A study the effect of supplementation vitamin C and dietary calcium on: I- Some productive performance in two different strains of broiler chicks under heat stress conditions

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Abstract

This study was undertaken to evaluate the effect of adding vitamin C at (0,150 mg/kg feed) and dietary calcium at (0.9,1.1%) on some productive performance of two different strains of broiler (Ross and Hubbard). A total of one hundred ninety two birds(96 chicks for each strain) one day old unsexed were used in this study. Each strain distributed randomly to four groups (24) chicks for each treatment, two replicates of (12)chicks for each. First group was fed on basal diet supplemented with (0.0 vitamin C+0.9% calcium). Second group was fed on the same basal diet supplemented with (0.0 vitamin C +1.1% calcium). Third group was fed on basal diet supplemented with (150 mg vitamin C/kg feed+0.9% calcium) and fourth group was fed on basal diet supplemented with (150mg vitamin C/kg feed +1.1% calcium). The results of this study showed that growth performance of chicks was significantly improved in Co-supplemented vitamin C and calcium (1.1%) and there was no significant interaction between vitamin C supplementation and calcium on dressing percentage and mortality rate.

Introduction

It is well known that high ambient temperature coupled with high humidity has a detrimental effect on the poultry industry by decreasing performance such as (body weight, weight gain, feed intake and feed conversion ratio(FCR),as well as profitability of broiler production, physiologically heat stress causes the release of corticosterone and catecholamines and initiates lipid peroxidation in cell membranes (1, 2). There are numerous methods to alleviate the negative effects of high temperature on performance of poultry; such methods are focused mostly on dietary manipulation. For this purpose vitamin C was used in poultry diets, because of their anti-stress effects and also because of their synthesis was reduced during heat stress (3, 1). In the same way under heat stress condition, birds are not able to synthesize sufficient amount of vitamin C (4). Positive effect of vitamin C supplementation in broiler chickens have been documented previously (5 and 6). (7) noted that during summer months, broiler performance was decreased and increased in mortality rate. (8) found that ascorbic acid supplementation in broiler diet reduced mortality by 14.6% during heat stress. Calcium play two an important physiological roles in the avian subject, first a provides the structural strength of avian skeleton by formation of calcium salt, second it plays vital role in many biochemical reaction with body via its concentration in the intracellular fluid (9). Vitamin C nutrition should have influence on calcium metabolism in young chicks which posses no ability to synthesize vitamin C (10). (5) stated that metabolism of calcium may also be influenced by dietary vitamin C, and the binding capacity of calcium binding protein is significantly improved with vitamin C supplementation. The present study was carried out to determine the effect of vitamin C and calcium supplementation on some productive performance for broilers under heat stress conditions.

* Part of M.sc. Thesis for the third researcher.
Materials and Methods

The experiment was conducted in commercial broiler farm with two different strains of broiler chicks, (Ross and Hubbard Flex). A total of one hundred ninety two one day old unsexed broiler chicks (96 chicks for each strain) were used in this study and were randomly distributed into four floor pens per each (24 chicks) with two replicates consisting (12) chicks for each. The chicks were reared in completely enclosed house and exposed to continuous heat stress. The temperature in the heat stress was increase in three phases (22, 28, 33°C). Feed and water were given ad Libitum, and the chicks vaccinated against New castle and Gumboro diseases similar management conditions were maintained for all group through out the experiment period. The experiment was carried out from September 15\textsuperscript{th} to October 20\textsuperscript{th} 2006.

Table (1): A summary of dietary supplementation of the experimental treatments

<table>
<thead>
<tr>
<th>Treatment-1-</th>
<th>Treatment -2-</th>
<th>Treatment -3-</th>
<th>Treatment -4-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal diet + vitamin C+0.9% ca</td>
<td>Basal diet + 0.0 vitamin C+1.1% ca</td>
<td>Basal diet +150 mg Vitamin C/kg feed +0.9% ca</td>
<td>Basal diet +150 mg vitamin C/kg feed +1.1% ca</td>
</tr>
</tbody>
</table>

The basal diet was formulated according to (11). The ingredients and chemical composition of the basal diet are shown in Table (2).

