Egyptian J. Nutrition and Feeds (2022), 25(2): 199-210

INFLUENCE OF PREBIOTIC, PROBIOTIC AND SYNBIOTIC SUPPLEMENTATION ON DIGESTIBILITY, HAEMOBIOCHEMICAL PROFILE AND PRODUCTIVE PERFORMANCE IN BARKI LAMBS

M.A. Elliethy, M.A. Abdel Fattah and A.A. Marwan

Animal Production Dept., Fac. of Agric., Ain Shams Univ., Egypt.
Corresponding author: Ahmed Marwan; E-mail: ahmed_marwan97@yahoo.com

(Received 9/5/2022, accepted 19/7/2022)

SUMMARY

Forty growing Barki lambs of (3:4) months age and 34.97 kg average body weight were divided randomly into four equal groups (10 animals each): Animals of T1 (control) were fed on a basal diet according to the farm feeding system regime while T2, T3, and T4 (treated) were fed as T1 plus (for T2) 1 gm of powder (prebiotics) for every 1 kg of concentrate feed given to this group, for T3 0.5 g of powder (probiotics) per 1 kg of concentrate feed and T4 were received 1 g per 1 kg of concentrate feed. The aims of the experiment were to study the effects of some feed additives, especially prebiotics, probiotics, and synbiotics, as synthetic sources, on the productive performance and feed efficiency of growing Barki lambs length of the experiment period. The results showed that the highest significant value ($P \leq 0.05$) of DMI was recorded for T4, followed by T3, T2, and then T1, and a higher non-significant value of dry matter conversion ($P \geq 0.05$) was recorded for T4. The highest significant values of (DM, OM, CP, and NFE) were recorded for T4, followed by T3, T2, and then T1 and the highest non-significant values of CF and EE were noticed for T4. There were significant ($P \leq 0.05$) differences in Blood plasma total protein, albumin, globulin, urea, creatinine, and GPT, and insignificant ($P \geq 0.05$) differences in Blood plasma cholesterol, and triglycerides. Regarding growth performance and feed efficiency, the group that received synbiotic treatment T4 showed the highest values of daily gain ($P \leq 0.05$) and DM conversion followed by Prebiotic, Preobiotic, and then the control. These results indicate that the use of synbiotics or prebiotic or probiotic as an additives to conventional or industrial feed leads to an increase in growth performance and feed conversion efficiency, increasing the the blood plasma total protein and reducing the levels of urea, creatinine, cholesterol, triglyceride, and liver enzymes which affects the economic return of raising lambs.

***Keywords**: Prebiotic, probiotic, synbiotic, Barki lambs and productive performance.*

INTRODUCTION

For the sake of animal health, reducing environmental pollution, increasing productivity and profitability, have been studied Earlier studies and more are being done about feed additives given to animals as natural growth stimulants that stimulate the growth and proper functioning of the body. Studies of feed additives for prebiotics and probiotics and synbiotics to maintain the balance of ruminant bacteria in ruminants have been shown to be an effective method in combating pathogens that pose a threat to both animals and consumers Markowiak and Śliżewska (2018).

Prebiotics stimulate growth and development, beneficial intestinal microflora in the animal's digestive tract while suppressing harmful pathogenic bacteria from the body Semeniuk et.al (2008). Also, Prebiotics are non-digestible food ingredients that, when consumed in sufficient amounts, selectively stimulate the growth and/or activity of one or a limited number of microbes in the gut Uyeno et.al (2015). Moreover, Probiotics are defined as live strains of strictly selected microorganisms which, when administered adequate amounts confer a health benefit (e.g., decrease in diarrhea incidence) on the host Markowiak and Śliżewska (2017).

FAO/WHO (2002) defined Probiotics (DFM) as live microorganisms that may beneficially affect the host upon ingestion by improving the balance of the rumen microflora” However Prebiotics are defined as “a nondigestible but fermentable food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of a number of bacteria in the host .

The healthy benefits of probiotics can be mentioned as protect animals from pathogens, enhance the immune response, reduce antibiotic use and morbidity or mortality, improving product quality, enhance calcium absorption, vitamins, and proteins synthesis, improve feed digestion efficacy, enhance feed conversion ratio in small ruminants and stimulating role on DMI and degradation of fiber (Bahari et. al.,2017, Retta, 2016 and Raabisa et.al., 2019).

Synbiotics can be defined as a mixture of probiotics and prebiotics They are beneficial to the host by increasing the survival and deposition of viable microbiological nutritional supplements in the gastrointestinal tract. Their joint action on the animal body is much more effective than the use of probiotics or prebiotics alone Radzikowski (2017) .

The objectives of this study were to investigate the effects of adding some feed additives on the feed efficiency and growth performance of growing Barki Lambs during the experiment period.

MATERIALS AND METHODS

This study was conducted in the experimental research station of the Agricultural Cooperation Institute, Ain Shams University, located in the Regwa area, Cairo-Alexandria Desert Road, Giza Governorate, Egypt, during the period from February, 2021 to May, 2021.

Feed additives composition and sources:

Prebiotic: The common commercial name of the product (Mos Guard Plus) is a natural biological component of antigenic prebiotic products extracted from Mannan oligo Saccharides (MOS) and Beta-Glucan, from the cell walls of cereal grains or fungi. It is added according to the recommended doses of 1 gram per 1 kg in the rations provided to animals after mixing well.

