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PRODUCTIVE PERFORMANCE, DIGESTIBILITY, BLOOD PARAMETERS AND INTESTINE MICROBIOLOGY OF BROILER CHICKS AFFECTED BY PREBIOTIC, PROBIOTIC AND SYNBIOTIC ADDITION

RUNNING TITLE: INFLUENCE OF PREBIOTIC, PROBIOTIC AND SYNBIOTIC ON BROILER CHICKS

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ABSTRACT: The present work was deliberate to study effect of prebiotic, probiotic or combination of prebiotic and probiotic as synbiotic on productive measurements as growth and slaughter yield, digestibility of nutrients, blood indicates and some intestinal bacterial counts of broiler chicks. A total of 120- Arbor Acres- at one day of age chicks were classified into four treatments (30 birds each). Broilers in the control clutch (T1) were fed starter and grower diet without supplementations. The second group (T2) was fed the same control added with 5.00 g (MOS) mannanoligosaccharides (as prepiotic). The third group (T3) was fed the same control diet plus 1.00 g Inviva-pro (as probiotic). Whereas, the fourth one (T4) was fed basal diet supplemented with mixture of 5.00g mannanoligosaccharides plus 1.00 g Inviva- pro (as synbiotic) during starter and grower diet (from 1 to 20 and from 21 to 35 days old). The obtained data showed that the mean values of live body weight and body gain were highest ($P < 0.05$) for probiotic group (T3), feed effeciency was greatest ($P < 0.05$) in synbiotic group (T4) and feed intake had no significant changes among all treatments. The total count of bacteria in small and large intestine was significantly higher in treatment (T2) followed by (T3) as compared to the other treatments. Dressing yield percentage and liver weight significantly increased for broilers in T3 (probiotic) and T4 (synbiotic), respectively. There were no variances ($P < 0.05$) in digestibility of all nutrients for broilers in all treatments. Number of *Lactobacilli* in both small and large intestine was higher in all treatments than in the control (T1). In addition, The highest number of *coliform* was recorded in T4 (synbiotic) in small intestine with no significant differences in large intestine.. The highest values of amylase, lipase and trypsin were determined to T3 broilers. While, the highest value of chymotrypsin activity was recorded to T4 broilers**.** The highest ($p<0.01$) total protein, globulin, triglycerides and basophils were recorded to synbiotic broilers group**.** In addition, probiotic group (T3) recorded the greatest values of glucose and neutrophils. Highest economic efficiency and relative economic efficiency were calculated to probiotic group.

Keywords: prebiotic; probiotic; synbiotic; performance; broilers

INTRODUCTION

The residues of antibiotics in poultry products such as eggs or meats has harmful effects on human health**.** The presence of such these substances makes pathogenic microbes of human flora resistance to those groups of antibiotics (Pelicano *et al.*, 2004). Current feeding training includes the use of phytobiotics (natural or herbal feed additives), prebiotic, probiotics, and symbiotic as productive agents to promote the growth (Alkhalf *et al*., 2010).

Prebiotics are definite as feed components that cause stimulation the growth signs and activation the beneficial microorganisms in the gastrointestinal tract resulting in benefit health.

Prebiotics also classified as fermented carbohydrate substances via intestinal flora (Bauer *et al*., 2006); counting non-starch polysaccharides, resilient starch and non-digestible oligosaccharides. Prebiotic is expected to be component that resistant to digestive enzymes of human or un-ruminants, it is the substrate related to helpful microbes in the large intestine because it completely fermented by beneficial microorganisms such as *Lactobacillus*, *Bifidobacteria* and *Bacteroides*, thereby having the likely effect to modify the arrangement of bacterial collections in the digestive gut.(Zhan *et al*.,2003; Chen *et al*., 2005). Prebiotic may augment the digestibility and performance factors by creating the favorable conditions for useful bacteria and reduce the pathogenic bacteria (Steiner, 2006; Alavi *et al*., 2012; De Oliveira *et al.* ,2019 and Shini *et al*. 2020). However, mannanoligosaccharides and other macro-molecules are progressively being examined for their prebiotics actions (Yang *et al*. ,2008).

Probiotics are defined as food supplementations that contain alive bacteria and encourage helpful effects to the host by the balance supporting in the gut microbes (Ripon *et al.*, 2019). Great importance of these products sideways with many herbs are possible applicants to substitute antibiotics as growth supporters (Landy and Kavyani, 2014**)**. Probiotics may exert beneficial effects on animal performance through there gulation of gastrointestinal tract microflora, in addition to inhibiting the growth of potentially pathogenic microorganisms so it is a potential alternatives to antibiotic enteric conditioners for performance enhancement(Guerra *et al.*, 2007; Shim *et al*., 2012); Zhou *et al*., 2010).In poultry production, probiotic bacteria and their metabolites supplements might offer positive effects both as feed additives and as replacements for antibiotics (Kabir *et al.*, 2004) and has many beneficial effects, including the improvement of general health, feed conversion ratios, growth rates, body resistance, body weight, carcass yield, digestibility of amino acids as lysine, valine and cysteine and hence increase production (Rowghani *et al*., 2007; Tang et al., 2018; Li *et al*., 2019; Neveling and Dicks, 2021 and Gharib-Naseri *et al.* 2020;2021).

