CITRULLUS COLOCYNTHIS (HANDAL) SEED MEAL AS A NATURAL FEED SUPPLEMENTATION IN BROILER CHICKENS’ DIETS

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ABSTRACT: An experiment was carried out to study the effect of Citrullus colocynthis seeds meal (CCSM) as a natural feed additive on performance of broiler chickens. Three treatments were carried out using three levels of CCSM (0%, 2%, and 4%). A total of 270 males, day old chicks (Cobb strain), were randomly allocated to three treatments with three replicates. All groups were fed ad libitum from one day old to 49 days of age. Data were analyzed according to the completely randomized design and Duncan’s multiple range test was used for means comparison. Feed intake was reduced and feed conversion ratio (FCR) was significantly impaired (P≤0.05) as CCSM dietary level was increased. Live body weight, carcass weight, and dressing percentages increased significantly (P≤0.05) increasing CCSM dietary levels. The gastrointestinal tract organs recorded different responses to CCSM inclusion, as the small intestine, the liver and the abdominal fat pad (AFP) weights were reduced significantly (P≤0.01) as the level of CCSM was increased. The gizzard and the heart weights were insignificantly (P>0.05) affected. Results obtained revealed that CCSM can be added to broiler's diets up to 4% without adverse effects.

INTRODUCTION

The poultry nutritionists have many endeavors to find ways and means of reducing the dietary costs through supplementation of poultry feed by conventional feed ingredients. Recently efforts had been directed towards the use of non-conventional feeds as alternative ingredients. Also in recent years, local materials were used as additives in poultry feed to overcome major problems in poultry industry, like environmental effects on digestibility and feed utilization. The colocynthis or C. colocynthis is one of these ingredients. C. colocynthis (L.) Schrad is a fruit commonly known as bitter apple or bitter cucumber, found in Sudan, Iran and India and in the deserts (Trease and Evans, 1970). The dried pulp of C. colocynthis has been used for constipation, edema, bacterial infections, cancer and diabetes (Al-Ghaithi, and El-Ridi, 2004). C. colocynthis (Cucurbitaceae), is prevalent in Najd, Hijaz, Eastern and Northern regions of Saudi Arabia and being used in folk medicine by people in rural areas as a purgative, anti-rheumatic, anti-helmintic, and as a remedy for skin infection (Ageel et al., 1987). It had been reported that medicinal plants can be used as growth promoters, due to the presence of active components in their leaves or seeds such as C. colocynthis and Nigella sativa (Al Jassir, 1992).

The essential amino acid contents of the seed protein were adequate (FAO – WHO, 1973). The bitter substances are mainly colocynthin and colocynthetin
(James and Duke, 1983). Lysine which is a limiting essential amino acid has a chemical score of 65% of the total protein. The seeds in particular are rich in methionine and cystine (5.5% of the protein). The seeds are bitter in taste and rich in fat and protein and can be eaten as a whole or used as an oil seed (Sawaya et al., 1983). The plant contains substances that are toxic when used in large amounts, but they may be useful for medicinal purposes if used in low concentrations. The protein digestibility in vitro was 75.9%, compared with casein which was 95.0% (Sawaya et al., 1986). They added that chickens grew normally with up to 15% whole C. colocynthis seeds in the diet, but with 15% unprocessed meal, growth and feed efficiency decreased. Chaudhary et al. (1989) found that C. colocynthis seed meal fed to 12 day old male commercial hybrid chickens for 6 weeks, up to 10% reduced growth.

Defatted melon seed and fluted pumpkin seed have protein contents of 66.20% and 66.54%, respectively, with an excellent pattern of amino acids, containing higher levels of most essential amino acids (except lysine) than soya bean meal (Nwokolo and Sim, 1987). Amino acid availability is high (melon seed 95.30%, pumpkin seed 93.12%) and similar to the level in soya bean meal (94.31%). Gurudeeban et al. (2010) concluded that there will be a great promise for development of novel drugs from the plant C. colocynthis. The kernels contain 52% oil, 28.4% protein, 2.7% fiber, 3.6% ash and 8.2% carbohydrate (Simmons et al., 1982). They are good sources of essential amino acids (such as arginine, tryptophan and methionine) and vitamins (B1, B2, Niacin) and minerals (Ca, Mg, Mn, K, P, Fe and Zn). Bhattacharya (1990) indicated that C. colocynthis seed meal could be a satisfactory partial replacement of soya bean meal in sheep diets.

