Effect of live *Saccharomyces cerevisiae* feeding on serum biochemistry in early weaned cross bred piglets

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Abstract

Aim: To assess the effect of feeding live *Saccharomyces cerevisiae* on serum biochemistry in early weaned cross bred (Landrace × Desi) piglets

Materials and Methods: 48 piglets assigned to four different groups (T1, T2, T3 and T4: n=12) following completely randomized design. T1 and T2 were weaned at age of 28 days while T3 and T4 were weaned at age of 42 days. T1 and T3 were fed basal diet without *S. cerevisiae*, however, T2 and T4 were supplemented with live *S. cerevisiae* (200 g/d/h containing 2-3×10^6 cfu/g).

Results: The period-wise comparison of mean values of serum albumin and globulin were similar, however, period-wise comparison of protein was significant. The mean glucose value of T4 was statistically higher than T1 and comparable with T2 and T3. The serum total cholesterol level was found to be lower in T2 and T4 as compared to T1 and T3.

Conclusion: Results of study suggest that supplementation of live *Saccharomyces cerevisiae* was effective in improving the health status of early weaned piglets.

Keywords: early weaned piglets, *Saccharomyces cerevisiae*, serum biochemistry

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Introduction

Early weaning increase the potential for annual production of piglets per sow and profit of farmer. Weaning is a complex process. At the time of weaning, young piglets are subjected to several stressors such as nutritional, environmental, psychological, social and microbial imbalance resulted in to low feed intake, impaired intestinal morphology and function [1]. Antibiotics have traditionally been widely used in nursery pigs to solve post weaning problems [2]. However, there is an increasing evidence of micro-organisms becoming resistant to antibiotics in both animal and human [3]. Feeding of probiotics in piglets came up as an alternative of antibiotics. The best indicator of animal's well being and its potential for production is its health status. Madubuike and Ekenyem [4] had stated that haematology and serum biochemistry assay of livestock suggests the physiological disposition of the animals to their nutrition. Serum biochemistry is important indicator of health and disease in animals and has become indispensible in the diagnosis, treatment or prognosis of many diseases [5]. Deter-mination of the serum biochemistry reflects the physiological responsiveness of the animals to its internal and external environment [6].

Keeping above in view, the present study was conducted to assess the effect of feeding live *Saccharomyces cerevisiae* on serum biochemistry in early weaned cross bred (Landrace × Desi) piglets.

Materials and Methods

Ethical approval: Prior approval for experiments was taken from Institutional Animal Ethics Committee as per CPCSEA (Govt. of India) norms.

A total of 48 crossbred piglets weaned at 28 and 42 days were selected for the present study and were assigned to four different groups (T1, T2, T3 and T4) of 12 piglets in each group. T1 and T2 group piglets were weaned at 28 days of age and T3 and T4 group

Table-1. Physical composition of ration for piglets

Ingredients (Parts/100 Kg)	Body weights (kg)			
	5-10	10-20	20-50	50-80
Crushed maize	46	54	62	71
Deoiled soya bean meal	30	22	15	10
Wheat bran	16	16	15	13
Fish meal	06	06	06	04
Mineral mixture	1.5	1.5	1.5	1.5
Common salt	0.5	0.5	0.5	0.5
Calculated CP (%)	23.7	20.9	18.3	15.6
Calculated DE (kcal/kg)	3400.1	3399.45	3399.37	3390

piglets were weaned at 42 days of age. T1 and T3 groups were fed basal diet without *S. cerevisiae* while T2 and T4 were fed basal diet supplemented with live *S. cerevisiae*. Basal diet was formulated with maize, soyabean meal, fish meal, wheat bran, salt, mineral mixture and vitamin supplements as per NRC [7]. Physical composition of the diet was as given in (Table 1.) Crushed maize was fermented with *S. cerevisiae* (2-3x10^6 cfu/g feed) as described below and fed @ 200g (on fresh basis) per piglet per day to T2 and T4 groups. The study was continued for 120 days. Blood was collected at 0 and 120 days of experimental trial and serum was collected and then stored at -20°C until it analysis. Finally after thawing, serum was analyzed for various biochemical and enzymatic profiles by standard protocol as per kit (Span Diagnostics Ltd. Surat, India) using spectrophotometer.