Synbiotics, are additives that have probiotics plus prebiotics, it contains live bacteria that found in the gut though the prebiotic existent in them function as a the probiotics's nutrient source, This relationship is important for host nutrition, metabolism, and immunity (Mohnl *et al.*, 2007). Li *et al*.,(2008) displayed that synbiotic resulting by combinations of pre- and probiotics more effective in broiler diets than addition of pre or pro alone. Similarly, Awad *et al*.

(2009) stated positive effects of a synbiotic more a probiotic product on broiler performance.

Previous studies reported that prebiotic, probiotics and its mixture helped in the production of H_2O_2 that damaging many harmful bacteria , dropping oxidation stress in gastro intestinal tract , inhibit aerobic pathogens, inhibition of poisonous amines, creation of essential digestive enzymes, production of (B) group vitamins, and stimulation of appetite and feed intake (Singh and Chauhan , 2004). Recently, many studies focused on the position of probiotics and prebiotics as efficient additives to influence gut microflora and microbial count of broiler chicks via two points: Firstly, probiotic benefit is improving its intestinal microbial balance. Secondly, prebiotic benefit linked in the host is choosy stimulating a limited number of bacteria in hind gut. Therefore, such supplements in broilers diet have a positive impact on intestinal microbiome and improve intestinal metabolism and absorption, thereby completely improve growth performance (Sohail *et al*., 2012).

Thus the current experiment was assumed to define the only or shared efficacy of prebiotic and probiotic addition in the diet on performance, carcass yield, digestibility, blood bio-chemistry, intestinal bacterial counts and net revenue of broilers as growth promoter.

MATERIALS AND METHODS

Chicks and diets:

120 one day-old Arbor Acres commercial broiler chicks were used for the experiment and randomly divided into four treatment groups. All birds were raised on the floor in open side house under the same and the suitable environmental conditions, with floor partitions, the wood shaving litter has been cleared , disinfected and dispersed with 5 cm depth . Each partition was provided with suitable feeder and waterer. Birds of T1 (control) were provided Corn-soya based basal diet, T2 (prebiotic) with Corn-soya based diet with 5.00 g mannan-oligo-saccharides (MOS), T3(probiotic) with corn-soya based diet with 1.00 g (Inviva pro), T4 (synbiotic) with corn-soya based diet with 6.00 g (MOS+Inviva)\ kg diet.The diets were fed in two periods: starter (1–20) and grower (21–36)days of age. The composition and nutrient analysis for the basal diet are shown in Table 1. All the nutrients met or exceeded the nutrient requirements of the NRC (1994). The chickens were allowed ad libitum access to water and fed throughout the experimental periods.

The composition of the probiotic (Inviva-Pro) was; 0.15 % dried *Bacillus Subtilis* fermentation product (*Bacillus* 3.00×10^8 cfu\g), 0.71% sodium aluminosilicate, 0.30% soy oil and 98.84% calcium carbonate. It was purchased from Multi-Vita Company for animal nutrition, 6 October, Giza, Egypt.

MOS is derived from the cell walls of the yeast *Saccharomyces cerevisiae*, 100.00% from Khayrat El- Nile Company for feed additives.

Synbiotic collected prebiotic plus probiotic. The inclusion rate of both the prebiotic and probiotic was used as suggested by the manufactures.

Growth measurements:

Live body weights of birds were recorded 3 times, initial, at the end of starter period and at 36 days of age (marketing weight). The average body weights gain of broilers in each treatment were calculated by subtracting the first body weight from the followed body weight. Feed consumption was calculated as the

offered feed deducting remained feed in each treatment . The amount of feed consumed per unit of weight gain was calculated and shown as feed conversion ratio (FCR).

Carcass yield:

At the end of experiment (day 36), after weighing, 6 birds per treatment were randomly selected and slaughtered. Carcass characteristics and organ weight of the

broiler birds were determined . Hot carcass, heart, liver, gizzard, spleen, and abdominal fat were weighed. Dressed yield percentage was determined using carcass weight as a proportion of the slaughter weight

Digestibility Trial:

Six chickens were taken from each treatment (2 birds from each replicate at the age of 36 days). The feed intake and excreta were accurately determined.The excreta samples were coll ected for each replicate, cleaned from feathers and feed, weighed, dried in a forced air oven at 70-80 C for 36h. They were finally ground and placed in screw-top glass jars until analyzed. The procedure described by Jakobson *et al* . (1960) was applied to excreta samples to separate faecal nitrogen and urine nitrogen. Dry matter (DM), organic matter (OM), crude protein (CP),ether extract (EE) and crude fiber (CF) of feed and feces were determined according to AOAC (1990). The digestibility of CP, EE, CF, DM and organic matter (OM) was calculated by dividing the amount digested (g/day) by the amount of intake (g/day).

