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SINGLE CELL PROTEIN (SCP) REPLACING SOYABEAN MEAL IN BROILER RATIONS

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SUMMARY

Single cell protein was used to replace 0,7,10,13 and 16% of soyabean meal in diets for broiler chicks up to 51 days of age.

In presence of 4% fish meal, ethanol yeast (SCP) could be added at 10% in broiler diet at age 1-24 days and 13% in the diet at age 24-51 days. Chicks given the diets containing 10 and 13% SCP grew significantly ($P<0.01$) faster than those given 0,7, and 16% SCP.

There were significant ($P<0.01$) differences in the efficiency of feed conversion among different groups.

INTRODUCTION

Single cell protein is produced by culturing different microorganisms on different substrates such as sacchaides and polysaccharides,hydrocarbons and alcohols. Reports have indicated that hydrocarbon yeast protein has excellent nutrition for chicken (1,2,3).

Feeding trials have shown that 10% ethanol yeast could be incorporated in the diet of broiler successfully with no apparent histological abnormalities (4,5). The present study was conducted to use the yeast protein fron ethanol at 0,7,10,13 and 16% levels in the diet of broiler chicks.

MATERIAL AND METHODS

Animals and Housing:

A total of 800 broiler chicks (one day old) were used in this experiment. The chicks were divided into five groups, each group contained 160 birds and each one of these groups was divided into four subgroups of fourty birds.

Weights and feed consumption were recorded weekly. This experiment was carried out at the poultry farm, College of Agriculture, University of Baghdad.

Feed:

The component and the chemical composition of the experimental rations are shown in table 1. The levels of ethanol yeast (Techno Export Co., Bratislava , Czechoslovakia) in the rations were 0, 7, 10, 13 and 16% for groups 1,2,3,4 and 5 respectively. The diets were supplemented with 4% fish meal to bring the levels up to the requirement (6).

Table 1: Components and chemincal composition of the experimental rations (%)

Rations	1	2	3	4	5
Corn	30	30	30	30	30
Wheat	22	25	25	25	25
Barley	10	10	10	10	10
Soyabean meal	33	23	20	17	14
Fish meal	4	4	4	4	4
SCP	0	7	10	13	16
Limestone	0.6	0.6	0.6	0.6	0.6
Nacl	0.4	0.4	0.4	0.4	0.4
Crude protein	23.50	22.94	23.12	23.28	23.46
Ether extract	2.26	2.52	2.62	2.72	2.82
Crude fiber	4.18	3.70	3.54	3.38	3.22
Ash	4.10	3.90	3.88	4.50	4.60
NFE	65.96	66.94	66.84	66.12	65.90
Calcium	1.12	1.17	1.16	1.15	1.14
Phosphorus	0.74	0.73	0.73	0.72	0.71
M.E. Kcal/Kg	2759	2774	2774	2773	2772

The procedures used for the chemical analysis were according to the AOAC methods (7). The purpose of this experiment was to investigate the use of the SCP in broiler diets.
Yeast progressively replaced soyabean meal as a protein source.
Histopathological studies of the liver, heart and kidneys were carried out at the Department of Pathology, College of Veterinary Medicine, University of Baghdad.
Statistical Analysis:

The data were analysed using least square analysis of variance procedures (8). Duncan multiple range was used to test the significant differences between treatments.

RESULTS

Feed Intake:

Birds fed diets containing 7 ,10, and 16% SCP at the first period (1-24 days) consumed significantly ($p<0.05$) more than those fed the control diet, but there were no significant differences between birds fed diet 4 (13% SCP) and birds on the control diet (Table 2).
At the second period (24-51 days), birds fed the diets 3 and 4 (10and 13% SCP) consumed significantly ($P<0.05$) more than those fed the control diet.

Table 2: Average feed consumption (g) per bird/day during different periods of the experiment ($X \pm S.D.$)

Groups	1-24 days	24-51 days	1-51 days
1	33.16 ± 0.86^{a}	67.80 ± 5.61^{a}	50.48 ± 3.18
2	36.76 ± 1.48^{b}	65.61 ± 7.11^{a}	51.18 ± 4.00
3	36.81 ± 2.16^{b}	69.37 ± 3.29^{ab}	53.80 ± 2.49
4	35.53 ± 2.55^{ab}	77.08 ± 2.17^{b}	56.30 ± 0.99
5	37.26 ± 0.32^{b}	68.54 ± 3.41^{a}	52.89 ± 1.71

Values within column with different superscripts are different ($p<0.05$)

Live Weight:

The mean live weight of birds at 24 and 51 days of age are given in table 3. Statistical analysis showed that birds receiving SCP in their diets were significantly ($P<0.01$) heavier than the birds fed the control diet. Howevere , best results were obtained by using 10% SCP in the diet for birds at the first period and 13% for birds at the second period (Table 3).

Table 3: Average weight (g) per bird during different periods of the experiment (X±S.D.)

Group	Weight at 24 day	wight at 51 day
1	359.0 ±10.66^{a}	1118.58±61.82^{c}
2	453.48±13.22^{a}	1250.20±69.78^{c}
3	463.40±23.54^{b}	1298.68±52.82^{abc}
4	428.25±22.89^{c}	1377.00±33.61^{a}
5	432.28±8.75^{c}	1222.18±42.83^{b}

Values within column with different superscripts are different ($p<0.01$)

Growth Rate:

Growth rate of birds at 1-24 days of age fed different proportion of SCP was significantly ($P<0.01$) higher than those fed the control diet (Table 4).

