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Efficiency of supplementing *saccharomyces cerevisiae var. ellipsoideus* for improved growth performance and carcass yield in broilers

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Abstract

The use of dietary additives is becoming a very interesting practise to improve animal health and performance in poultry production. Thepax® is a prebiotic that includes inactivated *Saccharomyces cerevisiae Var. ellipsoideus* cells and nutrients such as vitamins, enzymes, amino acids and short chain polypeptides. The effects of supplementing diet by Thepax® via potable water on growth and carcass yield were studied in broilers. Two treatments, an active with Thepax® and a control treatment, were used on 120 male and female chicks of the Hubbard JV breed. Birds were divided into 6 groups of 20 birds each managed on floor and received the same starter, grower and finisher concentrates based on maize and soybean meal during a 37 days trial period. Thepax® (0.5 ml of the additive for 1 litre of water) was used during only one month. Body weight and daily growth rate seemed to increase by 6.2% and 6.4%, respectively, in birds receiving Thepax® compared to control birds. Feed conversion ratio and water intake were similar ($P \geq 0.201$) for both groups of birds. The effect of the additive was important on birds' health. The mortality rate decreased ($P=0.0241$) by around 71% in birds receiving Thepax® compared to that in control birds. Furthermore, the active group of birds deposited ($P = 0.0172$) less abdominal fat (-35.2%) without affecting carcass yield. Positive effects of Thepax® with its structure and composition may be an important additional source of nutrients supports growth and enhance feed ingredients digestibility and beneficial intestinal microflora activity in broilers. In conclusion, Thepax® administered to broilers in drinkable water may improve birds' health and reduce abdominal fat without compromising carcass yield.

Keywords: Thepax, Broilers, Performance, Carcass

Introduction

The use of antibiotics was forbidden because of their side effects on consumers and the acquired bacterial resistance from prolonged use of such antibiotics. Therefore, the use of feed additives as alternatives has lately been widely spread in the chicken industry. Prebiotics are among those feed additives commonly used to supplement broilers' rations. They are selectively fermented compounds that affect the composition and/or the action of the gastrointestinal microflora to improve the health and well being of the host (Gibson and Roberfroid, 1995). These prebiotics adversely compete with pathogens (Biggs et al., 2007) for nutrients. They also enhance enzymatic reactions and reduce ammoniacal and phenolic digestion products. Several studies focused on supplementing broilers with prebiotics and reported various results on their effects on production performances and health of birds. The objective of this trial was to study the effect of incorporating Thepax® in drinkable water on growth and carcass characteristics in broilers. This prebiotic (Thepax®) is made of killed and stabilised suspension of *Saccharomyces cerevisiae Var. ellipsoideus* in addition to vitamins, enzymes, amino acids and short chain polypeptides.

Materials and Methods

A total of 120 one day old Hubbard JV males and females chicks were used in this essay. Chicks were fattened up to 37 days of age. The mean body weight at the beginning of the trial was 56.23±0.78 g. Birds were allotted into two pens, a control (C) and an active (TH), where each pen was divided into three homogenous groups (2x3x20). Birds in the TH group received Thepax® starting the first day of age at a rate of 0.5 ml/litre of drinkable water during one month. Thepax® is made of killed and stabilised suspension of *Saccharomyces cerevisiae Var. ellipsoideus*. It included also enzymes, vitamins (B1, B2, B6, B12, PP, pantothenic acid, biotin), enzymes, amino acids and

minerals (calcium, magnesium, sodium, potassium, phosphor, copper, iron, zinc and manganese). The pH of Thepax® concentrated was 4.23 but when diluted with water the pH of the solution, given to birds, was 6.87. The C group of birds received no additive. All birds were vaccinated against the Gumboro, Infectious Bronchitis and Newcastle diseases. Birds were fed a starter diet during the first three weeks and a grower-finisher diet in the remaining period. Feed characteristics are illustrated in table 1.

Table 1: Chemical composition and nutritive value of starter, grower and finisher feeds

Components	Starter	Grower-finisher
Corn (%)	60	61
Soya (%)	35	32
Fat (%)	-	2
CMV(%)	5	5
Metabolisable Energy (Kcal/kg)	2885	3000
Crude Protein (%)	21	19,6
Lysine (%)	1,25	1,1
DL-Methionine (%)	0,51	0,45
Phosphorus (%)	0,6	0,6
Calcium (%)	1	1,05

The ME and CP contents were 2885 and 3000 Kcal/kg and 21 to 19.6% respectively. Measures were taken on daily weight gains (DWG), daily feed intake (DFI) (g/d/bird), feed conversion ratio (FCR) and mortality rate (M) (%). Furthermore, daily water intake (DWI) (ml/d/bird) was measured during the whole trial period and one week thereafter.

At the end of the experimental period (at 37 days of age) 22 male birds homogenous for live body weight (2kg ± 100 g), 10 from the control group and 12 from the TH group were slaughtered to measure hot carcass yield (HCY in %), chilled carcass yield (CCY in %) and abdominal fat (AF in %).

Statistical analysis

Treatment effects were compared using a Student test following a one way analysis of variance (SAS, 2001) and Data were analyzed by a completely random design with the following model: $X_{ij}=\mu+T_i+e_{ij}$
where μ : the overall mean, T_i: the treatment and e_{ij}: random error.

