

Effect of Probiotic (*Saccharomyces cerevisiae* and *Bacillus subtilis*) on broiler performance

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Abstract:

The study was conducted to determine the effect of *Saccharomyces cerevisiae* and *Bacillus subtilis* on body weight gain, some serum parameter and salmonella colonization of cecum in broiler chicks. One hundred fifty 1 day old male broiler chicks (Ross breed) were used in experiment, the chicks were allocated into three groups and the first group as a control in randomized design (basal diet), the second group (basal diet with 1% *saccharomyces cerevisiae* and *Bacillus subtilis*), and the third group (basal diet with 2% *saccharomyces cerevisiae* and *Bacillus subtilis*) birds in each group were fed *ad libitum* for a period of 38 days.

The result showed that supplementation of *saccharomyces cerevisiae* and *Bacillus subtilis* 1% and 2% to the basal diet decrease cholesterol significantly ($p \leq 0.05$) at 29 and 38 days and increase total protein ($p \leq 0.05$) at 39 days, with no significant differences in another in blood parameters such as blood glucose and albumin.

Body weight of treated groups significantly different ($p \leq 0.05$) at 29 and 38 days of age compared with control group.

The results showed that *saccharomyces cerevisiae* and *Bacillus subtilis* decreased the number of *Salmonella* count of the cecal content of treated groups (38 days old) than control.

تأثير البروبيوتيك (*Saccharomyces cerevisiae*, *Bacillus subtilis*) على أداء دجاج اللحم

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الخلاصة:

الدراسة أجريت لتحديد تأثير *Saccharomyces cerevisiae* و *Bacillus subtilis* المضافة الى عليقة دجاج اللحم على وزن الجسم، نسبة تحويل الغذائي، بعض مقاييس المصل ونسبة تموضع بكتريا السالمونيلا في الاعورين في دجاج اللحم. استخدمت 150 فرخا من ذكور دجاج اللحم بعمر يوم واحد (عرق روس)، قسمت الافراخ إلى ثلاث مجموعات المجموعة الأولى سيطرة في التصميم العشوائي (عليقة اساسية)، المجموعة الثانية (عليقة أساسية مضاف لها 1% *saccharomyces cerevisiae* و *B subtilis*)، والمجموعة الثالثة (

عليقة أساسية مضاف لها 2% *saccharomyces cerevisiae* و *B subtilis* تم تغذيت الطيور بشكل حر ولغاية عمر التسويق 38 يوم. اوضحت التجربة ان اضافة خميرة *saccharomyces cerevisiae* وعصوي *B subtilis* 1% و 2% إلى العليقة الأساسية ساهم في نقصان الكولوستيروول في الدم بشكل معنوي ($p \leq 0.05$) بعمر 29 و 38 يوم وارتفاع معنوي في معدل بروتين الدم الكلي ($p \leq 0.05$) بعمر 38 يوماً، فيما لم تلاحظ فروق معنوية في معدل زلال و كوكوز الدم بين المجموع المختلفة. لوحظ زيادة وزن الجسم لمجموعتي المعاملة وبفارق معنوي قدره ($p \leq 0.05$) عن مجموعة السيطرة بعمر 29 و 38. كما لوحظ انخفاض في اعداد مستعمرات بكتريا السالمونيلا المعزولة من الاعور لمجموعتي المعاملة بعمر 38 يوماً بالمقارنة مع مجموعة السيطرة.

Introduction:

Probiotic has been derived from the Greek language meaning (for life) and the definition actually accepted presently was formulated as a live microbial feed supplement which beneficially affect the host by improving its intestinal microbial balance(1).

Probiotics such as *Saccharomyces cerevisiae*, *Bacillus subtilis*, play crucial role in intestinal pathogens control by one or more than one of the following reason such as production of antibacterial compounds including lactic acid, acetic acid, antibiotic like substances, competition for nutrients and adhesion sites, increased and decreased enzyme activity, increased antibody levels and increased macrophage activity (2).

