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## Research Article

# Effects of Alpha-tocopherol and Medicinal Plants Seeds Powders on Broiler Performance

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## Abstract

**Background and Objectives:** Growth promoters possess great interest in poultry feeds including vitamins, medicinal plants, enzymes and antibiotics where play an active role in production of poultry. This study aimed to evaluate the effects of dietary inclusion of alpha-tocopherol and medicinal plants seeds powder Black Seeds (BS), Fenugreek (FENS), *Moringa* (MORS), *Clitoria* (CLIS), Sun flower (SFS) on broiler performance. **Materials and Methods:** During the finisher period, one hundred and 5, 1 day old male broiler chicks (Ross 308) were allocated into seven treatments. In a completely randomized design, the experimental treatments consisted: Negative control (without additives), 200 g kg<sup>-1</sup> alpha-tocopherol (positive control) and tested seeds powder in 5% level of inclusion. Each treatment was replicated three times with 5 birds each. The experimental diets were formulated to be iso-energetic and iso-nitrogenous to meet the broiler requirements. Overall Daily Feed Intake (ADFI), Average Daily Gain (ADG) and Feed Conversion Ratio (FCR) were recorded. Three birds from each treatment were slaughtered. Then carcass percentage and relative weights of internal organs were determined. **Results:** The results showed that ADFI, ADG and FCR were significantly influenced by experimental treatments. The best FCR was recorded with BS treatment. The relative weights of internal organs were significantly influenced by experimental treatments. **Conclusion:** Based on results, it can be concluded that the average daily feed intake increased by the incorporation of SFS and CLIS where it was decreased by BS, MORS, FENS and Vit E inclusion. The best FCR was recorded with BS treatment which could be recommended to be included in broilers rations.

**Key words:** Alpha-tocopherol, medicinal plants, broiler performance, black seeds treatment, feed conversion ratio, poultry meat, feed efficiency

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

During the last few decades, the consumption of poultry meat has increased tremendously and also the current forecast and projection studies point out that poultry market will be keep growing in future<sup>1</sup>.

Fresh chicken meat and chicken products are universally popular the important reason for the success of poultry meat production is the healthy and nutritional image of poultry products<sup>2</sup>. To improve the weight gain of poultry and to prolonging the shelf life of poultry meat herbs and spices can be used when discussing the use of herbs and spices as feed additives, researchers can hardly rely only on old believes about health impact of certain herbs and spices or their active components. To justify the usage of herbs and spices we need a scientific proof of their beneficial effect on health and performance of the animals. Many seeds were classified as medicinal plants seeds such as; black seeds<sup>3</sup>, *Clitoria* Linn<sup>4</sup>. Fenugreek<sup>5</sup>, *Moringa*<sup>6</sup> and Sun flowers<sup>7</sup>.

Using the black cumin *Nigella sativa* seeds in the broilers diets improve the weight gain, because of its role in inhibition of growth of intestinal bacteria<sup>8</sup>, however, it was observed that there was no difference ( $p>0.05$ ) between the average dressing percentages, heart, gizzard, liver and spleen of broilers fed diets with or without supplementation of black seeds meal. El-Ghammry *et al.*<sup>9</sup> also found that broiler chicks fed rations contain low levels (0.2 and 0.4%) of crushed black cumin seeds revealed significant decrease in dressing percentage, but significant ( $p<0.05$ ) differences was found among breast meat, drumstick meat, abdominal fat and skin, which was agreed<sup>10-12</sup> that the addition of 40 g kg<sup>-1</sup> black cumin to broiler ration resulted in increased weight of thigh and breast meat. It was contradictory to Durrani *et al.*<sup>11</sup> who noticed that birds fed on rations supplemented with black cumin revealed no significant ( $p>0.05$ ) effect on abdominal fat.

*Clitoria ternatea* is known as reputed drug of Ayurveda and reported as a brain tonic, nerve tonic and laxative, from ancient times "Shankhpushpi"<sup>13</sup>. Extracts of this plant have been used as an ingredient in Medhya-Rasayana, a rejuvenating recipe used for treatment of neurological disorders<sup>4</sup>. *Clitoria ternatea* has long traditional use of laxative, diuretic, anthelmintic, inflammation, pain, ulcer, fever and tonic to the brain. *Clitoria ternatea* has scientifically studied for various pharmacological activities like; anti-inflammatory, antipyretic, analgesic, larvicidal, insecticidal, antimicrobial, anxiolytic, antidepressant, tranquilizing and sedative<sup>14</sup>.

