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Investigations into the Addition of Herbal Methionine (Phytonin) As Substitute of Synthetic Methionine in Poultry Feeds 2-Effect of Herbal Methionine (Phytonin) Supplementation on Performance and Carcass Characteristics of Broiler Chicks

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Abstract: This study was carried out during the period from February to March, 2014 at the Animal Production center (APRP) to investigate the replacement of the herbal methionine (HM, Phytonin) for synthetic methionine (SM) on the performance and carcass characteristics of broiler chicks. A number of 112 one day old broiler chicks Arber Ackers hybrid were used in this study and divided into 4 equal groups subdivided into 4 replicates with 7 birds each. Birds were fed a basal diet supplemented with 100:0, 50:50, 25:75 and 0:100% SM:HM for a period of 6 weeks. Experimental rations were formulated to furnish the nutrient requirements in the starter and finisher period as recommended by the National Research Council (NRC, 1994). No significant difference was observed among the dietary treatments in terms of performance indices, feed intake, body weight gain and feed conversion ratio (Kg feed per Kg gain). No significant differences were observed on carcass characteristics represented by the carcass cuts; breast, thigh, drumstick and wings as well as giblets; liver, heart and gizzard. Abdominal fat was not significantly affected, which indicates that HM Phytonin can replace partially or totally SM.

Key words: Herbal methionine, synthetic methionine, feed intake, broiler chickens

INTRODUCTION

Methionine is considered as the first limiting amino acid in poultry diets. It is very essential for all vital biological functions of birds. It may donate sulphur groups, methyl groups or serve as a building block of proteins. Methionine also participates in transmethylation reaction where amino acids are metabolized to form energy. For a long period of time, the SM was been added in broilers rations formulation to meet the requirement of methionine for broiler chicks. Recently the cost of SM has been on the increase with a resultant increase in the cost of finished poultry feed. The safety of the SM supplementation in poultry diets has been questioned and its use is becoming restricted in many regions of the world, demonstrated Francis *et al*. (2012). Kies *et al*. (1975) mentioned that, if the use of DL-methionine has a tendency to raise methionine plasma levels in calves, then it stands to reason that carcasses of DL-fed broilers could easily contain traces of D-methionine. The substance poorly utilized by the human. Chattopadhyay *et al*. (2006) issued that there are other natural alternative supplements recently developed to replace SM for maintaining animal performance and well being. As the same line, an Indian company called Natural Remidies developed an HM named (Phytonin), which is a combination of plants which have similar mechanisms of action in the body as of the SM. This product is now available in Sudan with a lower price compared to the SM. Former studies on the efficiency of HM on broiler chickens were done by Chattopadhyay *et al*. (2006), Halder and Roy (2007) and Kalbande *et al*. (2009) who found that broiler chickens fed on diets supplemented with HM (Methiorep®) had similar performance in terms of body weight, weight gain and feed conversion efficiency with birds fed on DL-methionine. In contrast Itoe *et al*. (2010) supplied broilers from 0-4 week of age with SM and HM (Methiorep, were diet 1 control (without addition) and diet 2 had 0.25% SM, while diets 3-5 had graded levels of 0.25, 0.5 and 1% Methiorep respectively. They Found that HM (Methiorep) gave a significantly inferior growth performance even at 1% level compared to that obtained on the 0.25% SM supplemented diet. Most of these studies were conducted in India where the products are manufactured.

The objective of this study is to evaluate the effect of the HM Phytonin on performance and carcass characteristics of broiler chicks under Sudan condition.

MATERIALS AND METHODS

Experimental trial: An experimental trail was carried out at Animal Production Research Center (APRC). A number of 112 one day old commercial broiler chicken Arber Ackers hybrid supplied by the Arab Poultry Breeders Co. Ltd. (Omamat) were used in this study. Birds were raised in a brooder house for 7 days adaptation period and fed on prestarter diet, before they were transferred to floor cages (each 1 x 1 m) in an open sided house. Birds were divided into 4 equal groups

replicated 4 times with 7 birds per replicate per cage (4 x 4 x 7) and allocated to the experimental diets. The brooder and experimental house and equipments were carefully cleaned and disinfected prior to the arrival of birds. A deep litter 5 cm depth form wood shavings was used. Chicks were vaccinated against Newcastle, Infectious Bronchitis and Gumboro diseases according to the programme followed at the Center, where this experiment was carried. A deep litter 5 cm depth form wood shavings was used.

