CERTAIN BIOCHEMICAL STUDIES ON THE EFFECT OF FORCED FEEDING IN PEKIN DUCKS

Yakout A.Y. El-Senosy


ABSTRACT

Foie-gras, the fatty liver produced by over feeding ducks is one of the world's most expensive foods. In order to achieve the desired taste and texture ducks, are force-fed two or three times/day. The present study was planned to clarify the effect of forced feeding on body weight and some liver and kidney function as well as the tissue lipid profile. For that aim, sixty male Pekin ducks, 70 days old obtained from commercial hatchery, they were divided into 3 groups each of 20 birds. Each group subdivided into two groups each of 10 birds reached adlibitum not forcibly and the other 10 forcibly fed, the first group supplemented with faba bean the second zea maize. The last group received a mixed diet composed of 49.75% faba bean, 49.75% zea maize and 0.05% salt. After 14 days the birds were weighed and slaughtered, blood samples were collected and sera, were separated and used freshly, as well as 5 g of thigh meat used for tissue lipid profile study. The present data revealed a significant (P<0.05) increase in liver function enzymes (ACT, ALT, ALP and ACP) as well as uric acid, urea, total cholesterol and triacyl glycerol. Meanwhile the serum creatinine was non-significantly changed.
INTRODUCTION

Force-feeding ducks with excessive amounts of food for 10 to 14 days during the finishing period is one of the fattening methods used commercially. Under this special nutritional state, it was found that the length of small intestine markedly increased in association with increase of body weight (19). It was also shown that digestibility and absorption were almost normal in ducks force-fed twice the amount of adlibitum intake (21). These functions suggest that force-feeding probably modify the gastrointestinal function.

In addition to absorption, the intestinal endogenous nitrogen was shown to be affected by nutritional state in chickens (4). This effect seems to depend partially upon the change of blood metabolic nitrogen which can diffuse free into the gastrointestinal tract (18).

In force-fed duck, the concentration of blood uric acid as well as other blood metabolic compounds containing nitrogen were markedly elevated butitis not known whether the intestinal endogenous nitrogen changed (22).

El-Medany et al. (6) reported that force-feeding increased all the blood levels of cholesterol, ester, sugar and total protein. However, it reduced the degree of estrifications. They concluded that male had more blood cholesterol than female. Nir et al. (15) also indicated that force-feeding increased plasma triacylglycerol, total lipids and total cholesterol. Glutamic oxalacetic transaminase and glutamic pyruvic transaminase have remarkable action in catabolic reaction of amino acid. They are widely distributed in various body tissues and are normally present in the blood serum in different concentration. Their level in blood serum is used to reflect liver function.

Yamani (20) reported pronounced increase in plasma cholesterol level due to force-feeding , it was also reported by Niespodziewanski (14) and El-Medany (6).

El-Gendi (7) reported that in force fed ducks the concentration of blood uric acid as well as other blood metabolic compounds containing nitrogen were markedly elevated . Analysis of variance revealed significant effect due to feeding system on the average of plasma uric acid and creatinine and tissue creatinine.

Accordingly the present study was planned to describe the effects of forced feeding on liver function enzymes (AST, ALT, ALP and ACP), kidney function (urea, creatinine and uric acid), serum lipid, total cholesterol and triacylglycerol as well as
tissue lipid profile (total lipid, total cholesterol, triacylglycerol, free fatty acids and phospholipids).

MATERIALS AND METHODS

Sixty male Pekin duckling were obtained from commercial hatchery. They were fed on a commercial starter diet containing 22% crude protein and 2900 K cal me/kg up to 21st day. Grower diet containing 16% crude protein and 2900 K cal ME/kg was than applied up to 70 days of age.

The birds were reared on the floor and supplied with fresh water and fed adlibitum. Force feeding for both male ducklings was applied when they reached 70 days of age and lasted 14 days. To realize this aim an equal number of 10 male in 6 group, 3 of then act as control the and other 3 forced feeding Controls were fed adlib with fava bean, maize and mixed faba bean, maize the diet mixed with water (1:1) before introduced into the bird’s crop. Force-feeding was applied three times daily at an amount of 250 g at 70 days age initially and increased 50 g every 4 days for 14 day period of force-feeding.