Use of Fenugreek seeds *Trigonella foenum-graecum* Linn. in broiler chicken diets increase the performances<sup>15</sup>. However, Duru *et al.*<sup>16</sup> reported that use of Fenugreek seed decreased

body weight at day 42 compared to control. Adil *et al.*<sup>17</sup> reported that supplementation of Fenugreek had a role in improving the performance of poultry birds by their antibacterial activity and positive effect on gut morphology.

Abbas and Ahmed<sup>18</sup> studied the effect of by using *Moringa* seeds meal on broiler's performance who found that addition of *Moringa oleifera* undecorticated seeds powder (MOUSP) to broiler chicks diet significantly ( $p<0.05$ ) lowered weight gain, feed efficiency and body weight during starter period. During finisher and whole periods supplying broiler chicks diet with (MOUSP) resulted in significant ( $p<0.05$ ) increase in feed consumption, also addition of different levels of MOUSP had no significant ( $p>0.05$ ) effects on weight gain, feed efficiency, final live body weight, dressing percentage, liver weight and heart weight. Olugbemi *et al.*<sup>19</sup> reported that a reduction in performance was observed with increasing inclusion level of *Moringa oleifera* leaf meal beyond 5%.

Salari *et al.*<sup>20</sup> evaluated the use of various levels of full-fat Sun flower *Helianthus annuus* L. seeds on broiler performance included in a basal diet reported that weight gain, feed intake and Feed Conversion Ratio (FCR) were improved ( $p<0.05$ ) when broilers were fed various levels of full-fat sunflower seeds in the starter and finisher diets, gastrointestinal tract and gizzard weight percentages were not affected by dietary treatments, however, liver weight percentage was decreased significantly ( $p<0.05$ ) and weight of abdominal fat decreased, but this effect was not significant. Full-fat sunflower seeds can be used at up to 21% in broiler diets without adverse effects on performance or other parameters of chickens. However, in another experiment, liver weight improved, while metabolizable energy intake increased in the diets<sup>21</sup>.

Malayoglu *et al.*<sup>22</sup> reported that supplementation of vitamin E at 200 mg to broiler diets significantly increased body weight gain, but did not affect Feed Conversion Ratio (FCR), mortality, carcass characteristics or organ weights, with an exception of spleen weight. Swain and Johri<sup>23</sup> reported that vitamin E supplementation at levels of 150 and 300 IU kg<sup>-1</sup> resulted in significant increases in body weight gain and feed conversion ratio compared with the control diet (no VE supplementation) at 42nd day broiler chickens under normal conditions. Guo *et al.*<sup>24</sup> also showed that addition of vitamin E (100 mg kg<sup>-1</sup>) improved ( $p<0.05$ ) the growth and feed conversion ratio of broilers compared to those fed the control diet (without vitamin E).

In the recent years, the use of additives from natural origin in animal nutrition has been encouraged. Herbs and spices bioactive substances could act as growth promoters which influencing the gastrointestinal ecosystem by inhibition

pathogenic micro-organisms and enhancement of enzymatic secretion. Consequently, the broiler performance will be improved by incorporation of herbs and/or spices.

## MATERIALS AND METHODS

**Experiment site:** The performance experiment was carried out at Elbashair farm at Elshukaba area, 10 km south Wad Medani city. The experiment started on the 23rd of September through the 22nd of October, 2012. The rest of the experiment was done at Food Technology Laboratory at Faculty of Engineering and Technology, University of Gezira, Sudan.

**Data collection:** The chicken were weighed and distributed to experimental pen. The live weight of the birds in each replicate was recorded the body gain for each replicate was calculated by subtraction the initial weight of the replicate from the final weight. The weekly Feed Conversion Ratio (FCR) for each group was calculated by division the total feed consumption of birds in the week by the overall body weight gain of birds in the week. Three birds from treatment were slaughtered then carcass weight percentage, abdominal fat pad percentage and internal organs related to live weight of the broiler chickens were calculated by division carcass weight, abdominal fat pad weight and internal organs weight by the live body weight of the chickens.

