Effect of Feeding on High Levels of Cotton-seed Meal on the Egg Quality

M.R. El-Abbady, M.I. El-Kotouby and M.S. M. Samy
Faculty of Agriculture, Cairo University and National Research Centre, Dokki, Cairo, Egypt.

One hundred eighty B.W. (Baladi White) pullets of similar age and weight were divided randomly into four equal groups. One hundred sixty eight R.I.R. (Rhode Island Red) pullets of similar age and weight were divided also into four equal groups. Four rations contained U.D. C.S.M. (undecorticated cottonseed meal) at levels 0, 10, 20 and 30% were used respectively for feeding the four B.W. groups, while with the R.I.R. breed, other four rations containing D. C.S.M. (decelleratorated cotonseed meal) at levels, 0, 10, 20 and 30% were used respectively for feeding the four groups.

The results showed that the eggs which were stored for either 21 or 28 days in the room became distorted. After the storage the egg yolks produced from the B.W. and the R.I.R. hens fed the rations containing 20 and 30% C.S.M. showed very light brown color. The albumins were normal and did not give any pink color at the different storage periods. The degree of egg yolk discoloration achieved by the Ammonia test at any storage period was positively associated with the level of cottonseed meal in the ration. There was no difference in the pH of yolks and albumins between treatments within each storage period. It was found that within each storage period, there was no appreciable difference between the four treatments as regards to the calculated calorific value of the whole eggs.

It has been concluded by many workers that a large proportion of stored shelled eggs produced by hens fed rations containing cotton seeds meal are of poor quality.

Stephenson and Smith (1952) found that cottonseed meal results in yolk and albumin discoloration. Heuser (1955) reported that cotton-seed meal is useful for the production of eggs when the eggs are to be used fresh but it has an adverse effect on stored eggs.

Heywang and Lowe (1959) indicated that feeding cottonseed meal to laying hens resulted in dark yolk and pink white discoloration.

Kemmerer et al. (1962) stated that cottonseed oil and gossypol had the same effect on egg discoloration. Cottonseed oil raised pH yolks in stored eggs.
Kemmerer et al. (1963) demonstrated that cottonseed oil unlike maize-oil increased the pH and caused discoloration in the stored egg yolk.

Lipstein and Bronstein (1966) reported that individuals differed in sensitivity or resistance to cottonseed products in causing discoloration in white and yolk of eggs.

Material and Methods

One hundred eighty B.W. (Baladi White) and one hundred sixty-eight R.I.R. (Rhode Island Red) pullets of similar age and weight were used in this study. Hens within each breed were divided into equal groups, each was confined in an earthen floor pen.

Four rations of nearly isonutritive values contained U.D.C.S.M. (undecorticated cottonseed meal) at levels 0, 10, 20 and 30% were used respectively for feeding the four groups of the B.W. and R.I.R. breed, while the R.I.R. breed, other four rations similar in their nutritive values contained D.C.S.M. (decorticated cottonseed meal) at levels 0, 10, 20 and 30% were used respectively for feeding the four groups. The crude fat of the different rations was within the limits recommended by Titus (1961) while the crude fiber were within the possible limits after Ibrahim (1969). The allowances of starch value and digestible protein for the B.W. and R.I.R. layers rations were taken after Ghoneim (1957). The starch values of the different ingredients of the rations were calculated after Abou-Rayas (1967). The sumative chemical analysis of the rations was done according to Raaifat (1969). Total and free gossypol of cottonseed meal were determined according to Smith (1958) and (A.O.C.S., 1957) respectively.

Each group of the B.W. and R.I.R. hens was given its diet ad libitum and the actual amount of feed consumed was recorded monthly throughout the experiment period which lasted for six months (Dec., 1967 to May 1968). Eggs were collected from each group, weighed and recorded daily at 4 P.M.

Chemical analysis of eggs

Chemical analysis were conducted on eggs produced from each treatment in both the two breeds of layers. The following items of chemical analyses were done on one day old eggs and on eggs stored for 7, 14, 21 and 28 days in the room temperature and on eggs in the refrigerator at 7°C for the same four periods. The room temperature during storage ranged between 19-42°C.

The degree of yolk discoloration was evaluated according to an arbitrary visual standard ranging from “0” for none, “1” for very light brown, to “5” for black, (Frampton et al. 1961). The whites were visually examined for the appearance of pink coloration.

For the prediction of olive yolk discoloration, two eggs from each treatment were used for the visual estimation of yolk and albumin colors were tested.

The ammonia atmosphere test was conducted after Gran et al. (1954). The intensity of coloration in the yolks was graded from “0” to “5”.

In determining the pH of yolk and albumins, four eggs from each treatment were used. The yolk and albumins of the eggs were separated alone into two small beakers. The content of each beaker was mixed thoroughly and the pH of both yolks and albumins was obtained by dipping the electrodes of the pH-meter in each beaker. Acid potassium phthalate was used as a buffer solution in the course of the pH measurements (A.O.A.C., 1955).