Hemato-biochemical blood parameters:

At the end of the experiment about 5 ml of blood were collected during slaughtering of three birds of each treatment in two test tubes. One tube without any anticoagulant another tube with heparin. All tubes were centrifuged at 3000 rpm for 15 minutes. The serum was preserved at –20°C for further use. Serum samples were analyzed for Total proteins, Albumin, Glucose, liver enzymes (aspartate aminotransferase (AST), alanine aminotransferase (ALT)), Total cholesterol, Triglycerides, High Density lipoprotein and Low Density Lipoprotein. Amylase, Lipase, Trypsin and Chymotrypsin of blood had been determined too. All serum biochemistry tests were performed using commercial kits (Biodiagnostic, Egypt).Blood on heparinized tubes were used for refereeing blood picture.

Economics:

Economic efficiency analysis was calculated as the net revenue per unit feed cost according to Hassan *et al.,* (1996).

Intestinal bacteria counts:

Intestinal content from the duodenum, jejunum, ileum and cecum of each treatment was separately collected in sterile glass flasks just after slaughter. Digesta was evacuated and mixed. Flasks were kept at 4°C till determination of microbial counts. Ten fold serial dilutions up to 10^7 of each sample were prepared. Total bacterial counts,count of coliform, *E. coli*, and *lactobacilli* were estimated. Nutrient agar medium **(**Allen, 1959) was used for enumeration of aerobic bacteria. MacConkey agar medium (APHA, 2012) was used for counting coliform bacteria(forming red color colonies). The eosin methylene blue (EMB) agar medium (Oxoid) was used for E. coli counts. For lactobacilli, deMan, Rogosaand Sharpe (MRS) agar medium was used. Three dilutions of each treatment were plated for each medium (10^2, 10^3 and 10^5 for counting of *E. coli,*

coliform, whereas, 10^3, 10^5 and 10^7 were used for total aerobic bacteria and *lactobacilli*). After incubation, colonies were counted. Numbers of colony-forming units (cfu) are expressed as log colony-forming units per gram of digesta content.

Statistical data analysis:

Data were statistically analyzed by the analysis of variance using the General Linear Model (GLM) procedure of Statistical Analysis System (SAS, 2002).Differences among groups were separated by Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

1- Growth and carcass traits

Effect of supplementations on growth performance measurements of broiler chickens including LW,WG, FI, and FCR are shown in Table (2).Averages LW and WG of all experimental treatments exposed significant ($P < 0.05$) difference among dietary treatments at the end of experimental period (36 days). The highest LW and WG were recorded for broiler in T3 that received basal diet supplemented with probiotic followed by broiler in T4 that received basal diet with synibiotic compared to T1 and T2. However, the lowest values of LW and WG were recorded to control chicks.

The increased live body weight and weight gain may be due to improving the digestibility and feed utilization as a result of probiotic supplementation by:

The stimulatory effects of probiotic on gut microflora, enhancing metabolism and increasing absorption of supplied feed nutrients which vital for their growth. The enriched body weight gain in combination group (T4) may be owed to cooperating effect of probiotic and symbiotic together (Alimohamadi *et al*., 2014).The augmented body weight logged in present study look like to that of Kabir (2009), Toghyani *et al.* (2011) and Kral *et al*. (2012) who specified that live weight and body weight gain were advanced in probiotics fed birds compared to control birds. Rahman *et al.*, (2019) showed that the broilers delivered probiotic or blend of probiotic with phytobiotic recorded the greatest weight and gain but the effect of probiotic was more notable. Like these our findings, developed body masses and weight gains resulting of probiotic fed broilers were also reported by Kamruzzaman *et al*. (2005); Islam *et al*. (2014) and Islam,(2004). On the other hand, Sarangi *et al*. (2016) found that the best values of live body weight and body gain were recorded to un-supplemented group compared to probiotic and prebiotic supplemented groups for Cobb broilers. Effects of adding prebiotic, probiotic and combination as growth promoters on feed intake were insignificant among all treatments. The present study is agreement with the result of (Ghasemi *et al*., 2014; Abudabos *et al*., 2015 ;Yousaf *et al*., 2016 and Al-Khalaifa *et al*., 2019) who reported that no significant differences among treatments in feed intake when black cumin, prebiotic, probiotic or synbiotic have been added to basal diet of broilers. Accumulative feed conversion ratio had been significantly enhanced with all additives to diet compared to control diet.

In our study, the obtained data showed that the greatest value of FCR was recorded to synbiotic group followed by probiotic group during starter and whole periods of the experiment. Abudabos *et al*., (2015) showed that the best FCR was for combined treatment (MOS + Galli-Pro) compared to other single supplemented treatments. The

improvement in growth performance parameters and FCR due to the addition of probiotic may be because it supplies the chicken intestine with *Bacillus subtilis*, which is known to produce lactic acid, in addition to protease, amylase, and lipase enzymes, which enrich nutrient digestion in gastrointestinal tract (Sen *et al*., 2011). The significant ($P<0.05$) effect on (FCR) of broiler as a result of synbiotic and probiotic addition was in completely agreement with Shim *et al*. *(*2012) , Zhou et al. (2010) and Mookiah *et al.* (2014) who found that improvement in FCR related to probiotic and synbiotic supplementation to control diet.

