EFFECT OF SOME GROWTH PROMOTERS ON PERFORMANCE OF WHITE AND BROWN BOVANS LAYERS

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ABSTRACT:

A total number of 570 Bovans hens was used in this experiment. Hens were classified into two equal strains (White and Brown) of 285 hens each and were divided into 3 treatments, each of 95 hens. One experimental corn- soybean meal diets was formulated. The basal diet contained 19.0% CP and 2800 Kcal ME/Kg diet was fed during the laying period. Two types of probiotics were supplemented to the diet (2 kg/ton) to study their effects on productive performance commercial laying hens compared to the control diet (without growth promoters):1- Choong Ang Yeast Culture (CYC-100) is a unique live yeast culture product (saccharomyces cerevisiae $1.510x10^{11}$ CFU/ kg) and 2- More Yeast (MY) is a unique dead yeast culture (saccharomyces cerevisiae). Hens in all treatments were kept under a similar management system.

The obtained results were summarized as follows:

- It can be concluded that Brown Bovans had significantly better feed conversion (FC) and economic of efficiency than White Bovans being 5.60 g feed/ g egg mass and 0.747 vs 7.00g feed/ g egg mass and 0.723. The MY treatment had higher economical efficiency of 0.777 than other the treatments.
- The White Bovans had significantly higher egg production % with lower egg weight (EW) than the Brown Bovans being 72.81% and 54.66g vs 68.80% and 55.81g, respectively. Hens fed the diets supplemented with CYC-100 and MY had higher egg production%, EW and egg mass (EM) than those fed the control diet. The highest egg production%, EW and EM were shown during the period from 29-32 weeks of age being 90.65%, 60.42 and 4922.05g, respectively.
- White Bovans had significantly higher haematocrit value (Ht %) and haemoglobin value (g/dl) than the Brown Bovans (25.76% and 9.64g/100ml vs 24.30% and 9.05g/100ml, $P \leq 0.05$). Hens fed the MY supplemented diets had lower Ht% and Hb of 24.19% and 8.87g/100ml than the other treatments.
- Diets supplemented with both CYC-100 and MY\ had lower cholesterol content than those fed the control diet. It can be seen that as birds advanced in age and production, both Ht% and Hb gradually increased. The period from 21-24 weeks of age had the lowest Ht, Hb and cholesterol estimates of 21.55% 8.13g/100ml and 149.05mg/dl**.**

Key words: Probiotics, layer performance, White and Brown Bovans hens.

INTRODUCTION

Since the continued use of subtherapeutic levels of antibiotics in animal feeds may result in the presence of antibiotics residues in animal products and the development of drug- resistant micro- organisms in humans. Therefore, the use of probiotics (direct- fed microbials) as a substitute for antibiotics in poultry production has become an area of great interest. The use of antibiotics as routine feed additives has been banned in some countries because of public concern over possible antibiotic residual effects and the development of drug-resistant bacteria. Probiotics have been introduced as an alternative to antibiotics; however their effects on poultry production are not consistent resulting in uncertainties and scepticism for development of the products. Some of the proposed modes of action of probiotics in poultry include (1) maintaining a beneficial microbial population in the alimentary tract **(Fuller, 1989)** (2) improving feed intake and digestion (**Nahashon *et al.*, 1992 and 1993**), and (3) altering bacterial metabolism (**Jin *et al.*, 1997**). **Savage *et al*. (1986)** found that lactobacillus stimulate intestinal villi which extracts nutrients from feed stuffs during digestion. All these effects may accelerate the absorption of most nutrients and this may account for the improvement in feed conversion. Also, **Fuller (1997)** reported that improvement in feed conversion by probiotics may be due to the balance of microbial population created in the intestinal tract and to the role of Lactobacillus in preventing the harmful bacteria which invade population in the digestive tract of the chickens. Similar results were obtained by **Nahashon *et al*. (1994a, b and 1996a, b**), **Mohan *et al*. (1995)** and **Tortuero and Fernandez (1995)**, **Balevi *et al.* (2001)**.