Blood samples were collected during slaughter into plastic centrifuge tubes and serum samples were separated by centrifugation 3000 r.p.m. for 10 minutes then the clear sera were aspirated and used freshly for quantitative estimation of: ALT and AST (17), ALP (10), acid phosphatase (10), urea (3), uric acid (1), creatinin (1),triglyceride (5) and total cholesterol (12).

Also 5 g of thigh red meat from thigh and breast were taken from all birds each samples was washed by distilled water, severely macerated minced in 100 ml saline solution for each sample and boiled under vacuum for 30 minutes. After cooling to room temperature centrifuged at 3000 r.p.m. for 10 minutes, then the clear sera is decantated and used freshly for estimation of total lipid (25) , total cholesterol (12), triacylglycerol (5) , free fatty acids (24) and phospholipids (23).

RESULTS

The present data in table 1 showed that, the mean values of serum hepatic function enzymes, (ALT, AST, ALP and ACP) were significantly increased (P<0.05) in forcedly feeding ducks by bean, maize and mixed in comparison with the control values of each group.
Yakout A.Y., 2004

A significant increase (P<0.05) in serum urea and uric acid whereas no change in the serum creatinine

Also, showed that the mean values of serum total cholesterol and triacylglycerol were significantly increased (P<0.05) in bean and mixed forced feeding groups and highly significant (P<0.01) increased in maize forced group

**Table 1:** the mean values of selected serum parameters in control and forced feeding male ducks

<table>
<thead>
<tr>
<th>Group Parameter</th>
<th>Control</th>
<th>Bean</th>
<th>Control maize</th>
<th>Maize</th>
<th>Control mixed</th>
<th>Mixed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALT Gpt (u/L)</strong></td>
<td>5.65 ± 0.86</td>
<td>9.33 ± 1.00*</td>
<td>7.38 ± 0.66</td>
<td>15.97 ± 0.88*</td>
<td>6.83 ± 0.75</td>
<td>14.63 ± 0.88*</td>
</tr>
<tr>
<td><strong>AST Got (u/L)</strong></td>
<td>14.40 ± 1.70</td>
<td>20.60 ± 0.99*</td>
<td>17.72 ± 1.80</td>
<td>29.67 ± 1.75*</td>
<td>16.66 ± 1.16</td>
<td>26.43 ± 1.08*</td>
</tr>
<tr>
<td><strong>Urea (mg/dl)</strong></td>
<td>16.60 ± 0.91</td>
<td>25.73 ± 1.60*</td>
<td>15.86 ± 1.86</td>
<td>24.00 ± 0.66*</td>
<td>16.87 ± 0.99</td>
<td>25.25 ± 1.60*</td>
</tr>
<tr>
<td><strong>Creatinin (mg/dl)</strong></td>
<td>0.43 ± 0.08</td>
<td>0.74 ± 0.10</td>
<td>0.38 ± 0.07</td>
<td>0.73 ± 0.07</td>
<td>0.37 ± 0.01</td>
<td>0.86 ± 0.01*</td>
</tr>
<tr>
<td><strong>Uric (mg/dl)</strong></td>
<td>4.92 ± 1.30</td>
<td>8.74 ± 1.98*</td>
<td>4.78 ± 0.96</td>
<td>9.10 ± 0.88*</td>
<td>3.69 ± 0.08</td>
<td>9.35 ± 0.97**</td>
</tr>
<tr>
<td><strong>ALP (u/L)</strong></td>
<td>160.7 ± 6.60</td>
<td>188.33 ± 6.75*</td>
<td>180.9 ± 7.01</td>
<td>213.97 ± 9.00**</td>
<td>176.1 ± 7.90</td>
<td>212.08 ± 11.00*</td>
</tr>
<tr>
<td><strong>Acid phoph (u/L)</strong></td>
<td>7.44 ± 0.91</td>
<td>13.17 ± 0.96*</td>
<td>9.47 ± 1.01</td>
<td>15.75 ± 0.97*</td>
<td>8.40 ± 0.97</td>
<td>22.95 ± 0.75**</td>
</tr>
<tr>
<td><strong>Tg. (mg/L)</strong></td>
<td>90.25 ± 3.33</td>
<td>119.28 ± 6.30*</td>
<td>95.10 ± 3.31</td>
<td>141.73 ± 5.6**</td>
<td>104.7 ± 2.66</td>
<td>154.00 ± 3.38*</td>
</tr>
<tr>
<td><strong>Total cholesterol (mg/L)</strong></td>
<td>204.7 ± 9.10</td>
<td>245.33 ± 10.30*</td>
<td>215.9 ± 15.6</td>
<td>252.67 ± 11.30*</td>
<td>210.5 ± 9.90</td>
<td>279.93 ± 11.78*</td>
</tr>
</tbody>
</table>

