Benha Vet. Med. J., Vol. 20, No.2, Dec. 2009

Effect of Dietary Supplementation of Probiotic, Prebiotic and Synbiotic on Performance, Carcass Characteristics, Blood Picture and Some Biochemical Parameters in Broiler Chickens

Fathy A. I. Abdel-Fattah [*], Khalid M. Fararh [**],
[*] Department of Nutrition and Clinical Nutrition, [**] Department of Clinical Pathology,
Faculty of Veterinary Medicine, Benha University, Egypt.

Abstract

This study was carried out to determine the effects of Prebiotic, Probiotic and Synbiotic in diets on broiler growth performance, carcass measurements, blood picture, serum glucose, calcium and phosphorus levels, liver function, and economical evaluation. Five hundred *Sasso* chicks (1-day-old) were used. The dietary treatments were as follow: basal diet (control); Basal diet plus 0.5 kg of probiotic *Lactic dry*®/ton of the feed; basal diet plus 1 kg of prebiotic *Bio-MOS*®/ton feed; and basal diet plus 0.5 kg of *Lactic dry*® and 1 kg *Bio-MOS*®/ton feed, respectively. Dietary supplementation of probiotic, prebiotic and synbiotic (probiotic with prebiotic) improved body weight gain, feed conversion ratio and breast muscle percentage. However, they did not affect liver enzymes. The prebiotic and synbiotic supplementation caused statistically significant increase in the erythrocyte count, hemoglobin concentration and haematocrit values comparatively with control values. Glucose, cholesterol, LDL, and Triglycerides concentrations showed significant decrease. Significant increase was recorded in calcium levels in prebiotic and symbiotic groups. Economical efficiency of the feed additives was improved. The results of the present study showed that synbiotic provide additive benefits in growth performance, feed conversion ratio, hematological and biochemical parameters than that of individual use of these additives.

Introduction

Recently, using natural growth promoters as alternatives for antibiotics is promising new future in the poultry production. Starting in 2006, the prophylactic use of antimicrobial growth promoters in the animal feed is banned due to increasing resistance of pathogenic bacteria against antibiotic. The international institutions and organizations related to public health are showing deep concern to reduce the use of antibiotics in the feed of animals and poultry. Using probiotics or prebiotics instead of antibiotics is increased in order to improve the useful microbial population of gastrointestinal tract **(33)**. Probiotics are live microbial feed supplements beneficially affect the host animal by improving its intestinal balance **(21)**. This improvement in conducted by correction of the population of bacteria present in the GI tract **(17)**. *Saccharomyces cerevisiae, Lactobacillus acidophilus, Streptococcus faecium, and Bacillus subtili* are being probiotic supplements in both animal and human nutrition **(22, 52 & 35).** Prebiotics are non-digestible food ingredients that leave a desired effect on the host by selective growth stimulation or activation of one or more bacteria in a large part of the GI tract **(23 & 57)**. Prebiotic are completely available for fermentation by intestinal flora. Oligosaccharides such as fructooligosaccharide (FOS), galactooligosaccharide (GOS), and mannanoligosaccharide (MOS) are among the most important prebiotics that have been studied as alternatives to antibiotics **(49)**. Synbiotic is mixture of probiotics and prebiotics that beneficially affects the host by improving the survival and implantation of live microbial dietary supplements in the gastrointestinal tract, by selectively stimulating the growth and/or by activating the metabolism of health-promoting bacteria, and thus improving host welfare **(5)**. In previous studies by **(41 & 42)**, it was found that dietary prebiotics improved recovery from iron deficiency anemia in rats. Also it increased erythrocyte counts (RBC), hemoglobin (Hb) concentration, haematocrit (Hct) value and iron absorption. Although a significant amount of studies by **(11, 25 & 44)** stated that probiotics had an effect on immunological and hematological parameters has been conducted, whereas little work has been performed to determine the effect of prebiotic and synbiotic on immunological, biochemical and hematological parameters.

Therefore, the objective of this study was to investigate the effects of probiotic, prebiotic and synbiotic supplemented diets on broiler growth performance, carcass measurements, blood picture, serum glucose, calcium and phosphorus levels, liver function, and economical evaluation.

Materials and methods

1. Birds, Housing, and Management

Five hundred 1-day-old broiler chicks of a broiler strain (*Sasso*) were obtained from a commercial hatchery. The experiment was carried out in the period between 28th May to 23th July. After 6 days of incubation, the birds were distributed randomly into 4 groups (125 birds/group) and reared on a deep litter system at a small farm. The chicks were maintained under good ventilation and continuous lighting program and were systematically vaccinated according to the sanitary programs for this category.