Several investigators reported that supplementation of layer diets with probiotics significantly improved feed conversion, hen-day egg production %, egg weight and egg mass (**Abd El- Rahman, 1993, Hamid *et al*., 1994, Tortuero and Fernandez, 1995, Abdulrahim *et al.*, 1996), Haddadin *et al*., 1996, Ghazalah and Ibrahim, 1998, Panda *et al*., 2000, Kucukersan *et al*., 2002, Osman, 2003, Siam *et al*., 2004 and Yousefi and Karoodi 2007**). **Kaya *et al*. (2003)** used probiotic (Yucca Schidigera) in laying quails diet at 9-14 weeks of age and observed no effect on haemoglobin concentration and packed cell volume (PCV). However, **Katz and Demain (1977)** and **Panda *et al*. (2003)** indicated that the reduction in cholesterol concentration was due to the inhibition of culture within the intestine. The reduction of plasma cholesterol was explained using rats as experimental animals by **Rao *et al.* (1981)** and **Nelson and Gilliand (1984).** This reduction in absorption and/or synthesis of cholesterol is happened in the gastrointestinal tract. Furthermore, **Mohan *et al.* (1995)** reported that lactobacillus acidophilus reduces cholesterol in the blood by deconjugating bile salt in the intestine thereby preventing them from acting as precursor in cholesterol synthesis and caused a reduction in the serum cholesterol. The objective of the present study was to measure the effect of two growth promoters, Choong Ang Yeast culture (CYC-100) and More Yeast (MY) on feed intake, feed conversion, egg production traits, some blood parameters and economical efficiencies from 21-32 weeks of age in White and Brown Bovans layers.

MATERIALS AND METHODS

The experimental work of the present study was carried out at the farms of Cooperative El- Ekhlass Society for Development of Animal and Poultry Wealth, Giza, Governorate, Egypt. The chemical analyses of samples were performed in the laborites of the Poultry Production Department, Faculty of Agriculture, Fayoum University. Total number of 570 Bovans hens was used in this experiment. Hens were randomly classified into two equal strains (White and Brown) of 285 hens each and were divided into 3 treatments, each of 95 hens. One experimental corn- soybean meal diets was formulated. The basal diet contained 19.0% CP and 2800 Kcal ME/Kg diet was fed during the laying period. Two types of probiotics were supplemented to the diet (2 kg/ton) to study their effects on productive performance commercial laying hen compared to the control diet (without growth promoters): 1- Choong Ang Yeast Culture (CYC-100) is a unique live yeast culture product (saccharomyces cerevisiae $1.510x10^{11}$ CFU/ kg) and 2- More Yeast (MY) is a dead yeast culture of the same strain. Hens in all treatments were kept under a similar management system. The experimental diet was mixed each week to insure that a viable microbial culture is present during the experimental period (from 21-32 weeks of age). Experimental mash diet and fresh clean water were offered ad-libitum all over the experimental period. Light schedule was held artificially according to the system of brooding period and reached 17 hours daily in the laying period. Electerical and gas heaters were used to provide the chicks with heat needed for brooding.

The following criteria were measured and/or calculated:

Feed intake (FI): Residual feed was weekly collected, weighed and subtracted from the offered one to obtain FI on a group basis for each treatment.

Feed conversion (FC): It was calculated using the following equation: Grams feed intake/grams of egg mass.

Egg production %: It was calculated as follows: Daily egg number/ Birds numberx100

Egg weight (EW): It was obtained on a hen- day basis from 21 up to 32 weeks of age by dividing the total egg weights by its total number to obtain the average.

Egg mass (EM): It was calculated by multiplying egg number by the average egg weight.

Economical efficiency: The economical efficiency was calculated from the input- output analysis based upon the difference in egg mass and feeding cost (**Heady and Jensen 1954**).