**Birds housing and managements:** Twenty one pens with (1×1.5×1) dimension were used. These pens were constructed using steel post and wire netting that has a mesh size of 1.25 cm. Each pen was provided with a plastic round fountain drinker and a metal round feeder. One hundred and five one day old male broiler chicks (Ross 308) strain

were selected from a commercial broiler flock in the farm. The birds were weighed and divided into a control group and 6 experimental groups, each group was subdivided into three groups with 5 chicks each (3 replicates) in a Completely Randomized Design (CRD).

**Experimental diets:** The birds were fed a pre-starter diet during the 1st week of age and then they received a normal balanced starter diet (24% crude protein and 3100 kcal Metabolizable Energy (ME)/kg) during the next 3 weeks. Then a finisher rations were offered during the last 3 weeks. The control, feed based on iso-nitrogenous iso-caloric ration and the experimental groups were fed a diet as same as the control diet supplemented with FENS, BS, MORS, CLIS and SFS at 5% of the ration and Vitamin E tablets at 200 mg kg<sup>-1</sup> the ration as shown Table 1.

**Statistical analysis:** The data was analyzed by using MSTAT program.

## RESULTS

**Birds performance:** Table 2 showed the Average Daily Feed Intake (ADFI), Average Daily Gain (ADG) and overall Feed Conversion Ratio (FCR) for different treatments.

There was a significant difference among the treatments in Average Daily Feed Intake (ADFI). The birds received SES recorded the highest ADFI, while the group received MORS recorded the lowest value. The birds groups received SFS and CLIS showed an increase in ADFI, while those chicken groups received BS, MORS, FENS and Vitamin E decreased ADFI when compared with control group. The Table 2 also showed that there were significant differences among the treatments in

Table 1: Ingredients percentage per treatment

Ingredients (%)	Treatments						
	FENS	BS	CLIS	MORS	SFS	Vitamin E	Control
Sorghum	68.88	68.88	66.38	66.38	60.38	66.38	68.88
Ground nuts meal	14	5.8	5.8	5.8	5.8	5.8	14
Meat meal	5	6	6.5	6.5	6.5	6.5	5
Wait bran	5.8	8	10	10	16	10	5.8
Super concentrate	5	5	5	5	5	5	5
Di calcium	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Sodium chloride	0.3	0.3	0.3	0.3	0.3	0.3	0.3
<b>Expected nutritional value after ration formulation</b>							
Lysine (%)	1.17	1.07	1.15	1.09	1.15	1.14	1.17
Methionine (%)	0.47	0.45	0.48	0.46	0.48	0.49	0.47
Meth+Cys (%)	0.66	0.62	0.74	0.64	0.66	0.74	0.66

FENS: Fenugreek, BS: Black seeds, CLIS: *Clitoria*, MORS: *Moringa*, SFS: Sun flowers

Table 2: Birds performance as affected by the use of different tested seeds

Parameters	Average Daily Feed intake (ADFI) (g/bird/day)	Average Daily Gain (ADG) (g/bird/day)	Overall Feed Conversion Ratio (FCR) (g:g)
BS	64.60 <sup>e</sup>	32.43 <sup>ab</sup>	1.99 <sup>c</sup>
MORS	44.30 <sup>e</sup>	19.7 <sup>d</sup>	3.27 <sup>a</sup>
FENS	70.77 <sup>cd</sup>	25.76 <sup>c</sup>	2.75 <sup>b</sup>
SFS	77.67 <sup>a</sup>	35.5 <sup>a</sup>	2.18 <sup>c</sup>
CLIS	74.43 <sup>b</sup>	27.3 <sup>bc</sup>	2.72 <sup>b</sup>
Vitamin E	69.03 <sup>d</sup>	34.36 <sup>a</sup>	2.01 <sup>c</sup>
Control	73.40 <sup>bc</sup>	35.76 <sup>a</sup>	2.05 <sup>c</sup>
SE±	00.23	0.4	0.11
CV (%)	10.70	7.99	7.73