Saccharomyces cerevisiae in broiler diet with 5ppm of aflatoxin, improve performance of intoxicated birds due to adsorption of aflatoxin by the cell wall of yeast with elimination this toxic agent for the feces in intestinal tract (3), Besides

these yeast are responsible for production of vitamin B complex and digestive enzymes also stimulate intestinal immunity(4), increasing protection against toxins produced by pathogenic microorganism, Cell wall of yeast contain mananoligosaccharides are thought to be enhancement the growth of beneficial organism in the gut like *Lactobacillus* spp, *Bacillus subtilis* that increase the growth performance and nutrient digestibility of birds (5).

Chiang and hsiem (6) reported that probiotic containing of *B subtilis* reduced the concentration of ammonia in the excreta and litter of broiler, also increase body weight gain more than control birds and improved feed to gain ratio. supplementation of broiler diets with Bacillary Probiotics reduced serum cholesterol concentration and increase leukocyte numbers (7a), improved gut mucosal immunity of young birds (7b) and reduced intestinal pathogens number such as *E COLI* 078:k80 in chickens (8) and

reduced *Salmonella enteridis* and *Clostridium perfringens*.

Material and method:

Chicks and diet

One hundred fifty one day old male broiler chicks (Ross breed) ,were obtained from a commercial hatchery , the groups housed in experimental room of college of veterinary medicine-kufa university . the birds were randomly assigned to 3 dietary treatment groups(50 birds/each)

1 - First group basal diet (control group) without probiotic .

2- Second group basal diet with 1 % probiotic .

3- third group basal treatment with 2% probiotic.

Each kilogram of dietary probiotic contained (*Saccharomyces cerevisiae* 3×10^{11} cfu , *Bacillus subtilis* 4×10^9 cfu) .

The composition of the basal diet is presented in table 1 meeting NRC requirement (9) birds were given diet to the end of the experiment , the administration of the treatment begin at age 14 days ,each group was fed ad libitum for a 38 days 24 hours lighting was

provided per day with ordinary vaccination program schedule of ND ,IB,AI and IBV vaccines.

Performance

Body weight gain and were determined in 22 , 29 . 38 days old.

Salmonella isolation

The cecal contents from five birds 38 days old from each group was collected to determined *Salmonella* counts the sample (1gram) were taken immediately and diluted with 1:10 distill water followed by culture analysis on selenite broth incubated for 18-24 hours at 40 c then cultured on selective media (brilliant green agar and bismuth agar). The cecal contents from 5 birds .

Serum biochemistry

Serum samples were taken at 29 and 38 days old , stored under (-20 c) until assayed for estimation of total protein , albumin ,cholesterol, and sugar by using standard kit (biomereux , france ; randox ,England) .

Statistical analysis:

The result were evaluated using SPSS (10) program . statistical differences among treatment means were analyzed using Duncan new multiple range test Duncan(11).

The estimated dietary ingredients.

Ingredient	Kg/ton	Met.energy kcal/kg	2940.35
Corn	653	Crude protein %	20.39
Soya bean meal44%	220	Fat%	3.20%
Broiler concen 50%	100	Fiber%	3.12%
Dicalcium phosphate	4	Ca%	1.35
Lysine	1	P%	0.63
Methionin	0.5	Methionin%	0.68
Salinomycin	0.5	Lysine%	1.23
Aluminum silicate	3	Na%	0.26
NACL		Choline mg/kg	250
Choline chloride	0.5		
Lime stone	10		
Wheat bran	7.5		

Results:

Table (1) the effect of Probiotic (*Saccharomyces cerevisiae* and *Bacillus subtilis*) on serum total protein , albumin , cholesterol and glucose at 28 days of age(means± SE) .

Treatment	probiotic %	total protein g/100ml	Albumin g/100 ml	Cholesterol mg/100 ml	Glucose mg/100ml
1	0%	9.64±0.47a	3.71±0.16a	271±8.92b	84.3±5.74a
2	1%	9.33±1.00a	4.04±0.24a	222.45±13..03a	94.6±10.79a
3	2%	10.68±0.31a	4.17±0.22a	228.56±20.04a	101.15±8.4a

Table(2) the effect of Probiotic (*Saccharomyces cerevisiae* and *Bacillus subtilis*) on serum total protein , albumin , cholesterol and glucose at 39 days of age(means± SE) .