Four experimental broiler diets were formulated such that diet A contained only SM (100%) as the main source of methionine supplement while in diets B, C and D the SM was proportionally replaced by HM; 50:50%, 25:75 and 0:100% SM:HM. Table 1 and 2 represent the composition of the experimental rations and calculated nutrients content for the starter (2-4WK) and finisher period (4-6W), respectively. The diets were balanced to meet the nutrients requirement of broiler according to the recommendations of the National Research Council (NRC, 1994) and Arber Ackers breeders directions. Feed and water were offered *ad libitum*. Feed intake, live body weight gain and feed conversion were recorded weekly. Mortality was monitored daily and recorded when ever occurred.

Carcass characteristics determination: By the end of the experiment, a representative sample of one birds per replicate were manually killed for the determination of carcass characteristics. Then they were scalded, defeathered and eviscerated. Giblets; liver, gizzard and heart as well as abdominal fat were isolated and separately weighed. Feathers, heads, shanks and internal viscera were removed and condemned. The eviscerated carcasses were gently washed and weighed (hot carcass weight), then chilled in iced and salted water and kept in deep freezer under -18°C at the Center. The dissection was carried out for the cold carcass, whereby breast, thigh, drumstick and wings were carefully cut. Their proportions to live body weight were recorded.

Data statistical analysis: StatSoft (2001). Statistica (data analysis software system), version 6. Was used. Data obtained were subjected to one way analysis of variance to detect significant treatment differences. The means were separated using the Duncans New Multiple Range Test (DNMRT) (Duncans, 1955).

RESULTS AND DISCUSSION

Data collected was tabulated, statistically analyzed and recorded. The following tables carry the results followed by discussions.

Table 3 shows the effect of the methionine source on feed intake. This result showed no significant difference ($p \leq 0.05$) between the different groups in their feed intake through the whole experimental period, however, group B (50%SM+50%HM) displayed the highest feed intake in the 3rd week of age compared to other groups. The weekly live body weight gain results presented in Table 4 and showed no statistical difference ($p \leq 0.05$) between the studied groups. In exception to the results of weight gain in the 3rd week was higher by group B (50%SM+50%HM) than the other experimental groups, but not significantly different from that of the groups A and D. This difference was not significant among the other weeks of the experiment. Feed conversion ratio (FCR) was significantly similar ($p \leq 0.05$) among the tested groups throughout the different experimental

Table 1: Experimental broiler starter rations composition (%) (1-4 wk)

Raw material/treatment	A	B	C	D
SM:HM	100%:O	50:50%	25:75%	0:100%
Sorghum	68.8	68.8	68.8	68.8
Groundnut cake	25	25	25	25
broiler concentrate 5%*	5	5	5	5
Lime stone	0.5	0.5	0.5	0.5
Salt	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15
Zeatox (Antimycotoxine)	0.2	0.2	0.2	0.2
Dl methionine	0.2	0.1	0.05	0
Herbal methionine (Phytonin)	0	0.1	0.15	0.2
Total	100	100	100	100
Calculated nutrient composition				
Protein (%)	23	23	23	23
ME, Kcal/ kg	2992	2992	2992	2992
Calcium (%)	0.96	0.96	0.96	0.96
Phosphorus (%)	0.55	0.55	0.55	0.55
Lysine (%)	1.23	1.23	1.23	1.23
Methionine (%)	0.59	0.59	0.59	0.59

Broiler concentrate* (Intraco) = 2300 Kcal/kg, 4% EE, 7% CF, 6% Ca, 4% Ph, 11% Lys and 3% Me

Table 2: Experimental broiler finisher rations composition (%) (4-6th wk)

Raw material/treatment	A	B	C	D
SM:HM	100%:O	50:50%	25:75%	0:100%
Sorghum	75	75	75	75
Groundnut cake	19	19	19	19
broiler concentrate 5%*	5	5	5	5
Lime stone	0.8	0.8	0.8	0.8
Salt	0.2	0.2	0.2	0.2
Lysine	0.15	0.15	0.15	0.15
Zeatox (Antimycotoxin)	0.1	0.1	0.1	0.1
Dl methionine	0.2	0.1	0.05	0
Herbal methionine, (Phytonin)	0	0.1	0.15	0.2
Total	100	100	100	100
Calculated nutrient composition				
Protein (%)	20.7	20.7	20.7	20.7
ME (Kcal/kg)	3026	3026	3026	3026
Calcium (%)	1	1	1	1
Phosphorus (%)	0.54	0.54	0.54	0.54
Lysine (%)	0.92	0.92	0.92	0.92
Methionine (%)	0.57	0.57	0.57	0.57