Probiotic: This is a raw natural bacterial component of strains Bacillus subtilis, which are Gram-positive, rod-shaped bacteria that form heat-resistant spores found in the digestive system of ruminants. It is added according to the recommended doses, 0.5 g per 1 kg in the rations provided to animals after mixing well.

Synbiotic: The common commercial name of the product (BALACTO) is a natural biological component of Mannan oligosaccharides (MOS), β-GLUCAN, Lactobacillus Acidophilus, and Bacillus Subtilies. It is added according to the recommended doses of 1 gram per 1 kg in the rations provided to animals after mixing well.

The experimental animals and rations:

Forty growing Barki lambs randomly divided into four similar groups (10 animals per group). Animals were fed according to the farm system feeding regime plus one of the experimental feed additives as following

T1; Fed control diet without additives.

T2; Fed as T1 group plus 1 g of prebiotic per 1 kg of concentrate feed.

T3; Fed as T1 group plus 0.5 g of probiotic per 1 kg of concentrate feed.

T4; Fed as T1 group plus 1 g of synbiotic per 1 kg of concentrate feed.

The total mean starting weights of the experimental lambs in this experiment were 31.89, 35.51, 36.21 and 36.26 kg for T1, T2, T3, and T4 lambs, respectively. Barki lambs were introduced into the transactions after the division of approximate weights.

Rations for all animals were provided according to the farm system regime **(**NRC, 1985). Rations were consisted of 44% yellow corn, 22% Wheat Bran , 33% groundnut vine, 1% salt. The feed intake for each animal was recorded every two weeks for three consecutive days. Rated residues (if any) were recorded for each group. Chemical compositions of feed stuffs are presented in Table (1).

Table (1): Chemical composition of the experimental feed stuffs (% on DM basis).

Feed stuff	DM	OM	CF	CP	EE	NFE	Ash	*AIA
Yellow Corn	90.43	97.93	2.84	8.20	4.12	82.77	2.07	1.31
Wheat Bran	91.08	94.68	11.16	12.14	2.37	69.01	5.32	1.49
Groundnut Vine Hay	90.26	93.52	31.18	13.04	1.96	47.34	6.48	2.27

***** *AIA: Acid insoluble ash*

Digestibility trials:

Digestibility trials were performed for all the experimental Barki lambs using a grab sample method where acid insoluble ash (AIA) was used as an internal marker according to Schneider and Flatt (1975) for determining the nutrients digestibility .

Blood samples:

Blood samples were collected from the jugular vein of all calves monthly. These samples were collected into clean dried tubes with EDTA. Plasma samples were obtained by centrifuging at 4000 (rpm) for 15 minutes, for the determination of selected biochemical analysis.

Blood plasma was analyzed for Total protein Armstrong and Carr (1964), albumin Doumas et.al (1971), urea March (1965), creatinine Husdan (1968), AST and ALT Reitman and Frankel (1957), cholesterol Trinder (1969) and triglyceride Fassati and Prencipe (1982): Globulin was calculated by difference.

Productive performance parameters:

Live body weights were individually recorded at two weeks intervals. The average daily body weight gain was individually calculated. Daily feed intake was determined for each replicate of a treatment by the difference between the daily offered feed and the daily residual one. Feed conversion ratios were obtained by dividing the amount of feed consumption per calf by the corresponding weight gain in a certain stage (two weeks).

Analytical methods:

The samples of feedstuffs and feaces were analyzed to determine the chemical composition by using the AOAC (1995) procedure to determine moisture, dry matter, organic matter, crude protein, crude fiber, ether extract and ash contents, while nitrogen free extract (NFE) content was calculated by difference.

Statistical Analysis:

The data obtained were statistically analyzed using SAS (2001). Separation among means were detected by using Duncan multiple tests (Duncan, 1955).

RESULTS AND DISCUSSION

Dry matter intake:

The results of Table (2) indicated that the highest significant value ($P \leq 0.05$) of dry matter intake (DMI) was recorded for group T4 (fed at a dose of 1 gm per 1 kg synbiotic/h/day) followed by T3, T2, then T1.

The average total DMI during entire the experimental period had a gradual significant increase ($P \leq 0.05$), in which the lowest value was recorded in the first period (1.46 kg/h/day), while the highest value was recorded in the sixth and last period (1.88 kg/h/day), also The highest significant value between the groups was recorded for T4 Followed by the prebiotic and probiotic groups. Due to the gradual increase in body weight. These results are in good agreement with those obtained by Estrada-Angulo et.al (2021) The experiment was conducted on forty male lambs of average initial weight (29.52 kg) for a period of 93 days. The groups were randomly divided into four groups (10 animals for each group). The first group (the control group) was fed a diet on the farm without any additions from the experimental treatments, while the experimental group was fed The second group (probiotics) was fed on the farm diet plus 3 gm of (live Saccharomyces cerevisiae/lamb/day) experimental treatment, while the third group (prebiotics) was fed on the farm diet plus 3 g of (mannan oligosaccharide plus b-glucan) experimental treatment -glucans/lamb/day) while the fourth group (synbiotic) was fed on the farm diet plus the experimental worker (1.5 g of live Saccharomyces cerevisiae/lamb/day) + (1.5 g of mannan oligosaccharide plus b-glucans/lamb/day). The results indicated that there were significant differences between the groups, and the highest rate of total dry matter intake (DMI) was recorded than the rest of the other groups. Also, Morrison et.al (2010) conducted an experiment that was randomly distributed to 80 calves (40 heifers and 40 bulls) with an average weight of 34 kg at 5 days of age. The groups were randomly divided into four groups (20 animals per group). The first group (control) was fed on the diet on the farm (mother milk + starter feed) while the second group (probiotics) was fed on the diet on the farm in addition to the experimental transaction of 10 g of Probiotics, while the third group (prebiotics) was fed on the diet on the farm in addition to the experimental treatment 10 g prebiotic, while the fourth group (Synbiotics) was fed on the diet on the farm in addition to (5 g probiotics + 5 prebiotics). The results indicated stated that the combination of probiotics and prebiotics increases dry matter intake (DMI) followed by probiotics and then prebiotics.

