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Response of Broiler Chicks to Diets Containing Live Yeast as Probiotic Natural Feed Additive

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Abstract

The effect of feeding broiler chicks on diet containing different levels of backer's yeast saccharomyces cerevisiae (Sc) as probiotic natural feed additive on performance, carcass quality and economic efficiency was studied. A total of one-hundred and forty one-day old unsexed (Hubbard) broiler chicks were randomly divided into four experiment groups. Each group was further subdivided into five replicates at the rate of seven chicks per pen in complete randomized design (CRD). The first group (A), fed on basal diet without feed additive (control group). The other groups B, C and D were fed on basal diet supplemented with yeast (Sc) at levels of 0.1, 0.2 and 0.3% respectively. The experimental diet were fed for 7-weeks duration. Health of the stock and performance parameters was recorded. Dressing percentage and economical evaluation were calculated. The result indicated that, the yeast (Sc) supplemented groups had significantly (P<0.05) higher body weight gain and better feed conversion ratio than the control group; while the feed intake and carcass dressing percentage were not significantly affected by the dietary treatments. The control group exhibit significantly (P<0.05) higher mortality rate compared to yeast supplemented groups. Economically, the highest profitability ratio (1.12) was obtained by the highest yeast (Sc) supplemented experimental groups.

Keywords: *Live yeast diet, Probiotic Natural feed, broiler cheeks*

Introduction

Poultry industry is under increasing pressure to produce high quantity and quality products for consumers. Antibacterial feed additives as antibiotics have been used worldwide for years as growth promoters to control and prevent pathogen bacteria in the gut mucosa so as to improve meat and egg production. However, the sub-therapeutic use of antibiotics in poultry production has become undesirable because of the residuals in meat products (Burgat, 1999) and development of antibiotic resistant bacteria population in human (Sahin *et al*., 2002).

Since January 2006 the use of antibiotics as growth promoter is prohibited by the European Union (Eckert *et al*., 2010). Currently, many parts of the world are experimenting alternative feed additives that may be used to elevate the problems associated with the withdrawal of antibiotics from feed. In this view, the use of probiotic products as substitutes for antibiotics in poultry production has become an area of great interests.

Probiotic was defined as alive microbial feed supplement that beneficially affects the host animal by improving its microbial intestinal balance (Fuller, 1989). The microorganisms used in animal feed as probiotic are mainly bacterial strains of gram positive bacteria belong to the types lactobacillus, enterococcus, pediococcus and bacillus. Some other probiotic are microscopic fungi such as strain of yeast belonging to saccharomyces cerevisiae species (Fuller, 1992; Guillot, 1998).

The effect of yeast products on production and their mode of action in poultry, have been reported by Stanley *et al*. (2004a); Zhang *et al*. (2005); Goat *et al*. (2008). However, there are many mechanisms may be responsible for effects of yeast culture (Sc) in poultry. Mannan-oligosaccharides and 1,3/1,6 β-glucan are component of the yeast cell wall that modulate immunity (Shashidhara and Devegowda, 2003), promoting growth of intestinal microflora (Spring *et al*., 2000) and increase growth (Parks *et al*., 2000). In addition to, other have reported that, yeast product improve digestion and absorption of nutrients (Bradley and Savage, 1995; Goa *et al*., 2008) and intestinal lumen health (Bradley *et al*., 1994; Zhang *et al*., 2005). However, an unambiguous application of probiotics in broiler nutrition is still far from being possible. This may be due to probiotic efficiency may depend on multifactor such as administration level, application method, overall diet, bird age, overall farm hygiene and environmental stress factors (Mountzouris *et al*., 2010). Therefore, the objective of this study to evaluate the effect of feeding different levels of supplemental yeast saccharomyces cerevisiae (Sc) as dietary probiotic source on performance and carcass quality of broiler chicks.

Materials and Methods

A total of 140 one-day old unsexed (Hubbard) broiler chicks were randomly distributed into 4 groups of 35 chicks. Each group was further subdivided into 5 replicates with 7 chicks per each. The chicks of each replicate were housed in a pen (1square meter) in an open-sided deep litter house. The Baker's yeast (saccharomyces cerevisiae) was added to basal diet at level (0.0, 0.1, 0.2 and 0.3%) resulting in four .

formulae respectively to group A, B, C and D with group A serving as control group. All the experimental diets were formulated to meet the nutrient requirements of broiler chicks according to NRC (1994) which was formulated from the local feed ingredients commonly used for poultry feeding in the Sudan. The experimental diets were fed for 7 weeks duration. Calculated analysis of the experimental basal diet was done according to feedstuff analysis outlined by Ellis (1981), while determined chemical analysis was conducted by the method of AOAC (1990). Formulation and proximate analysis and calculated analysis for the experimental basal diet shown in Tables (1 and 2) respectively, while chemical composition of the super concentrate used in the diet is show in Tale (3). Feed and water were offered ad-libitum. The light was continuous throughout of the experimental period. The performance of the experimental birds in term of feed intake, live weight gain and feed efficiency were recorded weekly. Health of the experimental stock and mortality rate were closely observed and recorded daily. At the end of 7th week the birds were individually weighed after overnight fast (except for water) then slaughtered and dressing percentage and financial evaluation were recorded and calculated. Statistical analyses were made by analysis of variance for a completely randomized design, according to Steel and Torrie (1986)