Broiler concentrate* (Intraco) = 2300 Kcal/kg, 4% EE, 7% CF, 6% Ca, 4% Ph, 11% Lys and 3% Me

Table 3: Effect of HM (Phytonin) on feed intake g/bird/week, Mean ± SD

Treatment/week	2	3	4	5	6
A (100%SM)	198±18	368±34^{b}	535±54	746±13	792±7
B (50%SM+50%HM)	204±7	432±14^{a}	549±9	761±32	775±71
C (25%SM+75%HM)	179±17	363±20^{b}	514±46	680±46	721±53
D (100%HM)	179±14	363±56^{b}	506±17	681±25	750±40
LS	NS	**	NS	NS	NS

SD: Standard deviation, NS: Not Significant (p>0.05), LS: Level of significance

Table 4: effect of HM (Phytonin) on live body weight gain g/bird/week, Mean ± SD

Treat./week	2	3	4	5	6
A (100%SM)	102±15	243±22^{ab}	324±61	375±39	315±7
B (50%SM+50%HM)	107±5	259±7^{a}	312±21	423±21	307±40
C (25%SM+75%HM)	86±18	227±16^{c}	324±45	381±30	314±32
D (100%HM)	99±10	237±17^{ab}	292±13	355±60	312±39
LS	NS	**	NS	NS	NS

SD: Standard deviation, NS: Not Significant (p>0.05), LS: Level of significance

weeks (Table 5). The difference found by feed intake and weight gain in the 3rd week of age (Table 3 and 4) is not observed in case of FCR (Table 5) because the birds consumed much feed (Group B (50%SM+50%HM) gained the highest body weight. The reasons for the high feed intake by group are not clear. The results of the effect HM on the broilers performance parameters during the whole period (2-6 weeks of age) was summarized in Table 6 showed no significant difference ($p \leq 0.05$) among the dietary treatments in terms of body weight gain and FCR.

The present results indicate that, 50% SM+50% HM (Phytonin) (1 kg SM+1 kg HM/Tonne feed) group gave the best Kg performance results, however, consumed high feed amount. The performance of the groups fed 100% SM or 100% HM Phytonin (2 kg/tonne feed each) was similar. These results are in consensus with the findings of Kalbande *et al*. (2009) who offered 1 kg HM (Methiorep®) and 1kg SM /tonne of commercial broiler diets from 0-42 day and observed that HM can replace SM very efficiently when used at the rate 1 g/kg diet. Chattopadhyay *et al*. (2006) used a different levels of methionine control, control plus 10 g SM/kg diet; control plus 10 g HM and 15 g HM (Herbomethion®)/kg broiler feed and observed that, the body weight and body weight gain of the broilers fed the 15 g HM/kg diet were heavier than the other groups. This difference can be explained by the high level of HM (15 kg/tonne feed) and the type of HM (Herbomethion®), on the other hand this level will be more expensive to farmers compared to others.

The finding of this study were also similar to those of Halder and Roy (2007) who fed broiler chickens on diets supplemented with HM and found similar performance in terms of body weight and weight gain and feed conversion efficiency with those birds fed on SM. However, the current results disagree with Itoe *et al*. (2010) who showed that birds fed the methionine supplemented diet performed significantly ($p \leq 0.05$) better than other birds fed diet supplemented with HM

Table 5: Effect of HM (Phytonin) on FCR (g feed/g gain), Mean ± SD

Treatment/weeks	2	3	4	5	6
A (100%SM)	2.0±0.2	1.5±0.1	1.7±0.3	2.0±0.3	2.5±0.1
B (50%SM+50%HM)	1.9±0.1	1.7±0.1	1.8±0.1	1.8±0.0	2.5±0.2
C 0(25%SM+75%HM)	2.1±0.3	1.6±0.0	1.6±0.3	1.8±0.1	2.3±0.1
D (100%HM	1.8±0.1	1.5±0.2	1.7±0.1	2.0±0.3	2.4±0.2
LS	NS	NS	NS	NS	NS

SD: Standard deviation, NS: Not Significant (p>0.05), LS: Level of significance

Table 6: Performance of broiler chicks (1-6 wk of age) fed on SM and HM (Phytonin)