Table 4: Average growth rate (g) per bird/day during different periods of the experiment (X±S.D)

Group	1-24 days	24-51 days	1-51 days
1	14.98±0.43^{a}	28.08±1.92^{a}	20.96±1.21^{a}
2	18.89±0.55^{bc}	29.50±2.20^{a}	23.75±1.05^{b}
3	19.30±0.98^{b}	30.93±1.73^{a}	24.51±1.03^{b}
4	17.84±0.95^{c}	35.14±1.80^{b}	26.05±0.64^{c}
5	18.01±0.31^{c}	29.25±1.74^{a}	22.93±0.89^{b}

Values within column with different superscripts are different ($p<0.01$)

No significant differences in growth rate were observed at 24-51 days of age except that the growth rate of birds fed diet 4 (13% SCP) was significantly ($P<0.01$) higher than that of the other groups.

Efficiency of Feed Conversion:

There were significant differences ($P<0.01$) in efficiency of feed conversion between groups fed different levels of SCP and those fed the control diet at 1-24 days of age (Table 5). At the first period (1-24 days), best efficiency of feed conversion was obseved with birds fed diet 3 (10% SCP) . At the second period (24-51 days), birds fed diet 4 (13% SCP) had the best efficiency of feed conversion.

Histopathological examination provided no evidence for abnormalities in the liver, heart and kidneys in any group.

Table 5: Efficiency of feed conversion Kg DM/kg gain during different periods of the experiment ($X \pm S.D.$)

Group	1-24 days	24-51 days	1-51 days
1	2.20 ± 0.02^{a}	2.41 ± 0.04^{a}	2.40 ± 0.02^{a}
2	1.94 ± 0.05^{b}	2.22 ± 0.07^{b}	2.15 ± 0.09^{b}
3	1.90 ± 0.02^{b}	2.24 ± 0.07^{bc}	2.16 ± 0.04^{b}
4	1.99 ± 0.07^{c}	2.19 ± 0.05^{b}	2.15 ± 0.05^{b}
5	2.06 ± 0.03^{d}	2.33 ± 0.03^{ac}	2.29 ± 0.01^{c}

Values within column with different superscripts are different ($p<0.01$)

DISCUSSION

In the present work SCP was incorporated at levels 0,7,10,13 and 16% to replace soyabean meal in diets for broiler chicks.

Some problems have been reported in the past when large amount of SCP have been used in chicks diet (2). Hewith

and Labib (9) and Saoud and Daghir (10) found that live weight at four weeks of broiler chicks fed 20% yeast was less than in those fed 10% or less . In the present experiment average feed consumption during the period (24-51 days) was less when 16% of yeast incorporated to the diet as compared with 13% (Table2).

Waldroup et al.(1) and plavnik et al (11) also found that body weight were depressed when the diet contained more than 15% yeast. Similar results were observed in the present work.

The final weight was increased significantly ($p<0.01$) by increasing SCP level in the diet up to 13% and then decreased significantly ($p<0.01$) when 16% SCP was used in the diet (Table 3), this might be due to lower feed intake in group 5 (1-51 days) compared with those in group 4. Daghir and Sell (12) reported a depression in feed intake when they use 33% of methanol yeast as compared with 23% soyabean meal in the diet of broiler.Feed intake of broiler was also depressed with the inclusion of SCP in the diet (13).

Sell et al (14) reported a significant depression in finishing weights of broiler when the level of methanol yeast was increased in the ration. Duthie and Edwards (15) obtained a depression in growth rate with diets containing 16.5% yeast compared with those containing 5% yeast, this is similar to that observed in the present work. Average growth rate (1-51 days) was depressed with diets containing 16% ethanol yeast compared with those contained 13% or less (Table 4). In the present experiment, there were significant differences in efficiency of feed conversion between birds given 0 and 7% SCP in their diet (Table 5). This is in contrast to that reported by Shannon and McNab (2).

There were no significant differences in efficiency of feed conversion among birds given 7,10 and 13% SCP but lowest feed conversion was observed in diet containing 16% yeast (Table 5).

Since the nutritive value of protein of yeast is of the same order as that for soyabean meal (16). It is concluded from this study that SCP was as good as soyabean meal as a protein supplement for broiler chicks. The results of this experiment suggest that SCP can be

used successfully at levels up to 10% in broiler diet at 1-24 days and up to 13% at 24-51 days of age.

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استعمال البروتينات احادية الخلية كبديل لفول الصويا في عليقة فروج اللحم

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الخلاصة

استعمل البروتين احادي الخلية كبديل لفول الصويا وبنسب صفر و ٧و ١٠ و ١٦٪ في عليقة فروج اللحم مع اضافة ٤٪ من مسحوق السمك. استمرت التجربة لمدة ٥١ يوم ولوحظ من نتائج هذه الدراسة بأن استعمال ١٠٪ من البروتينات احادية الخلية هي افضل نسبة في عليقة البادئ و ١٣٪ في العليقة الناهية. وان نمو فروج اللحم وكفاءة التحويل الغذائي كان افضل عند استعمال ١٠و ١٣٪ من البروتينات احادية الخلية في العليقة من النسب الاخرى المستعملة في الدراسة.