Table (2): Effect of experimental treatments on dry matter intake (kg/h/d).

Item	treatments				
days	T1	T2	T3	T4	Overall means
0 – 15	1.36± 0.10	1.47± 0.09	1.52± 0.08	1.52± 0.09	1.46^{C}
16 - 30	1.45± 0.10	1.56± 0.10	1.59± 0.07	1.62± 0.10	1.55^{C}
31 – 45	1.60± 0.10	1.72± 0.10	1.73± 0.06	1.76± 0.07	1.70^{B}
46 – 60	1.71± 0.16	1.70± 0.11	1.78± 0.07	1.81± 0.13	1.75^{AB}
61 – 75	1.74± 0.14	1.77± 0.13	1.84± 0.07	1.92± 0.10	1.82^{AB}
76 – 90	1.84± 0.13	1.78± 0.12	1.89± 0.06	1.99± 0.11	1.88^{A}
Overall mean	1.62^{b}	1.67^{ab}	1.72^{ab}	1.77^{a}	

a and b Means of treatments within the same row with different superscript letters are significantly different (P ≤ 0.05).
A, B and C Means of periods within the same column with different superscript letters are significantly different (P ≤ 0.05).

Nutrients digestibility:

Results of a Table (3) clearly showed that T4 recorded the highest significant values of DM, OM, CP, and NFE digestibility; and the highest non-significant values of CF and EE digestibility followed by T3, T2, and then T1. These results are in food agreement with those of Zapata et.al (2021) who that he conducted an experiment on four groups with a total of 12 male lambs with an average initial weight of 45.1 kg in order to evaluate the probiotic Saccharomyces cerevisiae or prebiotic mannan oligosaccharides + b-glucan alone or the probiotic and prebiotic together.

Table (3): Effect of experimental treatments on the nutrients digestibility coefficient of the lambs during the entire experimental period.

Item	T1	T2	T3	T4
DM	67.02±1.14^{c}	69.08±1.08^{b}	69.34±2.07^{ab}	70.43±1.61^{a}
OM	69.74±1.97^{b}	70.91±2.12^{b}	72.29±1.88^{a}	72.58±1.66^{a}
CP	70.76±2.40^{c}	72.29±3.12^{b}	73.12±2.57^{a}	73.92±2.66^{a}
CF	60.11±1.51	61.28±1.62	62.19±1.51	62.89±1.58
EE	77.04±1.35	77.48±1.39	78.39±2.54	79.24±1.89
NFE	80.02±2.68^{c}	82.44±2.53^{b}	83.25±3.06^{ab}	84.15±3.12^{a}

A, b & c Means of treatments within the same row with different superscript letters are differ significantly (P ≤ 0.05).

The results indicated that the combination of prebiotics and probiotics enhance the overall digestion of nutrients, especially for lambs fed a high-energy diet**.** Moreover, Arabi et.al (2020) who fed hybrid lambs for a period of 90 days on different doses of synbiotics, respectively 2, 4, and 6g /h/day. The results indicated that the nutrition under treatment with synbiotic 6 g gives the highest digestibility of nutrients and other fibers insoluble compared to other groups.

Blood Plasma:

Data of Table (4) showed that T4 recorded the highest significant value (P≤0.05) followed by T2,T3 and then control group T1. The highest concentration of total protein in T4 group (Synbiotic supplemented group) may be attributed to the positive effect of Synbiotic on CP digestibility (Table 3).

Same findings were recorded by Didarkhah and Vatandoost (2021) who conducted an experiment on 40 male lambs at an age of 4-5 months with an average initial weight of 30 kg for a period of 90 days. It was randomly divided into four replicate groups, each group containing 10 repetitions of lambs fed on the diet on the farm in addition to the experimental treatments. The first group (control group) was fed the diet without any experimental treatments, while the second group was fed the diet plus 5 grams of probiotics per head/daily, while the third group was fed the diet plus 2 grams of prebiotics per head/daily, while the fourth group was fed on the diet plus 5 grams of synbiotics. The results indicated that the highest value was recorded for the synbiotic group, followed by prebiotics and probiotics and then the control group.

Table (4): Effect of experimental treatments on some blood plasma parameters.

Item	Treatment			
	T1	T2	T3	T4
Total protein (g /dl)	6.81^{b}	6.89^{b}	6.87^{b}	7.30^{a}
Albumin (g /dl)	3.26^{b}	3.59^{a}	3.56^{a}	3.68^{a}
Globulin (g /dl)	3.55^{a}	3.30^{b}	3.31^{b}	3.62^{a}
Urea (mg /dl)	30.94^{a}	28.02^{ab}	26.28^{b}	28.73^{ab}
Creatinine (g /dl)	1.05^{b}	1.09^{b}	1.20^{a}	1.09^{b}
Cholesterol (mg/dl)	99.74	98.94	99.08	89.43
Triglyceride (mg/dl)	72.02	69.91	69.89	68.41
ALT (unit /L)	10.59^{b}	10.71^{b}	14.50^{a}	12.86^{ab}
AST (unit /L)	101.79^{ab}	107.77^{a}	111.66^{a}	91.47^{b}

a and b Means of treatments within the same row with different superscript letters are significantly different (P ≤ 0.05).

