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Effect of *Saccharomyces cerevisiae* on overall performance of broilers at starter phase

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Abstract

The reduction in feed cost and direct competition between human and poultry in obtaining food is a major challenge. An experiment was conducted to observe the effect of low levels of *Saccharomyces cerevisiae* incorporation as partial replacement for soybean meal on growth performance, carcass traits, economics, hematology, immunity and intestinal histo-morphology in broilers during starter phase. The feed for starter phase was prepared by replacement of soybean meal at 5, 10 and 15% with SC named as SC0, SC5, SC10 and SC15 respectively. The experimental design was complete randomized in 4×4×3 fashion. No significant effect (P>0.05) was observed for low level incorporation of SC for soybean meal during starter phase on observing parameters except livability, mortality and immunity against new castle disease. However, the numerical variation among the groups indicate positive trend for successful incorporation of SC in replacement to soybean meal. The increasing level of SC in feed during starter phase resulted in the highest productive performance. The group SC10 and SC15 reveal in best results in majority parameters of the productive performance i.e. SC10 (700-FBW), SC10 (1.31-FI), SC10 (660-WG), SC15 (1.83-FCR), SC15 (37.18-BPEF), SC15 (2.23-BFEI), SC15 (97.66-Livability), SC15 (2.33- Mortality), immunity i.e. SC15 (4.79-day 14th) and SC10 (4.86-day 21st), economics i.e. SC10 (91-GR) and SC05 (36.98-Profit),and blood constituents i.e. SC10 (30.76-PCV), SC15 (994-Hb), SC15 (2.98-RBC), SC15 (10.25-WBC), SC10 (4.47-STP), SC10 (2.49-SA), SC15 (1.98-SG). The non-significant effect among the groups shows successful replacement of SC with soybean meal. In conclusion, based on the observing parameters incorporation of SC in replacement to soybean meal resulted in about similar and better performance in some traits shows successful inclusion therefore, could be used on mass level for start ration in boilers.

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Introduction

In developing countries like Pakistan, poultry industry is one of the vibrant and fastest growing sectors. Being an agricultural country this organized segment grows with an annual increase of 8-10 percent and contributes 28% of the total meat production along with direct or indirect involvement of 1.5 million people (Economic Survey, 2014-2015). Furthermore, low protein intake is the major issue facing by developing countries due to rapid increase in human population and could be solved by provision of poultry meat (animal protein) because of having shortest generation interval and faster genetic improvement (Zaharudeen *et al.,* 2005). The rapid increase in poultry production and human population has created a direct competition in between them for intake of food, resulting in high cost of feed stuffs and scarcity. Due to this direct competition in obtaining food, adversely affect the poultry production and performance in terms of high cost and low quality because of the major contribution (65-75%) of feed in poultry production (Esonu *et al.,* 2006).This unparalleled boost in the cost of conventional feed stuffs have necessitated rigorous investigations to walk around alternating and non-conventional feed sources accessible at cheaper charge with no dropping of nutritive value of the feed. An attempt for overcoming this issue is the utilization of *Saccharomyces cerevisiae* (Shahzad *et al.,* 2011).

Saccharomyces cerevisiae also known as "baker's yeast" is one of the most extensively commercialized species, enriched in crude protein (40-45%) and with high biological value of niacin, biotin, thiamine, pantothenic acid, vitamin B complex is an effectual adsorbent. Encouraging reports have been provided for the use of *Saccharomyces cerevisiae* on growth performance of broilers and morphology, microbiology and physiology of intestinal tract in broilers (Hooge, 2004; Zhang *et al*., 2005) Huff *et al*., 2006; Rosen, 2007; Yang *et al*., 2008; Morales-Lopez *et al*., 2009). A favorable improvement has been experiential on broiler meat quality (Akiba *et al.,* 2001; Lee *et al.,* 2002) for incorporation of *Saccharomyces cerevisiae* in feed.

Increased tenderness (Bonomi *et al.,* 1999) and increased water holding capacity (Lee *et al.,* 2002) exhibit in broiler meat fed with SC enriched feed and indications for acquiring antioxidant property have been reported as well (Ampel *et al.,* 2000).

The commercial broiler strains have the potential of rapid growth and maximum feed conversion. This remarkable potential could not be expressed unless we provide nutritionally balanced rations and promote the environment of intestinal tract for maximum absorption and digestion.

