EFFECT OF REUSING BROILER LITTER AND BIO-MOS AS ALTERNATIVE OF GROWTH PROMOTERS ON BROILER PERFORMANCE DURING SUMMER SEASON.

By

El-Sheikh, T. M.; M. O. Abd-Elsamee and A. M. Ali

Anim. Prod. Dep. Fac. of Agric. Sohag Univ.

Anim. Prod. Dep. Fac. of Agric. Cairo Univ.

Anim. Prod. Dep. Fac. of Environ. Agric. Sci., Suez Canal Univ., El–Arish.

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Abstract: *A factorial experimental design 2 x 2 was used in this study (2 litter types, 3 diet treatments with 2 replicates of each). One hundred and eighty unsexed one day old Cobb broiler chicks were used in this study. The pens classified into two groups. The first group had six pens prepared with new litter (wheat straw). The second had six pens prepared with old litter (used litter). Every group was classified in to three treatments: 1) Birds were fed the basal diet and supplemented with Bio-Mos. 2) Birds were fed the basal diet and supplemented with linkomycine as growth promoters. 3) Birds were fed the basal diet and represented as control.*

Traits measured were body weight, feed consumption, fed conversions ratio (FCR) and mortality rate. At 6 weeks of age, blood samples were collected to determine total protein, albumin, glubulin, glucose, total lipids, cholesterol, GOT and GPT.

The obtained results were: - The use of Bio-Mos significantly increased (P<0.001) body weight compared to control at the age of 3 weeks by about 9%. While there were no significant differences either between Bio-Mos and growth promoter or between growth promoter and control. The corresponding trend was observed at 6 weeks of age. There were significant differences on body weight gain during the period from 0-21 and 0-42 days (P<0.001) between Bio-Mos, growth promoter and control. There are no significant differences in final body weight between chicks raised on new or old litter. Birds raised on new litter consumed feed more than birds raised on old litter during the period from 0-21 days of age, while there were no *significant differences during the period from 21-42 days of age. Supplementation either Bio-Mos or growth promoters improved feed conversion for the birds raised on old litter compared to control. Control diets had greater ($P < 0.05$) mortality (8.34 %) compared to growth promoters (6.67 %), and Bio-Mos (1.67 %). Mortality rate was significantly higher in birds raised on old liter (9.63 and 9.89 %) compared to that in birds raised on new litter (5.95 and 6.13%) during the period from 21- 42 and 0 – 42 days of age, respectively. Bio-Mos supplementation superior growth promoter for increasing total protein, albumin, globulin, and GPT than control. Bio-Mos decreasing the stress indicators as glucose, GOT, total lipids and cholesterol. With comparing Bio-Mos and growth promoter, it could be observed that under heat stress, Bio-Mos improved liver function more than growth promoter.*

INTRODUCTION

In recent years, expansion of the poultry industry and increasing the competition either from ruminant feeding on wheat straw and its expensive price or from wood by product markets have created shortages of pine shavings in many poultry producing area. This shortage has resulted in an intensive search for alternative bedding materials. The re-using broiler litter for many flocks represents as one of these alternative with using natural anti-pathogenic and as alternative of antibiotics materials like as Bio-Mos. Alltech, Inc. developed and pioneered the use of mannan oligosaccharides (MOS), derived from the outer layer of yeast cell walls, in poultry feeds. Oligosaccharides are carbohydrates, which on hydrolysis yield 2 to 10 monosaccharides. The idea to use yeast mannan oligosaccharides in poultry feeds evolved from the concept that certain sugars, particularly mannose, block the colonization of intestinal pathogens such as *Salmonella* and *Escherichia coli*, from attaching to intestinal mannose, proliferating, and producing toxins. The MOS had three main modes of action: 1) pathogen adsorption (agglutination) (Spring *et al.*, 2000), 2) improved gut health such as villi height (Loddi *et al.*, 2002), and 3) immune modulation (adjuvant effect) (Ferket *et al.*, 2002). The presence of dietary MOS and pathogens together in the lumen of the intestine functions as an adjuvant and antigen system, allowing enhanced antigenicity and superior immune response.