2. Dietary Treatments

The dietary treatments (Table 1) were: 1) basal diet (control), 2) basal diet plus 0.5 kg of probiotic *Lactic dry*® (LD, Kanzy Medipharm, Egypt) /ton of the feed; 3) basal diet plus 1 kg of prebiotic *Bio-Mos*® (Alltech, inc., Nicholasville, Kentucky USA) /ton feed; and 4) basal diet plus 0.5 kg of *Lactic dry*® and 1 kg Bio-Mos® / ton feed. The probiotic LD was a combination of beneficial bacteria [*Saccharomyces cerevisiae* ($5000X10^9$) cells, *Lactobacillus acidophilus* ($77x10^9$) cells, *Streptococcus faecium* ($44x10^9$) cells, and *Bacillus subtili* ($2.2x10^9$) cells]; added enzymes (amylase 10.500.000 IU/kg, cellulase 480.000 IU/kg, protease 1.000.000 IU/kg, and lipase 300.000 IU/kg); and fermentation by-products such as xylanase, phytase, B-glucanase, pectnase, and lactase. The prebiotic Bio-MOS® is a phosphorylated mannanoligosaccharide derived from cell wall of *Saccharomyces cerevisiae*. The chicks were provided with free access to water and were fed diets (starter from d 7 to 20, grower from d 21 to 41 and finisher from d 42 to 62 day). The diet (Table 1) based on yellow corn, soybean meal 44%, corn gluten meal 60%, soybean oil, and a premix with vitamins, minerals, amino acids, salt, and dicalcium phosphate. The basal diet was formulated according to the National Research Council (NRC, 1994).

3. Growth Performance Traits

All birds were weighed individually at 7th day from hatchery (initial weight) and every week. Daily body weight (BW) gain for each dietary treatment was calculated. Feed intake (FI) was recorded in the course of the whole experiment (7-62 days) for each treatment, and the feed conversion rate (FCR) was calculated subsequently.

4. Carcass yield and breast muscle percentages

At the end of experiment (day 62), after weighing, 10 birds per treatment were randomly selected and slaughtered. Afterward, the birds were scalded, defeathered, and carcasses were eviscerated. The head, neck, and feet were removed, and the carcass subsequently was ready to cook (RTC). The RTC carcass percentage was calculated in relation to the live BW of birds. Breast muscle percentage was also determined for each experimental group and was calculated relative to the dressed carcass.

Table (1): Composition and calculated analysis of the basal diet during the experimental period

Feed ingredient	Starter	Grower	Finisher
Soybean meal 44%	30.50	25.50	20.40
Yellow corn	49.70	58.60	65.50
Corn gluten 60%	9.00	6.50	6.00
DL-methionine	0.10	0.1	0.10
Lysine	0.30	0.30	0.30
Soybean oil	6.60	5.4	4.20
Salt	0.40	0.40	0.40
Limestone	1.50	1.50	1.30
Dicalcium phosphate	1.60	1.40	1.50
Premix broiler*	0.30	0.30	0.30
Total	100	100	100
Calculated analysis of experimental diets**			
ME (Kcal/kg diet)	3206.1	3204.25	3207.17
Crude protein	23.04	20.10	18.14
Calcium	1.05	0.99	0.92
Available phosphorus	0.47	0.42	0.43
Lysine	1.34	1.20	1.08
Methionine	0.51	0.46	0.43
Sodium	0.17	0.17	0.17

* Each 3 kg contains; Vitamins (A=12000000 IU, D_3= 2000000 IU, E= 10000 mg, K_3= 2000 mg, B_1= 1000 mg, B_2= 5000 mg, B_6= 1500 mg, B_{12}= 10 mg, Biotin= 50 mg, pantothenic acid= 10000 mg, nicotininc acid= 30000 mg, and folic acid= 1000 mg); Minerals (manganese= 60000 mg, zinc= 50000 mg, iron= 30000 mg, copper= 10000 mg, selenium= 100 mg, and cobalt= 100 mg); and carrier ($CaCo_3$) added to 3 kg. Produced by AGRI-Vet. Tenth of Ramadan City, A2, Egypt. **Calculated according to National Research Council **(40).**

5. Measurements of hematological and biochemical parameters:

At 62 days of age, chickens were slaughtered after overnight fasting and the blood was collected in EDTA and plain collection tubes. Blood samples were centrifuged at 2000 round per minute (rpm) for 10 min and the serum was transferred using individual Pasteur pipettes into Eppendorf tubes and stored at -20°C until used. Serum samples were analyzed for proteins (Total proteins, Albumin and Globulin **(16)**, [liver enzymes **(45)** (aspartate aminotransferase (AST), alanine aminotransferase (ALT)] and [Alkaline Phosphatase, (ALP) **(8)**], lipids (Total cholesterol **(58)**, [High Density

Lipoprotein (HDL) **(13)**], Low Density Lipoprotein (LDL) & Triglycerides) was calculated by using the formula: [LDL cholesterol = Total cholesterol – HDL cholesterol – (triglycerides divided by the factor 5) (Panda et al., 2006)], Glucose, Calcium and Phosphorus by appropriate commercial diagnostic kits (Abdulrahim et al., 1996). Blood on EDTA were used for assessing blood picture. Hemoglobin levels were determined following **Feldman, et al., (19)**. Packed cell volume (PCV, hematocrit) was estimated by the microhaematocrit method using capillary glass tubes **(10)**.

6. **Economical efficiency**

Economic efficiency is defined as the net revenue per unit feed cost calculated from input output analysis as described by **Hassan et al., (27)**. Economical efficacy has been carried out using data from feeding expenses, selling incomes, finally achieving the absolute revenue.

7. **Statistics**

The data were subjected to ANOVA and t-test procedures. Statements of statistical significance were based on $P<0.05$ according to **KaleidaGraph™ (31)** Data Analysis software.