Haematological Parameters:

Blood samples, about 5 ml were obtained in heparinized test tubes from the brachial vein at 24, 28 and 32 weeks of age from 6 birds in each group. Blood picture was measured immediately and plasma was separated by centrifugation for 15 minutes at a speed of 3000 rpm and kept frozen at -20°C until blood analysis. Haematocrit value (Ht %) was determined according to Wintrobe method. Blood hemoglobin concentration (g/100ml) was determined according to **Makaren (1974)**. Plasma cholesterol was determined according to **Richmond (1973)**.

Statistical Analysis:

Analysis of variance was performed using the General Linear Model (GLM) procedure of statistical analysis system (**SAS, 1982**) according to **Steel and Torrie (1980)** adopting the following model for laying performance traits:

$$Y\ ijkl = \mu + T_i + S_j + P_k + TS_{ij} + e_{ijkl}$$

μ = Overall mean, T_i = Effect of treatment, S_j = Effect of strain, P_k = Effect of period, TS_{ij} = Treatment x Strain interaction, e_{ijkl} = Random error term for layer performance traits. Variable means for treatments indicating significant differences in the ANOVA were tested using Dumcan's Multiple Range Test (**Duncan, 1955**).

Table 1. Composition of the experimental basal diet used from 21 up to 32 weeks of age.

Ingredients	%
Ground yellow corn	55.00
Soybean meal (44% cp)	31.60
Ground lime stone	8.50
Vegetable oil	3.00
Bone meal	1.00
Sodium chloride	0.30
Vit and Min- Mix *	0.30
Sodium bicarbomate	0.10
DL- Methioine	0.10
Choline Chloride	0.10
Calculated analysis:	100
Crude protein	18.80
Crude fiber	3.52
Crude fat	5.56
Ash	10.81
Ca.	3.62
P, Total	0.48
P, avail	0.26
Met.	0.41
Met. +Cyst.	0.686
Lys.	1.06
ME, Kcal/ Kg	2820

*** The vitamin and mineral mixture (Rovimix layer & broiler breeder Roche) was added as 3 kg per ton of diet and supplied the following (as mg or I.U. per kg of diet) vit A 12500,vit D3 2500 I.U., vit E 40mg, vit K3 4mg Vit. B1 2mg, vit B2 10mg, vit B6 5mg vit, B12 0.02mg, Niacin 40mg, Biotin 0.15mg pantothenic acid 12mg folic acid 1.5mg, choline chloride 700mg, Mn 100mg, Cu 10mg, Se 0.2mg, Fe 40mg, Zn 80 mg, I 0.5mg and Co 0.25mg.**

RESULTS AND DISCUSSION

Concerning strain effect, Brown Bovans had significantly better FC and economical efficiency than White Bovans being 5.60 g feed/ g egg mass and 0.747 vs 7.00g feed/g egg mass and 0.723. However, strain insignificantly affected FI, regardless of treatment or period effects as shown in Table 2.

Growth promoters resulted in an increase in FI of hens fed the diets supplemented by either CYC-100 or MY than those fed the control diet. The group fed the CYC-100 had significantly higher FI and poorer FC and economical efficiency than those fed the control diet being (108.20g, 7.18g feed/g egg mass and 0.685, respectively. However, the MY treatment had a higher economical efficiency of 0.777 than other treatments (Table 2).

Table 2. Effects of growth promoters (Ang Yeast Culture CYC-100 and More Yeast MY), strain and period on feed traits and economic efficiency (M±SE).

Main effects	Feed intake, g/bird/day	Feed conversion, g feed/g egg mass	Economic efficiency
Strain effect:			
White Bovans	**107.01±0.77a**	**7.00±0.91a**	***0.723***
Brown Bovans	**105.62±0.77a**	**5.60±0.90b**	***0.747***
Treatment effect:			
Control	**104.32±0.95b**	**6.17±1.11a**	***0.750***
CYC-100	**108.20±0.94a**	**7.18±1.11b**	***0.685***
MY	**106.43±0.94ab**	**6.03±1.12a**	***0.777***
Period effect:			
21-24wks	**95.22±0.95b**	**15.14±1.12a**	
25-28wks	**110.83±0.94a**	**2.22±1.11b**	
29-32wks	**112.90±0.94a**	**2.02±1.11c**	

a and b: Means having different superscripts within each column and each effect are significantly different (P<0.05).