These results agree with Moarrab et.al (2016) who fed new born lambs on the farm's diet along with a mother's milk. The diets contain 3 or 6 gm synbiotics.Results indicate that treatment with 3gm symbiotic showed the highest Total protein in the blood plasma of the second group treated with 3 g of Synbiotic.

Data of Table (4) clearly indicate that lambs of T4 group had the highest concentration ($P\leq0.05$) of albumin in plasma (3.68 g/dL), followed by T2 (3.59 g/dL), T3 group (3.56 g/dL), and then T1 (3.26 g/dL).The high level of albumin in plasma may be attributed to an increase in protein uptake and synthesis and a decrease in protein loss.

These results are in agreement with Kazemi-Bonchenari et.al (2013) who fed Farahani sheep on the farm diet in addition to synbiotics 2 g and 10 g, respectively. The results indicated that the second group 2 g of synbiotic had a higher concentration of albumin than other groups.on the other hand Didarkhah and Vatandoos (2021) mentioned that the albumin concentration was not affected by, probiotics, prebiotics or synbiotics.

Table (4) showed that T4 recorded the highest globulin value (3.62 g / dl) comparing with other groups. Results of Lekha et.al (2021) Fed buffalo calves on probiotics containing 7 bacteria strains and two yeast strains, prebiotic (mannan oligosaccharide + inulin), a mixture of probiotic and prebiotic .found no effects of treatments on albumin: globulin ratio.

Abdel-Salam et.al (2014) Fed Najdi male lambs fed on a farm diet plus (20 ml synbiotic given orally/h/day) and (40 ml synbiotic given orally/h/day). The results indicated a higher level of globulin in (40 ml synbiotic given orally/h/day) level of synbiotic than the other groups.

Blood plasma urea results of table (4) showed that control group T1 higher significant value ($P\leq0.05$) was recorded for the (30.94 mg/dL), While the lowest significant value was recorded for T3 (26.28 mg/dL) then both T2 an T4. Abdelhady and El-Abasy (2015) Fed male New Zealand white rabbits on 1 gm of prebiotics (mannoligosacchrid), 0.4 gm of probiotics (Bacillus subtilis and Bacillus licheniformis), and (1 gm mannoligosacchrid + 0.4 gm Bacillus subtilis and Bacillus licheniformis). The results showed reduction in urea concentration in the fourth group, which was experimentally treated with synbiotics.the same findings was found with Kazemi-Bonchenari et.al (2013) who found that the urea concentration was decreased in (2 g of synbiotic) and (10 g of synbiotic) than in the control group in Farahani male sheep.

Bush (1991) stated that plasma urea concentration was increased as a result of the increase in the rate of protein breakdown and carbohydrate deficiency, a decrease of renal perfusion as renal azotemia, and bladder rupture.

The results of Table (4) showed that T3 recorded the highest significant value ($P \leq0.05$) of creatinine concentration in blood plasma (1.20 g/dL) than the other group. while the lowest value (1.05 g/dL) was observed for T1 (control group). However, values In this study creatinine are within the normal range of blood plasma creatinine from 0.6 to 1.8 mg / dL Plumb (1999) and Merek et.al (1991). These results indicate that the experimental supplementation has no negative effects on kidney function and energy metabolism in skeletal muscle. these recent results are in accordance with those of Hussain Dar et.al (2017) who fed hybrid calves, fed on the system Farm diet plus 1 gm of probiotics (Lactobacillus acidophilus),4gm of prebiotics (Mannan oligosaccharide) and 2.5g of synbiotic (0.5g Lactobacillus acidophilus) + (2 g of Mannanoligosaccharide) They found that the creatinine level was not affected by treatments. However Abdelhady and El-Abasy (2015) showed reduction in the creatinine concentration in the groups treated with synbiotics (1 gm mannoligosacchrid + 0.4 gm Bacillus subtilis and Bacillus licheniformis) (infected and non-infected with Pasteurella multocida).

The results of the effect of the experimental treatments on the concentration of triglycerides in the blood plasma are shown in Table (4) with the presence of non-significant differences ($P\geq0.05$) between the different groups, where the highest value ($P\geq0.05$) was recorded for T1 (72.02 mg/dL) while the lowest value (68.41 mg/dL) was shown for T4. These results are in harmony with Didarkhah and Vatandoost (2021) who reported lowest significant value for the synbiotic group, followed by the probiotic group, while the highest value was recorded for the control group. Also, Hussain Dar et.al (2017) mentioned that which the lowest value of triglycerides was recorded for the synbiotic group, followed by the prebiotic group, while the highest value was recorded for the control group in hybrid calves.

The results of the effect of experimental treatments on plasma cholesterol concentration in Table (4) indicated non-significant differences ($P \geq 0.05$) between the different groups, where the highest value ($P \geq 0.05$) was recorded for T1 (99.74 mg/dL), while the lowest value (89.43 mg/dL) was shown for T4.

