

## Effect of Corn Fermented by *Saccharomyces cerevisiae* in Diets on Production Performance of Broiler Chicks

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### Abstract

The current study undertaken in the broiler farm belonging to Department of Animal Resources, Faculty of Agriculture, University of Kufa during the period of 13/8/2014 to 17/9/2014 to investigate the effects of corn fermented by *S.cerevisiae* (*Saccharomyces cerevisiae*) in diets on production performance of broiler chicks. 1gm of *S.cerevisiae* per 1kg of feed. 121 day of age and unsexed chicks (Ross 308) were used with average weight of 40.5 gm/ chick. Four treatments were used: T1 (standard diet contained unfermented corn), T2 (standard diet with contained fermented corn for 6 hr), T3 (standard diet with contained fermented corn for 12 hr) and T4 (standard diet contained fermented corn for 24 hr). Results showed a significant effect ( $P \leq 0.05$ ) of T4 on live body weight, cumulative body gain and economic figure compared with the other treatments. Significant increase in chicks fed on T4 in feed consumption while no significant effect of fermented corn addition on final feed conversion and viability.

**Keywords:** Feed, yeast, broiler, corn, fermentation.

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## INTRODUCTION

Attenuating the cost of diets and improving the quality of feed are the major aims of all breeders in poultry industry because feed is play crucial role in attainment of profit and constitute about of 60-70% from production cost<sup>1</sup>. Corn is one of dominant grain which use usually with high ratio in poultry diets and its constitute about 75% of poultry diet<sup>2</sup>. Corn contain of 8.5% protein, 4.3% ether extract, 2.1% crude fibers, 3350 kcal./kg<sup>3</sup> and 81% of digestive coefficient<sup>2</sup>. *S.cerevisiae* is one of important microbiology which used in microbial fermentation because it high ability of growth and we can control on it easily therefore it used widely in production and industrial projects, in addition to the high contain of protein and health safety<sup>4</sup>. Multiple uses of *S.cerevisiae* in many fields such as bread and glycerol manufacturing and it characterized of not produce the toxins, it also play an important role in enzymes production such as glucose 6 phosphate dehydrogenase<sup>5,6</sup>. *S.cerevisiae* used for decreasing of aflatoxins poisons<sup>7,8,9</sup>.

The major aim of this study is to determine the effect of fermented corn with *S.cerevisiae* on broiler to raise the efficiency of feed and decrease the cost of production.

## MATERIALS AND METHOD

### Corn fermentation

After the corn grinding to a suitable volume, it's weighted and backed inside bags made of polyethylene and moisturized by water to 50% and the add the *S.cerevisiae* which obtained from local market. *S.cerevisiae* which used in this experiment was a Turkish origin manufactured from saf-instant company. Mixing ratio between corn and yeast was 1 gm/Kg. After mixing, the mixture was put in the bags, closed tightly and stored in room under 25-30°C for three periods 6, 12 and 24 hours according to Shalesh *et al.*<sup>9</sup>. The growing of yeast is beginning from 0 hour and reach to the maximum growth at 24 hours. Finally, the mixture bags opened and the mixtures was dried on clean floor and added to the diets.

### Farm experiment

The farm experiment was conducted in poultry farm belonging to University of Kufa, Faculty of Agriculture during the period of 13/8/2014 to 14/9/2014 to determine the effect

of corn fermented by *S.cerevisiae* in diets on production performance of broiler chicks.

### Feeding

Chicks were fed on starter ration for three weeks of age followed by finisher ration until the 5<sup>th</sup> week of age and the treatments were: T1(standard diet, contained of corn-*unfermented*), T2 (contained of corn fermented by *S.cerevisiae* for 6 hr.), T3(contained of corn fermented by *S.cerevisiae* for 12 hr.) and T4 (contained of corn fermented by *S.cerevisiae* for 24 hr.

### Management

120 chicks (class Ross 308) at 1<sup>st</sup> day of

**Table 1.** Gross composition and calculated analyses of the experimental diets

Ingredients	Diets	
	Starter %	Finisher %
Ground maize	30	31
Wheat	30	31
Soybean meal (44% CP)	31	34.75
Sunflower oil	1.25	3.5
Premix <sup>1</sup>	3	2.5
Dicalcium phosphate	0.7	0.7
Salt	0.3	0.3
Total	100	100
	Calculated composition	
Crude protein%	22.98	21.32
Metabolizable energy (Kcal/kg)	2981.4	3138.8
Energy: Protein	129	147
Crude fiber %	3.02	3.14
Crude fat %	2.51	3.22
Calcium %	1.01	0.99
Avi. Phosphorus%	0.48	0.46