The poultry industry will stand suffering economic losses unless this genetic potential of the broilers is expressed. Commercially available natural products or the products which can be cultured such as yeast could be one of the most possible solutions to exploit and explore the genetic potential of the broilers for growth traits and reduce mortality as well. As compared to other livestock types, broilers are the most efficient converters of raw feed into meat from economic and nutritional stand point. To bring this about important role has been played through ration formulation, searching of new feed ingredients and modern advances in the processing of feed ingredients. Due to import of the protein rich ingredients like soybean meal from the neighboring countries with high price, is coupled with diminishing returns to poultry industry for the last decades.

These circumstances have intensified the search along these lines, for choosing the alternate feed sources for optimizing the feed cost and better feed efficiency. Keeping in view the above scenario the present study was designed to observe the effect of overall performance of broilers during starter phase.

Materials and methods

Ethical Considerations and Source of Birds

The materials used and procedures adopted in these studies involving birds were pre approved by the Ethical committee, The University of Agriculture Peshawar-Paksitan and the birds were obtained from commercial Hi-Tech Hatchery.

Birds Housing

Prior to commencement of experiment the experimental shed, other facilities and cages were washed and disinfected. The chicks after arrival were allocated to different treatments on the basis of physical look and similar body weight and the unwanted chicks were culled. The birds in the experiment were assigned to four groups of 60 birds each, having three replicates of 20 birds each. Each replicate was housed in small pen of 10 ft^2area with optimum temperature (95-70^oF) maintained according to the age of birds and continuous light provision. Water and feed were offered *ad-libitum* and the birds had access all the times. The birds were vaccinated on proper schedule against New castle Disease, Infectious Bronchitis and Infectious Bursal Disease.

Proximate analysis of ration

Proximate analysis the experimental rationed was performed according to Lodhi *et al.* (1976).

Growth traits

The feed consumption, weight gain, feed conversion ratio, dressing percentage, liability, broiler performance efficiency factor, broiler farm economy index and mortality was calculated.

Carcass traits

For analysis of the carcass traits weight was performed by digital balance for live weight, dressing weight and body parts. Dressing percentage and proportion of viscera, head, wing, breast, back, gizzard, lungs, heart, liver and kidney was calculated in percent.

Economics

Comparative economics for all groups in each starter and finisher phase was also calculated.

Hematology

Hemoglobin concentration (g/100 ml blood) and packed cell volume was determined by the spectrophotometer (Dacie and lewis, 1991). A total RBC count was counted using a hemocytometer. Leucocytes were counted using a hemocytometer (Natt and Herrick, 1952). Serum total protein concentration was measured calorimetrically as described by Doumas*et al.* (1981). Serum albumin was determined by a colourimetric method according to Doumas*et al.* (1971).Serum globulin concentration was obtained by subtracting the obtained albumin value from the corresponding total protein value for each sample as described by Doumas and Biggs (1972).

Immunity

Blood samples were taken for the determination of antibody titer against Newcastle disease (ND). Hemagglutination inhibition (HI) test (Allan *et al.*, 1983) was used to determine the antibody titer. The small intestine was removed and the segments were processed for light microscopy (Yu and Chiou, 1997; Iji *et al,*2001; Incharoen *et al,* 2009).

Statistical analysis

Analysis of variance (ANOVA) was used for analysis of data using Complete Randomized Design. Statistical package SAS (2009) was used to perform the above analysis on computer.

Results

The study was conducted to observe the effect of partial incorporation of *Saccharomyces cerevisiae* as replacement for soybean in broiler starter ration.

The purpose of the study was to see its effect on overall broiler performance, carcass traits and economics for the starter phase (1-21 days) in broilers.

The effect of *Saccharomyces cerevisiae* as partial replacement for soybean over growth performance of broiler in starter phase is given in Table 2. As a whole no significant effect ($P>0.05$) was observed in broiler's starter phase for almost all growth traits except livability and mortality which shows that *Saccharomyces cervisiae* could successfully be incorporated as partial replacement for soybean in starter phase for obtaining the desired growth traits.

Table 1. Composition of experimental rations for broiler at starter phase.