Results and Discussion

1. **Growth and performance and carcass traits**

The essential role of the diet is not only to supply the body with its required nutrients but also to modulate various functions in the body. Performance traits of broiler chickens including FI, BW gain and FCR are shown in Table (2). Average FI of all experimental groups showed no significant difference between dietary treatments. In agreement with the result of this study, researchers showing that the use of such additives has no effect on the feed consumption **(54 & 53)**. The initial BW of chicks did not differ between all treatments. At the end of the experiment (d 62), birds supplemented with the synbiotic (*LD+Bio-MOS*) had the greatest ($P < 0.05$) BW between all experimental groups. FCR in Table (2) and Figure (1) was lower for birds fed synbiotic (2.19), followed by probiotic (2.23), and prebiotic (2.29) in comparison with the control group (2.42). The positive effect of experimental additives was in agreement with the results reported by several researchers **(48, 1 & 18)**. In general, improvements in feed efficiency with probiotic were ascribed to an encouraged growth of the beneficial bacteria in the GI tract. In addition to the antimicrobial activity, a significantly increased intestinal amylase activity **(30)** and decreased urease activity in GI tract of broiler chicks **(55).** Prebiotic MOS in many researches was found to improve the growth performance in broiler chickens **(29)**. MOS may adsorb pathogenic bacteria, inhibiting them from binding to the carbohydrate moieties of the intestinal lining **(28)**, make aggregation of undesirable bacteria bringing them out of solution **(50)**, modify metabolic activity of normal intestinal flora **(14)** and stimulate immune system **(39)**, lower the gut pH through lactic acid production **(24)**. This reduction in pH is effective in controlling the population of pathogenic bacteria **(26)**. Increasing the BW gain and improving feed conversion ratio for broilers fed synbiotic indicate higher efficiency in converting feed to body mass during the experimental period. The growth of beneficial bacteria in the gut due to feeding a combination of prebiotic and probiotic was more effective than the supplementation with prebiotic or probiotic alone. The reason may be attributed to the synergism action of LD and MOS. Results of carcass traits concerning dressing percentage of the RTC carcass and breast muscle percentage in relation to the dressed carcass are demonstrated in Table (3). Statistically, there was no difference in dressing percentage between the experimental groups but a slight improvement was obvious in bird fed diets supplemented with the three additives.

Table (2): Effect of dietary supplementation of probiotic, prebiotic and synbiotic on performance of broiler chickens during the experimental period (7-62 days)

Group	Control	probiotic	prebiotic	Synbiotic
Average daily FI (g)	54.76±5.6a[a]	51.1±3.55[a]	50.57±3.85[a]	52.64±4.42[a]
Total FI (g)	3066.77	2862.09	2832.12	2948.24
Initial BW (g)	114.9±2.2[a]	116.7±2.04[a]	115.7±1.9[a]	115±2.05[a]
Final BW (g)	1384.29±15.7[b]	1397.7±16.8[b]	1350.6±18.2[b]	1461.29± 23.2[a]
Body gain (g)	1269.39	1281.06	1234.89	1346.29
FCR	2.42	2.23	2.29	2.19

* Column contains different letter differ significantly ($P<0.05$)

These results agreed with previous researchers that used different types of probiotics **(1 & 9)**, prebiotics **(6 & 38)** and synbiotics **(47)**. Breast muscle percentages in Table (3) showed significant increase ($P<0.05$) in treated groups compared with that of control. This result was in agreement with **Falaki et al., (18).**

Figure 1: Effect of dietary supplementation of probiotic, prebiotic and synbiotic on FCR of broiler during the experimental period

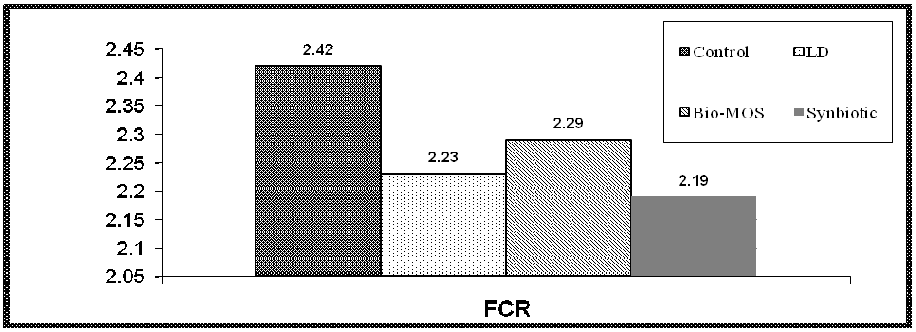

Table (3): Effect of dietary supplementation of probiotic, prebiotic and synbiotic on dressing and breast muscle percentages of broiler at the end of experimental period (7-62 days)

Item	Control	Probiotic	Prebiotic	Synbiotic
Final live BW (g)	1325.8±23.57	1405.4±28.8	1362.8±35.8	1409.6±16.4
Dressed carcass (g)	913.4 ±21.96	987±13.8	956.2±25.2	993.2±15.9
Dressing %	68.864± 0.48[a]	70.226±0.43[a]	70.422±0.91[a]	70.568± 0.76[a]
Breast muscle (g)	129.2±1.6	150.4±2.04	147.6±3.4	152±4.6
Breast muscle %	14.17±0.34[b]	15.24±0.23[a]	15.45±0.24[a]	15.3± 0.12[a]

* Column contains different letter differ significantly ($P<0.05$)