Period of production significantly influenced either FI or FC (P≤0.05). Hens had the lowest FI of 95.22g during the period from 21-24 weeks of age, however those fed both growth promoters insignificantly differed. Hens had the best FC of 2.02 g feed/g egg mass during the period from 29-32weeks of age whereas the worst FC was 15.14 g feed/g egg mass during the early period of production from 21-24 weeks of age as shown in Table 2. These results were in full agreement with the findings reported by several authors (**Tortuero and Fernandez, 1995, Siam *et al.*, 2004 Nahashon *et al.*, 1994 b, Mohan *et al.*, 1995 and Haddadin *et al.*, 1996**) in laying hens and **(Ghazalah and Ibrahim, 1998)** with laying Japanese quails. They found that continuous lactobacillus acidophilus dosing lowered the PH in the crop, cecum and rectum. They also added that the particular strain of lactobacillus acidophilus was capable of competing with E-coli in the gut. All these effects may cause an alternation in the absorption of most nutrients, and this may be accounted for the improved efficiency of feed utilization. **Fuller (1997**) explained this improvement in FC by probiotics may be due to the balance of microbial population created in the intestinal tract and to the role of lactobacillus in preventing the harmful bacteria which invade population in the digestive tract of the birds.

There were significant differences due to strain for both egg production% and EW. The White Bovans had significantly higher egg production % with lower EW than the Brown Bovans being 72.81% and 54.66g vs 68.80% and 55.81g, respectively. However, strain insignificantly affected EW as shown in Table 3.

Table 3. Effects of growth promoters (Ang Yeast Culture CYC-100 and More Yeast MY), strain and period on egg production traits (M±SE).

Main effects	Egg production%	Egg weight, g	Egg mass, g
Strain effect:			
White Bovans	**72.81±0.93a**	**54.66±0.19b**	**3706.16±44.47a**
Brown Bovans	**68.80±0.27b**	**55.81±0.18a**	**3769.78±44.19a**
Treatment effect:			
Control	**68.38±1.13b**	**54.77±0.23b**	**3640.47±54.29b**
CYC-100	**72.20±1.13a**	**55.26±0.23ab**	**3809.38±54.12a**
MY	**71.84±1.14a**	**55.67±0.23a**	**3764.06±54.47a**
Period effect:			
21-24wks	**36.13±1.15c**	**48.74±0.23c**	**1719.58±54.63c**
25-28wks	**85.63±1.14b**	**56.56±0.23b**	**4572.28±45.12b**
29-32wks	**90.65±1.14a**	**60.42±0.23a**	**4922.05±54.12a**

a and b: Means having different superscripts within each column and each effect are significantly different (P<0.05).

Results presented in Table 3 indicated that either treatment or period significantly influenced each of egg production%, EW and EM ($P \leq 0.05$). Hens fed the supplemented diets with CYC-100 and MY had higher egg production%, EW and EM than those fed the control diet. Hens during the period from 21-24 weeks of age had the lowest egg production%, EW and EM (36.13%, 48.74 and 1719.58g, respectively at $P \leq 0.05$). However, the highest egg production%, EW and EM were shown during the period from 29-32 weeks of age being 90.65%, 60.42 and 4922.05g, respectively as shown in Table 3. It can be concluded that growth promoters (CYC-100 and MY) improved EP% as compared with control. This finding was in full agreement with several authors (**Miles *et al*., 1981, Ezzat *et al*., 1988, Haddadin *et al*., 1996, Panda *et al*., 2000, Kucukrsan *et al*., 2002 and Siam *et al*., 2004**). Growth promoters MY slightly improved EW compared with the control. These results were in agreement with several authors (**Abd El-Rahman 1993, Hamid *et al*., 1994, Panda *et al*., 2000, Osman, 2003 and Siam *et al*., 2004**). Similar findings with respect to EM were reported by many authors (**Ezzat *et al*., 1988, Nahashon *et al*. 1994b, Ghazalah and Ibrahim, 1998, Kucukersan *et al*., 2002 and Osman, 2003**). Interactions had insignificant effects on the traits presented in Table 4.