The eggs from each treatment were used for obtaining the calculated caloric value of the whole eggs. The edible parts of the two eggs were mixed thoroughly by an electric blender. Moisture, crude protein, crude fat, ash and nitrogen free extract were determined (A.O.A.C., 1955). The caloric value was calculated on the basis of the conventional physiological value, i.e., 4 Kcal. per one gram of carbohydrate, 4 Kcal. per one gram of protein and 9 Kcal. per one gram of fat (U.S.D.A., 1940).

**TABLE I. The composition of the experimental rations**

<table>
<thead>
<tr>
<th>Ingredients, kg</th>
<th>B.W. rations</th>
<th>R.I.R. rations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4</td>
<td>5 6 7 8</td>
</tr>
<tr>
<td><strong>Corn (White)</strong></td>
<td>15 15 20 45</td>
<td>10 13 20 24.5</td>
</tr>
<tr>
<td><strong>Barley</strong></td>
<td>15 15 20 10</td>
<td>6 10 10 20</td>
</tr>
<tr>
<td><strong>Wheat bran</strong></td>
<td>20 25 15 10</td>
<td>15 15 10 10</td>
</tr>
<tr>
<td><strong>Rice bran</strong></td>
<td>38 25 15 8</td>
<td>25 22 25 10</td>
</tr>
<tr>
<td><strong>Undecorticated C.S.M.</strong></td>
<td>10 20 30</td>
<td></td>
</tr>
<tr>
<td><strong>Decorticat C.S.M.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bens (Vicia Faba)</strong></td>
<td>8 5 6 3</td>
<td>38.5 24.5 9.5</td>
</tr>
<tr>
<td><strong>Dried skim milk</strong></td>
<td>4 4 4 4</td>
<td>5.5 5.5 5.5 5.5</td>
</tr>
<tr>
<td><strong>Starch value (Calculated)</strong></td>
<td>67.89 66.16 65.01 64.39</td>
<td>69.15 69.67 70.05 71.72</td>
</tr>
<tr>
<td><strong>Chemical analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Crude prot., %</strong></td>
<td>15.41 14.63 16.09 15.51</td>
<td>18.9 18.46 19.83 19.69</td>
</tr>
<tr>
<td><strong>Crude Fiber, %</strong></td>
<td>10.36 11.66 11.93 11.58</td>
<td>9.05 9.46 8.83 7.68</td>
</tr>
<tr>
<td><strong>Crude Fat, %</strong></td>
<td>4.96 4.95 4.10 3.62</td>
<td>3.69 3.56 4.49 4.01</td>
</tr>
<tr>
<td><strong>Crude ash, %</strong></td>
<td>9.06 8.27 8.64 7.44</td>
<td>9.15 8.87 8.95 8.43</td>
</tr>
<tr>
<td><strong>Nitrogen-Free extract, %</strong></td>
<td>50.01 49.92 49.80 51.34</td>
<td>48.36 49.02 47.22 49.79</td>
</tr>
<tr>
<td><strong>Total gossypol, %</strong></td>
<td>0.00 0.104 0.208 0.312</td>
<td>0.000 0.137 0.275 0.412</td>
</tr>
<tr>
<td><strong>Free gossypol, %</strong></td>
<td>0.000 0.009 0.018 0.027</td>
<td>0.000 0.011 0.022 0.032</td>
</tr>
<tr>
<td><strong>Bound gossypol, %</strong></td>
<td>0.000 0.095 0.190 0.285</td>
<td>0.000 0.126 0.253 0.330</td>
</tr>
</tbody>
</table>

Each ration was supplied by 0.2 kg Vit. A+D₃ powder, 0.5 kg sodium chloride and 1.5 kg. calcium carbonate. Mineral mixture was added (Titus, 1961). Excess of Ca CO₃ was available for hens at apelite in separate containers.

Results and Discussion

The eggs stored in the room temperature for 21 and 28 days became distorted.

1. Visual estimation of yolk and albumin colors

The yolks produced from both the B.W. layers fed rations containing 20 and 30% of U.D.C.S.M. (0.018 and 0.027% free gossypol of the ration) and the R.I.R. hens fed rations containing the same levels but of D.C.S.M. (0.022 and 0.032% free gossypol of the ration) showed very light brown color, i.e. the discoloration was evaluated to be "1" after the storage for 28 days in the refrigerator.

The whites of eggs produced by both the two breeds of layers, fed the different levels of C.S.M. were normal and did not give any pink color after the storage for either 14 days in the room or 28 days in the refrigerator.

In this connection Heywang et al. (1955) demonstrated that the degree and incidence of both olive yolk and pink white discoloration increased with increasing the storage time.

2. Prediction of olive-yolk discoloration

It is clear that with eggs produced by both the B.W. and the R.I.R. hens, the degree of discoloration achieved by the ammonia test at any stage of storage was positively correlated with the level of C.S.M. in the ration. The all over average degrees of egg yolks discoloration was 0,12 and 3,5 for the B.W. hens fed on rations containing U.D. C.S.M. at levels 0, 10, 20 and 30% respectively. The corresponding figures for the eggs produced from the R.I.R. hens fed on the same levels of D.C.S.M. were 0,1,3 and 4.