2- Carcass yield:

Effect of prebiotic, probiotic and synbiotic (prebiotic+ probiotic) addition to basal diet of broiler chicks on carcass yield was presented in Table (3). There were no significant variances between control and supplemented treatments in carcass, gizzard, heart, abdominal fat and spleen weights. Carcass crop % and liver weight significantly increased ($p<0.05$) for broilers in T3 and T4 respectively compared to other broilers. Our present outcomes are semi-agreement with Al-Khalaifa *et al*., (2019) who detected that no significant consequence of prebiotic, probiotic or mixture supplementation on liver, heart and abdominal fat weights of broilers compared to un- supplemented control group. In addition to, Abudabos *et al*., (2015) showed that adding Prepiotic (MOS), probiotic (Galli-Pro) and synbiotic (MOS+ Galli- pro) had no effect on dressing %, carcass crop , carcass parts and abdominal fat of Ross 308 broilers but relative weight of liver was highest ($p<0.05$) in MOS broilers group and Rehman *et al*., (2020) who concluded that carcass, breast, thigh, heart, liver, and gizzard weights had no affected significantly by supplying broilers diet with probiotics , prebiotics or their interactions except dressing % only was affected by the interaction. While, the present obtained data are disagree with Ferdous *et al.* (2019) who initiate that there was significant increase in organs weight in the combination group (probiotic+ phytobiotic) compared to probiotic or antibiotic groups. The result of carcass yield percentage was in the same direction with other researchers who testified that the carcass crop % was amplified by the addition of probiotic and synbiotics (Abdel-Raheem and Abd-Allah, 2011; Saiyed *et al*., 2015).Yield of carcass improvement by the supplementation of probiotic in broiler diet might be linked to improving nutrients conversion (special protein and energy) and better utilization of feed digestion and absorption because of inhibition of pathogens colonization in digestive tract. (Toghyani *et al*., 2011; Neveling and Dicks, 2021).

3- Digestibility:

Results in Table 4 exhibited that insignificant differences in digestibility of all nutrients for broilers in all treatments. However, there was a slight improvement in digestibility of DM and CP in T4 and T3 respectively. The enhancement in CP digestibility in T3 may be due to that probiotic have advantageous effects on vigor metabolism by collective enzymatic activities during digestion definitely protease, that as well as improving digestibility of crude protein and enhancing the immune system (Král *et al*., 2012 ;Wang and Gu, 1010) or may be due to the increase of digestive enzymes secretion such as xylanase, amylase and ß- glucanase (Farhat-Khemakhem *et al*., 2018 and Saeed *et al.*, 2019). . Several previous findings

revealed that diets supplemented with probiotic main to greater digestibility's of DM and CP(Lei *et al.*, 2014; Edens, 2003and Apata, 2008). Also, Elbaz and El-sheikh (2020) indicated that using probiotic and mixture of antibiotic plus prebiotic (AP group) produced favorite effect on the digestibility of dry matter; crude protein and crude fiber in the chickens' diet.

4- Blood digestive enzymes:

Effect of different growth promoter supplemented to broiler diets on serum digestive enzymes is found in Table (5). From the results, it is noted a significant alterations in activities values of amylase, lipase, trypsin and chymotrypsin among treatments. The highest values of amylase, lipase and trypsin were determined to T3 broilers. However, the highest value of chymotrypsin activity was recorded to T4 broilers followed by T3 compared to other treatments. These results are on the line results of Wang and Gu, (1010) who reported that adding prebiotic, probiotic or antibiotic increased blood digestive enzymes as amylase, lipase and protease. Also, (Jin *et al.*, 1997) found that significantly increased intestinal amylase activity when probiotic has been added to the control diet of broiler chicks. Wang *et al*., (2021) and Sun *et al*., (2022) described that amylase, lipase and chymotrypsin activity were significant increased with basal diet supplemented with probiotic. While, Thenmozhi *et al*., (2020) concluded that probiotic group in broiler chickens was recorded significant increase in digestive enzymes of serum like amylase and protease, nevertheless activity of lipase was not enhanced in probiotic supplemented group compared to control group. The improvement of digestive enzymes because of declining pathogenic load in gut thereby the perfection in intestinal health morphology and integrity (Afsharmanesh *et al.*, 2010; Lei *et al*., 2015) and the great effect of antimicrobial activity of probiotic (Jin *et al.*, 1997). Additionally, because of the secretion of probiotic and the stimulation of endogenous enzymes synthesis and improve enzymes levels (Hu *et al*., 2018; Cao *et al*., 2020)

