PERFORMANCE, HAEMATOLOGY AND SERUM BIOCHEMISTRY OF RABBIT BUCKS FED SUPPLEMENTAL LEVELS OF *Saccharomyces cerevisiae*

ABSTRACT

This study was carried out to investigate the effect of Saccharomyces cerevisiae on growth performance, haematological and serum biochemical indices of rabbit bucks. Nine bucks were used for the study. They were assigned to three treatment groups with 3 bucks per treatment, replicated 3 times in a completely randomized design for twenty-eight (28) days. The bucks were allowed one week of acclimatization before the commencement of the study, during which they were fed commercial growers diets and forages. The bucks were fed a formulated ration supplemented with S. cerevisiae at 0.0, 0.3 and 0.6g respectively and were coded T1, T2 and T3 respectively. T1served as control. Growth parameters, haematological indices and serum chemistry were measured in the course of the study. The data collected were subjected to analysis of variance (ANOVA) using SPSS version 21, and means were separated using Duncan of same software. The results revealed that S. cerevisae did not have effect (p>0.05) on the growth parameters in the rabbit bucks. This study revealed that Saccharomyces cerevisiae did not have significant effect (p>0.05) in the PCV of bucks in the study as T1, T2 and T3 all had similar (p>0.05) PCV values of 39.00, 39.00 and 41.00% respectively. S. cerevisiae influenced (P<0.05) serum enzymes but did not have significant effect (p>0.05) on total protein, blood urea, ALT creatinine and glucose. In conclusion, dietary supplementation of S. cerevisiae at 0.60% did not have significant effect on growth parameters and most haematological and serum biochemical indices.

Keywords: Yeast, rabbit bucks, *Saccharomyces cerevisiae, probiotics, growth promoters*

INTRODUCTION

The ban on using antibiotics as growth promoters in the EU has led to investigating different natural feed additives to replace dietary antibiotics (Mahrose *et al*. 2019). It is known that high levels of antibiotics have been used in livestock and poultry production as growth promoters and for disease prophylaxis. However, a major problem with this practice is the occurrence of antibiotic residues in meat because of the wide use of antibiotics as well as antibiotic-resistance in both humans and animals. It therefore becomes very imperative to replace the use of antibiotics as growth promoter and to search for a new safe alternative for health improvement and disease control in animals. Probiotics (bacterial and yeast cultures) are non-pathogenic microbial adjuncts, which have been used as feed supplements and also as growth promoters, improving the immune system of animals by promoting the composition and microbial balance in their guts (Besseboua and Ayad, 2021). The probiotic characteristics of S*accharomyces cerevisiae* has been has been documented (Belhassen *et al.*, 2016; Abd el-aziz, *et al.* 2021; Besseboua and Ayad, 2021 and Adli *et al.*, 2023). *Saccharomyces cerevisiae*, also known as baker's yeast, is rich in proteins, vitamins, and minerals (Piskur *et al.*, 2006). However, there is paucity of empirical studies on the effects of *Saccharomyces cerevisiae* supplementation on rabbit bucks. This study was therefore designed to evaluate the effect of *S, cerevisiae* on growth performance, haematology, and serum biochemistry of rabbit bucks.

MATERIALS AND METHODS

Experimental Site

The study was carried out at the Rabbitry unit of Teaching and Research Farm of the Department of Animal *Sc*ience, University of Uyo, Uyo, Akwa-Ibom State. Uyo is located at $5^0$2'N; $7^0$55'E with a mean annual temperature of between 26 ^{0}C and 28 ^{0}C while the mean annual rainfall ranges from 2000mm – 3000mm (Solomon and Udoh, 2017).

Experimental Design

The study adopted a Completely Randomized Design (CRD). Nine (9) mongrel bucks of 20 - 24 weeks of age were randomly assigned to three treatment groups. Each treatment was further replicated three times with one buck per replicate. The experiment lasted for 28 days (4 weeks).

Table 1: Ingredients and Calculated Nutrient Composition of Experimental Grower Diet

Ingredient (%)	**T1 (0.00g *S. cerevisiae*)**	**T2 (0.3g *S. cerevisiae*)**	**T3 (0.6g *S. cerevisiae*)**
Maize	35.50	35.50	35.50
SBM	19.00	19.00	19.00
Wheat offal	26.00	26.00	26.00
PKC	15.50	15.50	15.50
Bone meal	3.00	3.00	3.00
Premix	0.25	0.25	0.25
Common Salt	0.25	0.25	0.25
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
**S. cerevisiae*	0.00	0.30	0.60
Total	**100**	**100**	**100**
Calculated Proximate Composition			
Crude Protein	17.11	17.11	17.11
Crude Fibre	6.65	6.65	6.65
Ether Extract	6.72	6.72	6.72
Calcium	1.15	1.15	1.15
Phosphorus	0.74	0.74	0.74
Lysine	1.00	1.00	1.00
ME	2644.20	2644.20	2644.20