Ayala-Monter et.al (2019) Fed newborn male lambs on mothers milk plus (pre-starter feed), control plus (2% inulin of live weight) and (2% inulin + L. casei of live weight). The results indicated a lower level of cholesterol in the third group (2% inulin + L. casei of live weight) than the rest of the other groups. Moreover Klebaniuk and Czech (2007) Fed newborn lambs on the farm diet, while the second group (MOS prebiotic) was fed on the farm diet in addition prebiotics (10 g /h/day), while the third group (Synbiotic) was fed on the farm diet plus 12 g (2 g Microbiosan probiotic + 10 g MOS prebiotic). Blood samples were taken from lambs after weaning, and the results indicated that the cholesterol level was significantly lower in the third group (Microbiosan probiotic + MOS prebiotic) than in others.

Results of Table (4) ALT and AST showed that T3 recorded the highest values whereas the lowest values of ALT and AST were shown for T1 and T4 respectively.Table (4) showed the effect of experimental treatments on the liver enzymes GPT from blood plasma alanine transaminase (ALT) and aspartate aminotransferase (AST) have no negative effect on the activity of these enzymes. Hussain Dar et.al (2017) reported no negative effects on liver enzymes when adding synbiotics, probiotics, and prebiotics to the ration. Moreover, Fenta et.al (2021) Fed sheep on the farms diet without any additive, while the second group was fed as control group plus two daily oral gulps of (Probiotic), the third group was fed on the farm diet, in addition to the experimental treatment: 1 g orally twice a day of (Probiotic & Prebiotic) and the fourth group was fed as control group in addition to the experimental treatment 1 g orally. Twice a day of (Probiotic & Rumenotoric), while the fifth group was fed on a farms diet plus 1.1 ml/kg once daily of (Sodium bicarbonate). All treatments indicated a significant improvement in liver enzymes (ALT/AST) over the control group.

Body weights and average daily gain:

The data in Table (5) showed that T4 recorded the highest final weight followed by T3, T2, and then T1.however the differences between groups were no-significant. The same trend was observed regarding the total gain but with significant differences.

Table (5): Effect of experimental treatments on changes of body weights and daily gain (kg/h/d).

Item	Treatment				
	T1	T2	T3	T4	Overall mean
Animal weight					
Initial weight	31.89±2.27	35.51±2.93	36.21±2.73	36.26±2.18	
Final weight	46.89±3.28	51.21± 3.12	52.82±2.87	54.90±1.76	
Total gain	15.00±1.11^{b}	15.69±1.20 ^{ab}	16.60±0.51^{ab}	18.64±0.82^{a}	
Days	Average daily gain (kg/h/day)				
0 – 15	0.144±0.03	0.137±0.03	0.162±0.01	0.145±0.02	0.147^{C}
16 – 30	0.155±0.02	0.153±0.04	0.165±0.01	0.179±0.02	0.163^{BC}
31 – 45	0.213±0.02	0.224±0.01	0.205±0.03	0.230±0.05	0.218^{A}
46 – 60	0.162±0.06	0.142±0.03	0.168±0.02	0.225±0.03	0.174^{ABC}
61 – 75	0.128±0.03	0.139±0.04	0.212±0.01	0.243±0.05	0.181^{ABC}
76 – 90	0.195±0.02	0.248±0.02	0.192±0.01	0.219±0.04	0.213^{AB}
Average	0.166^{c}	0.174^{b}	0.184^{b}	0.207^{a}	

a and b Means of treatments within the same row with different superscript letters are significantly different $P \leq (0.05)$A, B and C Means of periods within the same column with different superscript letters significantly different ($P \leq 0.05$).

Results of daily gain Table (5) clearly showed that T4 recorded the highest significant value whereas T1 showed the lowest one followed by T3, T4, and T1 that recorded the lowest daily gain.

Nwachukwu et.al (2021) on 32 rabbits at the age of 56 days, with an initial weight of 691 grams, for 12 weeks, they randomly divided rabbits into 4 groups, each group containing 8 animals. The control group was fed a basal diet without treatments while the second group (prebiotic) was fed as control plus (Biotronic® at 400 mg/kg), the third group (probiotics) was fed as control plus (Biovet®-YC at 50 mg/kg). While the fourth group (synbiotic) was fed on farms diet in addition to (combination of Biotronic® at 400 mg/kg + Biovet®-YC at 50 mg/kg). The results of the experiment indicated the presence of non-significant differences between groups in which the highest final weight was recorded for the fourth group (synbiotic), and the presence of significant differences between groups in which the highest daily growth rate was recorded for the fourth group (synbiotic).

The same findings were reported by Ayala-Monter et.al (2019), who found an improvement in the final weight gain, total weight gain, and daily growth rate for the synbiotic group compared to pebiotic,probiotic and control groups. Moreover, Hussain Dar et.al (2017) mentioned that the average final weight gain, average total body weight, and average body weight gain were significant for higher the synbiotic group.

El-Mehanna et.al (2017) conducted an experiment on twenty-four male lambs ranging in age from 4-5 months with an average initial weight of 29.89 kg for a period of 60 days. They were randomly divided into four groups, each group containing 6 lambs. First group (control) was fed on basal diet without any experimental treatments, while the second group was fed as first group plus 50 ml of prebiotics orally/head/day, the third group was fed a basal diet plus 50 ml of probiotics orally/head/daily, while the fourth group was fed (synbiotic) in a 1:1 ratio of prebiotics: probiotics orally / head / day. The results of the experiment indicated a significant increase in the final weight and a non-significant increase in the total weight of the synbiotic group.