Table 4. Effects of growth promoters (Ang Yeast Culture CYC-100 and More Yeast MY) and strain interaction on feed traits, layer performance traits and economic efficiency at different periods studied (M±SE).

Period	White Bovans			Brown Bovans		
	Control	CYC-100	MY	Control	CYC-100	MY
Feed intake,g						
21-24wks	88.64±2.36b	92.05±2.32b	94.37±2.32b	96.31±2.32b	99.79±2.32b	100.76±2.32b
25-28wks	109.47±2.32ab	111.25±2.32ab	113.81±2.32a	106.59±2.32a	113.11±2.32a	110.17±2.32a
29-32wks	118.27±2.32a	122.23±2.32a	113.01±2.32a	106.66±2.32a	110.79±2.32a	106.44±2.32ab
Feed conversion, g feed/g egg mass						
21-24wks	15.58±2.77a	22.39±2.72a	15.20±2.72a	12.78±2.72a	12.22±2.72a	12.69±2.72a
25-28wks	2.26±2.72b	2.18±2.72b	2.20±2.72ab	2.27±2.72b	2.28±2.72ab	2.16±2.72ab
29-32wks	2.13±2.72b	2.06±2.72b	1.98±2.72b	2.03±2.72b	1.98±2.72b	1.98±2.72b
Egg production %						
21-24wks	35.43±2.83b	36.17±2.78b	36.86±2.83b	32.68±2.78b	37.93±2.78b	37.63±2.78b
25-28wks	85.53±2.78ab	89.19±2.78ab	90.46±2.78a	79.52±2.78ab	83.44±2.78ab	85.67±2.78a
29-32wks	92.80±2.78a	95.87±2.78a	92.92±2.78a	84.33±2.78a	90.60±2.78a	87.40±2.78a
Egg weight, g						
21-24wks	48.23±0.56b	47.76±0.55a	49.48±0.57b	48.30±0.55b	49.63±0.55b	49.01±0.55b
25-28wks	55.30±0.55ab	55.00±0.55ab	56.13±0.55ab	56.64±0.55ab	58.14±0.55a	58.14±0.55a
29-32wks	59.07±0.55a	60.34±0.55a	60.66±0.55a	61.10±0.55a	60.70±0.55a	60.63±0.55a
Egg mass, g						
21-24wks	1624±135b	1626±133b	1682±138b	1674±133b	1823±133b	1888±133b
25-28wks	4454±133a	4588±133ab	4595±133a	4498±133ab	4507±133ab	4791±133ab
29-32wks	4482±133a	5272±133a	4703±133a	4782±133a	5040±133a	4924±133a
Economic efficiency						
21-32wks	0.74	0.66	0.77	0.76	0.71	0.77

a and b: Means having different superscripts within each row are significantly different (P<0.05).

Results presented in Table 5 showed that White Bovans had significantly higher Ht% and Hb than the Brown Bovans (25.76% and 9.64g/100ml vs 24.30% and 9.05g/100ml, P≤0.05). However, no strain effect was shown for cholesterol concentration. Hens fed the MY supplemented diets had lower Ht% and Hb of 24.19% and 8.87g/100ml than other the treatments. However, diets supplemented with both CYC-100 and MY had lower cholesterol contents than those fed the control diet as shown in Table 5. It can be seen that as birds advanced in age and production, both Ht% and Hb gradually increased. The period from 21-24 weeks of age had the lowest Ht, Hb and cholesterol estimates of 21.55% 8.13g/100ml and 149.05mg/dl (Table 5). These results are in agreement with several authors (**Abdulrahim e*t al*., 1996, Kaya *et al*., 2003**). The reduction in plasma cholesterol could be attributable to reduction in absorption and/or synthesis of cholesterol in the gastrointestinal tract by probiotics supplementation (**Nelson and Gilliand, 1984)**. Furthermore, **Mohan *et al*. (1995)** stated that lactobacillus acidophilus reduces cholesterol in the blood by deconjugating bile salt in the intestine, thereby preventing them from acting as precursor in cholesterol synthesis and caused reducing in the plasma cholesterol. Strain x treatment interaction effect on blood parameters traits at different periods are presented in Table 6. The interaction effect was significant at all periods for Ht% except the period from 29-32 weeks and was significant with all periods for Hb values. Also the interaction effect was significant for cholesterol concentration during the periods from 25-28 and 29-32 weeks of age (Table 6). It can be conclude that Brown Bovans hens had lower blood parameters traits than the white hens for all treatments and periods.