Vitamin Premix supplied the following per kg of diet, vitamin A 10,000 i.u., vitamin D3 12,000 i.u., vitamin E 20 i.u., vitamin K 2.5mg, thiamin 2.0mg, riboflavin 3.0mg,**S. cerevisiae* – Saccharomyces cerevisae; SBM – Soybean Meal; PKC – Palm Kernel Cake; ME – Metabolizable Energy

Animal bucks and Management

The nine (9) bucks were housed individually in a three – tier wooden hutch according to their treatments and managed under standard husbandry conditions with ad libitum supply of feed and water. Other routine management practices were carried out in the best of animal welfare principles.

Experimental Diet

The bucks were fed a formulated ration with the proportionate inclusion of *S. cerevisiae* in treatments two and three at 0.3 and 0.6g respectively, while treatment one which served as control was not supplemented with *S. cerevisiae*. The diets were coded T1, T2 and T3 respectively.

Data Collection

Growth Performance

To evaluate growth performance of these bucks, their initial weights were recorded at the beginning of the experiment, thereafter on weekly basis for the 4 weeks of the study. Other parameters evaluated were total and daily feed intake, total and daily weight gains and feed conversion ratio (FCR).

Serum and Haematological parameters

Upon termination of the experiment, blood samples for biochemical and haematological analysis (2 ml each) were collected via the external ear veins of the bucks from each replicated. The samples for haematological analysis were collected into EDTA bottles to prevent coagulation while those of the serum biochemistry were collected in plain sample bottles without EDTA. The serum blood samples were kept in slope position till sera samples were separated through centrifugation at 1000 rpm for 20 minutes, followed by cooling in a deep freezer. All samples were then taken to the laboratory within two hours after collection for analysis.

Statistical Analysis:
The data collected were subjected to analysis of variance (ANOVA) using statistical package for social *S. cerevisiae*iences (SPSS) version 21, and means were separated using Duncan of same software to determine significant differences.

RESULTS

Growth performance of rabbit bucks fed diets containing dietary levels of *Saccharomyces cerevisiae*

The results on the growth performance of rabbit bucks fed diets containing dietary levels of *S. cerevisae* is presented in table 2. The results revealed that *S. cerevisae* did not have effect ($p>0.05$) on the growth parameters in the rabbit bucks. Final weight was similar ($p>0.05$) in the study but was non – significantly increased in T3.

Table 2: Growth performance of rabbit bucks fed diets containing dietary levels of *Saccharomyces cerevisiae*

Parameters	T1	T2	T3	SEM
Initial weight (g)	1383.33	1383.67	1375.33	65.96
Final weight (g)	1772.67	1778.67	1819.33	71.64
Total weight gain (g)	389.33	395.00	444.00	32.31
Daily weight gain (g)	13.90	14.11	15.86	1.15
Feed intake (g)	3095.33	3204.00	2787.67	142.49
Daily feed intake (g)	110.55	114.43	99.56	5.09
Feed Conversion Ratio	8.27	8.12	6.41	0.46

SEM – Standard error of mean, means without letters were not significant ($p>0.05$)

Total and daily weight gains respectively were not affected ($p>0.05$) by the inclusion of *S. cerevisae* in the diets of the bucks but increased non-significantly in *S. cerevisae* treated groups than those without *S. cerevisae* in their diets. The values obtained in this study were 1772.67, 1778.67 and 1819g for T1, T2 and T3 respectively for final weights and 389.33, 395.00 and 444.00g for T1, T2 and T3 respectively as total weight gain. Although, there was no significant difference in the total and daily feed intake respectively, rabbit bucks on T3 diets had non – significantly ($p>0.05$) lower feed intake. Bucks in T3 had total feed intake of 2787.67g while T1 and T2 had total feed intake values of 3095.33 and 3204.00g respectively. Non – significantly higher ($p>0.05$) daily feed

intake feed intake was observed in T2. There was a non – significantly better (p>0.05) feed conversion in bucks fed T3 diets. FCR values in the study were 8.27 (T1), 8.12 (T2) and 6.41 (T3).