Feed conversion (kg DM/ kg gain):

The data of DM conversion Table (6) indicated there were non-significant ($P \geq 0.05$) differences in the mean of DM conversion and indicated that the better non-significant value ($P \geq 0.05$) was recorded for (T4) compared followed by T3,T2 and then T1.that showed the poorest DM conversion this may be due to : 1) the good nutrient digestibility (table 3) that was recorded for this group. 2) increased protein anabolism due to higher protein digestibility which led to higher blood plasma total protein and albumin concentration, which result in an increase in protein biosynthesis in this group (table 3) and improvement of total gain and average daily gain (table 5).. These results agree with those obtained by Nwachukwu et.al (2021) who stated the superiority of the synbiotic (combination of Biotronic® at 400 mg/ kg + Biovet®-YC at 50 mg/kg) compared to the other groups in their experiment.

Table (6): Effect of experimental treatments on dry matter conversion (kg DM/ kg gain).

Item	Treatment				
days	T1	T2	T3	T4	Overall mean
0 — 15	7.68± 0.35	14.55± 2.35	9.72± 1.46	11.08± 1.44	10.96
16 - 30	9.76± 1.14	8.49± 1.13	9.57± 0.25	9.37± 1.05	9.35
31 — 45	7.92± 1.41	7.86± 0.95	9.38± 1.88	9.45± 1.90	8.65
46 — 60	11.99± 2.71	10.61± 1.08	11.05± 1.15	8.30± 0.76	10.37
61 — 75	14.92± 3.10	10.24± 1.61	8.78± 0.49	8.93± 1.64	10.75
76 — 90	10.37± 2.13	7.29± 0.88	10.13± 1.12	7.41± 0.79	8.79
Overall mean	10.50	9.85	9.77	9.16	

In an experiment by Didarkhah and Dirandeh (2018) they used 40 Baluchi lambs with an average initial body weight of 30 kg, aged one year, for a period of 90 days. They were randomly divided into four groups, the first one (control) was fed a basal diet without any treatments, the second group was fed as control group plus 0.5 grams of probiotics per head/day, while the third group was fed the farm's diet plus 2 grams of prebiotics per head/day and the fourth group was fed as control plus (0.5 g probiotic + 2 g prebiotic) per head/day. The results of the experiment indicated that the best feed conversion was recorded for the synbiotic group compared to the other groups in the experiment.

CONCLUSION

From the previous obtained results, it can be concluded that the use of prebiotic, probiotic and synbiotics as a feed additives led to an improvement in all nutrients digestibility coefficients, increasing the blood plasma total protein and reducing the levels of urea, creatinine, cholesterol, triglyceride, and liver enzymes, enhance growth and final body weight rates which affects the economic return of raising lambs. The use of feed additives for small growing ruminants requires more and more research.

REFERENCES

Armstrong, W. D and Carr.C.W. (1964). Physiological chemistry 3rd ed. P, 75. Burges Publishing Co. Minneapolis, Minnesota.

AOAC (1995). Official methods of analysis. 15th ed. Association of Official Analytical Chemists. Arlongton, Virginiall USA.

Arabi.R , Bahari.M and Sadeghi M.R. (2020). The effect of different levels of Biomin®IMBO synbiotic supplement in diet on growth performance, apparent digestibility nutrients and some blood parameters fattening Zel lambs. J. of Ruminant Research, Vol. 8(3).

Abdel-Salam.A.M.,Zetoun.M.M.and Abdel-Salam M.M. (2014). Effect of Synbiotic Supplementation on Growth Performance, Blood Metabolites,Insulin and Testosterone and Wool Traits of Growing Lambs.Journal of Biological Sciences 14 (4): 292-298,2014.

Abdelhady .Doaa. H. and El-Abasy .Moshira A. (2015). Effect of Prebiotic and Probiotic on Growth, Immuno-hematological responses and Biochemical Parameters of infected rabbits with Pasteurella multocida. BENHA VETERINARY MEDICAL JOURNAL, VOL. 28, NO. 2:40-51, CONFERENCE ISSUE, 2015.

Ayala-Monter.M.A.,Hernández-Sánchez.D.,González-Muñoz.S.,Pinto-Ruiz.R.,A.MartínezAispuro.J.,Torres-Salado.N.,Herrera-Pérez.J.,and Gloria-Trujillo A. (2019). Growth performance and health of nursing lambs supplemented with inulin and Lactobacillus casei. Asian-Australas J Anim Sci Vol. 32, No. 8:1137-1144.

Bahari.M. (2017) Animal Nutrition University of Agricultural Sciences and Natural Resources, Sari, Iran,. Review on the Consumption of Probiotics in Feeding Young Ruminants. Wings to the Research 2576-9162.

Bush. B.M. (1991). Interpretation of laboratory results for small animal clinicians. Oxford Blackwell scientific puplications , London.

Doumas. B; Wabson .W. and Biggs H. (1971). Albumin standards and measurement of serum with bromocresol green, clin. Chem.. Acta., 31:87.

Duncan David B. (1955). Multiple range and multiple F test. Biometric, 11: 1-42.

Didarkhah.M. and Vatandoost.M. (2021). The Effect of Probiotic and Prebiotic Supplements on Growth Performance,Blood Parameters and Skeletal Growth of Baluchi Male Lambs. Iranian Journal of Animal Science Research. Vol. No. 4, Winter 2021, p. 411-422.

Didarkhah.M. and Dirandeh.E. (2018). The Effect of Probiotic and Prebiotic Supplements on Performance and Health of Baluchi Growing Lambs. Research on Animal Production, Vol. 9, No. 21, Autumn 2018.