(1) Use of Premix Jordanian Origin Type Provimi 3110 Contains: 2750 kcal/ kg Representative energy, 10% raw protein, 1.1% fat, 21% calcium, 11.0% phosphorus, 6.5% methionine, 6.5% methionine + Lysine, 4.8% Sodium, 5.4% Chloride, 575000 IU Vitamin A, 201250 IU Vitamin D3, 1380 mg Vitamin E, 138 mg Vitamin K3, 138 mg Vitamin B1, 345 mg Vitamin B, 1840 mg Vitamin B3, 552 mg Vitamin 5 B, 184 mg B vitamins, 46 mg vitamin B9, 1000 micrograms B12, 6900 micrograms peyutin, 14,000 mg choline chloride, 460 mg copper, 2760 mg iron, 3680 mg manganese, 3680 mg zinc, 50 mg iodine, 9.2 mg selenium, 30000 m Vitez mine, 250 mg antioxidants, 250 mg lincomycin, 2400 mg selenomycin).

age and unsexed with 40.5 gm of average weight were used and reared in closed enclosure divided of pens (3m<sup>2</sup>/pen) and chicks distributed randomly inside pens. All the necessary equipments were found to achieve the optimal temperature during the rearing period and sawdust (7 cm of thickness) while water and feed were supplemented *Ad-libitum*. Chicks were fed the experimental diets from 1-35 days of age Table 1.

Weekly live body weight, weekly and cumulative body weight gain, total and weekly feed consumption, total mean, economic figure and livability ratio were calculated<sup>11</sup>. Data were analyzed by completely randomized design (C.R.D.) according to computer statistical program<sup>12</sup> while significance of means differences was tested by Duncan multiple range test<sup>13</sup>.

## RESULTS AND DISCUSSION

Results represented in Table 2 showed no significant effect of diets that contained corn fermented by *S.cerevisiae* on weekly live body

weight in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> week of age while the T4 effected significantly ( $P\leq 0.05$ ) AT 4<sup>th</sup> week of age (1185 gm). The highest body weight in last week was in T4, it's about 1504 gm with a significant difference with T1 and T2 but no significant difference with T3. Results showed a clear difference among treatments resulted from the elongation of fermentation time which lead to increase of yeast growth through increasing of biomass especially the enzymes content which necessary in digestion process. In addition, yeast consider as probiotic to displace the harmful pathogens outside the digestive system, the results are similar with the results of El Barkouky *et al.*<sup>14</sup> when he used 3 gm of yeast/ kg of feed to the diets of broiler males and noticed a significant enhancement in final body weight compared with control.

Results represented in table 3 showed no significant effect of fermented diets in both 1<sup>st</sup> and 2<sup>nd</sup> week of age compared with control. The highest significant effect ( $P\leq 0.05$ ) was found in T4

**Table 2.** Effect of fermented maize by *S.cerevisiae* in diets on the live body weight (g) of broiler chicks for 5 weeks.

Treatments	Age/week				
	1	2	3	4	5
T1	170±1.	379±12.0	682±37.0	1072±2.5 bc	1309±5.5 b
T2	177±2.5	390±11.5	665±23.0	1020±30.0 c	1328±21.0 b
T3	168±3.0	368±26.0	735±14.0	1105±25.0 b	1480±23.0 ab
T4	176±3.5	374±88.0	743±6.5	1185±15.0 a	1504±36.0 a

T1: standard diet, T2: contained of corn fermented by *S. cerevisiae* for 6 hr., T3: contained of corn fermented by *S. cerevisiae* for 12 hr. and T4: contained of corn fermented by *S. cerevisiae* for 24 hr.

during 3<sup>rd</sup> and 4<sup>th</sup> week of age, it's about 375 gm compared with control which was about 237 gm while no significant difference between T2 and T4.

Due to cumulative body gain, results showed a significant increase in T4 compared with T1 and T2 while no significant difference between T1 and T2 or between T3 and T4, this resulted from the increase of the fermentation period of corn and the decrease of accumulative body gain in 5<sup>th</sup> week may be resulted from the high temperature inside the rearing farm compared with the optimal level.