In a United Kingdom study, ten Doeschate and Kenyon ten Doeschate (1999) evaluated Ross broiler chickens on new litter and reported that dietary MOS improved 35-d body weight by, 1.46%, feed conversion ratio by 1.71%, and mortality by 22.2% relative to negative control results. Similarly, Petersen and Villaldsen (2002) conducted 2 trials (36 and 38 d) with Ross broilers on new litter and demonstrated improvements in body weight by 5.45 and 4.56%, feed conversion ratio by 4.88 and 2.42%, and mortality by 24.2 and 22.2%, respectively, for birds fed MOS birds compared to unsupplemented control birds. Hybro broilers on used litter were observed by Clementino dos Santos *et al.* (2002) in Brazil to have better 42-d body weight by 3.65% and feed conversion ratio by 6.25% relative to performance of the negative control group. Sefton *et al.* (2002) used Ross broiler chickens on new litter and found that MOS-supplemented diets improved 49-d body weight by 2.70%, feed conversion ratio by 2.40%, and mortality by 9.70% compared to results on unsupplemented control diets.

Hooge *ET. al.* (2003) concluded that MOS alone improved live performance of broiler chickens under simulated commercial conditions and demonstrated an additive effect when used in combination with the antibiotic shuttle program (BMD followed by VM in finisher).

Otherwise, the use of antibiotics in animal nutrition to enhance growth performances has been practiced for long time (Boyd, 1994). The search for additives that improve growth of animals and minimize risks from side effects on consumer health have been investigated (Wiedmer and Hadorn, 1999). Probiotics (direct-fed microbial) have been proven effective in broiler nutrition and might replace antibiotics in diet formulation (Buenrostro and Kratzer., 1983; Watkins and Kratzer, 1984; Goodling *et al.*, 1987; Baba *et al.*, 1991). This study within these researches aimed to evaluate the re-using broiler litter for many flocks and the effect of Bio-Mos supplementation as alternative of growth promoters on broiler performance.

MATERIALS & METHODS

This study was carried out at the farm of the Faculty of Agriculture, Sohag University during the period from July to August 2004. A factorial experimental design 2 x 3 was used in this study (2 litter types, 3 diet treatments with 2 replicates of each).

One hundred and eighty unsexed one day old Cobb broiler chicks were used in this study. All chicks were wing banded, weighed and randomized into treatment combinations with two replicate pens and 15 birds per pen (180 birds). The pens classified into two groups as follow:

Group 1: Six pens were prepared with new litter (wheat straw) by deep of 4-6 cm from one day old up to 42 days of age.

Group2: Six pens were prepared with old litter (re-used broiler litter for the second time) by deep of 4 - 6 cm from one day old up to 42 days of age.

Either group one or group two was classified in to three treatments as fellow: - .

- First treatment was fed the basal diet and supplemented with Bio-Mos (BM) by about 1 kg/ton from the one day old up to 42 days of age.
- Second treatment was fed the basal diet and supplemented with Linkomex (Linkomycin) as growth promoter (GP) by about 500 g/ton from the one day old up to 42 days of age.
- Third treatment three was fed the basal diet and represented as control (Con.).

Each pen was prepared with drinkers, feeder and fans to maintain adequate temperature and good ventilation. All chicks were vaccinated against the infection diseases and maintain under continuous lighting program with water and feed *ad libitum* at all time. The birds received starter diet until two weeks of age, grower diet from two to four weeks of age and finisher diet from five to the end of the experiment (Table 1).

The traits measured were body weight, mortality, feed consumption (FC), feed conversion ratio (FCR) and blood constitute. The average body weight for each treatment was determined by weighing individual birds at 0, 3 and 6 weeks of age. Feed consumption, fed conversions ratio (FCR), and mortality rate were recorded weekly and pooled from 0-3, 3-6 and 0-6 weeks of age. Feed conversion was calculated as the unit weight of feed per unit body weight.

At 6 weeks of age, blood samples were collected from brachial veins into heparinized tubes, centrifuged at 3000 rpm for 10 min to separate plasma. Plasma samples were stored at -20°C until used for determination of total protein, albumin, and glucose. Total lipid, total cholesterol, GOT, GPT were determined in serum by spectrophotometric methods using available commercial kits.

Statistical analysis was conducted using the General Linear Models procedure of base SAS® software (SAS Institute, 1997). Factors tested in analysis included litter type, diet treatments. Means were compared using Duncan's multiple range test (Duncan, 1955). Pen data of body weight, feed consumption, feed efficiency, mortality and blood constituents were analyzed by a model that included litter type and diet treatments as main effects, and their two-way interaction, the statistical model as follow:

$Y_{ijk} = M + L_i + T_j + (L \times T)_{ij} + E_{ij}$

Where M= overall mean.