Fermentation of maize with *S. verevisiae* culture: The *S. cerevisiae* (yeast) culture was maintained by repeated sub culturing on agar slants. The ingredients of yeast extract peptone glucose (YEPG) medium (composition/1000ml) were yeast extract-3 g, Peptone-5 g, Glucose-10 g, Agar-15 g and distilled water-1 lit.

Preparation of yeast culture for feeding: From the agar slant of yeast, a loopful of yeast culture was transferred aseptically to 100 ml of sterilized broth (Table 2). The broth was incubated for 24 hours at 39ºC. Crushed maize (1000g) mixed with 1000 ml of tap water was inoculated with the 100 ml of 24 hours old yeast culture (10% of the total feed) and incubated for 24 hours at 39ºC. The fermented material was fed to the animals and the same fermented material was used as inoculum (20% of concentrate mixture) for preparation of next day's fermented feed. After 15 days, fresh culture was taken as described above and used consecutively for next 15 days.

Statistical Analysis: The experimental data generated were analyzed using the statistical software program SPSS (SPSS Inc., Chicago, Illinois, USA).

Table-2. Composition of medium for growing *Saccharomyces cerevisiae*

Ingredients	Composition/1000ml
Yeast extract	3 g
Peptone	5 g
Glucose	10 g
Distilled water	Up to 1000 ml

Results and Discussion

The results are presented in Table-3. The plasma protein concentration at any given time is in turn a function of hormonal balance, nutritional status, water balance and other factors affecting the state of health. In the present study, serum total proteins, albumin and globulin remained within normal range [8] and did not differ significantly among different dietary treatments. The period-wise comparison of mean values of serum albumin and globulin were similar, however, period-wise comparison of serum protein was statistically significant. This may be due to improvement in appetite and feed utilization by the animals. Our results were paralleled with that recorded by Bakr *et al*. [9] who reported no significant difference in the levels of serum albumin and globulin in probiotic treated calves, however, they observed a significant increase in the levels of serum total proteins. The findings were also in harmony with that recorded by Sayed [10] in probiotic treated kid. Chen *et al*. [11] concluded that there was no effect of complex probiotic feeding on total protein and albumin. The activities of glucose in the present investigation were significantly changed along the period of the experiments. The present findings were line with the observation of Bakr *et al.* [9]. Serum glucose values also increased both in T2 and T4 due to supplementation of *S. cerevisiae* as compared to their respective control, though the difference was not significant. The serum glucose level of T4 was significantly higher in as compared to T1. Significant increased in serum glucose levels in probiotic treated buffalo calves was observed by Bakr *et al.* [9]. The level of cholesterol was significantly