5- Blood biochemical parameters

Effect of adding prebiotic, probiotic and their combination to broilers diet on biochemical parameters was shown in Table (6). The obtained results cleared that there were a high significant ($p<0.01$) differences in total protein, globulin and glucose values. While, albumin, T. cholesterol, triglycerides, high density lipoprotein, low density lipoprotein, ALT and AST values of serum . The highest ($p<0.01$) total protein and globulin were recorded to synbiotic broilers group followed by probiotic group. In addition, probiotic group recorded the greatest value of glucose followed by symbiotic group. Insignificant increase had recorded to symbiotic followed by probiotic groups. There was insignificant reduction in total cholesterol value for probiotic birds. Results that obtained by Ismail *et al.*, (2011) were in the same trend, who found that serum total protein and albumin values are higher significantly for broiler chicks treated with probiotic, Rahman *et al*., (2019) found that T. cholesterol value dropped significantly in probiotic treated group and Abdel-Fattah and Farah., (2009) found that activities of enzymes such as AST, ALT and ALP in serum were not influenced due to probiotic, prebiotic or synbiotic supplementation. However, unlike with Rahman *et al.*, (2019) when showed the highest LDL was detected in

control group while the lowest belonged to combination group. High total protein in blood plus supplementation of probiotic can be attributed to the favorable environment in the intestinal tract created by the feeding of *Lactobacillus spp*., as it might have helped to digest and absorb more nitrogen (Panda *et al.* 2006).

The mechanisms of probiotic in decreasing total cholesterol may breakdown adhesion between bile acids and bile-salt hydrolase enzymes of probiotic, deposition and inhibition of intestinal cholesterol absorption, cholesterol binding to cell walls of probiotics, production of short-chain fatty acids upon fermentation by probiotics, combination of cholesterol into the cellular membranes of probiotics during growth, (Lye *et al*., 2010; Rahman *et al*., 2019).

6- Blood picture

There were no significant differences on hematological blood parameters such as RBCs, Hb, HCT, MCV, MCH, MCHC, WBCs, monocyte and eosinophils except neutrophils, lymphocytes and basophils that were differed significantly. The highest neutrophil was measured for birds that treated with probiotic followed by birds in T4 that received symbiotic. While, the lowest value of lymphocyte was determined to symbiotic followed by probiotic groups. Basophile significant increased for symbiotic group. These results were in agreement with the findings of Shareef and Al-Dabbagh (2009) and Mohan *et al*. (1996) who quantified that there were insignificant differences in blood counts as a result of probiotics supplementation. Al-Khalaifa *et al.*, (2019) showed that no significant effect of the adding of probiotic and prebiotic on all of blood picture parameters like as erythrocyte, leukocyte and the differential

among the experimental treatments of broilers at 35 days of age. on the other hand, the present results were disagreement with Islam *et al.* (2004) and Kamruzzaman *et al*. (2005) who itemized that the mean values of RBC, Hb, and PCV enlarged significantly ($p < 0.05$) in probiotics. Samy *et al*., (2011) found that there was no significant difference ($p < 0.05$) in the blood hematological profiles (RBCs, WBCs, Hb%, and PCV) of broiler chickens as a result of probiotic growth promoter supplementation.

Alkhalf *et al*. (2010) institute that the supplementation of the commercial probiotic Bactocell® (*Pediococcusacidilactici*) for 42 days did not affect blood Hb% or PCV content in Ross broiler chicks. These differences in blood hemato-biochemical parameters may be accredited to the different types of probiotics from the different species and different numbers of bacteria which extant in various probiotics that are used.

7- Economic efficiency:

Table 8 showed that highest values of selling revenues, net revenue, economic efficiency and relative economic efficiency were calculated to probiotic group followed by synbiotic group. The same results were calculated by Abdel-Fattah and Farah., (2009)who showed that diet contained probiotic and symbiotic had the best values (109.6 and 101.2) respectively compared to the control diet. This improvement could be due to improving the feed conversion and productive performance for these broilers compared to other groups.

8- Microbiological analyses :

Data presented in Table (9) indicated that the total count of bacteria in small and large intestine was significantly higher in treatment (T2) followed by (T3) as compared to the other treatments. Moreover, number of *Lactobacilli* in both small and large intestine was higher in all treatments than in the control (T1). In addition, *coliform* count was highest ($P<0.05$) number in T4 (synbiotic) in small intestine with no significant differences in large intestine. *E coli* bacteria recorded the lowest ($P<0.05$) values for probiotic group in both small and large intestine of broiler chicks. Dierck,(1989) reported that prebiotics and probiotics stimulate microorganisms that have ability to adjust the gastrointestinal tract conditions to perfect health status and recover digestion of feed for more efficiency. Moreover, Yang, *et al.*(2009) stated that probiotics encourage modification in intestinal environment, increase the growth of nonpathogenic facultative anaerobic and Gram positive bacteria making lactic acid and hydrogen peroxide, and destroy the growth of intestinal pathogens.