L_i = the effect of $i^{\underline{th}}$ litter types and i = 1, 2 where 1= New litter, 2= old litter

T_j = the effect of $j^{\underline{th}}$ diet treatments and j=1, 2, 3 where 1= Bio-Mos supplementation, 2= growth promoters supplementation and 3= control.

$(L \times T)_{ij}$ = the interaction between litter types and diet treatments.

E_{ij} = Random error.

Analysis of variance was conducted for each parameter, and the level of significance was set at a minimum at $P < 0.05$.

RESULTS & DISCUSSION

1- Body weight and body weight gain

The effect of Bio-Mos and growth promoter on body weight and body weight gain is presented in Table 2. The use of Bio-Mos significantly increased ($P<0.001$) the average values of body weight compared to control at the age of 3 weeks by about 9%. While there were no significant differences either between Bio-Mos and growth promoter or between growth promoter and control. The corresponding trend was observed at 6 weeks of age. There were significant differences on body weight gain during the period from 0-21 and 0-42 days ($P<0.001$) between Bio-Mos, growth promoter and control. These results are in agreement with the findings of Hooge (2004) who found that broiler chicken diets containing Mos significantly improved final body weight compared to control, but gave statistical equivalent body weight compared to diet containing antibiotic. Sun (2004) found that daily body weight gain of birds fed growth promoter and Bio-Mos improved compared to birds fed control diet at 35 and 49 days of age. Hooge *et al.* (2003) concluded that MOS alone improved live performance of broiler chickens under simulated commercial conditions and demonstrated an additive effect when used in combination with the antibiotic shuttle program (BMD followed by VM in finisher).

The effect of litter type on body weight and body weight gain is presented in Table 2. It could be observed that broiler chicks on new litter significantly ($P<0.05$) improved body weight at 3 weeks and body weight gain during the period from 0-21 days of age compared to old litter. While there is no significant differences in final body weight between chicks raised on new or old litter. This may be due to improving litter materials or visual scores as mentioned by ten Doeschate and Kenyon (1999) who used scores of 0 as worst and 10 as the best, and reported that there were significantly improved with Mos diet (4.0) compared to control diet (3.0).

There was an interaction between litter types and diets (Table 2). It could be noticed that Bio-Mos supplementation with old litter improved body weight and body weight gain compared to growth promoter and control. Duncann multiple tests showed that there were significant differences between means of body weight and body weight gain for treatments. This maybe due the exact mechanism through which pathogenic bacteria are inhibited by mannose is unclear, though two theories have been presented. One being that MOS may adsorb bacteria containing type-1 fimbriae inhibiting them from binding to the carbohydrate moieties of the intestinal lining (Hooge, 2003). Or maybe due to the improvement of litter quality as a result of Bio-Mos supplementation.

The other being one of agglutination that MOS causes pathogenic cells with type-1 fimbriae to aggregate or clump, brining them out of solution (Spring *et al.*, 2000). Finucane *et al.*, (1999b) found that 80% of *Salmonella enteritidis* and 67% of *Salmonella typhimurium* freely agglutinated with MOS. It is interesting to note that adhesion appears to not o with *Clostridium* or *Helicobacter pylori*, though production improvements have been observed with the use of MOS products. They attributed to the implicate other mechanisms of intestinal modification beyond simple type-1 agglutination.

2- <u>Feed consumption (FC) and feed conversion ratio (FCR)</u>

Broiler diets containing Bio-Mos resulted in significantly improved feed conversion rates compared to control, whereas Bio-Mos and growth promoter's diets gave statistically similar values either during the period from 0-21 or 0-42 days of age (Table 3).

Feed consumed by control birds (42.71 g/bird/day) less compared to growth promoters (43.38 g/bird/day) and Bio-Mos (45.46 g/bird/day) during the period from 0-21 days of age. The corresponding values were 89, 90 and 95 g/bird/day, respectively. During the period from 0-42 days of age the total feed consumed by control, growth promoters and Bio-Mos were 65, 67, and 70 g/bird/day, respectively. Hooge (2004) reported that the water intake per bird from 0 to 14 days of age expressed as dL water/100 g feed (that is, water: feed ratio) was significantly lower for MOS-fed birds (1.91) than for negative control broilers (1.99). These finding maybe explain that Bio-Mos supplementationled to increasing feed consumption.