Ingredients	% control	SC05 %	SC10 %	SC15 %
Corn	54	54	54	54
Br.rice	2.4	2.9	2.9	3.4
C.S.meal	5	5	5	5
Guarmeal	4	4	4	4
S.F.meal	3.4	3.4	3.4	3.4
Soyameal	10	9.5	9	8.5
M.G.meal	7.4	7.4	7.4	7.4
Fishmeal 50%	5	5	5	5
Rice polish	6	6	6	6
Molasses	1	1	1	1
Lime stone	0.4	0.4	0.4	0.4
R.phosphate	1	1	1	1
Lysine	0.1	0.1	0.1	0.1
Methionine	0.1	0.1	0.1	0.1
V.M.premix	0.1	0.1	0.1	0.1
Salt	0.1	0.1	0.1	0.1
SC	0	0.5	1	1.5
Total	100	100	100	100

Table 2. Effect of low level of *saccharomyces cerevisiae* incorporation as partial replacement for soybean meal on productive performance in broilers during starter phase.

Production traits	Diets				P Value
	SC0	SC5	SC10	SC15	
Initial body weight (g)	39.847±0.3028	39.833 ±0.4410	39.667±0.1667	40.833±0.3333	0.1192
Final body weight (g)	656.67±12.129	681.33±53.183	700.00±5.2915	676.00±19.079	0.7319
Total feed intake (kg)	1.1933 ±0.0521	1.2333±0.0333	1.3197±0.0456	1.2367±0.0367	0.2743
Total weight gain (g)	616.83±12.386	641.50±53.589	660.33±5.4186	635.17±19.411	0.7345
Feed conversion ratio	1.9348±0.0723	1.9455±0.1404	1.8864±0.0789	1.8355±0.1090	0.8687
Broiler Performance Efficiency Factor	35.137±1.2698	35.191±2.3688	36.072±1.5612	37.185±2.0847	0.8500
Broiler Farm Economy Index	1.8098±0.2565	1.6262±0.2206	2.2007±0.1702	2.2399±0.2481	0.2331
Livability%	94.000± 1.0000^{c}	95.667±0.5774^{b}	95.333±0.5774^{b}	97.667±0.5774^{a}	0.0016
Mortality%	6.0000±1.0000^{a}	4.3333±0.5774^{b}	4.6667±0.5774^{b}	2.3333±0.5774^{c}	0.0016

Feed Intake

The results show no significant (P>0.05) difference for feed intake in any of the control or treated groups.

Weight Gain

The results reveal no significant effect (P>0.05) over any of the treated group for replacement of soybean by *Saccharomyces cerevisiae* in starter phase in broiler's starter ration.

Feed conversion ratio

Overall there was no significant effect of replacement (P>0.05) on feed conversion ratio on any of the treated group.

Broiler performance efficiency factor

The incorporation of *Saccharomyces cerevisiae* as replacement for soybean meal had no significant effect (P>0.05) over broiler performance efficiency factor as per result obtained in starter phase of broiler.

Broiler farm economy index

Saccharomyces cerevisiae had no significant effect (P>0.05) over broiler farm economy index in starter phase in broilers according the results obtained as shown in Table 2.

Livability

The incorporation of *Saccharomyces cerevisiae* in broiler's starter ration has significant effect (P<0.05) over the livability percentage according to our results as shown in Table 2.

Mortality

The mortality percentage in broiler's starter phase was significantly affected (P<0.05) through incorporation of *Saccharomyces cerevisiae* for replacement of soybean as shown in Table 2.

Carcass traits

The replacement of soybean by *Saccharomyces cerevisiae* in feed had no significant effect (P>0.05) over mean carcass traits in broiler's starter phase as shown in Table 3.

Table 3. Effect of low level of *Saccharomyces cerevisiae* incorporation as partial replacement for soybean meal on carcass traits in broilers during starter phase.

Traits	Diets				P Value
	SC0	SC5	SC10	SC15	
Gizzard%	2.6921±0.0512	2.6181±0.1627	2.6493±0.1099	2.6828±0.0689	0.3338
Back%	21.068±0.2966	22.499±1.1918	22.090±0.2514	21.606±0.6781	0.5515
Breast %	30.695±0.4892	30.984±0.2840	31.665±0.7118	31.694±0.4283	0.4462
Dressing %	64.019±1.4941	65.887±1.0514	65.551±2.3209	63.858±2.5055	0.8477
Head%	2.7715±0.0558	2.6973±0.1823	2.7192±0.1080	2.7621±0.0774	0.9625
Heart%	0.7722±0.0905	0.7658±0.0327	0.7579±0.0598	0.7844±0.0455	0.5581
Intestine%	6.0198±0.9222	6.2612±0.3180	7.4972±1.0526	7.0354±0.2604	0.4913
Kidney%	0.7688±0.1529	0.5946±0.1352	0.6443±0.1668	0.6134±0.1840	0.8676
Liver%	2.8940±0.0874	2.7088±0.0858	2.7120±0.0949	2.6346±0.0114	0.5249
lungs%	0.6170±0.1569	0.8154±0.0194	0.7924±0.1420	0.7188±0.1515	0.7122
Viscera%	24.577±1.0568	26.072±1.2843	24.939±1.7488	25.248±0.6862	0.8537
Wing%	10.136±0.4653	11.483±0.5213	11.191±0.7890	10.773±0.4849	0.4352