Treatment	probiotic %	total protein g/100ml	Albumin g/100 ml	cholesterol mg/100 ml	Glucose Mg/100ml
1	0%	10.32±0.3b	4.08±0.29a	270±7.99b	93.79±7.4a
2	1%	14.45±1.12a	5.68±0.75a	225.03±12.97a	84.73±4.6a
3	2%	13.1±1.11a	5.2±0.66a	230.05±19.9a	89.78±4.6a

Table (3) The effect of Probiotic on body weight 15, 22 ,29 and 38 days (means± SE)

Treatment	probiotic %	body weight 15 days	Body weight 22 days	Body weight 29 days	Body weight 38 days
1	0%	290±47a	526±84a	889±71b	1315.5±312b
2	1%	293±27a	541±64a	898±94b	1411.5±155a
3	2%	289±68a	547±84a	944±155a	1439.5±235a

Table (4) the effect of probiotic on salmonella Colony forming unit log₁₀

Treatment	Probiotic %	Salmonella count log ₁₀
1	0%	5.56
2	1%	3.1
3	2%	2.99

Discussion:

The purpose of the present experiment was to determine the advantage of dried *Bacillus subtilis* and *Saccharomyces cerevisiae* feed additives on body weight, blood parameter and *Salmonella* count.

Addition of 1% or 2% of probiotic to the basal diet significantly.

Decreased cholesterol level ($p < 0.05$) in comparison to the control group (table 1 and 2) these results are agreement with previous study (12) that mention *B subtilis* influenced fatty acid synthesis in the liver of broiler as indicated by a decrease activity of acetyl-CoA carboxylase, is of major important for the triglycerol lowering effect (13), the reduction in hepatic triacylglycerol concentration is known to be beneficial for chicks by inhibiting the development of Fatty liver syndrome, whilst a lower triacylglycerol content in carcass would result in a healthier meat for the consumer. Our results also indicate that *B subtilis* might have anticholesterolemia properties, however by which mechanism *B subtilis* methylglutaryl (HMG) coenzyme A reductase (EC1.1.1.88) with rate limiting enzyme of cholesterologenesis and hepatic cholesterol content of growing chicks (14).

Other possible mechanism include assimilation of cholesterol by probiotic supplementation could have enhanced the lactobacilli count which produce bile salt hydrolase

and maintain bile salt homeostasis this may need more bile acids to be synthesized this in turn will reduce cholesterol in the body pool since cholesterol is the precursor for bile acids (15).

As shown in table (2) statistically significant differences were seen in total protein between control and treated groups results indicated that supplementation of *Saccharomyces cerevisiae* and *B subtilis* to growing diets significantly improved the digestibility coefficient of dry matter (DM) and crude protein (4) that agree with those of (16;17) used Japanese quail and (18) used broiler chicks who reported a significant increase in the value of total protein and albumin as a result of feeding microbial probiotic, in addition to the role of yeast cell wall (chitin, mannan and glucan) that have been known as stimulator to immune system that increase globulin protein level (4).

In this experiment the probiotic supplementation increase body weight gain compared with control group this result mention that the beneficial effect of *Saccharomyces cerevisiae* is attributed to the fact that is a naturally rich source of protein, mineral and B complex vitamins (19), in addition to the role of *B subtilis* that increase weight gain and significantly improved feed efficiency (12), continuous feeding of *B subtilis* to animals provides a constant inoculation of the organism

in the alimentary tract(20) furthermore this organism may associate with the gut wall and favourable increase in number of natural lactobacilli which enhance by increased acidity of the intestine which in turn will suppress the growth of undesirable enteric microorganism such as Salmonella and Ecoli (21) that explain the reduce in Salmonellae count in the cecum showed in table (4) .

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