Cumulative feed conversion rate was numerically higher ($P<0.05$) in control birds (1.48) compared to growth promoters (1.44) and Bio-Mos (1.42) at 21 days. At 42 days FCR was significantly ($P<0.o5$) improved in Bio-Mos and growth promoter compared to control. Birds (1.91, 2.31 vs. 2.173, respectively). These results are in agreement with findings of Sun (2004) found that feed consumed by NC birds (101.2 g/bird/d) was less ($P<0.05$) compared to PC (104.0 g/d) and PG1 (104.0 g/d) birds from 15 to 28 days of age. Cumulative feed conversion rate (CFCR) was numerically higher in NC birds (1.63) compared to PG2 (1.59) at d 28. At days 35 and 49, CFCR was significantly improved in PC and PG2 birds compared to NC birds (1.76 vs. 1.73, 1.73; 2.00 vs. 1.96, 1.95, respectively). Hooge (2004) found that broiler diets containing MOS resulted in significantly improved feed conversion ratio compared to unsupplemented diets (nCON) whereas MOS and pCON diets gave statistically similar values. ten Doeschate and Kenyon ten Doeschate (1999) reported that dietary MOS improved 35-d body weight by about 1.46%, feed conversion ratio by 1.71%. Petersen and Villaldsen (2002) conducted 2 trials (36 and 38 d) with Ross broilers and demonstrated improvements in feed conversion ratio by about 4.88 and 2.42%, respectively, for MOS-fed birds relative to unsupplemented control birds.

The effect of litter type on feed consumption and feed conversion ratio are presented in Table 3. It could be noticed that birds raised on new litter consumed more than birds raised on old litter during the period from 0-21 days of age, while there were no significant differences during the period from 21-42 days of age. Supplementation either Bio-Mos or growth promoters improved FCR for the birds raised on old litter compared to control. Newman (1994) reported that the presence of dietary Mos in the intestinal tract removed pathogenic bacteria that could attach to the lumen of the intestine in this manner. This might provide a more favorable environment for nutrient utilization by birds (Savage *et al.*, 1996a). Wiedmer and Hadorn (1999) reported that no significant improvement feed conversion rate, and litter quality of Ross Hybrid chicks fed diets supplemented with either a probiotic or an antibiotic compared to a control diet up to 41 days. Petersen and Villaldsen (2002) reported that Ross broilers on new litter had improvements in feed conversion ratio by 4.88 and 2.42%, respectively, for MOS-fed birds compared to control birds.

3- Mortality rate

Overall, birds consuming control diets had greater (P<0.05) mortality (8.34 %) compared to growth promoters (6.67 %), and Bio-Mos (1.67 %) with most of the mortality occurring from d 0 to 21 (Table 4). Mortality for birds consuming Bio-Mos was also significantly (P < 0.05) improved compared to growth promoters and control during the period from 21-42 and 0 – 42 days of age. These results are in agreement with the findings of Sun (2004) who found that birds fed normal control diet had greater (P < 0.05) mortality (12%) compared to Bio-Mos (4.6%) and growth promoters (6.7 %). The improvement of mortality as a result of Bio-Mos, maybe due to the increasing of immune response according the findings of Savage *et al.*, (1996b) who reported that the immunoglobulin status of chickens has been shown to be greeter in birds receiving Bio-Mos. The MOS product is reported to have at least three probable modes of action by which broiler performance is improved: 1) adsorption of pathogenic bacteria containing type 1 fimbriae with mannose-sensitive lectins, sometimes referred to as the "receptor analog" mechanism (strongly binding to and decoying pathogens away from the "sugar coated" intestinal lining), or stated another way, different bacterial strains can agglutinate MOS (Oyofo *et al.*, 1989; Spring *et al.*, 2000); 2) improved intestinal function or "gut health" (for example: increases villi height, uniformity and integrity) (Loddi *et al.*, 2002) and 3) immune modulation simulates gut associated and systemic immunity by acting as a non-pathogenic microbial antigen, giving an adjuvant-like effect (Ferket *et al.*, 2002). Hooge (2004) reported that, broiler diets containing MOS gave significant improvement in mortality compared to normal control diets.