Table (1): Formulation and proximate analysis of the experimental basal diet (percent as fed)

	Ingredients (%)	Basal diet
A:	**Formulation:**	
	Grain sorghum	61.00
	Groundnut meal	15.00
	Sesame meal	12.00
	Super concentrate	5.00
	Oyster shell	2.75
	Common salt	0.25
	Vegetable oil	4.00
	Total	100
B:	**Determined analyses**	
	Dry matter	97.90
	Crude protein (N% x 6.25)	22.31
	Ether extract	8.37
	Crude fibre	4.70
	Ash	8.58
	Nitrogen free-extract	54.04

Table (2): Calculated analysis of the experimental basal diets dry matter basis (DM)

Item	Basal diet
Metabolizable energy (Kcal/kg)	3197
Crude fat	9.10
Crude protein	22.12
Lysine	1.09
Methionine	0.47
Cystine	0.32
Methionine + cystine	0.79
Calcium	1.03
Available phosphorus	0.68
Caloric-protein ratio	146
ME Kcal/kg: protein %	

Metabolizable energy: calculated according to Ellis (1981

Table (3): Chemical composition of the super concentrate used in the basal diet formulation (Hendrix broiler concentrate)

Metabolizable energy	1900 (Kcal/kg)
Crude protein	32.00%
Lysine	11.00%
Methionine	2.80%
Methionine + cystine	2.25%
Calcium	8.00%
Available phosphorus	5.00%

Results

The effect of different levels of dietary yeast (Sc) on boiler's performance is shown in Table (4). Birds fed on dietary yeast (Sc) (B, C and D) obtained significantly ($P<0.05$) higher body weight as compared to those fed the basal diet without dietary yeast (Sc) (control diet A). On the other hand, no significantly differences ($P>0.05$) were observed between group B, C and D in weight gain throughout the experimental period. The treatment effect on the feed intake was not significant ($P>0.05$). However, chicks of group D consumed more feed as compared to other groups.

The chicks in group B, C and D produced significantly ($P<0.05$) better feed conversion ratio as compared to group A. although, the differences between those groups were insignificant ($P>0.05$). The mortality rate was highly significant ($P<0.05$) among the chicks of group A as compared to other experimental treatments.

Table (5) shows the effect of different levels of dietary yeast (Sc) on hot and cold dressing carcass percentages. The hot and cold dressing percentages were not significantly ($P>0.05$) affected by the experimental treatments. All treatment mean values are similar but birds fed on highest dietary yeast (Sc 0.3%) dressed slightly more value as compared to other groups.

Table (4): The effect of different levels of dietary yeast (saccharomyes cerevisiae; Sc) on the performance of broiler chicks

Item	Treatment groups				SEM
	A	B	C	D	
Initial body weight (g/chick)	45	45	45	45	-
Final body weight (g/chick)	1934[b]	2033[a]	2060[a]	2079[a]	14.65
Body weight gain (g/chick)	1889[b]	1988[a]	2015[a]	2034[a]	14.60
Total feed intake (g/chick)	3684	3698	3708	3722	85.80[NS]
Feed conversion ratio	1.95[a]	1.86[b]	1.84[b]	1.83[b]	0.015
Mortality	1.12[a]	0.28[b]	0.28[b]	0.22[b]	0.014

A: Control (without yeast additive)
B: 0.1% yeast (Sc)
C: 0.2% yeast (Sc)
D: 0.3% yeast (Sc)
NS: Not significant

SEM: Standard error of the mean

Means on the same raw with the same superscripts are not significantly different (P>0.05).

Table (5): Effect of different levels of dietary yeast (Sc) on hot and cold dressing percentages of broiler chicks

Item	A	B	C	D	SEM
Hot dressing percentage	70.1	70.3	70.4	70.8	0.21[NS]
Cold dressing percentage	69.2	69.4	69.5	69.9	0.23[NS]

A: Control (without yeast additive)
B: 0.1% yeast (Sc)
C: 0.2% yeast (Sc)
D: 0.3% yeast (Sc)
NS: Not significant (P>0.05)

SEM: Standard error of the means

Table (6) showed the calculation for total cost, revenues and net profit for the experimental treatments. The profitability ration/kg meat (1.12) of group D (0.3% yeast) was the highest of the test groups. On the other hand the control group (0.01% yeast) showed the lowest profitability ratio/kg meat (1).

Table (6): Total costs, revenues and net profit of broiler chicks fed on different levels of yeast (Sc).