2. Hematological and biochemical changes

a) Proteins

The serum concentrations of total protein and albumin were not affected by probiotic and prebiotic supplementation in this study. However synbiotic increased significantly total proteins, albumin and globulin compared with control group. These findings are in agreement with those of **Dimcho et al. (15)** who found that probiotic supplementation did not affect the total proteins concentrations of chickens.

b) Blood Glucose

Glucose levels decreased significantly in a probiotic, prebiotic and synbiotic groups compared with the control one. These results are in agreement with those found by **Yoon et al. (56)** and **Al-Kassie and Abd-Aljaleel, (3)**, who recorded similar results. The reduction of glucose in group 2, 3 and 4 compared with the control could be due to the additions to chick diet that had a positive effect, on birds which meant, that those additions decreased stress factor on birds **(4)**.

c) Lipid profile

The probiotic have lipid decreasing effect in broilers. Probiotic showed a significant decrease in cholesterol, triglyceride, and LDL concentrations when compared to the control group (Table 4). HDL showed significant increase. This observation is in agreement with **Panda et al., (43)** who found that serum total cholesterol and triglycerides were reduced significantly by dietary supplementation of probiotic containing L. sporogenes. The significant reduction in serum cholesterol of broiler chickens fed probiotic supplemented diet could be attributed to reduced absorption and/or synthesis of cholesterol in the gastro-intestinal tract by probiotic supplementation **(36 & 37)**. Also, it was speculated that Lactobacillus acidophillus reduces the cholesterol in the blood by deconjugating bile salts in the intestine, thereby preventing them from acting as precursors in cholesterol synthesis **(2)**. Lactobacillus has found to have a high bile salt hydrolytic activity, which is responsible for deconjugation of bile salts **(51)**. Deconjugated bile acids are less soluble at low pH and less absorbed in the intestine and is more likely to excrete in feces **(34)**. Another explanation of the mechanism by which a probiotic can lower the serum cholesterol has been declared by **Fukushima and Nakano (20)**. The authors demonstrated that probiotic microorganisms inhibit hydroxymethyl-glutaryl-coenzyme A; an enzyme involved in the cholesterol synthesis pathway thereby decrease cholesterol synthesis. Prebiotic and synbiotic decreased total serum cholesterol levels, as well as decreasing LDL-cholesterol and the LDL/HDL ratio. Lipid decreasing effect of synbiotic is more pronounced than prebiotic and probiotic as illustrated in Table 4.

d) Calcium and phosphorus

Significant increase was recorded in calcium levels in prebiotic and synbiotic groups. Phosphorus level showed no significant difference between groups. Prebiotics have been linked to an enhancement of mineral absorption in the large bowel **(46)**. Stimulation of calcium and magnesium absorption has been demonstrated in humans and animals after the consumption of prebiotics **(Coudray, et al., 12).**

a) Liver enzymes

Activities of enzymes such as AST, ALT and ALP in serum were not influenced due to probiotic, prebiotic or synbiotic supplementation. Similar results were recorded by **Panda et al., (43)**.

a) Hematology

With regard to the influence of probiotic on hematological parameters (Table 5), there were only significant increase in RBCs count, hemoglobin and PCV in prebiotic and synbiotic fed broilers. This was in agreement with the study done by **Al-Kassie et al., (4)**. These could be due to the low stress on birds. These results were found by **Karoglu and Drudag (32)**, who found that adding probiotic diet, could inhibit the nutritional stress in broiler chickens.

Table (4): Effect of dietary supplementation of Prebiotic, Probiotic and Synbiotic on biochemical parameters in broiler chickens

	Control	Probiotic	Prebiotic	Synbiotic
Total proteins (g/dl)	5.72 ± 0.98[a]	5.85 ± 0.06[a]	5.64 ± 0.27[a]	6.82 ± 0.14[b]
Albumin (g/dl)	2.25 ± 0.42[a]	2.12 ± 0.14[a]	2.41 ± 0.52[a]	2.98 ± 0.12[b]
Globulin (g/dl)	3.51 ± 0.25[a]	3.75 ± 0.23[a]	3.17 ± 0.54[a]	3.99 ± 0.13[b]
Glucose (mg/dl)	219.1±18.3[a]	200.14±5.2[b]	199.24±3.48[b]	189.14± 3.49[b]
Calcium (mg/dl)	8.51 ± 0.14[a]	8.29 ± 0.05[a]	9.51 ± 0.48[b]	10.59 ± 0.72[b]
Phosphorus (mg/dl)	5.18 ± 0.23[a]	5.27 ± 0.13[a]	5.24 ± 0.32[a]	5.53 ± 0.94[a]
AST (U/L)	48.49± 2.10[a]	50.34 ± 2.1[a]	44.35 ± 0.31[a]	46.68 ± 3.51[a]
ALT (U/L)	27.32± 1.59[a]	26.12 ± 1.2[a]	28.23 ± 2.17[a]	27.56 ± 1.49[a]
ALP (U/L)	39.12 ±2.47[a]	38.75±0.32[a]	37.51 ± 1.11[a]	38.3 ± 1.14[a]
Total cholesterol (mg/dl)	139.34±4.2[a]	125.95±5.1[b]	123.72±4.21[b]	122.24± 3.84[b]
HDL (mg/dl)	75.41± 2.47[a]	77.41±3.24[b]	80.35 ± 2.15[b]	82.14 ± 3.21[b]
LDL (mg/dl)	48.46± 2.45[a]	35.46±1.57[b]	30.54 ± 2.11[b]	27.97 ± 2.33[b]
Triglycerides (mg/dl)	77.47±1.98[a]	65.45±2.47[b]	61.17±2.48[b]	60.73±1.87[b]

* Column contains different letter differ significantly ($P<0.05$)

Also, these results may be attributed to increased iron absorption **(42)**. The total white blood cell and lymphocytes counts were significantly increased ($P > 0.05$) by dietary supplementation with the additives compared with the control values. These results indicate that dietary supplementation with probiotic, prebiotic and synbiotic stimulates immune functions as previously recorded **(7)**. No significant changes were recorded in other cellular count in all groups.