The effect of litter types on mortality rate are presented in Table 4. Mortality rate was significantly higher in birds raised on old liter (9.63 and 9.89 %) compared to that in birds raised on new litter (5.95 and 6.13%) during the period from 21- 42 and 0 – 42 days of age, respectively.

4 - Blood constituents:

As shown in Table (5) it could be observed that the litter types has significant effect (P<0.05) on serum levels of albumen, GOT and GPT, it was 2.624, 19.78 and 44.39 in birds raised on new litter compared to 2.216, 22.22 and 39, respectively. While it has no significant effect on Glucose, cholesterol, total protein, globulin and total lipids. These results indicate that the reusing litter during summer had not effect on liver function and oxidative stress condition.

As shown in Table (5) it could be concluded that the concentration of total protein, albumin, globulin, GPT were increased with Bio-Mos compared to growth promoter and control. Bio-Mos exceed total protein, Albumin, Globulin, and GP than control by about 21.5, 26.86, 15.6%, and 12.3 %, respectively. The corresponding vales with growth promoter were about 11.9, 13.5, 10.1 % and 5...7 %, respectively. While glucose, GOT, cholesterol and total lipids were significantly ($P<0.05$) decreased as a result of Bio-Mos supplementation by about 9.6, 22.5, 15.7 and 25.3 %, respectively, the corresponding vales with growth promoter were 6.6, 16.0, 7.7 and 21.4 %, respectively. Bio-Mos supplementation superior growth promoter increasing total protein, albumin, globulin, and GP than control. Bio-Mos decrease the stress indicators as glucose, GOT, total lipids and cholesterol. With comparing Bio-Mos and growth promoter, it can be observed that under heat stress, Bio-Mos improved liver function more than growth promoter. This improvement may be due to improving feed consumption, absorption and utilization of nutrients. Li *et al.* (2007) the birds receiving 100 mg/kg of chito-oligosaccharide (COS) had better nutrient digestibility of DM, energy, calcium, and phosphorus; higher ($P < 0.05$) concentrations of cecal *Lactobacillus*; and lower ($P < 0.05$) serum triglyceride and total cholesterol during the starter phase. The birds fed 100 mg/kg of COS had lower ($P < 0.05$) serum triglyceride, higher ($P < 0.05$) serum high-density lipoprotein cholesterol, and higher serum total protein content than birds in the other treatments. Dietary supplementation with COS appeared to improve the average daily gain of broilers by increasing the average daily feed intake and nutrient digestibility and modulating the concentrations of cecal microbial flora. Additionally, COS increased serum protein and high-density lipoprotein cholesterol and decreased serum triglyceride.

The improving stress indicators as a result of Bio-Mos supplementation may be due to increasing the immune response. Savage *et al.*, (1996b) reported that humeral immune modulation in Bio-Mos®-supplemented animals has also been noted. They added that responses include increased plasma IgG and bile IgA in turkeys. Higher maternal antibody titers in progeny of broiler breeders fed Bio-Mos®- supplemented diets (Shashidhara and Devegowda, 2003) and elevated titers to SRBC and BSA in commercial layers (Cotter *et al.*, 2000).

In conclusion, evidence shows no problem for using old litter or reused the litter for many flocks. Based on the results obtained from this experiment, it could be concluded that using Bio-Mos as alternative of the antibiotic growth promoter is the best for broiler performance and human health.

Table 1: Experimental diets composition

Ingredients	Starter			Grower			Finishers		
	1	2	3	1	2	3	1	2	3
Yellow corn	650	650	650	600	600	600	650	650	650
Soya bean	300	300	300	250	250	250	190	190	190
Broiler concentrate	100	100	100	100	100	100	100	100	100
Di-calcium phosphate	4	4	4	3.5	3.5	3.5	3	3	3
Salt	1	1	1	1	1	1	1	1	1
Oil	30	30	30	40	40	40	50	50	50
Premix	1	1	1	1	1	1	1	1	1
Lysine	1	1	1	1	1	1	1	1	1
Methionine	1	1	1	1	1	1	1	1	1
Colin Chloride	1	1	1	1	1	1	1	1	1
Anti-cocedia	1	1	1	1	1	1	1	1	1
Growth promoter	-	1	-	-	1	-	-	1	-
Bio-Mos	1	-	-	1	-	-	1	-	-

1= Bio-Mos (phosphorylated mannanoligesaccharide derived from the cell wall of certain strain of saccharomyces cerevisiae) Alltech company. 2= Linkomex (Linkomycin) pfyzer company. 3=control diet.