Means having similar letter in rows or columns have no significant differences between them at  $p \leq 0.05$ , FENS: Fenugreek, BS: Black seeds, CLIS: *Clitoria*, MORS: *Moringa*, SFS: Sun flowers

Table 3: Effects of medicinal plant seeds on relative weight of broilers carcass and internal organs

Parameters	Treatments								
	BS	SFS	CLIS	MORS	FENS	Vitamin E	Control	SE±	CV (%)
Dressing percentage	66.86 <sup>b</sup>	68.94 <sup>ab</sup>	66.27 <sup>b</sup>	62.53 <sup>b</sup>	62.77 <sup>b</sup>	74.65 <sup>a</sup>	66.04 <sup>b</sup>	1.00	40.27
Proventriculus	0.390	00.34	00.38	00.5	00.53	00.37	00.34	0.03	28.72
Gizzard	2.470 <sup>bc</sup>	10.81 <sup>c</sup>	30.40 <sup>a</sup>	30.40 <sup>a</sup>	20.44 <sup>ab</sup>	20.79 <sup>bc</sup>	10.85 <sup>c</sup>	0.12	10.35
Pancreas	0.260	00.16	00.24	00.22	00.3	00.18	00.17	0.02	31.60
Liver	1.570 <sup>bc</sup>	10.52 <sup>bc</sup>	10.57 <sup>bc</sup>	10.98 <sup>a</sup>	10.72 <sup>abc</sup>	10.87 <sup>ab</sup>	10.40 <sup>c</sup>	0.06	11.81
Intestine	4.810 <sup>ab</sup>	30.87 <sup>b</sup>	50.25 <sup>ab</sup>	70.36 <sup>a</sup>	60.98 <sup>a</sup>	30.97 <sup>b</sup>	40.26 <sup>b</sup>	0.35	19.58
Spleen	0.140 <sup>ab</sup>	00.13 <sup>b</sup>	00.11 <sup>b</sup>	00.22 <sup>a</sup>	00.15 <sup>ab</sup>	00.12 <sup>b</sup>	00.13 <sup>b</sup>	0.01	22.20
Abdominal Fat Pad	1.700	10.13	10.23	10.14	00.96	10.03	10.57	0.08	24.24

Means having similar letter in rows or columns have no significant differences between them at  $p \leq 0.05$ , FENS: Fenugreek, BS: Black seeds, CLIS: *Clitoria*, MORS: *Moringa*, SFS: Sun flowers

ADG. The control had the highest ADG, while chicken group received MORS recorded the lowest value. The different seeds lead to a reduction in ADG at different level compared to the control. The overall Feed Conversion Ratio (FCR) as seen in the table was significantly differ, the chicken group received BS had the best FCR, while chicken group received MORS had the lowest FCR. The chicken group received BS and Vitamin E had the best FCR compared with the control. However, FCR deteriorated when the birds fed with MORS, FENS, SFS and CLIS that maybe due to the high levels of antinutritional in this seeds.

**Dressing percentage:** Table 3 shows that there was a significant difference ( $p < 0.05$ ) in the Dressing Percentage (DP) among the different seeds supplements. The Vitamin E inclusion had the highest dressing percentage, while the MORS and FENS inclusion had the lowest dressing percentage. Table 3 showed that some internal organs were affected significantly ( $p < 0.05$ ) by the different treatments, among which were the gizzard, liver and intestine, while other were not affected significantly ( $p < 0.05$ ) among which were the liver, proventriculus, pancreas and abdominal fat pad. The results showed there was a significant difference in the internal organs by the inclusion of different seeds in the bird's rations.

## DISCUSSION

As shown in Table 2, finding are in agreement with previous report by Abu-Dieyeh and Abu-Darwish<sup>25</sup> that dietary supplementation with BS had shown positive effects on broiler performance. The result disagreed with many previous findings<sup>26-28</sup> that addition of BS to the diet significantly decreased body weight of the chickens that maybe due to the level of BS addition to the diet.