Table 3: Haematological indices of rabbit bucks fed diets containing dietary levels of *Saccharomyces cerevisiae*

Parameters	T1	T2	T3	SEM
Packed Cell Volume (%)	39.00	39.00	41.00	0.69
White Blood Cells ($\times10^9$/dL)	3.80^b	5.17^a	5.23^a	0.29
Platelet	174.67^b	339.67^a	221.67^{ab}	30.61
Red Blood Cells ($\times10^{12}$/L)	5.87	5.77	5.97	0.18
MCV (fl)	66.67	68.67	70.00	1.45
MCH (pg)	23.00	23.67	23.00	0.32
MCHC (%)	34.00	33.67	33.67	0.15
Haemoglobin (g/dL)	13.27	13.10	13.38	0.28
Lymphocytes (%)	47.00	59.00	59.00	2.71
Eosinophil (%)	2.67	2.67	2.00	0.53
Monocytes (%)	2.00	2.00	1.67	0.11
Neutrophils (%)	48.67^a	35.67^b	37.67^{ab}	2.67
Basophil (%)	0.00	1.00	0.00	0.17

MCV - mean corpu*S. cerevisiae*ular volume, MCH – mean corpu*S. cerevisiae*ular haemoglobin, MCHC – Mean corpu*S. cerevisiae*ular haemoglobin concentration, SEM – Standard error of means; Means with different super*S. cerevisiae*ripts are significant (p<0.05)

Haematological indices of rabbit bucks fed diets containing dietary levels of *Saccharomyces cerevisiae*

The dietary inclusion of *Saccharomyces cerevisiae* in the diets of rabbit bucks in this study as shown in table 3, significantly affected (p<0.05) white blood cells (WBC), platelets and neutrophils in the bucks. However, other haematological parameters were not influenced by dietary levels of *Saccharomyces cerevisiae*. This study revealed that *Saccharomyces cerevisiae* did not have significant effect (p>0.05) in the PCV of bucks in the study as T1, T2 and T3 all had similar (p>0.05) PCV values of 39.00, 39.00 and 41.00% respectively. Higher (p<0.05) WBC was observed with inclusion of *Saccharomyces cerevisiae* in the diets of the bucks when compared with those without *Saccharomyces cerevisiae* in their diets (T1). Bucks fed T3 and T2 had WBC values 5.23 and 5.17 $\times10^9$/dL respectively while bucks on T1 diet had WBC value of 3.80 $\times10^9$/dL. Significantly higher (p<0.05) platelet was observed in bucks fed T2 in the study while similar (p>0.05) lower values were recorded in T1 and T3 respectively. S*accharomyces cerevisiae* did not have effect on RBC as values recorded were statistically similar (p>0.05). MCV, MCH and MCHC were all similar (p>0.05) across dietary treatment groups. Haemoglobin was not also affect by S*accharomyces cerevisiae* in the study as values observed were 13.27, 13.10 and 13.38 g/dL respectively for T1, T2 and T3. Similarly, lymphocytes, eosinophil, basophils and monocytes all showed no significant alteration (p>0.05) with inclusion of S*accharomyces cerevisiae* in the diets of the bucks in the study. However, neutrophils were substantially increased (p<0.05) in bucks fed T1 diet compared to those fed T2 and T3 diets respectively.

Table 4: Serum biochemistry of rabbit bucks fed diets containing dietary levels of *Saccharomyces cerevisiae*

Parameters	T1	T2	T3	SEM
Total protein (g/dL)	60.67	56.00	60.67	1.03
Urea (mmol/L)	7.90	7.30	7.40	0.18
AST (µ/L)	168.67[a]	91.67[b]	112.00[ab]	15.00
ALP (µ/L)	31.00[a]	24.67[b]	26.00[ab]	1.13
ALT (µ/L)	46.67	37.67	37.00	3.15
Creatinine (mg/dL)	154.00	119.33	133.00	8.17
Glucose (g/dL)	5.60	5.55	6.30	0.21

AST - Alanine aspartate aminotransferase; ALP – Alanine amino phosphatase; ALT - Alanine aminotransferase; SEM – Standard error of means; Means with different super Scripts are significant ($p<0.05$).

The result on serum biochemical indices of male rabbits fed dietary levels of *S. cerevisiae* is presented in table 3. Results in this study showed that *S. cerevisiae* influenced ($P<0.05$) serum enzymes but did not have significant effect ($p>0.05$) on total protein, blood urea, ALT creatinine and glucose. Values of total protein observed in the study were 60.67, 56.00 and 60.67 g/dL for T1, T2 and T3 respectively. Similar ($p>0.05$) urea values were recorded for all treatments in the study. Lower ($p<0.05$) AST and ALP were observed with inclusion of *S. cerevisiae* in the bucks diets. Aspartate aminotransferase (AST) was higher (168.67 µ/L) in the control group (T1) while bucks on T2 diet had the least AST value. Alanine amino phosphatase (ALP) was higher in bucks whose diet did not contain *S. cerevisiae*. Alanine aminotransferase (ALT) did not show ($p>0.05$) any significant statistical variation with dietary inclusion of *S. cerevisiae* in the bucks' diets. Creatinine values were 154.00, 119.33 and 133.00 mg/dL for T1, T2 and T3 respectively. Glucose value were also similar ($P>0.05$) across diets. Values obtained in the study were 5.60, 5.55 and 6.30 g/dL for T1, T2, and T3 respectively.