*significant (P < 0.05)

**Highly significant (P < 0.01)**

**DISCUSSION**

The present data, in table 1 showed that, the mean values of serum hepatic function enzymes, (ALT, AST, ALP and ACP) were significantly increased (P<0.05)
in forcibly feeding Ducks by bean, maize and mixed in comparison with the control values of each group, that came in accordance with the recorded data by Zhau (22) and El-Gendi (7) who recorded that the forced feeding processes had stressful action of liver. The recorded increase of hepatic function enzymes could be related to the developed fatty liver in forcibly feeding ducks as reported by Marai and Yamani (11) who demonstrated the high amount of lipids in the maize forced feeding duck produced fatty liver and Austic (2) who noticed that the excess amount of protein of bean in forced feeding modified protein digestion and initiated fatty liver, moreover it could be concluded that, changes in transaminase may depended mainly on the rate of protein metabolism which may be a function of bird’s age rather than any other factor (19).

Regarding the effect of forced feeding on kidney function test the recorded data revealed significant increase in serum urea and uric acid whereas no change in the serum creatinine. The observed data was similar to the registered results by Wany et al. (19) and Farghaly and Asar (8) who demonstrated that the forced feeding processes increased the serum uric acid as well as blood urea nitrogen were markedly elevated. The recorded data could be attributed to the change of blood metabolic nitrogen which can diffuse free into the gastric intestinal tract which stimulates the hepatic biosynthesis of urea and the forced feeding of excess protein elevated uric acid biosynthesis (4).

The recorded data in table (1) showed that the mean values of serum total cholesterol and triacylglycerol were significantly increased (P<0.05) in bean and mixed forced feeding groups and high significant (P<0.01) increase in maize forced group which were came in agreement with the provided data by El-Medani et al. (6) and Nir (15) who indicated that the forced feeding increased plasma triglyceride and cholesterol and marked action on catabolism of amino acids. The recorded high significant increase of triacyl glycerol and total cholesterol in the maize forced group could be related to the excess amount of lipid in maize than bean groups and the developed fatty liver (16).

REFERENCES

Yakout A.Y., 2004
7. El-Gendi,G.( 1994 ) : productive and metabolic response to forced feedind to improve meat quality of peckin ducks of different ages and sex Analysis agricultural science Moshtohor vol.32.no.1; pp.229-41

92
أجريت هذه الدراسة لمعرفة تأثير التغذية الإجبارية في البط البيكيني لإنتاج الكبد الدهني على وظائف الكبد والكلى ومستوى الدهون في الدم. استخدمت لهذه الدراسة 60 من ذكور البط البيكيني تم تغذيتها تغذية حرة على عليقة متوازنة حتى عمر 70 يوم ثم بعد ذلك قسمت إلى ستة مجاميع متساوية كل واحدة تحتوي على عشرة ذكور ثلاثة منها استخدمت كمجموعة ضابطة وثلاثة أخرى أعطيت التغذية الإجبارية المجمعة الثلاثة الضابطة كانت تتأذى حتى الشبع تغذية حرة على الفول والفوائل المتوازنة بالذرة والذرة بالترتيب. أما المجموعات الثلاثة الأخرى فقد تم تغذيتها إجباريا على الفول والفول المخلوط بالذرة والذرة بالترتيب على ثلاث مرات يوميا بمقدار 250 جرام وتزداد بمقدار 50 جرام كل أربعة أيام لمدة 41 يوما. أخذت عينات الدم بعد الذبح في نهاية التجربة لقياس وظائف الكبد والكلى ومستوى الدهون في الدم. أظهرت الدراسة أن التغذية الإجبارية أدت إلى زيادة معنوية في مستويات الalanine امينو ترانسفيراز وast program وfatty liver ويدمجة معنوية في مستويات حمض الامينة وواليوريا والكوليسترول والدهون الثلاثية. ولم يظهر أي تغير معنوي في مستويات الكرياتينين من هذه الدراسة توضح أهمية التغييرات البيوكيميائية التي تحدثها التغذية الإجبارية في البط البيكيني من أجل إنتاج الكبد الدهني.