Table 5. Effects of growth promoters (Fang Yeast Culture CYC-100 and More Yeast MY), strain and period on blood parameters traits (M±SE).

Main effects	haematocrit value%	Haemoglobin value(g/100ml)	Cholesterol, mg/dl
Strain effect:			
White Bovans	25.76±0.48a	9.64±0.19a	174.54±2.96a
Brown Bovans	24.30±0.47b	9.05±0.18b	169.77±2.96a
Treatment effect:			
Control	26.04±0.63a	9.49±0.24ab	175.35±3.63a
CYC-100	24.87±0.56ab	9.67±0.22a	168.19±3.63b
MY	24.19±0.56b	8.87±0.22b	172.92±3.62ab
Period effect:			
21-24wks	21.55±0.58b	8.13±0.23b	149.05±3.62c
25-28wks	26.02±0.56a	9.90±0.22a	192.30±3.62a
29-32wks	27.52±0.60a	10.00±0.24a	175.11±3.62b

a and b: Means having different superscripts within each column and each effect are significantly different (P<0.05).

Table 6. Effects of growth promoters (Ang Yeast Culture CYC-100 and More Yeast MY) and strain interaction on blood parameters traits at different periods studied (M±SE).

Period	White Bovans			Brown Bovans		
	Control	CYC-100	MY	Control	CYC-100	MY
haematocrit value%						
21-24 wks	30.75±1.54a	25.50±1.26b	24.67±1.26b	25.20±1.38b	27.17±1.26a	23.67±1.26b
25-28 wks	30.89±1.53a	26.80±1.19ab	25.30±1.25b	25.95±1.30b	26.19±1.27a	25.47±1.18b
29-32 wks	31.00±1.54a	27.00±1.38a	26.50±1.26ab	27.00±2.18a	25.67±1.26b	27.83±1.26a
Haemoglobin value (g/100ml)						
21-24 wks	12.38±0.57a	9.67±0.46b	9.33±0.46b	9.20±0.51b	10.67±0.46ab	8.75±0.46b
29-32 wks	11.60±0.56a	10.39±0.49ab	9.40±0.44b	8.70±0.72b	10.19±0.41ab	9.19±0.42b
25-28 wks	10.75±0.56ab	11.10±0.51a	9.42±0.46b	8.50±0.80b	9.83±0.46b	9.67±0.46b
Cholesterol, mg/dl						
21-24 wks	196.92±8.50a	193.65±8.50a	212.05±8.50a	183.90±8.50b	184.45±8.50b	182.83±8.50b
25-28 wks	193.76±8.30a	182.33±8.52b	182.12±8.40b	182.60±8.49b	170.15±8.40b	178.15±8.51b
29-32 wks	192.03±8.50a	174.83±8.50b	158.53±8.50c	183.72±8.50a	168.72±8.50b	172.82±8.50b

a and b: Means having different superscripts within each row are significantly different (P<0.05)

In conclusion, Brown Bovans had significantly better FC and economic efficiency than White Bovans. The group fed the growth promoter CYC-100 had significantly higher FI and poorer FC and economical efficiency than those fed the control diet and hens fed the MY treatment had higher economic efficiency of 0.777 than the other treatments. Period of production significantly influenced either FI or FC ($P \leq 0.05$). Hens had the lowest FI of 95.22g during the period from 21-24 weeks of age, however those fed both growth promoters were insignificantly differed than each other. Layers had the best FC of 2.02 g feed/g egg mass during the period from 29-32weeks of age whereas the worst FC was 15.14 g feed/g egg mass during the early period of production from 21-24 weeks of age. The White Bovans had significantly higher egg production % with lower EW than the Brown Bovans. However, strain insignificantly affected EW. It can be seen that growth promoters (CYC-100 and MY) improved EP% as compared with the control.