Discussion

Growth performance of rabbit bucks fed diets containing dietary levels of *Saccharomyces cerevisiae*

This findings of this study is in variance with the report of Besseboua and Ayad (2021), who in their study observed that the weights of rabbits treated with *S. cerevisiae* at 0.3 g/day were significantly decreased, compared to the group control and group treated with *S. cerevisiae* at 0.6 g/day. The insignificant effect of *S. cerevisiae* on the growth parameters in rabbit bucks confirmed earlier studies of Seyidoglu and Galip (2014) and Belhassen *et al*. (2016), who reported no significant differences in the growth performance of rabbits fed diets supplemented with *S. cerevisiae*. Kimsé *et al*. (2012), in their study noted that yeast did not affect final body weight, daily weight gain nor feed intake in New Zealand rabbits. Abdel-Aziz *et al*. (2021) also reported insignificant improvement in growth performance of mice administered *S. cerevisiae*. However, Saied *et al.* (2011) and Onwurah and Okejim (2014), reported significant improvements with *S. cerevisiae* supplementation in broiler chicks and broiler chickens respectively. These variations may be attributed to the species of animals, age, dose and environmental conditions.

Haematological indices of rabbit bucks fed diets containing dietary levels of *Saccharomyces cerevisiae*

The WBCs, platelets and neutrophils of rabbit bucks fed diets supplemented with *S.*

cerevisiae were significantly different in the study as compared to the control group, while other haematological parameters remain the same. This observation agrees with the reports of Seyidoglu and Galip (2014) and Belhassen *et al*. (2016) who noted that *S. cerevisiae* in the diets of rabbits had no effect on some haematological parameters, although they observed slight increase in PCV and haemoglobin concentrations in rabbits supplemented with yeast, which is in divergence with this study. The significant effect of *S. cerevisiae* supplementation in bucks' diets on WBC in the current study supports the reports of Paryad *et al.* (2008) and Mulatu *et al.* (2019) who also recorded significantly elevated WBCs in their studies but differs from the report of Besseboua and Ayad (2021), for the stated parameters. Mulatu *et al*. (2019), revealed that WBCs, packed cell volume (PCV) and haemoglobin (HGB) were higher in chickens fed diets containing *S. cerevisiae*. Elghandour *et al*. (2019), observed that yeast-fed rabbits had more WBCs and LCTs, compared to the rabbited fed the control diet. The significant increase in the WBC, platelets and decrease in neutrophils suggest improved immunity, better clotting factors and reduced parasitism in the bucks, supporting the earlier report of Kazuun and Kazuun (2019), who noted that probiotics have immune stimulatory effects.

Serum biochemistry of rabbit bucks fed diets containing dietary levels of *Saccharomyces cerevisiae*

Total protein, urea, ALT, creatinine and glucose were not influenced by *Saccharomyces cerevisiae* supplementation in the bucks' diets in the study. Serum total protein is a marker of the synthetic function of the liver and a valuable guide to assess the severity of liver damage (Osigwe *et al.* (2017). The similarity therefore in the study suggest no liver damage in the bucks. Low or high total protein is an indication of liver disorders and malnutrition (Augustine *et al.*, 2020). The insignificant effect of *S. cerevisiae* on ALT, urea and creatinine in the study is similar to the findings of Abd El-aziz *et al.* (2021). Similar results were observed by Seyidoglu and Galip (2014), who supplemented 3 g of yeast/kg in rabbit diet and Ozsoy and Yalcin (2011), with Saccharomyces *cerevisiae* in broiler turkey. The reduction in AST and ALP may be triggered by the presence of *S. cerevisiae* in the buks' diet. According to Alagbe and Adegbite (2019), serum enzymes values are triggered by the presence of antinutrients or toxic substances in the feed of an animal. Yin and Tong (2014), identified raised ALT and AST as laboratory indicators for hepatocellular injury which result from leakage of these enzymes into the systemic circulation. Hence, results in this study indicated that the hepatic functions of the bucks was not compromised in the course of the study.

CONCLUSION

The findings of this study showed that dietary supplementation of *S. cerevisiae* at 0.60% did not have significant effect on growth parameters and most haematological and serum biochemical indices in rabbit bucks.

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