Also, the results were in agreement with the studies reveled that Fenugreek seeds gave insignificant effect on ADFI compared to the control<sup>29</sup>, decreased body weight<sup>16</sup>. While, the results were contradicted with authors reported that adding FENS to broiler diet resulted in increased body weight<sup>30</sup> had significant effect live body weight, ADG, FCR and ADFI<sup>31</sup>. These discrepancies maybe due to the level of Fenugreek seeds to the diet.

The result was in agreement with Abbas and Ahmed<sup>18</sup>, who conducted an experiment to study the effect of incorporation of MORS undecorticated seed powder (MOUSP) in the broiler's diets (0, 0.37, 0.75 and 1.5%), performance and carcass characteristics. The authors observed that the use of 1.5% MOUSP significantly ( $p < 0.05$ ) reduced the weight gain, body weight and feed efficiency. During the finisher period, incorporation of MOUSP affect ADG, final live body weight, FCR, DP, liver and heart weights.

The result was in agreement with De Araujo *et al.*<sup>32</sup>, who reported that increasing dietary inclusion of SFS meal with enzyme blend supplementation reduced ADG and deteriorated FCR. It concluded that the inclusion of sunflower meal (0, 8, 16 and 24%) in broiler diets negatively influenced performance and carcass parameters. The results were in agreement with the recent finding which revealed that Vit E inclusion had no effect on the growth performance<sup>33</sup>, while the results were in disagreed with many authors who reported that Vit E supplementation improved body weight gain and FCR<sup>23,24</sup>.

No improvements has been reported in carcass characteristics when MORS were included<sup>34</sup>. Similar results were reported in the current study. However, contradiction was observed with David *et al.*<sup>35</sup>, who reported that dietary MORS powder increased the DP. That maybe due to the variation in level of MORS in rations of birds.

The results were disagreed with the authors reported no significant effects of dietary BS were observed on the edible inner organs of broiler chicks<sup>29</sup>, gizzard percentage<sup>36</sup>. The variation maybe due to the differences between black seeds origin and level used in the experiments. The result in agreement with the report that gastrointestinal tract and gizzard weight percentages were not affected by dietary Sun flower seeds supplement<sup>20</sup>.

Table 3 showed that significant increase in liver relative weight when BS included in the diet which in the line with the previous report by Erenner *et al.*<sup>29</sup> and Abbas and Ahmed<sup>36</sup>, however, the results disagreed with finding that of BS had no significant effect on liver percentage and it concluded that addition of whole crushed *Nigella sativa* seeds to the broiler chicks diet produces adverse effects on the performance and carcass quality<sup>11,29</sup>. The contradiction of the present results with the previous studies may be due to the different doses, species and breed of the birds and/or the age of the birds. Also, the results were contradicted with the observation, that dietary full fat SFS affected the liver weight percentage<sup>20</sup>. Also, the results disagreed with the report that MORS meal supplementation had no effect ( $p > 0.05$ ) on liver weight of female (Ross 308) broiler chickens<sup>37</sup>.

The results were in agreement with the previous study who reported that dietary black seed, *Nigella sativa* increased the relative weight of caecum ( $p < 0.05$ )<sup>36</sup>, that maybe due to the variety and level of seeds used in the studies. The results were in agreement with the report that dietary Fenugreek linearly increased the relative length of the small intestine<sup>38</sup>.

The results were contradicted with previous study who found that dietary supplementation of vitamin E and selenium did not affect the relative weight of some organs such as;

spleen and liver<sup>23</sup> that maybe due to the variation in age of birds and level of vitamin E in the study. The study recommended that inclusion of medicinal plants seeds and Vitamin E in broilers for their positive effects on overall performance of birds and inner edible organs.

## CONCLUSION

Based on the results of the study it can be concluded that the average daily feed intake increased by the addition of SFS, where as CLIS and decreased by BS, MORS, FNS and Vit E inclusion. The best FCR recorded with treatment of BS which recommends including in broilers diets by 5%.

## SIGNIFICANCE STATEMENT

This study discovers the possible synergistic effect of *Moringa*, Fenugreek, Black seeds and Vitamin E inclusion in broiler ration decrease feed intake. This study will help the researcher to uncover the critical area of feed consumption that many researchers were not able to explore. Thus, a new theory on these medicinal plant seeds inclusion in broiler rations and other inclusion maybe arrived.

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