Table 4. Effect of low level of *Saccharomyces cervisiae* incorporations as partial replacement for soybean meal on economics in broilers during starter phase.

Group	Feed cost/chick		Gross return		Profit over feed cost	
	Mean	P-value	Mean	P-value	Mean	P-value
SC0	50.120±2.1869	0.3199	85.367±1.5768	0.7720	35.247±1.8985	0.9898
SC5	51.584±1.3942		88.573±6.9138		36.989±5.9571	
SC10	54.964±1.8996		91.000±0.6879		36.036±2.5819	
SC15	51.291±1.5207		87.880±2.4802		36.589±3.9971	

Economics

The effect of yeast incorporation in broiler's starter ration did not show any significant effect (P>0.05) over mean value of feed cost per chick, gross return per chick and profit over feed cost as shown in table 4.

Hematology

The low level incorporations of *Saccharomyces cerevisiae* as partial replacement for soybean meal did not significantly affect (P>0.05) the observed blood parameters during starter phase in broilers. Anyhow the numerical variation among the groups indicates beneficial impact of *Saccharomyces cerevisiae* incorporation.

Table 5. Effect of low level of *saccharomyces cerevisiae* incorporation as partial replacement for soybean meal on hematology in broilers during starter phase.

Parameters	Diets				p-value
	SC-0	SC-5	SC-10	SC-15	
PCV %	30.740±0.0702	30.757±0.1189	30.767±0.0384	30.717±0.1167	0.9814
Hbmg/dl	9.9200±0.0651	9.9233±0.0333	9.9067±0.0636	9.9467±0.0384	0.9566
RBC (cells x 106/mm3)	2.9500±0.0351	2.9167±0.0318	2.9800±0.774	2.9800±0.774	0.2693
WBC (cells x 103/mm3)	10.677±0.2783	10.570±0.1779	10.257±0.1320	10.257±0.0841	0.3123
Serum Total Protein (g/dl)	4.3633±0.1200	4.3033±0.667	4.4700±0.0200	4.3867±0.1105	0.5757
Serum Albumin (g/dl)	2.4700±0.0265	2.4200±0.0971	2.4967±0.0410	2.4033±0.0549	0.6886
Serum Globulin (g/dl)	1.8933±0.1438	1.8833±0.0994	1.9733±0.0484	1.9833±0.1490	0.8946

Table 6. Effect of low level of *Saccharomyces cerevisiae* incorporation as partial replacement for soybean meal on immunity against ND in broilers during starter phase.

Group	Day-14		Day-21	
	Mean ±SE	P-value	Mean ±SE	P-value
SC0	4.4667^{b}±0.0296	0.0004	4.4467^{c}±0.0876	0.0054
SC5	4.7133^{a}±0.0260		4.6633^{b}±0.0371	
SC10	4.7267^{a}±0.0285		4.8667^{a}±0.0623	
SC15	4.7933^{a}±0.0384		4.7867^{ab} ±0.0371	

Immunity

The low level incorporation of *Saccharomyces cerevisiae* as partial for soybean meal in broilers during starter phasehas significantly affected (P<0.05) antibody titer against new castle disease in broilers presented in Table 6.

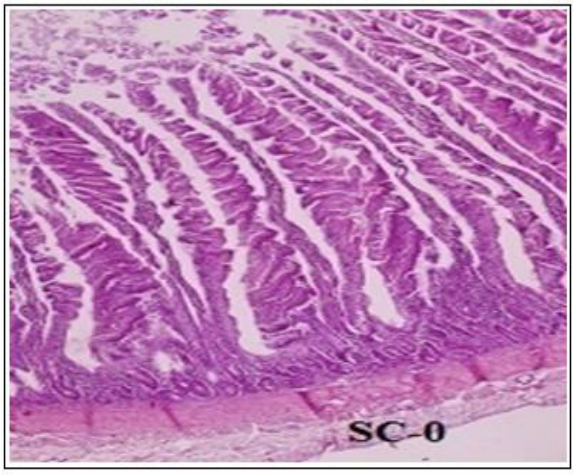

Fig. 1. Normal appearance of the intestine of the group SC0. No prominent change found with treated group.