Table (5): Effect of adding Prebiotic, Probiotic and Synbiotic on blood picture in broiler

	Control	Probiotic	Prebiotic	Synbiotic
RBCs (10^6/µl)	3.12 ± 0.21[a]	3.20 ± 0.31[a]	3.90 ± 0.24[b]	4.00 ± 0.28[b]
Hb (g/dl)	7.51 ± 0.41[a]	7.60 ± 0.33[a]	8.12 ± 0.14[b]	8.20 ± 0.47[b]
PCV (%)	34.14 ±0.98[a]	34.40±0.75[a]	35.11±0.41[b]	35.61 ± 0.91[b]
WBC (10^3/µl)	22.71 ±0.87[a]	23.42±0.65 [b]	23.90±0.34[b]	23.99 ± 0.37[b]
Neutrophils (10^3/µl)	9.56 ± 0.98[a]	9.29 ± 0.78[a]	9.38 ± 0.94[a]	9.62 ± 0.88[a]
Lymphocytes (10^3/µl)	12.14±1.12[a]	13.12± 1.25[b]	13.21±1.97[b]	13.24 ± 1.56[b]
Monocytes (10^3/µl)	0.54 ± 0.10[a]	0.51 ± 0.11[a]	0.53 ± 0.13[a]	0.49 ± 0.09[a]
Eosinophils(10^3/µl)	0.15 ± 0.04[a]	0.16 ± 0.04[a]	0.14 ± 0.07[a]	0.15 ± 0.05[a]
Basophils (10^3/µl)	0.35 ± 0.09[a]	0.35 ± 0.08[a]	0.36 ± 0.07[a]	0.35 ± 0.09[a]
Thrombocytes (10^3/µl)	250.12±12.2[a]	246.01±14.2[a]	247± 13.18[a]	249 ± 17.24[a]

* Column contains different letter differ significantly (P<0.05)

Table (6): Input/output analysis and Economical efficiency of growing chicks fed the Experimental diets

	Unit	Control	Probiotic	Prebiotic	Synbiotic
Final BW gain	g	1269.39	1281.06	1234.89	1346.29
Feed cost (7-20 d)	L.E.	1.02	1.15	1.08	1.1
Feed cost (21-41 d)	L.E.	2.59	2.27	2.33	2.59
Feed cost (42-62d)	L.E.	2.60	2.39	2.34	2.58
Cost of additive	L.E.	0.00	0.0858	0.227	0.31
Total feed cost /chick	L.E.	6.21	5.9	5.98	6.58
Selling revenue	L.E.	16.5	16.65	16.05	17.5
Net revenue / chick	L.E.	10.29	10.75	10.07	10.92
Economic efficiency	L.E.	1.66	1.82	1.68	1.66
Relative economic efficiency	L.E.	100.0	109.6	101.2	100.0

Feed cost = number of kg feed per bird X price of kg feed.
Selling revenue=body weight gain per bird X price of kg for live BW chick (13 L.E).
Net revenue = difference between selling revenue and feed cost.
E.E (Economic efficiency) = net revenue/feed cost.
R.E.E (Relative economic efficiency), assuming control treatment = 100%

a) Economical evaluation

Results of economic efficiency (E.E.) for chicks fed experimental diets during the growth period (7-62 d) are summarized in Table (6). Differences in relative economic efficiency showed that diet contained LD and synbiotic had the best values (109.6 and 101.2) respectively compared to the control diet. While the value of the prebiotic (*Bio-MOS*) supplemented group was equal to control. This improvement could be due to improving the feed conversion or reducing the amount of feed required to produce body weight gain.

Conclusion

The results of the present study showed that combining strategies of prebiotic with probiotic provide additive benefit in growth performance, feed conversion ratio, hematological and biochemical parameters than that of individual use of these additives. Also the results showed an ideal effect of prebiotic synergistically with probiotic preparation to optimize digestion, and absorption of minerals thus to convert feed to body mass more effectively.