As shown in Table (9) with increasing the *Lactobacilli* count number of *E. coli* decreased. This may be due to that *Lactobacillus* can successfully defeat other bacteria via decreasing pH as a result of production of lactic acid. These results are in the same line with those obtained by Francis *et al*. (1978) who narrated that the dietary extension of *Lactobacillus* products significantly lessened the coliform numbers in the duodenum of turkeys. In addition, prebiotic (Y-MOS) not only stop the pathogenic bacteria such as *E. coli*, from conferring to gut wall but also move them from the gut wall **(**Kumar, *et al.*, 2002).

Ashayerizadeh *et al.* (2009) reported that as a result of probiotic addition, growth performance of broiler chicks was improved by enhancing the balance of microbial populations in the gut which allied with destroying intestinal pathogens *e.g. Salmonella, Campylobacter and E. coli,* and aggregate the digestibility of essential nutrients.In the same line of our work, Many results indicated that probiotic inspired the growing of helpful cecal bacteria such as *lactobacilli* in broiler chickens and inhibited the number of potentially harmful bacteria such as *E coli* (Guo *et al*. ,2003 and 2004; Jamroz *et al*. ,2003a and Ferdous *et al*., 2019).

CONCLUSION

Supplementation of single prebiotic , probiotic or mixture prebiotic plus probiotic (as symbiotic) had beneficial effect on growth performance, carcass dressing, some blood metabolites and enzymes and enhance economic efficiency of broiler chicks. Moreover, improvement in the gut health resulting in increasing total count, *lactobacilli* and reducing *Ecoli* bacteria of these supplemented broiler chicks.

Table (1): The composition of starter and grower diets

Component %	**Starter diet**	**Grower diet**
Yellow corn	53.50	60.00
Soybean meal,44	31.80	24.00
Rich concentrates ,45	10.00	10.00
Wheat bran	0.00	0.60
Poultry fat	3.30	4.00
Di Calcium phosphate	0.20	0.20
Lime stone	0.70	0.70
Common salt	0.25	0.25
Vit.&min.[1]	0.25	0.25
Total	100.00	100.00
Calculated analysis		
Crude protein	23. 05	20.30
Metabolisable energy	3064.94	3185.78
Crude fiber	4.11	3.83
Crude fat	4.56	5.89
Calcium	1.13	0.88
Phosphorus	0.57	0.45
Lysine	1.00	0.77
Methionine + cysteine	0.73	0.51
Determined analysis		
Dry matter%	93.05	92.85
Crude protein%	22.60	19.48
Crude fiber%	4.06	3.55
Ether extract%	4.08	6.00
Ash %	13.60	13.08
Nitrogen free extract%	55.66	57.89

1 mineral and vitamin premix broilers ;Each 2.5 kg contain: 12,000000 IU Vit. A, 2,000000 Vit D3, 10 g vit. E, 2g Vit K3, 1g Vit.B1, 5g vit b2, 1.5 g Vit. B6, 10 mg Vit B12, 30 g nicotinic acid, 10 g pantothenic acid, 1g folic acid, 50 g biotin, 250 g choline chloride 50 %, 30g iron, 10 g copper, 50g zinc, 60 g manganese, 1g iodine, 0.1 g selenium, 0.1 g cobalt and carrier Caco3 to 2.5 kg

Table (2): Effect of different treatments on productive performance of broiler chicks

Parameter	treatments				SEM	P- value
	T1 (Con.)	T2	T3	T4		
Live weight (LW), g						
1 day	44.17	41.30	45.00	43.40	2.07	0.643
20 days	827.23	848.92	875.55	880.49	18.08	0.211
36 days	2077.75^{b}	2109.61^{ab}	2204.45^{a}	2185.62^{ab}	33.08	0.076
Weight gain (WG), g						
1-20 days	783.07	794.23	830.55	837.09	19.49	0.214
21-36	1250.52	1260.69	1328.90	1305.13	36.46	0.429
days	2033.59^{ab}	2054.91^{ab}	2159.45^{a}	2142.22^{a}	37.35	0.089
1-36 days						
Feed intake (FI), g						
1-20 days	1319.47	1261.21	1253.63	1225.79	28.44	0.210
21-36	2577.49	2571.41	2591.31	2568.05	18.20	0.812
days	3897.14	3835.96	3825.48	3805.31	33.44	0.338
1-36 days						
Feed conversion, (FCR)						
1-20 days	1.69^{a}	1.59^{ab}	1.52^{bc}	1.47^{c}	0.02	0.004
21-36	2.07	2.04	1.92	1.97	0.06	0.399
days	1.95^{a}	1.87^{ab}	1.79^{ab}	1.78^{b}	0.04	0.119
1-36 days						

a,b,c Within the same rows, means have similar letter(s) are not significant different at 0.05
SEM = standard error of mean.