Discussion

The results obtained in our experiment show no significant effect (P>0.05) of *Saccharomyces cerevisiae* incorporation as partial replacement for soybean meal in broiler starter phase.

Feed intake

Our results are in alliance with Zhang *et al.* (2005) and Gao *et al.* (2008) who reported non significant effect over feed intake in broilers starter phase. Similarly, Hassanein and Soliman (2010) have given repots for non significant effect of yeast over feed intake. Our results give indication for successful replacement of soybean with *Saccharomyces cerevisiae* in broilers starter ration. In contrast to our results Chen *et al.* (2009) and Sharif *et al.* (2012) presented increase (P<0.05) in feed intake through incorporation of *Saccaromyces cerevisiae* in feed while Manal and Abou El Nagha (2012) observed decrease (P<0.05) in feed intake for low level incorporation of yeas in the ration.

The contrast could be possibility due to change in environmental condition or source of the yeast.

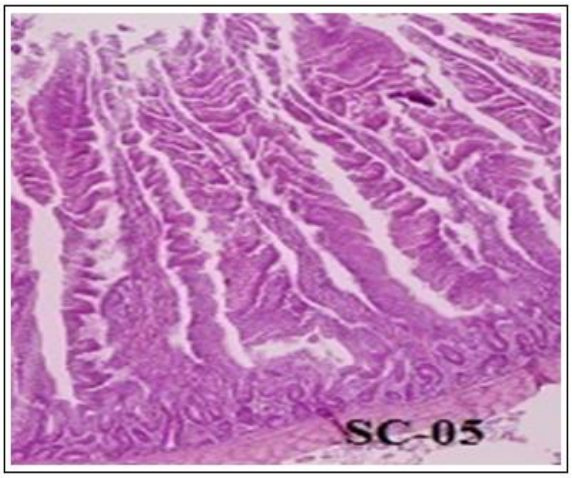

Fig. 2. The low level of *Saccharomyces cerevisiae* didnot brought any remarkable change in the histogram of the group SC5. It is an indication for successful replacement for the starter group. Only goblets cells show minute positive impact.

Weight gain

Our results indicate no significant effect (P>0.05) of *Saccharomyces cerevisiae* over total weight gain in starter phase in broilers. Madriqal *et al.* (1993) and Brummer *et al.* (2010) have also provided no significant effect (P>0.05) for *Saccharomyces cerevisiae* inclusion in feed over weight gain broilers starter phase. Our results show positive impact for replacement of soybean with *Saccharmyces cerevisiae* in starter ration in broilers. Our results are also supported by Hadj Ayed *et al.* (2004) who found significant effect of yeast over weight gain. Paryad and Mahmoudi (2008), Shareef and Al- Dabbagh (2009) and Manal and Abou El.Nagha (2012) have oppose our results by provision of significant effect (P<0.05) over weight gain in broilers through dried yeast feeding.

Feed conversion ratio

The feed conversion ratio in starter phase was not significantly affected (P>0.05) by low level of substitution of soybean with yeast in our results. In agreement to our results Ignaco (1995), Onifade *et al.* (1998) and Chen *et al.* (2009) have also reported non-significant effect (P>0.05) over FCR broiler's starter phase by feeding yeast in the boilers.

Kanat and Calialar (1996) have also supported our results by presenting non significant effect (P>0.05) over FCR in starter phase by broilers. In opposition to our results (Sharif *et al.,* 2012) reported significant effect (P<0.05)over FCR in broilers starter phase through yeast feeding which may be due to high biological value of the yeast used or different amino acid composition of the yeast from our experiment.

Livability

The results obtained in our experiment shows significant effect (P<0.05) over livability in starter phase in response to partial replacement of soybean with *Saccharomyces cerevisisiae*. This is a positive impact rather than other benefits regarding growth performance. In accordance to our results significant effect for yeast substitution has been reported by Shareef and Al-Dabbagh (2009) and Ozsoy and Yalcin (2011).