Bakhiet and Adam (1995) showed that when feeding 7 day old Bovan egg-type chicken a ration supplemented with C. colocynthis seeds at 2% and 10% of the basal diet for 6 weeks, the average body weights and the efficiency of feed utilization were markedly depressed in the chicks fed on 10% C. colocynthis. However, using 2% C. colocynthis the chickens grew normally. Adding processed C. colocynthis seed powder up to 6% in broiler ration improved feed efficiency and reduced abdominal fat pad (Ali, et al., 2011). Little knowledge concerning the use of C. colocynthis seed meal in broiler rations in Sudan was reported. The objective of this experiment was to study the effect of inclusion of different dietary levels of C. colocynthis (Handal) seed meal as a natural feed additive on performance of broiler chickens. Also to detect the best inclusion level of C. colocynthis seed meal in broiler rations.

MATERIALS AND METHODS

Experimental site and pens
This experiment was carried out at a farm 10 kilometers south of Wad Medani town in the Gezira State. Nine small pens (2 x 2 meters) size were used. These pens were allocated inside an open-sided poultry house.

Experimental birds
A total of 270 one day-old male broiler chicks (Cobb strain) were used in this experiment. The birds were weighed and divided randomly into three treatments with three replicates and 30 birds of the same average weight in each replicate.

Experimental diets
C. colocynthis seed meal was brought from the local market of Omdurman city in Khartoum State. The experimental diets were formulated according to the nutrient requirement for broiler chickens as stated by NRC (1994).
The experimental groups were randomly assigned to three dietary treatments with three replicates. The chicks were fed on the starter mash diets from one day-old up to the third week of age; they were then shifted to the finisher mash diets (Table 1). During both phases of feeding the birds were fed as follows:

**Group 1 received CCSM 0%** (control), where the birds were fed a balanced broiler diet not supplemented with *C. colocynthis* seed meal *ad libitum*.

**Group 2 received CCSM 2%** where birds were fed on a balanced broiler diet which was supplemented with *C. colocynthis* seed meal at a rate of 2% and was offered *ad-libitum*.

**Group 3 received CCSM 4%** where birds were fed on a balanced broiler diet which was supplemented with *C. colocynthis* seed meal at a rate of 4%, offered *ad-libitum*.

All the management programs, including vaccination and medication, were properly executed.

**Data collection**

Feed intake was recorded daily then the weekly feed intake was calculated for all subgroups, at the experiment termination the cumulative feed intake was calculated. All chickens from each subgroup were weighed weekly and the average live body weight was obtained. Average feed conversion ratio for all subgroups was weekly calculated on basis of kilograms of feed consumed to one kilogram body weight gain; also the cumulative feed conversion ratio was calculated.

At the end of the experiment, six chickens with approximately average body weight were randomly selected from each treatment to be slaughtered for further studies. The chickens were slaughtered according to the Islamic traditional method by severing the jugular veins, trachea and the esophagus. Live body weight and carcass weights were recorded. The dressing percentage was calculated on basis of hot carcass weight to live body weight. Some internal organs weights were taken (empty intestine, empty gizzard, liver, heart and abdominal fat pad).

**Statistical analysis**

Data collected were analyzed using MSTAT-C ([Russel and Eisensmith, 1983](#)). The data were subjected to ANOVA test based on the completely randomized design (CRD) as described by [Steel and Torrie (1980)](#), and differences among treatments were examined by [Duncan's (1955)](#) multiple range test.

**RESULTS AND DISSCUSSION**

**Feed intake**

There were insignificant (P>0.05) differences in weekly feed intake using different levels of *C. colocynthis* seed meal, although there were very slight reduction in feed consumed as the level was increased (Table 2). For the overall time of the experiment, the control group consumed significantly (P ≤ 0.05) the highest feed, where as the group fed on the diet supplemented with 4% *C. colocynthis* seed meal consumed the lowest amount of feed. This might be attributed to the bitter taste of *C. colocynthis* seed which is mainly due to presence of bitter substances (colocynthin and colocynthetin) in *C. colocynthis* seed ([James and Duke, 1983](#)), and which might affect the palatability of the diet.