Results and Discussion

Live body weights, DWG, DFI, FCR and mortality rate are given in table 1. There were no significant differences in the C and TH groups of birds during the whole experimental period. The mean body weight of TH birds was around 130g (≈ 6%) heavier than control birds but that difference was not significant (P>0.05). Mathlouthi et al. (2009) and Hadj Ayed et al. (2010) found an increase in the mean body weights of chicks receiving a diet supplemented with yeast prebiotic. Haj Ayed et al. (2004) found an improvement in broilers growth performances when fed a regimen supplemented with a *Saccharomyces cerevisiae* suspension rich in vitamins and amino acids. Daily feed intake and FCR were also comparable between both bird groups (P≥0.4701). Benites et al. (2008) found no effects on feed conversion between chickens fed a prebiotic compared to those of control birds. During all the fattening period, water intake was not affected by the treatment (P≥0.0733). On the other hand, overall mortality was reduced in birds receiving Thepax® (P = 0.0241) up to 71.4%. Mortality in C groups was mainly caused by diarrhoea during the third week of age. Similar results were reported by Mathlouthi et al. (2009) and Hadj Ayed et al. (2010). Improvement in the health status of birds receiving Thepax® may be explained by the content of the product in yeast cell walls which may increase intestinal villus development and consequently stimulating broiler immune system (Zhang and al., 2005; Flickinger and Fahey, 2002). Furthermore, the diluted Thepax® constitutes a considerable source in nutrients especially the B vitamins, amino acids and enzymes which may serve as nutrients to improve chickens' health. Thepax® may have also a competitive action in favour of beneficial micro-organisms and revitalised intestines by limiting the adhesion of pathogen bacteria to the intestine wall.

Treatment effects on carcass yield and deposited abdominal fat are presented in table 2. The percentage of abdominal fat was lower by around 35.2% in the Thepax® bird group compared to control birds (P = 0.0172). Reduction in deposited fat may be caused by the presence of lipases in Thepax® that may improve the digestion of lipids and limit their accumulation in the abdomen.

Conclusion

The supplementation of broilers by Thepax® did not seem to affect growth performances and feed intake. However, this feed additive seemed to improve birds survival by competing indirectly with pathogens, enhanced the immune system and digestion of nutrients. Furthermore, the prebiotic Thepax® rich in vitamins, minerals and essential amino acids has positively affected carcass quality by reducing the abdominal fat. Thepax® may be safely used in broilers diets to improve health and improve carcass quality.

Table 1: Effects of the control (C) and Thepax® (TH) treatments on birds' performances

	Live body weight (BW) (g) at different ages			
	BW_{1d}	BW_{15d}	BW_{30d}	BW_{37d}
C	56.00[a]	487.66[a]	1409.00[a]	2102.66[a]
TH	56.66[a]	492.00[a]	1462.00[a]	2233.33[a]
Probability	0.3739	0.8108	0.3808	0.1969
	Daily weight gains (DWG) (g/d) at different ages			
	$DWG_{(1-15d)}$	$DWG_{(15-30d)}$	$DWG_{(30-37d)}$	$DWG_{(1-37d)}$
C	28.77[a]	61.42[a]	86.70[a]	52.47[a]
TH	29.02[a]	64.66[a]	96.41[a]	55.81[a]
Probability	0.8330	0.3270	0.4237	0.1982
	Daily feed intake (DFI) (g/d/bird) at different ages			
	$DFI_{(1-15j)}$	$DFI_{(16-30j)}$	$DFI_{(31-37j)}$	$DFI_{(1-37j)}$
C	46.38[a]	132.32[a]	216.11[a]	113.52[a]
Th	46.18[a]	136.54[a]	215.33[a]	114.81[a]
Probability	0.7640	0.7311	0.9728	0.8902
	Feed conversion ratio (FCR) at different ages			
	$FCR_{(1-15d)}$	$FCR_{(15-30d)}$	$FCR_{(30-37d)}$	$FCR_{(1-37d)}$
C	1.62[a]	2.15[a]	2.57[a]	2.16[a]
TH	1.59[a]	2.10[a]	2.23[a]	2.05[a]
Probability	0.6486	0.6671	0.4480	0.4701
	Daily water intake (DWI)(ml/day/bird) at different ages			
	$DWI_{(1-30d)}$		$DWI_{(30-37d)}$	
C	173.22[a]		304.35[a]	
TH	202.58[a]		327.46[a]	
Probability	0.0733		0.3530	
	Mortality rate (M) (%) at different ages			
Probability	$M_{(1-15d)}$	$M_{(15-30d)}$	$M_{(30-37d)}$	$M_{(1-37d)}$
C	4.443[a]	2.776[a]	0.533[a]	7.776[a]
TH	0.553[a]	1.11[a]	0.533[a]	2.222[b]
Probability	0.0686	0.2508	-	0.0241

[a,b,]means within a column with no common superscripts were significantly different at P<0.05

Table 2: Effect of Thepax® on carcass yields (%) and abdominal fat (%)

	Body weight	HCY	CCF	% Abdominal fat
C	2016.00[a]	73.28[a]	70.94[a]	11.19[a]
TH	2045.08[a]	74.75[a]	72.67[a]	7.25[b]
Probability	0.1193	0.1950	0.130	0.0172

[a,b]means within a column with no common superscripts were significantly different at P<0.05

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