Estrada-Angulo,A.;Zapata-Ramírez.O.,Castro-Pérez.B.I.,Urías-Estrada.J.D.Gaxiola-Camacho,S.,Angulo-Montoya.C.,Ríos-Rincón.F.G.,Barreras.A.,Zinn.R.A.,Morales.J.B.L.,Perea-Domínguez.X.and Plascencia,A. (2021). The Effects of Single or Combined Supplementation of Probiotics and Prebiotics on Growth Performance, Dietary Energetics, Carcass Traits, and Visceral Mass in Lambs Finished under Subtropical Climate Conditions. Biology 2021, 10, 1137.

El-Mehanna.S.F,Abdelsalam.M.M.,Hashem.N.M.,El-Azrak.K.E.M.,Mansour.M.M.andZeitoun.M.M (2017). Relevance of probiotic, prebiotic and synbiotic supplementations on hemato-biochemical parameters, metabolic hormones, biometric measurements and carcass characteristics of sub-tropical Noemi lambs. International Journal of Animal Research IJAR, 2017; 1:10.

FAO/WHO (2002). Report of a Joint FAO/WHO expert consultation on guidelines for the evaluation of probiotics in food. London, Ontario, Canada: World Health Organization and Food Agriculture Organization of the United Nations.

Fassati P ., Prencipe. L. (1982). Clin . Chem., 28. 2077.

Fenta.M.D.,Jemberu.W.t.,G/mariam.A.A.and Mebratu.A.S. (2021). Comparative therapeutic effectiveness of probiotic and combinations of Probiotic with prebiotics and probiotic with rumenotorics in experimentally induced ruminal acidosis sheep.Research Square rs.3.rs-129885/v1,2021.

Husdan, H. (1968). Chemical determination of creatinine with depproteinization. Clin. Chem., 14: 222.

Hussain Dar Aashaq, Singh.S. K., Kumar Sanjay, Irshad Ahmad Para, Merina. K. Devi,Nitesh Kumar, Aamir Suhail Khan and Kurat-Ul-Ain (2017). Impact of supplementation of probiotic, prebiotic and synbiotic on serum biochemical profile of crossbred calves. Indian J. Anim. Res., 0367-6722 sept 2017.

Kazemi-Bonchenari.M.,Ghasemi.H.A.,Khodaei-Motlagh.M.,Khaltabadi-Farahani.A.H.,and Ilani.M. (2013). Influence of feeding synbiotic containing Enterococcus faecium and inulin on blood metabolites, nutrient digestibility and growth performance in sheep fed alfalfa-based diet. Scientific Research and Essays 2013 Vol. 8(21), pp. 853-857, 4 June, 2013.

Klebaniuk .R. and Czech. A. (2007). The influence of synbiotic participation in feed ration for ewes on selected lamb blood parameters. ul. Akademicka 13, 20-950 Lublin.

Lekha.M.Sri.,Seshaiah.Ch.Venkata,Ashalatha.P.andKishore.K.Raja(2021).EffectofProbiotic,PrebioticandSynbioticSupplementationonHaematologicalandSerumBiochemicalProfilesinMurrahBuffaloCalves.Int.J.Curr.Microbiol.App.Sci., 10(05): 272-279.

Markowiak,P.,and Śliżewska.K. (2017). Effects of probiotics, prebiotics,and synbiotics on human health. Nutrients 9:1021.

Markowiak.P. and Śliżewska.K. (2018). A REVIEW: The role of probiotics, prebiotics and synbiotics in animal nutrition. Gut Pathog 1757-4749.

March, W. (1965). Determination of urea by diacetylmonoxime method. clin. Chem., 11. 624(Pp 967-973).Merek,1991. the Merek veterinary manual, 7th edition Mishra-DK; S.N. Naik; VK. Srivastava and R. Prasad ,1999. Effect of drying Matricaria chamomilla flowerson chemical composition of essential oil.Journal-of-Medicinal-and-Aromatic-Plant-Sciences. 1999, 21: 4, 1020-1025.

Moarrab.A., Ghoorchi.T., Ramezanpour.S., Ganji.F.and A.R.Koochakzadeh (2016). Effect of Synbiotic on Performance, Intestinal Morphology, Fecal Microbial Population and Blood Metabolites of Suckling Lambs. Iranian Journal of Applied Animal Science, 6(3), 621-628.

Morrison S. J., Dawson S., Carson A. F. (2010). Livestock Science 131(2). The effects of mannan oligosaccharide and Streptococcus faecium addition to milk replacer on calf health and performance. (2010) 292—296.

NRC (1985). Nutrient Requirements of Sheep. 6th ed. National Research Council. National Academy Press. Washington, D. C., USA.

Nwachukwu Chinwe Uchechi, Aliyu Karimat Imam, and Ewuola Emmanuel Olubisi (2021). Growth indices, intestinal histomorphology, and blood profile of rabbits fed probiotics- and prebiotics-supplemented diets. Anim. Sci., 5:1-11.

Plumb.D.C. (1984)Iowa State University Press, Veterinary Drug Handbook, 1999.Veterinary Clinical Pathology Practice Publishing Co. and other sources.

Raabisa.S., Lib.W., Cersosimoc.L. (2019). Effects and immune responses of probiotic treatment in ruminants. Review In Veterinary Immunology and Immunopathology 0165-2427.

Radzikowski Daniel (2017). Effect of probiotics, prebiotics and synbiotics on the productivity and health of dairy cows and calves.WSN 78 (2017) 193-198.

Reitman.S. and Frankel.S. (1957). Calorimetric method for the determination of serum glutamic-oxaloacetic and glutamic- pyruvate transeaminase. An.J. Clin.Path. 28:56.

