EFFECT OF FEEDING GUM ARABIC WITH OR WITHOUT COMMERCIAL XYLEM ENZYME 500 ON THE PERFORMANCE OF BROILER CHICKS

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ABSTRACT

The experiment was conducted to investigate the effect of addition of Gum Arabic powder with or without xylem 500 to broiler chicks feed on the performance and serum chemistry. Three experimental diets were designed as A, B and C. A serves as control, B supplemented with 0.6% Gum Arabic and C supplemented with 0.6% Gum Arabic with xylem 500 enzyme. Sixty three broiler chicks, 7 days old were randomly distributed into three treatments, each treatment with 3 replicates and each replicate with 7 chicks. Average weight gain, feed consumption, feed conversion ratio, mortality rate, dressing percentage, noncarcass component (heart, gizzard, liver) and chemical analysis of blood serum parameters were used as a criteria of response. Results obtained showed a significant difference between treatment groups in performance parameters, dressing percentage, none carcass components and chemical analysis of blood serum. The supplementation of control diet with Gum Arabic significantly (P>0.05) decreased total cholesterol in the blood serum compared to control group which improved the general performance of broilers chicks. Economically Gum Arabic with xylem can be safely used in broiler diets without any side effects.

KEYWORDS: Gum Arabic, Xylem Enzyme, Performance Values (Body Weights, Feed Intake, Feed Conversion.

INTRODUCTION

The rise in poultry production and consumption in Sudan generally and in Khartoum State in particularly may be attributed to many precipitating reasons including, increased preference...
to consume white meat, rise in living standards and change in food habits (Agricultural census, 2009).

The cost of feed in broiler chick production represents 70-75% of the total cost of production. Therefore, poultry production will be feasibly economic when feed cost is reduced & efficiency of its utilization is increased (Qureshi, 1991).

During the past decades, antibiotics have widely been used in poultry production as growth promoter to enhance performance. However, in 2006, EU and many countries have banned using antibiotics as growth promoter in animal nutrition. This action encourages many investigators to search for alternatives to enhance performance. Patterson and Burkholder (2003) stated that an alternative approach to sub-therapeutic antibiotics in livestock is the use of probiotic micro-organisms, prebiotic substrates that enrich certain bacterial populations, or symbiotic combinations of prebiotics and probiotics.

Probiotic (direct-fed microbial) is a generic term and products can contain bacterial cultures that stimulate micro-organisms capable of modifying the gastrointestinal environment to favor health status and improve feed efficiency (Dierck, 1989).

Prebiotics are defined as a non-digestible feed ingredient that beneficially affect the host by selectively stimulating the growth and activity of one or a limited number of bacteria in the colon (Gibson and Rober Ford, 1995). The application of probiotics and prebiotics significantly improved the weight gain of broiler chickens (Mateova et al., 2008).

Gum Arabic (Acacia Senegal) is defined as the dried exudates obtained from the stems and branches of Acacia Senegal or the related species of Acacia. It consists mainly of high molecular weight polysaccharides and their calcium, magnesium and potassium salts yield arabinose, galactose, rhanose and glucuronic acids on hydrolysis. It is important to remember that a damage tree will give a larger yield of gum (Glicksman, 1969). Acacia Senegal and Acacia seyal are the two species of Acacia that are commercially exploited, mainly in Africa and Asia. Nowadays, its use is extended to cosmetics, pharmaceutics and foods. The properties of gum exudates are affected by the age of the tree, amount of rainfall, season of exudation and type of storage (Aspinall et al., 1968).

Enzyme is defined as “The enzyme protein together with the other constituents deriving from the fermentation or extraction process, but excluding any water, which may be separated
without affecting the stability of the enzyme protein or changing its composition” (Amfep, 2012).

The objectives behind this research are to study the usage of Gum Arabic as natural prebiotic with or without commercial Xylam 500 enzyme on the performance, serum chemistry of internal organs and dressing percentage of broiler chicks.

MATERIAL AND METHODS
The experiment was conducted in the Department of Animal Production of College of Agricultural Studies, Sudan University of Science and Technology, during the period from (27/9 - 1/11/2014). The ambient temperature ranged between 30°C-39°C.

A total of sixty three, 7 day old unsexed broiler chicks with average weight of about 41 grams, were randomly divided into three treatment diets (A, B, and C). Each treatment group was subdivided into three replicates of 7 chicks each. The chicks were adapted to commercial broiler pre starter diet over 7 days before start of the experiment.

The basal diet fed to the chicks in all groups had the same formulation of broiler chicken. The birds in all groups were reared under optimum environmental condition and were provided ad libitum feed. Based on a local vaccination program chicks in all groups were vaccinated against Gumboro disease at 10 days old.

The experimental diets were designed as A control diet, B was supplemented with GA (0.6%) as growth promoter and C was supplemented with GA (0.6%) and xylem 500 enzyme (25 mg).