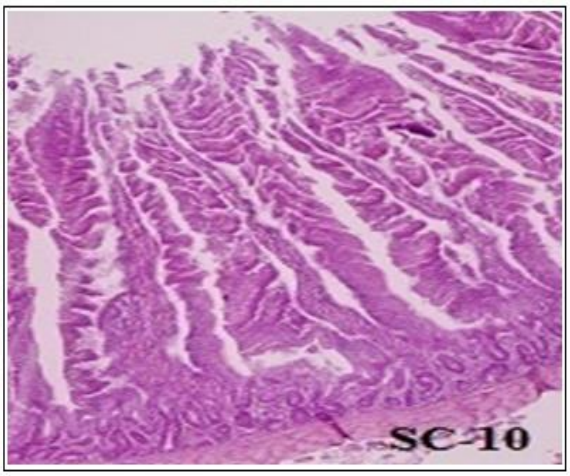

Fig. 3. The intestinal morphology of the treated group SC10 having about similar results for the villus height and crypts. The height and crypts of villus have no prominent change regarding variable effect for *Saccharomyces cerevisiae* during starter phase**.**

The results of Thongsong *et al.* (2008) are also in line to our observation regarding livability for the experiments conducted during starter phase in layers. Tangendjaja and Yoon (2002) have also presented similar reports of significant effect (P<0.05) over livability for yeast incorporation in broiler's starter ration. Consistent results to ours were obtained by Jensen *et al.*, 2008 during in vitro studies and have

stated that due to presence of activated B lymphocytes cells, anti inflammatory effect and natural killer cell livability is being enhanced in broilers in starter phase. Contrary results were given by Gao *et al.* (2008) and Yalcin *et al.* (2008) for livability in broilers in starter phase who shown only numerical difference among the groups through yeast incorporation in starter ration.

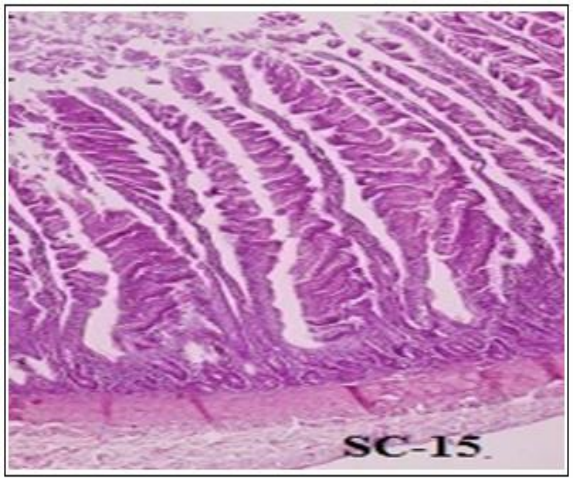

Fig. 4. The group SC15 during starter phase resulted in about the same histologocal appearance of intestine shown mild or no changes in comparison to control group (SC0). No greater difference found thus proved indication for successful replacement soybean meal with *Saccharomyces cerevisiae*.

Mortality

The mortality was significantly affected (P<0.05) in starter phase in broilers by incorporation of *Saccharommyces cerevisiae* in replacement to soybean meal in the ration. Balance microbial population in the gastrointestinal tract through yeast feeding to broilers could be the reason for markedly reduction in mortality. Jensen *et al.*, 2008 reported on the basis of in-vitro studies that yeast has anti inflammatory effect and it activated B lymphocytes and natural killer cells. In favor to our results Tangendjaja and Yoon (2002), Shareef and Al-Dabbagh (2009) and Ozsoy and Yalcin (2011) have also reported significant effect (P<0.05) over mortality through yeast incorporation broilers starter ration. Similar results for significant effect (P<0.05) of yeast over mortality were given by Thongsong *et al.* (2008) in layers starter phase. Yalcin *et al.* (2008) and Gao *et al.* (2008) have opposed our results and shown only numerical variation without any significant effect (P>0.05) over mortality by lower level of yeast inclusion in broilers in starter phase.