References

1. **Abaza, I. M., M. A. Shehata, M. S. Shoieb, & I. I. Hassan (2008):** Evaluation of Some Natural Feed Additive in Growing Chicks Diets. International Journal of Poultry Science 7 (9): 872-879.
2. **Abdulrahim, S. M., M. S. Haddadin, E. A. Hashlamoun, & R. K. Robinson (1996):** The influence of Lactobacillus acidophilus and bacitracin on layer performance of chickens and cholesterol content of plasma and egg yolk. British Poultry Science, 37: 341-346.
3. **Al-Kassie, G. A. & R. A. Abd-Aljaleel (2007):** Effect of dietary probiotic (Sacchromycescerviciae) on some physiological properties and intestinal microflora in Broiler chicks. Proceeding of second Veterinary, Scientific Conference. College Vet. Med. Univ. Baghdad, pp: 102-115.
4. **Al-Kassie G. A., Y. M. F. Al-Jumaa & Y. J. Jameel (2008):** Effect of Probiotic (Aspergillus niger) and Prebiotic (Taraxacum officinale) on Blood Picture and Biochemical Properties of Broiler Chicks. International Journal of Poultry Science 7 (12): 1182-1184.
5. **Awad W. A., K. Ghareeb, S. Nitsch, S. Pasteiner, S. Abdel-Raheem, & J. Böhm (2008):** Effects of Dietary inclusion of Prebiotic, Probiotic and Synbiotic on the Intestinal Glucose Absorption of Broiler Chickens. International Journal of Poultry Science 7 (7): 686-691.
6. **Baurhoo, B., P. R. Ferket, & X. Zhao (2009):** Effects of diets containing different concentrations of mannanoligosaccharide or antibiotics on growth performance, intestinal development, cecal and litter microbial populations, and carcass parameters of broilers. Poultry Science 88: 2262–2272.
7. **Benyacoub, J., C. Czarnecki-Maulden, T. Cavadini, R. E. Southier, E. J. Schiffrin, & T. Weid (2003):** Supplementation of food with Enterococcus faecium (SF68) stimulates immune functions in young dogs. Journal of Nutrition 133: 22–27.

8. **Bergmyer HU (1974):** In methods of Enzymatic Analysis. Vol. 11 Academic Press. Inc ; USA.
9. **Chumpawadee, S., O. Chinrasi, T. Somchan, A. Ngamluan, & S. Soychuta (2008):** Effect of Dietary Inclusion of Cassava Yeast Source on Growth Performance, Small Intestine (Ileum) Morphology and Carcass Characteristic in Broilers. International Journal of Poult. Sci. 7(3):246.
10. **Coles, E. H. (1986):** Veterinary Clinical Pathology fourth ed. WB Saunders Company, Philadelphia, London, Toronto.
11. **Cotter, P. F., A. Malzone, B. Paluch, M. S. Lilburn, & A. E. Sefton (2000):** Modulation of humoral immunity in commercial laying hens by a dietary probiotics. Poultry Science 79: 38.
12. **Coudray C, C. Demigné, & Y. Rayssiguier (2003):** Effects of dietary fibers on magnesium absorption in animals and humans. Journal of nutrition, 133:1–4.
13. **Demacker P. N. M. & Hifmans A. G. M. (1980):** A study on the use of polyethylene glycol in estimating cholesterol in highdensity lipoproteins. Clinical Chemistry, 26: 1775-1779.
14. **Demigne, C., C. Yacoub, C. Remezy, & P. Fafournoux (1986):** Effects of absorption of large amounts of volatile fatty acids on rat liver metabolism. Journal of nutrition, 116: 77-86.
15. **Dimcho D., M. Stefanov, S. Boicheva & T. Vlaikova (2005):** Effect of Diet Formulation on Basis of Digestible Amino Acids and Supplementation of Probiotic on Performance of Broiler Chicks. Trakia Journal of Sciences, Vol. 3, No. 1, pp 61-69.
16. **Doumas B. T., Watson W. A. & Biggs H. G. (1971):** Albumin standard and the measure-ement of serum albumin with bromocresol green. Clinical Chemistry Acta, 31: 87.
17. **Fairchild, A. S., J. L. Grimes, F. T. Jones, M. J. Wineland, F. W. Edens & A.E. Sefton (2001):** Effects of bio-mos and flavomycin on poultry susceptibility to oral Escherichia coli challenge. Poult. Sci. 80: 562-571.
18. **Falaki, M., M. S. Shargh, B. Dastar, & S. Zerehdaran (2011):** Effects of different levels of probiotic and prebiotic on performance and carcass characteristics of broiler chickens. Journal of Animal and Veterinary Advances 10 (3): 378-384.
19. **Feldman, B. F., J. G. Zinkl & N. C. Jain, (2000):** Schalm's Veterinary Hematology. Lippincott Williams and Wilkins. USA.
20. **Fukushima M. & M. Nakano (1995):** Effects of the lipid-saccharide complex and unsaponifiable matter from sunflowers on liver lipid metabolism and intestinal flora in rats. Biosci. Biotechnol. Biochem. 59:860-863.
21. **Fuller, R. (1989):** Probiotics in man and animals. A review. J. Applied Bacterol., 66: 365-378.
22. **Ghasemi, H. A., A. M. Tahmasbi, G. H. Moghaddam, M. Mehri, S. Alijani E. Kashefi & A. Fasifi, (2006):** The effect of phytase and *Saccharomyces cerevisiae* (SC47) supplementation on performance serum parameters, phosphorous and calcium retention of broiler chickens. Int. Poult. Sci., 5: 162-168.

