some researchers [13, 17, 18] noted a positive significant decrease in cholesterol and triglycerides in pigs, similar to our current study. Similarly, some studies reported a significant decrease in cholesterol [11, 19], while others consistently found lowered cholesterol levels [9,21]. However, our results are not in agreement with studies [3, 6, 20] reporting no significant decreases in serum profile.

CONCLUSION

In the current study, a significant increase in serum albumin levels and a noteworthy decrease in cholesterol and triglycerides were observed in the treatment groups compared to the control. Glucose and total protein levels remained consistent, while no significant changes were noted in any haematological parameters. Additionally, it's worth highlighting that the observed alterations in serum albumin, cholesterol, and triglycerides suggest a positive impact on metabolic health and lipid regulation in the treated groups. This aligns with the growing body of evidence supporting the potential of dietary supplementation with probiotics, prebiotics, or their combination in influencing metabolic markers. Furthermore, the stability in glucose and total protein levels indicates that the observed effects are specific to certain biochemical pathways, emphasizing the nuanced impact of these supplements on different physiological processes. In conclusion, the findings underscore the potential of probiotic, prebiotic, or synbiotic supplementation to not only influence haematological parameters positively but also to bring about favorable changes in key biochemical markers associated with metabolic health.

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