Carcass traits

Non-significant effect (P>0.05) of *Saccharomyces cerevisiae* incorporation in replacement to soybean meal in starter ration was noted in our results in broilers, which open ways for recommendation of the use of *Saccharomyces cerevisiae* in replacement to soybean meal in broiler's starter ration. Similar results were given by Kahraman *et al.* (1997) and Karaoglu and Durdag (2005) for non significant effect (P>0.05) of *Saccharomyces cerevisiae* over dressing percentage and other carcass traits. In line to our observation no significant effect over carcass dressing percentage and other carcass traits was observed by Savage *et al.*(1985) for turkeys and Fatufe *et al.* (2010) for rabbits. Likewise no significant effect (P>0.05) of *Saccharomyces cerevisiae* over liver, gizzard and heart was reported by Ozsoy and Yalcin (2011) in alliance to our observation for low level of yeast substitution in starter ration. Savage *et al.* (1985) have also supported our results by observation of non significant effect (P>0.05) of yeast incorporation in the ration in turkeys. The same results were given by Karaoglu and Durdag (2005) in broilers in consistent to our observation. In contrast to our observation Khan (2001) and Manal and Abou El.Nagha (2012) have reported significant effect (P<0.05) for yeast inclusion in starter ration only for dressing percentage which might be due use of different stain of the yeast used or manipulation of some other ingredients in the starter ration.

Economics

The incorporation of *Saccharomyces cerevisiae* in partial replacement to soybean meal have no significant effect (P>0.05) over feed cost per chick, gross return per chick and profit over feed cost per chick in starter phase according to our observation. The whole economic appraisal was resulted only in numerical variation among the groups.

Contrary to our observation significant effect (P<0.05) of *Saccharomyces cerevisiae* over economics were observed by Said and Elsheikh (2012) Ayanwale *et al.* (2006) and Naila chand *et al.* (2014) but the reason was evaluation of economic appraisal in finisher phase of broilers.

Hematology

The common source of protein in broiler chicken diet as soybean meal and in certain situation it may be fish meal and bone meal. Despite of these animals by products and soybean meal *Saccharomyces cerevisiae* have the potential to be used as protein source in the broiler chicken ration as replacement of soybean meal. In present study the soybean meal was partially replaced by *Saccharomyces cerevisiae* in broiler ration during starter phase of their production. Hematological parameters of the blood serve as indicator of the physiological state of the bird (Castagliulo *et al.*, 1996; Sarker *et al.*, 1996; Chowdhury *et al.*, 2005).In the present experiment a non significant effect of the partial replacement of soybean meal with *Saccharomyces cerevisiae* was recorded on the studied hematological parameters. Red blood cell counts and hemoglobin concentration were non significantly affected by the partial replacement of soybean meal with *Saccharomyces cerevisiae*. However numerical increase was observed in red blood cell (RBC) count with the increasing level of *Saccharomyces cerevisiae* replacement with soybean meal. These results of the present study are an agreement with findings of Gheisari and Kholeghipour (2006), and Mansour *et al.* (2011), who reported a significant increase in the RBC counts with the increasing level of yeast. A numerical decrease in White blood cells (WBC) counts were recorded, these results of the present study are in line with findings of Mansour *et al.*, (2011), who recorded a significant decrease in WBC count with the increases in yeast culture supplementation. Contrary to the findings of the present study Paryad and Mahmoudi (2008) reported a significant increased in the WBC count with the increasing level of the *Saccharomyces cerevisiae*. Reduction in the level of WBC may be due to decrease in level of disease threat.

A nonsignificant effect of partial replacement of soybean meal with *Saccharomyces cerevisiae* was recorded for serum total protein, serum albumin, serum glogulin and pack cell volume. These results of the present study are an agreement with findings of Konca *et al.*, (2009) who reported that inclusion of yeast in diet of turkeys does not affect the serum level of total protein, serum albumin and globulin. Similarly Stanley *et al.* (2000) observed that serum components were not influenced by dietary MOS and SC supplementation.

Immunity

Anti body titer against Newcastle disease virus (NDV) was significantly affected by partial replacement of soybean meal with *Sacchromyces cerevisiae* single cell protein during starter phase of their production at day 14 and 21. These results of the present study are an agreement with results of Gao *et al.* (2009) who reported significant increase in antibody titer against NDV as compared to control group. In contrast to these finding Silva *et al.* (2000) reported that yeast supplementation did not affect antibody titer against Newcastle disease virus.

Conclusion

The replacement of soybean meal with *Saccharomyces cerevisiae* at low level (5,10 and 15) had non-significant affect on overall growth performance and carcass traits of broiler during starter phase hence, a positive impact of SC substitution was observed was noted for livability and mortality and economics.

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