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تأثير بعض منشطات النمو على الأداء الانتاجى لانتاج البيض لدجاج البوفانز الأبيض والبنى

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تم استخدام عدد 570 دجاجة من سلالة البوفانز البياض الأبيض و البنى عند عمر ٢١ اسبوع. وقد استعملت عليقة تجريبية من الذرة وفول الصويا احتوت على ١٩% بروتين خام و٢٨٠٠ كيلو كالورى طاقة ممثلة/كجم عليقة خلال فترة الانتاج. وقد استخدمت فى هذه الدراسة نوعان من الخميرة أحدهما CYC-100 وهى منتج بيئة خميرة حية و أخرى ميتة (MY) كمحفزات للنمو. هدف هذا العمل هو دراسة اثنين من محفزات النمو (CYC-100) و(MY) على الأداء الانتاجى وبعض صفات الدم عند أعمار مختلفة فى طيور البوفانز الأبيض و البنى البياض (WB and BB). وقد خلصت الدراسة الى أن:

- البوفانز البنى كان له معدل تحويل وكذلك كفاءة اقتصادية أفضل معنويا عن البوفانز الأبيض وكانت قيمته ٥.٦٠جم علف/جم كتلة بيض منتجة و ٠.٧٤٧ كفاءة اقتصادية مقابل ٧.٠جم علف/جم كتلة بيض منتجة و ٠.٧٢٣ كفاءة اقتصادية. وكان للمعاملةMY كفاءة اقتصادية أعلى عن المعاملات الأخرى.
- أثرت فترة الانتاج معنويا على معامل التحويل الغذائى. وقد كان للدجاجات أفضل معامل تحويل غذائى فى الفترة من ٢٩ -٣٢ أسبوع بينما كان معامل التحويل الأسوأ هو ١٥.١٤ جم علف/ جم كتلة بيض منتجة خلال فترة الانتاج المبكرة من ٢١-٢٤ أسبوع من العمر.
- كان للبوفانز الأبيض نسبة انتاج بيض أعلى ووزن بيضة أقل معنويا عن البوفانز البنى والذى كان ٧٢.٨١% و ٥٤.٦٦جم مقابل ٦٨.٨٠% و ٥٥.٨١جم على التوالى. الدجاجات التى تغذت على كل من CYC-100 وMY نسب انتاج بيض ووزن بيضة وكتلة بيض أعلى عن تلك المغذاة على عليقة المقارنة. و قد تحققت أعلى نسبة انتاج بيض ووزن للبيضة وكتلة بيض منتجة خلال الفترة من ٢٩-٣٢ أسبوع من العمر وكانت ٩٠.٦٥% و ٦٠.٤٢جم و٤٩٢٢.٠٥جم على التوالى.
- كان للبوفانز الأبيض نسبة مكونات خلوية وهيموجلوبين أعلى من البوفانز البنى (٢٥.٧٦%و٩.٦٤جم/١٠٠مل مقابل ٢٤.٣٠% و ٩.٠٥جم/١٠٠مل عند P≤0.05). وقد كان للدجاجات التى غذيت على MY نسبة مكونات خلوية و هيموجلوبين أقل (٢٤.١٩% و٨.٨٧جم/١٠٠مل) عن المعاملات الأخرى.
- العلائق المدعمة بـ CYC-100 and MY كان بها محتوى كوليسترول أقل عن المغذاة على عليقة المقارنة.
- وقد لوحظ انه كلما تقدمت الدجاجات بالعمر زاد تدريجيا كلا من نسبة المكونات الخلوية والهيموجلوبين. وقد كان للفترة ٢١-٢٤ أسبوع أقل تقديرات لكل من نسبة المكونات الخلوية و الهيموجلوبين والكوليسترول.