Table (2) Ingredients and chemical composition of experimental diet.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>%</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow corn</td>
<td>35.5</td>
<td>35.0</td>
</tr>
<tr>
<td>Wheat</td>
<td>23.5</td>
<td>23.5</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Fish meal</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Soybean meal (44%)</td>
<td>30.0</td>
<td>30.0</td>
</tr>
<tr>
<td>Lime stone</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Di calcium phosphate</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Minerals and vitamins premix</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Lysine</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>methionine</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Chemical composition calculated (%)

| Metabolisable Energy (kcal/kg)   | 2918 | 2901 |
| Crude protein (cp) %             | 23.3 | 23.2 |
| Calcium (ca) %                   | 0.9  | 1.1  |
| Phosphorus (p) %                 | 0.82 | 0.81 |
| Available (p) %                  | 0.57 | 0.56 |
| Ca :p                            | 1:1.6| 1:2  |

Measurements: -

Body weight, weight gain and feed consumption were recorded weekly during the experimental period. Mortality was checked on weekly basis. Feed conversion ratio (FCR) calculated as the ratio of feed intake during a particular week to the weight gain during the same week. At the end of experiment, three chicks were selected from each treatment group, weighed and slaughtered to determine the
dressing percentage after removing of head, shank and alimentary tract.

**Results and discussion**

**Growth performance**

**Body weight:**

Results of the present study showed that a dietary supplement of vitamin C at 150 mg/kg feed as combination with 1.1% Ca, had the heaviest body weight as compared with other treatment groups (Table 3) such combination can offer potential protective management practice in preventing heat stress related to losses in performance of broiler chicks exposed to heat stress. Similar results were obtained by (12).

**Weight gain:**

Supplemental vitamin C coupled with calcium significantly (P<0.01) increased weight gain, the highest weight gain was in chicks fed 150 mg vitamin C /kg feed with 1.1% Ca (Table 4). (13) found that vitamin C supplementation increased weight gain. (14) stated that greater weight gain found in chicks fed supplement vitamin C.

**Feed consumption**

The effect of supplemental dietary vitamin C and calcium during heat stress of broiler chicks are shown in (Table 5). Suplemental vitamin C significantly increased feed intake (P<0.01) and also fed 1.1% calcium affected significantly (P<0.01) on feed intake as compared with 0.9% Ca. (15) noted that vitamin C supplementation in feed at 200mg/kg during heat stress increased feed intake of birds. Similar results were obtained previously (12,16).

**Feed conversion ratio (FCR):**

Table(5) showed that dietary supplementation of vitamin C (150 mg/kg feed) and 0.9% calcium improved the (FCR). (16) have demonstrated that (FCR) was significantly improved in broilers fed with vitamin C. (17) reported that an improved feed conversion ratio by Ascorbic acid supplementation to Japanese quail reared under high temperature. (12) also detected an improvement in feed conversion ratio of broilers as result of vitamin C supplementation during heat stress. On the other hand, (18), did not find improved in broiler chicks.

**Mortality rate and dressing percentage:**

The results presented in Table (6) showed that mortality rate of birds during the experimental period were not influenced by dietary supplementation of vitamin C, similar results were obtained by (5).Dressing percentage also did not differ significantly when interaction between vitamin C and calcium were done, this study coincided with the finding of (19).
References

دراسة تأثير إضافة فيتامينات C والكالسيوم في بعض صفات الأداء الإنتاجي لسلالتين مختلفتين من فروج اللحم تحت ظروف الإجهاد الحراري

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الخلاصة

أجرت هذه الدراسة تقييم تأثير إضافة فيتامينات C عند مستوى (صفر، 0.5، 1 ملغم/ كجم علف) والكالسيوم الغذائي عند مستوى (%0.9، 1.1) في بعض الصفات الإنتاجية لسلالتين من فروج اللحم. (مصمود، روت، هوبيرد). استخدم في هذه الدراسة (48) طنارا لكل سلالة عبر مجنسة عمر يوم واحد ووزع طيور كل سلالة على أربعة مجموعات التحكم كل منها (12) طنا. تم توزيع المجموعة الأولى على علبة أساسية ذات محتوى (0.9٪) كالسيوم. (1.1٪) كالسيوم. بدون إضافة فيتامين C. المجموعة الثانية تحتوي على علبة أساسية ذات محتوى (0.9٪) كالسيوم (0.9٪) كالسيوم. المجموعة الثالثة تناولت علبة أساس ذات محتوى (1.1٪) كالسيوم + (0.5٪) كالسيوم. بدون إضافة فيتامين C. المجموعة الرابعة تناولت علبة أساس ذات محتوى (1.1٪) كالسيوم + (1.1٪) كالسيوم. أظهرت نتائج التحليل لهذه الدراسة تأثير الأداء الإنتاجي للطيور معروفا بإضافة كل من فيتامين C و1.1٪ كالسيوم بينما لم تتأثر كل من نسبة الهلاك الناتج والخسائر الناتجة عن إناء فيتامينات كالسيوم والكالسيوم.

* جزء من رسالة ماجستير للباحث الثالث.