**Live body weight**

There were insignificant (P>0.05) differences in live body weight during the first five weeks; still, there was slight reduction in body weight as the level of *C. colocynthis* seeds was increased. The final body weight was significantly (P ≤ 0.05)
the heaviest at 4% level of *C. colocynthis* seed meal (Table 2). These findings are in accord with that of Sawaya et al. (1986) who found chickens grew normally with up to 15% processed whole seeds in the diet. However, these results disagree with findings of Chaudhary et al. (1989) who found that *C. colocynthis* seed meal fed to 12 day old male commercial hybrid chickens for 6 weeks, up to 10% reduced growth. This might be due to the fact that they used unprocessed seeds with higher levels compared to that in the present study. Moreover, the improvement in growth performance of the chickens receiving the highest levels of the processed *C. colocynthis* seed meal might be attributed to the presence of growth promoting factors within the *C. colocynthis* seed meal. A positive relation was found in the weekly body weight gain with the level of *C. colocynthis* seeds inclusion in broiler diets (Figure 1). No big differences in body weight gain were clear during the first three weeks. However, there were slight differences in the weekly body weight gain during the fifth, the sixth and the seventh weeks of age.

**Feed conversion ratio**

The feed conversion ratio FCR was significantly (P ≤ 0.05%) affected by the level of *C. colocynthis* seed meal during the whole experimental period except in the first week, where there was insignificant (P>0.05) differences in feed conversion ratio during the first week (Table 3). However, during the second through the end of the experiment, the weekly and the cumulative feed conversion ratio (CFCR) of the control group of chickens had significantly (P ≤ 0.01) the worst FCR (1.91), the best feed conversion ratio (1.81) was obtained by the group receiving the highest (4%) dietary level of the *C. colocynthis* seed meal. The best feed efficiencies of food utilization and body weight gains in broiler chicken fed on 6% levels of *C. colocynthis* seeds, are in line with previous findings (Sawaya et al., 1986) who found that chickens grew normally with up to (15%) of the processed *C. colocynthis* seeds in the diet. This is might be attributed to the amino acids contents of the seed protein, especially in methionine and cystine. The findings of this study disagree with the observations of Chaudhary et al. (1989) who found that chickens fed on diets supplemented with *Citrullus colocynthis* seeds and safflower up to (10%) had reduced growth. These findings disagree with the findings obtained by Bakhiet et al, (1995) who showed that feeding 7–day broiler chicks on unprocessed *Citrullus colocynthis* seed at 10% of the basal diet for 6 weeks, the average body weights and the efficiency of feed utilization were markedly depressed. This is because the inclusion is higher than in the present study. However, the findings were in line with these authors when feeding 2% of *C. colocynthis* seeds to the same flock and they grew normally. These variations in the findings might be due to the levels of *C. colocynthis* seeds used by the later three groups of researchers which were higher than those in the present study, or might be attributed to the different chemical profile of *C. colocynthis* seeds.

**The gastrointestinal tract**

Supplementation of broiler’s diets with 4% *C. colocynthis* seed meal had significant (P ≤ 0.05) effects on the different parts of the gastrointestinal tract (Table 4). The group of birds fed on 4% *C. colocynthis* seed meal had statistically the highest gastrointestinal tract weight. This group had significantly (P ≤ 0.05) the heaviest empty intestinal, empty gizzard, heart and liver weights. However, there was a negative relation between the abdominal fat pad (AFP) and the levels of *C. colocynthis* seed meal in the diet. The control group had significantly (P ≤ 0.05) the heaviest AFP. This might be attributed to the higher feed intake by the control and lower live body weight recorded by the
control and that excess feed was converted to fats compared to CCSM 2% and CCSM 4% groups.