23. **Gibson, G. R. & M. B. Roberfroid (1995):** Dietary manipulation of the human colonic microbiota, introducing the concept of prebiotics. Journal of nutrition 125: 1401-1412.
24. **Gibson, G. R. & X. Wang (1994):** Bifidogenic properties of different types of fructo-oligosaccharides. Food Microbiology 11: 491-498.
25. **Gill, H. S., K. J. Rutherfurd, M. L. Cross & P. K. Gopal (2001):** Enhancement of immunity in the elderly by dietary supplementation with the probiotic Bifidobacterium lactis HN019. American Journal of clinical nutrition 74: 833–839.
26. **Gunal, M., G. Yayli, O. Kaya, N. Karahan, & O. Sulak (2006):** The effects of antibiotic growth promoter, probiotic or organic acid supplementation on performance, intestinal microflora and tissue of broiler. International Journal of Poultry Science5: 149-155.
27. **Hassan, I., A. G. Abdullah & S. Abo El-Wafa (1996):** Utilization of decorticated local cottonseed meal in broiler diets. Egyptian Poult. Sci., 16: 31-49.
28. **Hooge, D. M. (2003):** Broiler chicken performance may improve with MOS. Feedstuffs, 75: 1.
29. **Hooge, D. M. (2004):** Meta-analysis of broiler chicken pen trials evaluating dietary mannan oligosaccharide. International Journal of Poultry Science3: 163-174.
30. **Jin, L. Z., Y. W. Ho, N. Abdullah & S. Jalaludin (1997):** Probiotics in poultry: Modes of action. Worlds Poult. Sci. J., 53: 351-368.
31. **KaleidaGraph™ computer program (2000):** Data Analysis and Graphic Presentation for Business, Science and Engineering. Version 35b5 March 22.
32. **Karoglu, M. & H. Durdag (2005):** The influence of dietary probiotic (Sacchromyces cerviciae) supplementation and different slaughter age on the performance, slaughter and carcass properties of broiler. Int. J. Poult. Sci., 4:309-316.
33. **Kermanshahi, H., & H. Rostami (2006):** Influence of supplemental dried whey on broiler performance and cecal flora. International Journal of Poultry Science 5: 538-543.
34. **Klaver, F. A. M., & R. Van der Meer (1993):** The assumed assimilation of cholesterol by lactobacilli and *Bifidobacterium bifidum* is due to their bile salt-deconjugating activity. Appl. Environ. Microbiol. 59:1120-1124.
35. **Mahdavi A. H., H. R. Rahmani & J. Pourreza (2005):** Effect of Probiotic Supplements on Egg Quality and Laying Hen's Performance. International Journal of Poultry Science 4 (7): 488-492.
36. **Mohan, B., R. Kadirvel, M. Bhaskaran & A. Notarajan (1995):** Effect of probiotic supplementation on serum/yolk cholesterol and on egg shell thickness in layers. Br. Poult. Sci., 36: 799-803.
37. **Mohan, B., R. Kadirvel, A. Natarajan & M. Bhaskaran (1996):** Effect of probiotic supplementation on growth, nitrogen utilization and serum cholesterol in broilers. Br. Poult. Sci. 37:395–401.
38. **Mokhtari, R., A. R. Yazdani, M. Rezaei, & B. Ghorbani (2010):** The Effect of Different Growth Promoters on Performance and Carcass Characteristics of Broiler Chickens. Animal and Veterinary Advances 9 (20): 2633-2639.

39. **Monsan, P. F., & F. Paul (1995):** Oligosaccharide feed additivesز In: Biotechnology in Animal Feeds and Feeding, Wallace, R.J. and A. Chesson (Eds.). VCH Verlagsgesellschaft, Weinheim and New York, pp: 233-245.
40. **National Research Council (1994):** Nutrient Requirements of Poultry, Ninth Revised Edition. National Academy Press, Washington, D. C.
41. **Ohta, A., M. Ohtsuki, S. Baba, T. Takizawa, T. Adachi, & S. Kimura (1995):** Effects of fructo-oligosaccharides on the absorption of iron, calcium and magnesium in iron-deficient anemic rats. Journal of Nutritional science and Vitaminology 41: 281–291.
42. **Ohta, A., M. Ohtsuki, M. Uehara, S. Hosono, M. Hirayama, T. Adachi, & H. Hara (1998):** Dietary fructooligosaccharides prevent post-gastrectomy anemia and osteopenia in rats. Journal of Nutrition, 128:485– 490.
43. **Panda, A. K., S. V. Rama Rao, M. V. Raju, & S. R. Sharma (2006):** Dietary supplementation of lactobacillus sporogenes on performance and serum biochemico-lipid profile of broiler chickens. The Journal of Poultry Science 43: 235-240.
44. **Panda, A. K., M. R. Reddy, S.V. Rama Rao, & N. K. Praharaj (2003):** Production performance, serum yolk cholesterol and immune competence of white leghorn layers as influenced by dietary supplementation with probiotic. Tropical Animal Health and Production, 35: 85–94.
45. **Reitman, S. & S. Frankel (1957):** Got and Gpt transaminase determination in serum and plasma. Am. J. Clin. Path., 28: 56.
46. **Roberfroid, M. B. (2000):** Prebiotics and probiotics: are they functional foods? American Journal of Clinical nutrition71: 1682s–1687s.
47. **Sahin T., I. Kaya, Y. Unal, & D. A. Elmali (2008):** Dietary Supplementation of Probiotic and Prebiotic Combination (Combiotics) on Performance, Carcass Quality and Blood Parameters in Growing Quails. Animal and Veterinary Advances 7 (11): 1370-1373.
48. **Samli, H. E., N. Senkoylu, F. Koc, M. Kanter, & A. Agma (2007):** Effects of Enterococcus Faecium and dried whey on broiler performance, gut histomorphology and microbiota. Archives of Animal Nutrition 61:42-49.
49. **Spring, P. (1999):** Mannanoligosaccharide as an alternative to antibiotic use in Europe. Zoot. Intern. 22:38-41.
50. **Spring, P., C. Wenk, K. A. Dawson & K. E. Newman (2000):** The effects of dietary mannan-oligosaccharides on cacal parameters and the concentrations of enteric bacteria in the ceca of *Salmonella*-challenged broiler chicks. Poult. Sci., 79: 205-211.
51. **Surono, S.I. (2003):** *In vitro* probitic properties of indigenous lactic acid bacteria. Asian-Australasian J. Anim. Sci., 16: 726-731.
52. **Vicente J. L., L. Aviña, A. Torres-Rodriguez, B. Hargis & G. Tellez (2007):** Effect of a *Lactobacillus Spp*-Based Probiotic Culture Product on Broiler Chicks Performance under Commercial Conditions. International Journal of Poultry Science 6 (3): 154-156.
53. **Willis, W. L., O. S. Isikhuemhem, & S. A. Ibrahim (2007):** Performance assessment of broiler chickens given mushroom extract alone or in combination with probiotics. Poult. Sci. 86:1856. **Yalcinkayal, H., T. Gungori, M. Bafialani, & E. Erdem (2008):** Mannan oligosaccharides (MOS) from Saccharomyces cerevisiae in broilers: Effects