Table 2: Effect of litter type and Bio-Mos as alternative of antibiotic on body weight (gram) and body weight gain (gram).

Treatments		Bw 0	Bw 3	Bw 6	0-21 days	21-42 days	0-42
Litter	New	43.34^{a}	701^{a}	1434^{a}	31..36^{a}	34.78^{a}	33.11^{a}
	Old	43.32^{a}	662^{b}	1404^{a}	29..47^{b}	35.14^{a}	32.40^{a}
Std. Error			±13.58	±28.34	±0.664	±1.51	±0.69
Diets	Con.	43.53^{a}	717^{a}	1584^{a}	32.09^{a}	41.07^{a}	36.70^{a}
	BM	43.38^{a}	677^{ba}	1391^{b}	30.16^{ba}	33.93^{b}	32.09^{b}
	Linko.	43.08^{a}	650^{b}	1270^{c}	28.91^{b}	29.43^{b}	29.22^{c}
Std. Error			±16.64	±35.36	±0.79	±1.85	±0.85
New Litter	BM	43.02^{a}	738^{a}	1648^{a}	33.13^{a}	43.33^{a}	38.23^{a}
	Linko.	43.40^{a}	711^{ba}	1360^{dc}	31.81^{ba}	30.89^{b}	31.35^{dc}
	Con	43.55^{a}	652^{b}	1272^{d}	29..01^{b}	29.32^{b}	29.26^{d}
Old Litter	BM	43.13^{a}	694^{ba}	1515^{ba}	31.02^{ba}	38.64^{a}	35.05^{ba}
	Linko.	43.67^{a}	642^{b}	1423^{bc}	28.51^{b}	37.08^{ba}	32.86^{bc}
	Con	43.22	648^{b}	1268^{d}	28.82^{b}	29.54^{b}	29.18^{d}
Std. Error			23.24	50.02	1.12	2.61	1.18
Probability							
Litter		NS	*	NS	*	0.86	0.549
Diet		NS	**	***	**	0.0001	0.0001
Litter x diet		NS	NS	NS	NS	0.113	0.1332

BM = Bio-Mos, Linko = Linkomycin Con = control

A, B, C Means within a raw for each effect differ significant, based on least significant difference * $P<0.05$, **$P<0.01$, ***$P<0.001$; NS= not significant

Broiler, Bio-Mos, Growth Promoter, Mortality, Performance.

Table 3: Effect of litter type and Bio-Mos as alternative of antibiotic on feed consumption (gram/bird/day) and feed conversion ratio gram feed/ gram gain).

Treatments		0-21	21-42	0-42	0-21 days	21-42 days	0-42
Litter	New	44.89^{a}	89.17^{a}	67.03^{a}	1.44^{a}	2.64^{a}	2.05^{a}
	Old	42.81^{a}	93.81^{a}	68.31^{a}	1.46^{a}	2.70^{a}	2.11^{a}
Std. Error		±1.58	±6.89	±2.94	±0.03	±0.09	±0.05
Diets	BM	45.46^{a}	95.17^{a}	70.32^{a}	1.42^{a}	2.32^{b}	1.92^{b}
	Linko.	43.38^{a}	90.76^{a}	67.07^{a}	1.44^{a}	2.69^{ab}	2.09^{ab}
	Con	42.71^{a}	88.54^{a}	65.62^{a}	1.48^{a}	3.01^{a}	2.25^{a}
Std. Error		±1.93	±8.45	±3.60	±0.031	±0.11	±0.06
New Litter	BM	46.83^{a}	99.32^{a}	73.06^{a}	1.41^{a}	2.96^{b}	1.91^{b}
	Linko.	45.22^{a}	81.85^{a}	63.53^{a}	1.42^{a}	2.69^{ab}	2.03^{ab}
	Con	42.65^{a}	86.34^{a}	64.49^{a}	1.48^{a}	2.94^{a}	2.21^{ab}
Old Litter	BM	44.11^{a}	91.02^{a}	67.57^{a}	1.42^{a}	2.35^{b}	1.93^{b}
	Linko.	41.54^{a}	99.68^{a}	70.61^{a}	1.46^{a}	2.68^{ab}	2.14^{ab}
	Con	42.78^{a}	90.74^{a}	66.76^{a}	1.49^{a}	3.07^{a}	2.29^{a}
Std. Error		±2.74	±11.94	±5.09	±0.04	±0.15	±0.08
Probability							
Litter	NS	NS	NS	NS	NS	NS	NS
Diet	NS	NS	NS	NS	NS	0.01	0.01
Litter x diet	NS	NS	NS	NS	NS	NS	NS