Retta .K.S. (2016). Role of probiotics in rumen fermentation and animal performance: A review. International Journal of Livestock Production 2141-2448.

Semeniuk, W., & Klebaniuk, R. (2008). Dodatki paszowe w żywieniu zwierząt.[W:] Lucerna w żywieniu ludzi i zwierząt (red. ER Grela). In 3rd International Conference „Feed and Food Additives", Dzierdziówka—Lublin (pp. 139-164).

Schneider.B. H. and Flatt.P. W. (1975). The evaluation of Feeds Through Digestibility Experiments The Univ. of Georgia Press Athens 30602.

SAS (2001). Statistical Analysis System guide: Version 8.2th. Institute Inc. Cary. Nc. USA.

Trinder .P., Ann.Clin. Biochem, 6,24.Umesb, P. C. P. (1969). A colorimetric method for the determination of glucose. Poultry International 38(12):40-44.

Uyeno.Y.,Shigemori.S.,and Shimosato.T. (2015). Minireview: Effect of Probiotics/Prebiotics on Cattle Health and Productivity. Microbes and Environments 1342-6311.

Zapata.O.,Cervantes.A.,Barreras.A.,Monge-Navarro.F.,Gonz´alez-Vizcarra.V.M., Estrada-Angulo.A.,Urías-Estrada.J.D.,Corona.L.,Zinn.R.A.,Martínez-Alvarez.I.G.,Plascencia.A.(2021).Effects of single or combined supplementation of probiotics and prebiotics on ruminal fermentation, ruminal bacteria and total tract digestion in lambs. 0921-4488.

تأثير مكملات البريبيوتيك والبروبيوتيك والسينبيوتيك على المقدرة الهضمية ، بعض القياسات الكيميائية الحيوية للدم والأداء الإنتاجي في الحملان البرقي.

محمود عادل الليثى ، محمد على عبد الفتاح و أحمد عبد الله مروان

قسم الإنتاج الحيواني - كلية الزراعة - جامعة عين شمس – مصر.

تم تقسيم اربعين حملا برقيا ناميا عشوائيا تتراوح اعمارهم (3-4) شهور متوسط اوزانهم 34.97 كجم الى اربع مجموعات متساوية (10 حيوانات لكل مجموعة) .تم تغذية المجموعة الاولى T1 (الضابطة) على نظام غذائى اساسى وفقا لنظام تغذية المزرعة بينما تم تغذية المجموعات الثانية والثالثة والرابعة (T2وT3وT4) المعاملة تجريبيا على نفس تغذية المجموعة الاولى مضافا على التوالى لـ (المجموعة الثانية T2) ا جم من مسحوق (البريبيوتيك) لكل 1 كجم من العلف المركز ، لــ (المجموعة الثالثة T3) 0.5 جم من مسحوق (البروبيوتيك) لكل 1 كجم من العلف المركز ، لــ (المجموعة الرابعة T4) 1 جم من مسحوق (السينبيوتيك) لكل 1 كجم من العلف المركز.حيث تم توفير المواد لهذه المجموعات بعد مزجها جيدا حسب التوصيات والجرعات التجارية الموصى بها لكل معاملة.تهدف التجربة لدراسة تأثير الاضافات العلفية وخاصة البريبيوتيك و البروبيوتيك و السينبيوتيك كمصادر تركيبية على الاداء الانتاجى وكفاءة التغذية لنمو حملان البرقى طول فترة التجربة.أظهرت النتائج أن اعلى قيمة معنوية ($P\leq0.05$) من تناول المادة الجافة (DMI) سجلت الى المجموعة الرابعة (T4) السينبيوتيك تليها المجموعات على التوالى (T3وT2وT1) وسجلت اعلى قيمة غير معنوية ($P\geq0.05$) لتحويل المادة الجافة DM للمجموعة الرابعة (T4) السينبيوتيك .سجلت قابلية هضم العناصر الغذائية (DM, OM, CP, NFE) للحملان اعلى قيمة معنوية ($P\leq0.05$) للمجموعة الرابعة (T4) السينبيوتيك تليها المجموعات على التوالى (T3وT2وT1) بينما سجلت اعلى قيمة غير معنوية ($P\geq0.05$) لهضم العناصر الغذائية (CF, EE) للمجموعة الرابعة السينبيوتيك .كانت هناك فروق معنوية ($P\leq0.05$) فى بلازما الدم للبروتين الكلى والالبومين والجلوبيولين واليوريا والكرياتينين وانزيمات الكبد GPT وفروق غير معنوية ($P\geq0.05$) فى الكوليسترول والدهون الثلاثية.فيما يتعلق أداء النمو وكفاءة التغذية اظهرت المجموعة الرابعة (T4) التى تلقت معاملة السينبيوتيك اعلى قيمة معنوية ($P\leq0.05$) لمعدل النمو اليومى وتحويل المادة الجافة DM يليها مجموعة البروبيوتيك ثم البريبيوتيك واخيرا الكونترول.تشير هذه النتائج الى ان استخدام السينبيوتيك والبروبيوتيك والبريبيوتيك كمواد مضافة للاعلاف التقليدية او الصناعية تؤدى الى زيادة اداء النمو وكفاءة تحويل الاعلاف وزيادة البروتين الكلى وانخفاض مستويات اليوريا والكرياتينين والكوليسترول والدهون الثلاثية وانزيمات الكبد مما يؤثر على العائد الاقتصادى لتربية الحملان.