Table (3): Effect of different treatments on carcass characteristics of broiler chicks

parameters	treatments				SEM	P-value
	T1 (Con.)	T2	T3	T4		
LBW, g	2070.00	2179.33	2103.70	2219.00	60.78	0.351
CW,g	1448.80	1563.54	1619.03	1663.07	61.86	0.160
Carcass yield%	70.01^{c}	71.71^{bc}	76.92^{a}	75.93^{ab}	1.39	0.029
Gizzard W.	38.86	37.31	38.15	37.89	6.42	0.998
Liver W.	43.30^{b}	51.03^{ab}	49.45^{ab}	59.07^{a}	4.17	0.094
Heart W.	13.92	11.98	12.66	17.38	2.84	0.570
Abdominal fat,W.	31.78	25.91	37.00	35.09	5.12	0.481
Spleen,W.	4.76	4.78	5.04	5.73	0.329	0.208

a,b,c Within the same rows, means have similar letter(s) are not significant different at 0.05.
SEM = standard error of mean.

Table (4): Effect of different treatments on digestibility coefficient of broiler chicks

parameters	treatments				SEM	P-value
	T1 (Con.)	T2	T3	T4		
DM%	70.75	73.71	72.63	76.94	1.86	0.2015
OM%	72.65	71.75	70.83	71.17	1.49	0.8326
CP%	75.47	76.15	81.99	80.93	2.01	0.1161
CF%	30.25	29.88	30.93	28.98	3.24	0.9781
EE%	76.77	78.74	78.74	79.13	1.26	0.5948
NFE%	72.31	74.08	73.81	73.81	1.68	0.7323

a,b,c Within the same rows, means have similar letter(s) are not significant different at 0.05.
SEM = standard error of mean. DM= dry matter, OM=organic matter, CP=crud protein, CF=crud fiber, EE=ether extract, NFE=nitrogen free extract.

Table (5): Effect of different treatments on digestive enzymes of broiler chicks

parameters	treatments				SEM	P-value
	T1 (Con.)	T2	T3	T4		
Amylase (U\L)	52.33^{b}	48.00^{b}	62.00^{a}	41.67^{c}	1.72	0.0002
Lipase (U\L)	24.67^{b}	26.33^{b}	44.67^{a}	32.00^{b}	2.21	0.0008
Trypsin (U\L)	41.33^{b}	45.66	65.67^{a}	59.33^{a}	2.90	0.0011
Chymotrypsin (U\L)	25.67^{c}	37.33^{b}	46.33^{b}	57.67^{a}	2.78	0.0002

a,b,c Within the same rows, means have similar letter(s) are not significant different at 0.05.
SEM = standard error of mean.

Table (6): Effect of different treatments on blood biochemical parameters of broiler chicks

parameters	treatments				SEM	P-value
	T1 (Con.)	T2	T3	T4		
Total protein, g/dl	2.69^{b}	2.79^{b}	3.27^{a}	3.51^{a}	0.10	0.001
Albumin, g/dl	1.26	1.22	1.17	1.24	0.05	0.691
Globulin, g/dl	1.42^{b}	1.58^{b}	2.09^{a}	2.27^{a}	0.12	0.003
Glucose, mg/dl	178.83^{b}	183.70^{b}	236.47^{a}	191.29^{b}	4.37	<.0001
T. cholesterol,	179.00	185.00	163.00	180.00	15.70	0.777
mg/dl	150.00^{b}	170.67^{ab}	178.00^{ab}	186.67^{a}	9.68	0.123
Triglycerides, mg/dl	85.00	82.33	85.00	86.00	6.02	0.984
HDL, mg/dl	67.00	68.33	44.00	59.00	14.01	0.612
LDL, mg/dl	20.00	21.00	20.67	19.67	1.24	0.945
ALT, U/L	52.30	56.60	58.00	61.67	8.11	0.861
AST, U/L						

a,b,c Within the same rows, means have similar letter(s) are not significant different at 0.05.
SEM = standard error of mean., HDL= high density lipoprotein, LDL= low density lipoprotein, ALT= alanine transaminase, AST= aspartate transaminase

Table (7): Effect of different treatments on blood hematological parameters of broiler chicks

parameters	treatments				SEM	P-value
	T1 (Con.)	T2	T3	T4		
RBCs ($x10^6$/m3)	4.00	4.17	4.02	4.36	0.41	0.922
Hb%	12.47	12.70	12.77	13.08	0.55	0.894
HCT	37.40	38.10	38.27	39.10	1.63	0.905
MCV	93.78	91.92	95.54	85.39	3.36	0.236
MCH	31.27	30.64	31.83	31.07	1.93	0.976
MCHC	36.33	32.34	31.92	32.60	9.65	0.986
WBCs ($x10^3$/m3)	18.53	18.63	19.17	18.43	0.72	0.890
Neutrophils	37.33^b	37.67^b	57.33^a	43.33^{ab}	5.06	0.073
Lymphocytes	60.00^a	59.00^a	55.67^{ab}	49.67^b	2.67	0.092
Monocytes	4.00	4.33	4.00	5.33	1.46	0.902
Basophils	1.66^b	1.67^b	1.70^b	4.67^a	0.78	0.062
Eosinophils	0.67	1.00	1.33	1.67	0.28	0.163

a,b,c Within the same rows, means have similar letter(s) are not significant different at 0.05.
SEM = standard error of mean.