BM = Bio-Mos, Linko = Linkomycin Con = control

A, B, C Means within a raw for each effect differ significant, based on least significant difference. * P<0.05, **P<0.01, ***P<0.001, NS= not significant

Table 4: Effect of litter type and Bio-Mos as alternative of antibiotic on mortality rate.

Variables	Mortality % during the periods		
	0-21	21-42	0-42
	Litter type		
New litter	4.44^{a}	5.95^{b}	6.13^{b}
Old litter	6.67^{a}	9.63^{a}	9.89^{a}
Std. Error	±1.11	±0.84	±0.97
	Diets		
Bio-Mos	1.67^{b}	3.45^{a}	3.57^{b}
Linkomycine	6.67^{a}	7.14^{b}	7.14^{b}
Control	8.34^{a}	12.78^{a}	13.32^{a}
Std. Error	±1.36	±1.05	±1.19
	Interaction		
New Litter x Bio-Mos	0.00^{b}	0.00^{c}	0.00^{c}
Linkomycine	6.67^{ab}	7.14^{b}	7.14^{b}
Control	6.67^{ab}	10.72^{ab}	11.26^{ab}
Old Litter x Bio-Mos	3.35^{ab}	6.91^{b}	7.14^{b}
Linkomycine	6.67^{ab}	7.14^{b}	7.14^{b}
Control	10.00^{a}	14.84^{a}	15.38^{a}
Std. Error	±1.92	±1.48	±1.68
	Probability		
Litter	NS	**	*
Diet	*	***	***
Litter x diet	NS	NS	NS

A, B, C Means within a raw for each effect differ significant, based on least significant difference. * P<0.05, **P<0.01, ***P<0.001, NS= not significant

Table 5: Effect of litter type and Bio-Mos as alternative of antibiotic on blood constituents.

Variables	Glucose (mg/dl)	Cholesterol (mg/dl)	Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	Total lipids (mg/dl)	GOT (u/l)	GPT (u/l)
Litter								
New	236.1^{a}	116.3^{a}	4.645^{a}	2.624^{a}	2.021^{a}	192.2^{a}	19.78^{a}	44.39^{a}
Old	244.0^{a}	123.9^{a}	4.424^{a}	2.216^{b}	2.208^{a}	214.3^{a}	22.22^{a}	39.00^{a}
Std. Error	5.74	4.45	0.241	0.108	0.217	10.75	0.884	1.968
Diets								
BM	229.5^{b}	109.9^{b}	4.958^{a}	2.706^{a}	2.252^{a}	179.9^{b}	18.67^{b}	44.17^{a}
Linko	237.1^{ab}	120.3^{ab}	4.565^{a}	2.421^{ab}	2.144^{a}	189.3^{b}	20.25^{b}	41.58^{a}
Con.	253.6^{a}	130.3^{a}	4.081^{a}	2.133^{b}	1.948^{a}	240.6^{a}	24.08^{a}	39.33^{a}
Std. Error	7.03	5.45	0.295	0.133	0.266	13.17	1.083	2.409
Interaction								
NL x BM	225.7^{a}	107.8^{b}	5.141^{a}	3.025^{a}	2.117^{a}	174.7^{b}	17.17^{c}	46.33^{a}
NL x Linko	233.0^{a}	117.0^{ab}	4.725^{a}	2.521^{ab}	2.203^{a}	178.8^{b}	19.17^{bc}	44.50^{a}
NL x Con.	249.7^{a}	124.2^{ab}	4.068^{a}	2.325^{b}	1.74^{a}	223.2^{ab}	23.00^{ab}	42.33^{a}
OL x BM	233.3^{a}	112.0^{ab}	4.773^{a}	2.386^{b}	2.386^{a}	185.2^{b}	20.17^{bc}	42.00^{a}
OL x Linko	241.2^{a}	123.5^{ab}	4.405^{a}	2.320^{b}	2.085^{a}	199.8^{b}	21.33^{abc}	38.67^{a}
OL x Con.	257.5^{a}	136.3^{a}	4.093^{a}	1.940^{b}	2.153^{a}	258.0^{a}	25.17^{a}	36.33^{a}
Std. Error			0.418	0.188	0.377	18.62	1.53	3.41
Probability								
Litter	NS	NS	NS	**	NS	NS	*	*
Diet	*	*	NS	**	NS	***	***	NS
Litter x diet	NS	NS	NS	NS	NS	NS	NS	NS