Item	Treatments			
	A	B	C	D
Cost SDG				
Chick purchase	3	3	3	3
Management	3	3	3	3
Feed	4.399	4.430	4.553	4.587
Total cost	10.399	10.430	10.553	10.587
Revenues				
Average evasicerated carcass weight (kg)	1.343	1.387	1.434	1.469
Price(SDG/Kg)	12	12	12	12
Total revenues	16.12	16.64	17.20	17.62
Net profit				
Total revenues	16.120	16.640	17.200	17.620
Total cost	10.399	10.430	10.553	10.587
Net profit/bird	5.72	6.20	6.65	7.03
Net profit/kg meat	4.26	4.47	4.63	4.78
Profitability ratio/kg meat	1.00	10.04	1.08	1.12

*Total cost calculated according to June 2011.

Discussion

The effect of feeding different levels of supplemental yeast (Sc) as dietary probiotic source on productive performance of broiler chicks is shown in Table (4). The addition of dietary (Sc) had no significant effect on feed intake of broiler chicks. This result in line with the finding of Felmming *et al*. (2004); Paryad and Mahmoudi (2008); Brummer *et al*. (2010) and disagrees with those obtained by Zhang *et al*. (2005); Abaza *et al*. (2008) who found that addition of dietary (Sc) increased significantly the feed intake of broiler chicks. The inclusion of dietary (Sc) at different levels improved significantly (P<0.05) the body weight gain and feed conversion ratio of broiler chicks. This result agreed with the finding of Santin *et al*. (2001); Zhang *et al*. (2005); Goa *et al*. (2008); Paryad and Mahmoudi (2008); Celik *et al*. (2001), who found that the addition of dietary (Sc) improved the body weight gain and feed conversion ratio of the broiler chicks. This improvement in body weight gain and feed conversion ratio may be attributed to culture yeast (Sc) contains yeast cells as well as metabolites such as peptides, organic acid, oligosaccharides, amino acids, flavour and aroma substances, and possibly some unidentified growth factors, which have been propose to beneficial performance responses in animal production (Goa *et al*., 2008). Moreover, the supplement yeast increased digestion and absorption of nutrients (Bradely and Savage, 1995; Abaza *et al*., 2008; Goa *et al*., 2008), and improved the intestinal lumen health (Spring *et al*., 2000; Paryad and Mohamoudi, 2008), which resulted better performance. The improvement of nutrient utilization resulted from the addition of (Sc) may be due to Mannan Oligo Saccharides (MOS) found in the yeast cell wall, which have been shown to improve nutrient utilization through stimulation of specific microbial populations in the gastro-intestinal tract (Kocher *et al*., 2004), and increased surface area resulting from longer villi (Zhang *et al*., 2005; Santin *et al*., 2001). Also greater villus height increases the activities of enzymes secreted from the lips of the villi resulting in improved digestibility of nutrients (Hampson, 1986). Recently Baurhoo *et al*. (2009) found that (MOS) also increased numbers of goblet cells in all section of small intestine in broilers. The main function of goblet cells is the production of mucus, which was found to assist with transportation between lumen and epithelial cells and form an environment in which certain digestive process could occur (Smirnov *et al*., 2004). The mucus also protects the intestinal lining from damages (Smirnov *et al*., 2006). However, the results of the present study were disagreed with the findings of Flemming *et al*. (2004); Karaoglu and Durdag (2005); Brummer *et al*. (2010) who found that the dietary (Sc) had no significant effect on body weight gain and feed conversion ratio in broilers.

The broiler chicks which supplemented with dietary yeast (Sc) had significantly (P<0.05) lower mortality rate as compared to control group. The low mortality among the chick groups that fed on dietary (Sc) may be due to the ability of (Sc) to reduce disease infection (Line *et al*., 1997), through increasing concentration of comensal microbes or suppressing pathogenic bacteria in intestinal tract (Spring *et al*., 2000; Stanley *et al*., 2004a). Also several workers (Spring *et al*., 2000; Shashidhara and Devegourda, 2003; Goa *et al*., 2008) reported that (Sc) improved the efficancy of immune system of broilers. Similar findings were obtained by Devegowda *et al*. (1997) who found positive effect of dietary (Sc) on mortality rate of broiler. In addition to, Karaoglu and Durdag (2005) reported that, the use of probiotic (Sc) in the broiler diet reduced or prevented the mortality. This result disagrees with Flemming *et al*. (2004) who mentioned that, the addition of dietary (Sc) had no significant effect on mortality rate of broiler.

As shown in Table (5) the hot and cold dressing percentages of broiler carcass were unaffected significantly by supplementation of dietary (Sc). These results are in agreement with those reported by Abaza *et al*. (2008) who found that, the dressing percentage was not affected by the addition of dietary (Sc) at level 0.3%. In addition to, similar results have been obtained by Karaoglu and Durdag (2005) who stated that, the dressing percentage was unaffected significantly by supplemental dietary (Sc) at level 0.5%.

The economical evaluation showed that, supplementation of dietary (Sc) improved the performance of broiler chicks and resulted economical benefit. Profitability ratio (1.12) of groups 0.3% yeast (Sc) was the highest of the test groups. This result agreed with those obtained by Abaza *et al*. (2008), who reported that, addition of (Sc) at level 0.3% to broiler diet gave the better relative economic efficiency compared to the control diet.

"Cite this article"

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