In this connection Heywang and Vavich (1965) showed that eggs from birds given glandless cottonseed meal had no discoloration when tested with ammonia test unlike that of birds given glanded cottonseed meal.

3. pH of yolks and Whites

With the B.W and the R.I.R. eggs there was no difference in the pH of yolks and whites between treatment within each storage period.

The storage periods had a slight effect on the pH of either yolks or whites produced by the layers fed on the different rations (Table 2).

In this connection Schiable et al. (1946) and Deutschman et al. (1964) reported that defects in eggs associated with pink white discoloration increased yolk and decreased white pH.

4. Calculated calorific value of unshelled whole eggs

With the B.W. and the R.I.R. eggs there was no appreciable difference in the calorific value of eggs among treatments within each storage period.

The storage periods had no appreciable effect on the calorific value of the whole eggs (Table 2).

In this connection Ministry of Agriculture, Northern Ireland (1958) demonstrated that, changes in feeding appear to have little or no effect on the energy value of eggs. Heuser (1955) demonstrated that as far as the hen is concerned, she will endeavor to produce a complete egg which is capable of reproducing herself and production is always full and complete or there is none.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Rations</th>
<th>Av. of the pH</th>
<th>Calorific value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Yolk</td>
</tr>
<tr>
<td>B.W.</td>
<td>Contained no C.S.M.</td>
<td>6.23</td>
<td>8.63</td>
</tr>
<tr>
<td></td>
<td>Contained 10% U.D. C.S.M.</td>
<td>6.25</td>
<td>8.65</td>
</tr>
<tr>
<td></td>
<td>Contained 20% U.D. C.S.M.</td>
<td>6.27</td>
<td>8.62</td>
</tr>
<tr>
<td></td>
<td>Contained 30% U.D. C.S.M.</td>
<td>6.35</td>
<td>8.64</td>
</tr>
<tr>
<td>Av.</td>
<td></td>
<td>6.28</td>
<td>8.64</td>
</tr>
<tr>
<td></td>
<td>Contained no C.S.M.</td>
<td>6.24</td>
<td>8.65</td>
</tr>
<tr>
<td>R.I.R.</td>
<td>Contained 10% D. C.S.M.</td>
<td>6.32</td>
<td>8.65</td>
</tr>
<tr>
<td></td>
<td>Contained 20% D. C.S.M.</td>
<td>6.35</td>
<td>8.61</td>
</tr>
<tr>
<td></td>
<td>Contained 30% D. C.S.M.</td>
<td>6.39</td>
<td>8.62</td>
</tr>
<tr>
<td>Av.</td>
<td></td>
<td>6.30</td>
<td>8.63</td>
</tr>
</tbody>
</table>

% Calculated for 100 g unshelled whole eggs.

References


EFFECT OF FEEDING ON EGG QUALITY


بعض الدراسات الكيميائية للكبد الناجم عن النكاف، بدءًا من الورود الأبيض، على علاقة مختبرية بين مستويات مختلفة من كسب بذرة القنطور.

محمد رشدي الياباني، محمد إبراهيم الفتوهوي، ومحمد سامي
كلية الزراعة جامعة القاهرة، المركز القومى للبحوث

إجراء هذه الدراسة على 180 دجاج بذرة أبيض، فئة D.I. 188 دجاجة.

رود الأقزام الأحمر، كانت طورها كل نوع متماثلة من القنطور ووزن عند بداية التجربة، وقد قسم دجاج كل نوع إلى أربع مجموعات متساوية، وضعت كل مجموعة في غرفة مستقلة، قبضت جميع الأقزام البذور إلى مجموعات كسب بذرة القنطور في ثلاثة مراحل، حيث كان الاسترداد لأيديا على البذور بمعدل 100%.

وعلى نفس النطاق كررت مراحل الكسب لجميع مجموعات الأقزام البذور، مستخدمين في غرفة تحكم بدرجة القنطور 10%، ولفقد استمرت التجربة لعدة سنوات.

ويتم إجراء التحليل الكيميائي للبابيب البذور النافع من مجموعات القنطور بتحكيم طبيعية لدبيح البذور بعد خروج البذور لمدة 7-14 يومًا في كل من الفرد والخلاصة.

وقد أظهرت نتائج هذه التجربة أن تركيز البذور لدة 11 أو 12 يومًا في ظروف التربة في ظروف قادرة على تعزز الن البنية، وأثر على النكاف البذور، القنطور القنطور على ظروفها، فعند استمرار الزمن في الظروف المعتدلة، في حالة البذور النافع من الورود الأبيض، والبذور قابلة للزراعة في الظروف المعتدلة، وبدأت النكاف في مستويات المشابهة لمستوى التربة.

في الظروف المريحة، وجد أنه في حالة البذور النافع من الورود الأبيض، البذور قابلة للزراعة في الظروف المريحة، وبدأت النكاف في مستويات مشابهة لمستوى التربة.

مراجع