on performance and blood biochemistry. Turkish Journal of Veterinary and Animal Sciences 32: 43-48.

54. **Yeo J. & K. I. KIM (1997):** Effect of Feeding Diets Containing an Antibiotic, a Probiotic, or Yucca Extract on Growth and Intestinal Urease Activity in Broiler Chicks. Poult. Sci. 76:381–385.
55. **Yoon, C., J. H., S. K. Park Han, Y. M. Nam, & J. T. Kwon (2004):** Effect of feeding multiple probiotics on performance and fecal noxious gas emission in broiler chicks. Kor. International Journal of Poultry Science 3: 229-235.
56. **Young, R. J., D. B. Whitney, T. L. Hanner, D. L. Antonson, J. V. Lupo, & J. A. Vanderhoof (1998):** Preventing of antibiotic-associated diarrhea utilizing Lactobacillus GG. Gastroenterology International, 11: 86.
57. **Zlatkis A, Zak B, & Boyle A J (1953):** A new method for the direct determination of serum cholesterol. Journal of Laboratory Clinical Medicine. 41: 486-492.

الملخص العربى

مدى تأثير إضافة غذائية لبروبيوتك ، بريبيوتك وسنبيوتك على الأداء وصورة الدم وصفات الذبيحة وبعض القياسات الحيوية فى كتاكيت التسمين

*فتحى عطية إسماعيل عبدالفتاح – ** خالد محمد مصطفى فرارة
* قسم التغذية والتغذية الإكلينيكية – كلية الطب البيطرى – جامعة بنها
** قسم الباثولوجيا الإكلينيكية – كلية الطب البيطرى – جامعة بنها

هذه الدراسة تم إجراؤها لتقييم تأثير إضافة بروبيوتك وبريبيوتك وكذلك الإثنين معا فيما يسمى السنبيوتك إلى علف بدارى التسمين على أداء النمو وبعض خواص الذبيحة وصورة الدم ومعدل الجلوكوز والكالسيوم والفوسفور فى مصل الدم وكذلك وظائف الكبد والكفاءة الإقتصادية. تم إستخدام حوالى ٥٠٠ من كتاكيت التسمين ساسو عمر يوم تم تقسيمها إلى أربع معاملات. تم تغذية الأولى على عليقة كنترول بدون إضافات و الثانية مضاف عليها ٠,٥ كجم/ طن علف بروبيوتك لاكتيك دراى والثالثة مضاف عليها ١ كجم / طن علف بريبيوتك بيوموص ، أما المجموعة الرابعة فقد تمت تغذيتها على عليقة محتوية على نفس الكميات من البروبيوتك والبريبيوتك. أظهرت النتائج تحسن النمو ومعدل التحويل الغذائى و نسبة لحوم الصدر للمجموعات المغذاه على علائق تحتوى على الإضافات. ومن ناحية أخرى لم يكن هناك تأثير ضار على وظائف الكبد. وبالنسبة لحالة الدم فقد أظهرت النتائج زيادة فى عدد كرات الدم الحمراء ونسبة الهيموجلوبين إذا ما قورنت بالكنترول. وكذلك كان هناك إنخفاض ملحوظ فى معدل الجلوكوز والكوليسترول والدهون المشبعة و البروتينات الدهنية ذات الكثافة القليلة فى مصل الدم. فى حين كان هناك زيادة فى معدل الكالسيوم فى مصل الدم للمجموعات المغذاة على علائق محتوية على البربيوتك وكذلك المحتوية على السنبيوتك. بالنسبة للناحية الإقتصادية، كان هناك تحسن فى المجموعات المغذاة على العلائق التى بها الإضافات ولم يؤثر إضافتها إلى العلف أى زيادة فى التكاليف. من هذه النتائج قد إتضح أن إضافة السنبيوتك قد أضاف منافع من حيث النمو ومعدل التحويل الغذائى وقد حسن من صورة الدم وبعض المقاييس الحيوية لبدارى التسمين وذلك بمقارنتها بإضافة البروبيوتك أو البريبيوتك منفرداً.