BM = Bio-Mos, Linko = Linkomycin Con = control, NL= New litter, OL= old litter.
A,B,C Means within a raw for each effect differ significant, based on least significant difference. * $P<0.05$, ** $P<0.01$, *** $P<0.001$, NS= not significant

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Broiler, Bio-Mos, Growth Promoter, Mortality, Performance.

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الملخص العربى

تأثير نوع الفرشة وإضافة البيومص كبديل للمضادات الحيوية كنشطات نمو على أداء بدارى التسمين أثناء الصيف

طلعت مصطفى الشيخ[١]، ممدوح عمر عبدالسميع[٢]، أحمد محمد على[٣]

[١] كلية الزراعة جامعة سوهاج، [٢] كلية الزراعة جامعة القاهرة، [٣] كلية الزراعة بالعريش جامعة قناة السويس

أجرى هذا البحث فى تجربة عاملية ٢ × ٣ وهى عبارة عن معاملتين فرشة وثلاثة معاملات إضافات أعلاف ولكل معاملة مكررتين. واستخدم فى هذا البحث ١٨٠ كتكوت كوب

عمر يوم. تم تربية نصف العدد على فرشة جديدة والنصف الأخر على فرشة مستخدمة وكل مجموعة تم تقسيمها عشوائيا على ثلاثة معاملات الأولى تم إضافة البيومص والثانية تم إضافة اللينكوميسين كمنشط نمو فى علائقها والثالثة عبارة عن الكنترول بدون إضافات. وكانت الصفات التى تم قياسها فى وزن الجسم والزيادة اليومية فى وزن الجسم واستهلاك العلف وكفاءة تحويل العلف ونسبة النفوق ومركبات الدم التى لها علاقة بالإجهاد الحرارى أثناء الصيف ثم حساب العائد الاقتصادى لهذه المعاملات

وكانت النتائج المتحصل عليها كما يلى:-

١- استخدام البيومص أدى الى زيادة معنوية فى وزن الجسم والزيادة اليومية فى وزن الجسم مقارنة باللنكوميسين ومجموعة الكنترول.

٢- أدت تربية بدارى التسمين على فرشة جديدة الى زيادة معنوية فى وزن الجسم عند عمر ٣ أسبوع بينما لم يكن هناك فرق معنوى فى وزن الجسم عند التسويق (٤٢ يوم) بين الطيور التى تم تربيتها على الفرشة الجديدة والفرشة المستخدمة.

٣- كان العلف المستهلك أعلى فى الطيور التى ربيت على فرشة جديدة خلال الفترة من ٠ – ٢١ يوم من العمر بينما لم يكن هناك فرق معنوى فى خلال الفترة من ٢١-٤٢ يوم. كما أدى إضافة البيومص الى زيادة الكفاءة الغذائية مقرنة بالمجموعة التى أضيف لها اللينكوميسين ومجموعة الكنترول.

٤- كانت نسبة النفوق أعلى فى مجموعة الكنترول مقارنة بكل من المجموعة المضاف إليها بيومص والمضاف إليها مضاد حيوى.

٥- أدى إضافة البيومص الى زيادة البروتين الكلى فى الدم ونسبة الالبيومين وكذلك **GPT** وأدى انخفاض الجلوكوز والكوليستيرول والليبدات الكلية فى الدم مقارنة بالمجموعتين الأخريين. ولم يكن للفرشة أى تأثير معنوى على مكونات الدم.

٦- خلصت الدراسة بأنه يمكن استخدام البيومص كمنشط نمو طبيعى وكبديل لاستخدام المضادات الحيوية

٧- إعادة استخدام الفرشة يحتاج الى مزيد من الدراسة .