Table-3. Effect of different treatments on Serum biochemical profile

Attributes	Treatment	Period		Mean
		0 d	120 d	
Total Protein	T1	6.4±0.20	6.6±0.15	6.5±0.13
	T2	6.5±0.20	7.1±0.19	6.8±0.15
	T3	6.6±0.17	6.7±0.15	6.6±0.11
	T4	6.6±0.12	7.1±0.11	6.9±0.10
	Mean	6.5±0.08[b]	6.9±0.08[a]	
Albumin	T1	3.8±0.11	4.0±0.21	3.9±0.12
	T2	3.7±0.08	3.9±0.13	3.8±0.08
	T3	3.9±0.15	4.0±0.13	4.0±0.10
	T4	4.1±0.22	4.0±0.23	4.1±0.15
	Mean	3.9±0.07	4.0±0.09	
Globulin	T1	2.6±0.18	2.7±0.18	2.6±0.12
	T2	2.7±0.26	3.2±0.12	2.9±0.15
	T3	2.6±0.17	2.7±0.12	2.7±0.10
	T4	2.5±0.28	3.1±0.25	2.8±0.20
	Mean	2.6±0.11[b]	2.9±0.10[a]	
Glucose	T1	95.9±2.83	101.7±1.52	98.8±1.72[b]
	T2	96.0±1.20	111.5±0.83	103.8±2.13[ab]
	T3	99.7±3.24	106.5±2.19	103.1±2.09[ab]
	T4	99.0±1.46	116.0±0.99	107.5±2.35[a]
	Mean	97.6±1.16[b]	108.9±1.19[a]	
Cholesterol	T1	54.6±2.87	52.3±2.91	53.4±2.00[a]
	T2	47.4±0.52	45.4±1.57	46.4±0.84[b]
	T3	54.3±2.26	53.2±2.47	53.8±1.62[a]
	T4	47.9±1.61	46.4±1.94	47.1±1.23[b]
	Mean	51.0±1.14	49.3±1.25	
Triglycerides	T1	28.9±1.64	34.0±2.16	31.4±1.47
	T2	29.3±1.56	30.9±1.81	30.1±1.17
	T3	29.3±1.31	34.0±1.09	31.6±1.02
	T4	28.9±1.64	30.9±1.91	29.9±1.24
	Mean	29.1±0.74	32.4±0.90	
Serum urea	T1	22.5±0.56	22.5±.52	22.5±0.37
	T2	22.2±0.35	22.2±0.34	22.2±0.24
	T3	22.6±0.47	22.8±0.44	22.7±0.31
	T4	22.1±0.26	22.2±0.31	22.1±0.19
	Mean	22.3±0.20	22.4±0.20	
AST	T1	84.1±2.59	86.2±1.64	85.2±1.50
	T2	85.6±1.80	84.9±5.00	85.3±2.57
	T3	85.4±1.69	85.6±3.33	85.5±1.80
	T4	85.3±3.00	84.0±3.43	84.6±2.21
	Mean	85.1±1.12	85.2±1.69	
ALT	T1	40.0±3.85	43.8±2.21	41.9±2.20
	T2	39.7±3.42	41.8±2.28	40.7±2.00
	T3	39.7±2.82	43.4±2.78	41.5±1.97
	T4	40.2±3.28	42.2±2.95	41.2±2.15
	Mean	39.9±1.60	42.8±1.23	

abc-Means bearing different superscripts in a row differ significantly ($P<0.05$)

decreased in yeast fed piglets as compared to control. The values of triglycerides were also lower but not statistically significant. The present findings were in agreement with Jouybari *et al.* [12], Ahmadi [13] and Oie [14] who have observed the low levels of cholesterol synthesis in chickens treated with probiotics. Homayouni *et al.* [15] did conclude the same result in a review.

The beneficial effect of *S. cerevisiae* is attributed to the fact that it is a naturally rich source of enzymes, proteins, minerals and B-complex vitamins [16]. Yeast culture, and its cell wall extract containing 1,3-1,6 D-glucan and mannanoligosaccharide, are the important natural growth promoters for modern livestock. *S. cerevisiae* is considered as one of the most popular probiotic that, when administered through the digestive tract, have a positive impact on the host's health through its direct nutritional effect [17].

Probiotics have the ability to deconjugate with bile acids, enzymatically increasing their rate of excretion and the use of cholesterol to synthesize new bile lead to the reduction of serum cholesterol level [18]. Serum urea level was within the normal physiological range [8] and there was no effect of *S. cerevisiae* feeding. The obtained results were in consistent with that reported by Sayed [10]. The values of both ALT and AST were within the normal physiological range [8] and no significant difference was evident in growing pigs irrespective of dietary treatments. The levels of ALT and AST were insignificantly changed along the period of the experiment. The findings were in agreement with that detected by Patrascanu *et al.,* [19] who reported that the activities of AST and ALT were normal and were similar in control and probiotic treated animals.

Conclusion

It can be concluded from present study that supplementation of live *S. cerevisiae* has obvious and beneficial effect on the serum biochemistry profile of the piglets and it was effective in improving the health status of early weaned piglets.

Author's contribution

SK, AKV and SKM designed the study. SK, MG, AKP and BLJ analyzed the samples. SK and AKV analyzed the data. SK and BLJ drafted the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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