Table(8): Effect of different treatments on economic return parameters of broiler chicks

parameters	treatments			
	T1 (Con.)	T2	T3	T4
LW,gk	2.078	2.109	2.204	2.189
FI. Starter[1]	1.319	1.261	1.254	1.226
FI. Grower[2]	2.577	2.571	2.591	2.568
Price of total feed intake	23.44	24.31	23.49	24.41
Selling revenue	68.57	69.59	72.73	72.23
Net revenue	45.13	45.28	49.24	47.82
Economic efficiency	1.93	1.86	2.09	1.96
Relative economic efficiency	100.00	96.37	108.29	101.55

1 feed intake during starter, 2 feed intake during grower , 1 kg starter = 6.15 LE , 1 kg grower= 5.95 LE , sale price= 33.00 \kg LBW, 1 kg inviva-pro =95.00 LE (1 kg\ton) , 1 kg MOS= 65.00 (5kg\ton)

Table (9): Effect of different treatments on microbiological parameters of broiler chicks

Parameter	treatments				SEM	P- value
	T1 (Con.)	T2	T3	T4		
Small intestine (duo.+jej.)						
Total count	6.46^{b}	8.30^{a}	7.66^{ab}	6.60^{ab}	0.52	0.109
Lactobaccili	6.53^{b}	7.33^{a}	7.06^{ab}	7.03^{ab}	0.21	0.137
Coliform	6.33^{b}	7.03^{ab}	7.16^{ab}	7.33^{a}	0.27	0.124
E.coli	2.90^{a}	2.36^{ab}	2.33^{ab}	1.77^{b}	0.22	0.044
Large intestine (cecum)						
Total count	9.16^{b}	10.76^{a}	8.50^{b}	8.80^{b}	0.42	0.023
Lactobaccili	7.56^{b}	7.73^{b}	9.23^{a}	9.10^{a}	0.22	0.001
Coliform	7.00	6.57	6.93	6.70	0.37	0.831
E.coli	3.90^{a}	3.20^{ab}	2.80^{ab}	2.60^{b}	0.34	0.112

a,b,c Within the same rows, means have similar letter(s) are not significantly different at 0.05.
SEM = standard error of mean.

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prebiotic; probiotic; synbiotic; performance; broilers

الملخص العربي

الأداء الانتاجي، القابلية للهضم، قياسات الدم وميكروبيولوجيا الامعاء لدجاج اللحم وتأثره باضافة كل من البريبيوتك، البروبيوتك و السينبيوتك

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تمت هذه الدراسة لدراسة تأثير اضافة البريبيوك، البروبيوتك، السينبيوتك على الاداء الانتاجي، محصول الذبيحة، معاملات هضم العناصر الغذائية، بعض مقاييس الدم وكذلك بكتريا الامعاء لدجاج التسمين
تم استخدام 120 كتكوت عمر يوم وتم تقسيمهم الى 4 مجموعات (30 طائر لكل مجموعة). تم تغذية المجموعة الاولى على عليقة الكنترول بدون اضافات . والمحموعات الثانية والثالثة والرابعة تم تغذيتهم على عليقة الكنترول مضاف اليه 5جم من سكر المنان اوليجو سكرايد (مجموعة البريبيوتك)، 1 جم من مركب انفيفابرو(البروبيوتك) وايضا خليط من الاثنين (السينبيوتك) على التوالي. من النتائج المتحصل عليها يتضح ان اضافة هذه المركبات كمنشطات للنمو ادت الى تحسين الدلالات الانتاجية. وسجلت مجموعة البروبيوتك زيادة معنوية فى وزن الجسم الحي والزيادة الوزنية ونسبة تصافى الذبيحة وكذلك الانزيمات الهاضمة ة، كما سجلت مجموعةالسينبيوتك افضل معامل تحويل غذائي وزيادة ملحوظة فى نشاط انزيم الكيموتربسين مقارنة بالمجموعات الاخري. تحسنت ايضا بعض دلالات الدم للمجموعات المعاملة مقارنة بالكنترول، ولوحظ زيادة الكفاءة الاقتصادية فى مجموعة البربيوتك مقارنة بباقى المجموعات. اظهرت النتائج السابقة ايضا ان هذه الاضافات ادت الى زيادة معنوية فى كل من اعداد البكتريا الكلية والكوليفورم وانخفاض فى عدد الايشرشيا كولاى فى الامعاء. كما ان أعداد بكتيريا اللاكتوباسلاى فى كل من الامعاء الدقيقة والغليظة سجلت زيادة فى كل المعاملات مقارنة بالكنترول.
نستنتج من هذه الدراسة ان اضافة هذه الاضافات كمنشطات للنمو كان لها تأثير ايجابى على الاداء الانتاجى ومحصول الذبيحة وقياسات الدم وبكتريا الامعاء وكذلك الكفاءة الاقتصادية لكتاكيت التسمين.