**Some carcass traits**

Broiler chickens fed on diets supplemented with 4% *C. colocynthis* seed meal had significantly (P ≤ 0.05) the heaviest live body weight and carcass weight. These groups also recorded significantly (P ≤ 0.05) the highest dressing percentage. These higher live body weights might be attributed to the best feed utilization reported by this group. Also the best dressing percentage might be due to the lesser AFP reported by this group (CCSM 4%). The study findings suggest that the use of natural products as feed additives may be of concern in covering expenses of feed additives which are very expensive. The study finding also support that of Bhattacharya (1990) who indicated that *C. colocynthis* seed meal could be a satisfactory partial replacement of soya bean meal in sheep diets.

**CONCLUSIONS**

It can be concluded that *Citrullus colocynthis* seed meal may be used up to 4% of broiler chicken without adverse effect on their performance. Furthermore improvements in following parameters were observed:

- Reduced feed intake
- Enhanced growth rate and higher live body weight
- Improved feed efficiency in terms of lower feed conversion ratio
- Reduced abdominal fat pad

Further experiments are required to test blood parameters, immune response and biochemical changes to make clear that there are no harm effects in using *Citrullus colocynthis* seed meal in poultry diets.

More research work can be carried out to evaluate broiler meat products in using *Citrullus colocynthis* seed meal in poultry diets.
Table (1): Ingredients and chemical composition of starter and finisher diets supplemented with different levels of *C. colocynthis* (Handal) seed meal

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Starter</th>
<th></th>
<th>Finisher</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CCSM 0%</td>
<td>CCSM 2%</td>
<td>CCSM 4%</td>
<td>CCSM 0%</td>
</tr>
<tr>
<td>Maize</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>29.0</td>
</tr>
<tr>
<td>Sorghum (Feterita)</td>
<td>28.0</td>
<td>28.0</td>
<td>28.0</td>
<td>27.0</td>
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<tr>
<td>Groundnut meal</td>
<td>30.0</td>
<td>28.0</td>
<td>26.0</td>
<td>27.0</td>
</tr>
<tr>
<td><em>C. colocynthis</em> seed meal*</td>
<td>0.0</td>
<td>2.0</td>
<td>4.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Super concentrate**</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Groundnut oil</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Oyster shell</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Salt</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Anti fungal</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Multi vitamin</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
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</table>

Calculated chemical analysis

<table>
<thead>
<tr>
<th></th>
<th>Starter</th>
<th></th>
<th>Finisher</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Dry matter (%)</td>
<td>95.1</td>
<td>94.9</td>
<td>94.8</td>
<td>95.2</td>
</tr>
<tr>
<td>Crude protein (%)</td>
<td>22.0</td>
<td>21.9</td>
<td>21.9</td>
<td>20.3</td>
</tr>
<tr>
<td>Crude fibre (%)</td>
<td>4.8</td>
<td>4.7</td>
<td>4.7</td>
<td>4.9</td>
</tr>
<tr>
<td>Ether extract (EE %)</td>
<td>4.9</td>
<td>4.8</td>
<td>4.7</td>
<td>7.6</td>
</tr>
<tr>
<td>Ash (%)</td>
<td>5.7</td>
<td>5.6</td>
<td>5.5</td>
<td>5.8</td>
</tr>
<tr>
<td>Nitrogen free extract%</td>
<td>57.7</td>
<td>57.9</td>
<td>58.0</td>
<td>56.6</td>
</tr>
<tr>
<td>Calcium (%)</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Phosphorus available(%)</td>
<td>0.36</td>
<td>0.36</td>
<td>0.36</td>
<td>0.35</td>
</tr>
<tr>
<td>ME (kcal/kg)***</td>
<td>2960</td>
<td>2956</td>
<td>2952</td>
<td>3068</td>
</tr>
</tbody>
</table>

* *C. colocynthis* seed meal contains: 19.5 % CP, 6.8% CF, 4.4% EE, 61.6 % NFE, 2.9 % Ash and 2970 ME kcal/kg.

** Super concentrate contains: 40% CP, 2% EE, 2% CF, 10% calcium, 4% phosphorous available, 12% lysine, 3% methionine and 3.2% methionine + cystine with added vitamins and minerals.