Results in Table 4 showed that no significant effect of fermented corn on weekly and total accumulative feed consumption in 1<sup>st</sup> and 2<sup>nd</sup> week of age while the highest significant increase in weekly or accumulative feed consumption was noticed in T4 in the 5<sup>th</sup> week of age. No significant differences between T1 and T2 in both weekly or accumulative feed consumption for all ages. Depending on the results of the current study we can expect to reasons for increasing the feed consumption in T4, first reasons is the enhancement of Palatability of feed after yeast

**Table 3.** Effect of fermented maize by *S. cerevisiae* in diets on the weight gain (g) of broiler chicks for 5 weeks.

Treatments	Age/week					
	1	2	3	4	5	0-5
T1	129±1.5	209±10.5	303±25.5	390±40.0	237±3.0	1268±5.5
T2	136±2.5	213±9.0	275±12.0	355±53.5	308±8.5	1287±21.5
T3	127±3.0	200±23.0	367±12.0	370±39.0	375±15.0	1439±30.0
T4	135±3.5	198±11.0	369±18.0	442±30.5	319±14.0	1463±21.5

T1: standard diet, T2: contained of corn fermented by *S. cerevisiae* for 6 hr., T3: contained of corn fermented by *S. cerevisiae* for 12 hr. and T4: contained of corn fermented by *S. cerevisiae* for 24 hr.

addition. Second reason, the increase of feed consumption resulted from the increase of body weight as the age advance which lead to increase the body capacity of corn contain the yeast. The results are similar with the results that reported from Al-Mosawi *et al.*<sup>15</sup> who noticed a significant effect on feed consumption when he used 1.5 and 2.25 % of *S.cerevisiae* in broiler diets.

Results in Table 5 showed no significant effect of fermented corn on feed conversion coefficient in all periods and for all ages, the results came accordance with the results of Hammod<sup>16</sup> who proved no significant effect of different levels of fermented wheat on feed conversion coefficient.

**Table 4.** Effect of fermented maize by *S.cerevisiae* in diets on broiler feed intake (g) for 5 weeks.

Treatments	Age/ weeks					
	1	2	3	4	5	0-5
T1	137±2.0	350±6.0	596±8.5	997±7.0	1167±57.0	3247±49.0
T21	39±2.0	366±4.0	527±8.0	1077±23.0	1225±25.0	3334±42.0
T3	137±2.5	342±18.0	637±17.5	1031±38.0	1297±17.5	3444±18.0
T4	143±3.0	376±3.5	627±13.0	1177±18.0	1362±22.0	3685±32.0

T1: standard diet, T2: contained of corn fermented by *S. cerevisiae* for 6 hr., T3: contained of corn fermented by *S. cerevisiae* for 12 hr. and T4: contained of corn fermented by *S. cerevisiae* for 24 hr.

Results in Table 6 showed no significant effect of experimental treatments on viability, the results similar with the results of Onwurah<sup>17</sup> who reported that viability did not affected by fermented diets by *S.cerevisiae* in different levels 0.5, 1.0, 1.5 and 2.0 gm/ kg of feed or gm/ liter of drinking water or both. The results in Table 6 showed a significant increase ( $P \leq 0.05$ ) of

economic figure in T4 compared with T1 and T2 while no significant deference between T1 and T2 or between T3 and T4. The chicks that fed on T4 were the highest of economic figure compared with others groups and that resulted from the increase of body weight which reflex positively on economic figure.

**Table 5.** Effect of fermented maize by *S.cerevisiae* in diets on the feed conversion ratio (feed/gain) of broiler chicks for 5 weeks

Treatments	Age/week					
	1	2	3	4	5	0-5
T1	1.05±0.23	1.67±0.06	1.96±0.11	2.55±0.24	4.92±0.30	2.56±0.06
T2	1.01±0.01	1.72±0.09	1.91±0.06	3.03±0.40	3.97±0.27	2.58±0.01
T3	1.07±0.04	1.71±0.11	1.73±0.01	2.78±0.33	3.45±0.43	2.39±0.23
T4	1.05±0.01	1.89±0.06	1.70±0.07	2.66±0.55	4.26±0.26	2.52±0.04

T1: standard diet, T2: contained of corn fermented by *S. cerevisiae* for 6 hr., T3: contained of corn fermented by *S. cerevisiae* for 12 hr. and T4: contained of corn fermented by *S. cerevisiae* for 24 hr.

**Table 6.** Effect of fermented maize by *S.cerevisiae* in diets on viability and economic figure of broiler chicks for 5<sup>th</sup> week

Treatments	Viability %	Economic figure
T1	90±0.0	136±5.6 b
T2	97±5.0	142±10.0 b
T3	90±10.0	163±11.0 ab
T4	100±0.00	170±9.8 a

T1: standard diet, T2: contained of corn fermented by *S. cerevisiae* for 6 hr., T3: contained of corn fermented by *S. cerevisiae* for 12 hr. and T4: contained of corn fermented by *S. cerevisiae* for 24 hr.

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#### DATA AVAILABILITY

All datasets generated or analyzed during this study are included in the manuscript.

#### ETHICS STATEMENT

This article does not contain any studies with human participants or animals performed by any of the authors.

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