Treatment	A	B	C	D	
Parameters/ SM:HM	100:0%	50:50%	25:75%	100:0%	LS
Initial body weight, g/bird	124±4.8	124±4.4	124±4.3	124±3.4	NS
Final body weight, g/bird	1491±55	1532±75	1456±78	1417±50	NS
Body weight gain, g/bird	1367±60	1408±72	1333±79	1295±50	NS
Feed intake, g/bird	2639±102^{ab}	2720±209^{a}	2457±107^{bc}	2479±67^{bc}	*
Feed conversion ratio	1.9±0.03	1.9±0.02	1.9±0.04	1.9±0.07	NS

^{abc}: Means with different superscript on the same row differ significantly ($p \leq 0.05$)
NS: Not Significant (p>0.05); *: Significant at $p \leq 0.05$; LS: Level of Significance

Table 7: Effect of HM, Phytonin on carcass cuts as (%) of body live weight

	A	B	C	D	
Cut/treatment	100%SM	50%SM+50%HM	25%SM+75%HM	100%HM	LS
Breast (%)	27.3±3.3	22.5±0.5	22.0±5	22.5±0.5	NS
Thigh (%)	12.4±2.4	11.9±2.4	12.0±2.4	11.9±1.5	NS
Drumstick (%)	11.5±1.9	12.0+2.5	10.3±0.6	12.0±2.5	NS
Wings (%)	9.0±1.3	7.8±1.1	8.6±0.5	7.8±1.1	NS
LS: Significance level		NS: Not significant			

Table 8: Effect of HM, Phytonin on the edible organs (giblets) and abdominal fat

	A	B	C	D	
Organ/treatment	100%SM	50%SM+50%HM	25%SM+75%HM	100%HM	LS
Liver (g)	41±12.8	49±9.1	42±4.2	38±12.3	NS
Gizzard (g)	23±4.0	22±2.8	21±1.4	23±4.0	NS
Heart (g)	8.8±1.7	8.8±0.5	8.3±1.0	8.1±0.6	NS
Abdominal fat (g)	17±5.9	25±6.2	19±6.1	17±2.8	NS
LS: Level of significance		NS: Not significant			

(Methiorep) in body weights, weight gains, feed intake, feed to gain. This may be because they used different type of HM in starter period (0-4 wk) only and the conditions of the studies were different.

It was observed in this study that, neither SM nor HM supplementation had effect on broiler mortality. This result agrees with the findings of Chattopadhyay *et al.* (2006).

Effect of HM, Phytonin on carcass characteristics: The results of the effect of HM, Phytonin on carcass characteristics was presented in the following tables followed by the discussions.

Table 7 showed no significant differences ($p \leq 0.05$) on the carcass cuts; breast, thigh, drumsticks or wings% of the corresponding live body weight among the different groups. The 100% SM (group A) showed (not significantly) the biggest breast% of live weight compared to other groups. Wang *et al.* (2004) found a marked and significant response to methionine supplementation (1.2 g DL-methionine/kg) in breast yield in ducks. Table 8 reveal no significant differences ($p \leq 0.05$) between the giblet weights; liver, heart, gizzard and the weights abdominal fat of the different groups. Wang *et al.* (2004) agreed that, the effect of methionine supplementation in meat ducks feed was not significant on abdominal fat The present results also indicated that, the abdominal fat and liver weights decreased (not significantly) with the increase of HM in the diet; 38, 42 and 49 g liver/bird and 25, 19 and 17 g/bird abdominal fat for the group fed 50, 75 and 100% HM/kg broiler feed, respectively (Table 8). This result agreed with Chattopadhyay *et al.* (2006) who found abdominal fat (%) and liver lipid (g/kg) was significantly decreased by the addition of 15 g HM/kg diet compared to 10 g HM/kg. The biggest weights of liver and abdominal fat by the group (50%SM: 50%HM) could be attributed to highest feed and energy consumption of this group, which was stored or in form of fat in liver and abdomen, when it became more that required for growth and maintenance of the broilers.

Conclusion: From these results it can be concluded that, the HM (Phytonin) can totally or partially substitute the SM in broiler feed without adverse effect on broiler performance and carcass characteristics.

Referring to finding of this study on (Phytonin) as a methionine replacer in layers diets. It can be advocated that (Phytonin) can be used as methionine replacement for both layers and broilers without adverse effect on production or quality.

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