*** Metabolisable energy (ME M cal/kg) was calculated according to the formula derived by Lodhi et al. (1976). ME kcal/kg = 32·95 (% crude protein + % ether extract × 2·25 + % available carbohydrate) –29·20
Table (2): Effect of feeding different levels of *Citrullus colocynthis* seeds (Handal) meal on broiler performance

<table>
<thead>
<tr>
<th>Age</th>
<th>Treatments</th>
<th>S.E. ±</th>
<th>C.V. %</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CCSM 0%</td>
<td>CCSM 2%</td>
<td>CCSM 4%</td>
<td></td>
</tr>
<tr>
<td>Weekly Feed Intake (g)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 1</td>
<td>133</td>
<td>132</td>
<td>130</td>
<td>2.64</td>
</tr>
<tr>
<td>Week 2</td>
<td>253</td>
<td>246</td>
<td>244</td>
<td>3.78</td>
</tr>
<tr>
<td>Week 3</td>
<td>510</td>
<td>505</td>
<td>503</td>
<td>6.0</td>
</tr>
<tr>
<td>Week 4</td>
<td>693</td>
<td>688</td>
<td>686</td>
<td>6.87</td>
</tr>
<tr>
<td>Week 5</td>
<td>764</td>
<td>754</td>
<td>747</td>
<td>4.7</td>
</tr>
<tr>
<td>Week 6</td>
<td>833</td>
<td>830</td>
<td>828</td>
<td>11.66</td>
</tr>
<tr>
<td>Week 7</td>
<td>933</td>
<td>931</td>
<td>929</td>
<td>9.7</td>
</tr>
<tr>
<td>Cumulative feed intake</td>
<td>4119 a</td>
<td>4086 b</td>
<td>4067 bc</td>
<td>24.0</td>
</tr>
<tr>
<td>Weekly Body Weight (g)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 1</td>
<td>130</td>
<td>131</td>
<td>131</td>
<td>1.0</td>
</tr>
<tr>
<td>Week 2</td>
<td>290</td>
<td>292</td>
<td>295</td>
<td>1.91</td>
</tr>
<tr>
<td>Week 3</td>
<td>590</td>
<td>600</td>
<td>610</td>
<td>4.06</td>
</tr>
<tr>
<td>Week 4</td>
<td>993</td>
<td>1004</td>
<td>1016</td>
<td>5.92</td>
</tr>
<tr>
<td>Week 5</td>
<td>1415</td>
<td>1430</td>
<td>1452</td>
<td>4.74</td>
</tr>
<tr>
<td>Week 6</td>
<td>1840 b</td>
<td>1875 a</td>
<td>1902 a</td>
<td>6.74</td>
</tr>
<tr>
<td>Week 7</td>
<td>2282 c</td>
<td>2340 b</td>
<td>2372 a</td>
<td>7.93</td>
</tr>
<tr>
<td>Weekly Feed Conversion Ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 1</td>
<td>1.52</td>
<td>1.49</td>
<td>1.48</td>
<td>0.01</td>
</tr>
<tr>
<td>Week 2</td>
<td>1.58 a</td>
<td>1.53 b</td>
<td>1.52 b</td>
<td>0.01</td>
</tr>
<tr>
<td>Week 3</td>
<td>1.70 b</td>
<td>1.64 a</td>
<td>1.62 a</td>
<td>0.01</td>
</tr>
<tr>
<td>Week 4</td>
<td>1.72 a</td>
<td>1.68 b</td>
<td>1.65 c</td>
<td>0.01</td>
</tr>
<tr>
<td>Week 5</td>
<td>1.81 a</td>
<td>1.77 b</td>
<td>1.73 c</td>
<td>0.01</td>
</tr>
<tr>
<td>Week 6</td>
<td>1.96 a</td>
<td>1.87 b</td>
<td>1.84 b</td>
<td>0.01</td>
</tr>
<tr>
<td>Week 7</td>
<td>2.11 a</td>
<td>2.00 b</td>
<td>1.98 b</td>
<td>0.01</td>
</tr>
<tr>
<td>Cumulative FCR</td>
<td>1.84 b</td>
<td>1.78 ab</td>
<td>1.75 b</td>
<td>0.02</td>
</tr>
</tbody>
</table>

*, **, *** and NS indicate significance at P<0.05 and not significant, respectively.

Means within each row followed by the same letter(s)

**CCSM 0%** = Diet not supplemented with *C. colocynthis* seed meal

**CCSM 2%** = Diet supplemented with 2% *C. colocynthis* seed meal

**CCSM 4%** = Diet supplemented with 4% *C. colocynthis* seed meal
Table (3): Effect of feeding different levels of *Citrullus colocynthis* seeds meal to broiler chickens on the gastrointestinal tract (GIT) and some carcass traits weights (g)

<table>
<thead>
<tr>
<th>Age</th>
<th>Treatments</th>
<th>SE±</th>
<th>C.V.%</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CCSM 0%</td>
<td>CCSM 2%</td>
<td>CCSM 4%</td>
<td></td>
</tr>
<tr>
<td>Live body weight</td>
<td>2283 b</td>
<td>2242 b</td>
<td>2417 a</td>
<td>36.32</td>
</tr>
<tr>
<td>Carcass weight</td>
<td>1667 ab</td>
<td>1617 b</td>
<td>1688 a</td>
<td>21.74</td>
</tr>
<tr>
<td>Dressing %</td>
<td>73.6 b</td>
<td>73.0 b</td>
<td>73.6 b</td>
<td>0.35</td>
</tr>
<tr>
<td>Small intestine weight</td>
<td>96.3 a</td>
<td>87.5 b</td>
<td>86.9 b</td>
<td>1.88</td>
</tr>
<tr>
<td>Gizzard weight</td>
<td>78.8 b</td>
<td>88.8 a</td>
<td>87.5 ab</td>
<td>2.89</td>
</tr>
<tr>
<td>Liver weight</td>
<td>55.1 b</td>
<td>51.6 b</td>
<td>68.8 a</td>
<td>3.63</td>
</tr>
<tr>
<td>Heart weight</td>
<td>11.8</td>
<td>12.5</td>
<td>12.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Abdominal fat pad weight</td>
<td>39.9 a</td>
<td>29.5 b</td>
<td>28.7 b</td>
<td>1.34</td>
</tr>
</tbody>
</table>

* *, ** and NS indicate significant differences at levels 5% and 1% and not significant, respectively.

Means in rows followed by the same letter(s) are not significantly different at P=0.05, according to Duncan's Multiple Range Test.

CCSM 0% = Diet not supplemented with *C. colocynthis* seed meal

CCSM 2% = Diet supplemented with 2% *C. colocynthis* seed meal

CCSM 4% = Diet supplemented with 4% *C. colocynthis* seed meal

REFERENCES


الملخص العربي

أمباز بذور الحنظل (Citrullus colocynthis) كمضاف غذائي طبيعي لعلائق فراخ اللحم

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أجريت تجربة لدراسة تأثير أمباز بذور الحنظل على أداء فراخ اللحم بإستخدام ثلاث مستويات من أمباز بذور الحنظل (0% و 2% و 4%). وُضع 270 كتكوت عمر يوم من ذكور فراخ اللحم (سلالة روس) عشوائياً علي ثلاثة معاملات وبثلاثة تكرارات. غذى كل المجموعات إلي مستوي حد الشبع منذ عمر يوم وحتى 49 يوماً. و خللت البيانات باستخدام التصميم العشوائي الكامل واعتبار مدى ذكر لمقارنة المواتيات. أظهرت النتائج إنخفاضاً معنوياً في كمية الغذاء المتناول و الكفاءة التحويلية، بينما زاد الوزن الحي و وزن الذبيحة ونسبة التصافي معنوياً بزيادة معدل أمباز بذور الحنظل، كذلك أظهرت النتائج إنخفاضاً معنوياً في وزن الوريد الدهني البطنية. وأوزان الأعضاء الداخلية (المعاء الدقيق الفارغ و الزبد) في المجموعات التي غذى على البذور الذي يحتوي على نسبة 4% من أمباز بذور الحنظل بينما لم تتأثر أوزان القانصة والقلب بإضافة أمباز بذور الحنظل لعلائق فراخ اللحم بنسبة 4% دون أثار سلبية.