The chemical analysis of experiment diets was calculated according to (Ellis, 1981). The measured performance parameters, include final weight (gm) body weight gain, feed intake, feed conversion ratio and mortality rate were recorded daily. Carcass preparation in the end of the experimental period: 3 birds were selected randomly from each group and weighed individually after an overnight fasting with only water allowed, and then they were slaughtered by severing the right and left carotid and jugular vessels, trachea and esophagus and blood samples were collected in test tubes and analyzed to determine total plasma cholesterol. After bleeding they were scalded in hot water, hand-plucked and washed. The head was removed closed to skull, feet and shanks were removed at the hock joint. The hot
carcass was weighed for calculating the dressing percentage, expressed as a percentage of live weight. Non carcasses components (heart, liver, and gizzard) were also weighted.

**Statistical Analysis**

The data were tabulated and subjected to one separated according to (DMRT) by using the statistical analysis system (SAS) computer program. Completely randomized design was used in this experiment. The least significance differences (LSD) between treatments were separated using the method of Montgomery and Dacuglas (2001).

**RESULTS**

Performance value effects of feeding Gum Arabic (GA) with or without Xylam 500 on the performance of broiler were illustrated in Table (1).

The results revealed that chicks group fed on diet supplemented with GA recorded significantly (P < 0.05) heavy body weight compared to other treatment group on control, although chicks group on control diet recorded significantly (P > 0.05) the lowest value of body weight. Chicks fed on control group consumed significantly (P < 0.05) more feed, while chicks group fed on diet containing GA and supplemented with Xylam 500 consumed significantly (P > 0.05) the lowest value of feed. However, there is no significant difference for feed conversion ratio (FCR) between experimental groups.

According to non carcasses component and dressing percentage, the addition of GA with or without Xylam 500 in broiler chicks diet increased significantly (P < 0.05) the heart weight (Table 2).

The result revealed that chicks group fed on diet supplemented with GA recorded significant increase (P < 0.05) in the carcass dressing percentage compared to other tested groups, and chicks group on control diet recorded significant decrease (P > 0.05) in the carcass dressing percentage.

The addition of GA and GA with Xylam 500 in broiler chick diet significantly increased (P < 0.05) the heart weight compared to control group. Also the addition of GA in broiler chick diet significantly (P > 0.05) decreased the gizzard weight compared to the tested groups, although the inclusion of GA with Xylam 500 in broiler chicks diet significantly increased (P < 0.05) the gizzard weight compared to other tested groups. Results also showed that inclusion of GA in broiler chicks diet significantly (P < 0.05) enlarged the liver size.
compared to control group, while the supplementation of Xylam 500 to broiler diet containing GA, highly significantly (P < 0.05) increased the liver size compared to other tested groups.

According to chemical analysis, addition of GA with xylem diet significantly (P < 0.05) decreased the total cholesterol, uric acid and calcium content serum and at the same time increased the level of total protein.

Chicks fed on supplemented GA with Xylam 500 recorded the highest profit followed by chicks fed on diet content GA 6% compared to test group chick fed on control diet.

Based on the results obtained, it may be concluded that GA with Xylam 500 can be supplemented in the broiler diet without any side effect.

Economically, GA with enzyme xylem 500 can be included in broiler diets with reasonable cost.

Table (1): Effect of feeding Gum Arabic with or without Xylam on performance of broiler chicks:

| Parameter            | Treatments          | A               | B               | C               | Lsd<sub>0.05</sub> | SE±  
|----------------------|---------------------|-----------------|-----------------|------------------|-------------------|------
| Final weight (gm)    |                     | 1786.33±185.77  | 1870.33±56.92   | 1810.33±434.53   | 54.91*            | 15.87 |
| Body weight gain (gm)|                     | 1655±187.73     | 1738±118.19     | 1676±191.23      | 33.78             | 9.763 |
| Feed intake (gm)     |                     | 3790.00±166.87  | 3513.67±347.34  | 3416.00±122.56   | 46.64*            | 13.48 |
| Feed conversion ratio|                     | 2.29±0.32        | 2.02±0.21       | 2.4±0.23         | 0.5171<sup>ns</sup> | 0.1494 |
| Mortality rate (%)   |                     | 1.6             | 1.6             | 3.1              | -                 | -    |

Values are mean±SD.

Any two mean value(s) bearing different superscript(s) in a row are significantly different (P≤0.05).

**KEY**

A ≡ Sample without treatment (control)

B ≡ Sample treated with gum Arabic.

C ≡ Sample treated with gum Arabic and enzyme.
Table (2): Effect of feeding Gum Arabic with or without Xylam on Dressing Percentage and Non Carcasses Component of broiler chicks:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatments</th>
<th></th>
<th></th>
<th>Lsd&lt;sub&gt;0.05&lt;/sub&gt;</th>
<th>SE±</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot dressing</td>
<td>67.33&lt;sup&gt;c&lt;/sup&gt; ±8.39</td>
<td>69.33&lt;sup&gt;a&lt;/sup&gt; ±1.15</td>
<td>68.33&lt;sup&gt;b&lt;/sup&gt; ±1.15</td>
<td>0.9855&lt;sup&gt;+&lt;/sup&gt;</td>
<td>0.2848</td>
</tr>
<tr>
<td>Heart</td>
<td>10.00&lt;sup&gt;a&lt;/sup&gt; ±0.0</td>
<td>11.67&lt;sup&gt;b&lt;/sup&gt; ±2.89</td>
<td>11.67&lt;sup&gt;a&lt;/sup&gt; ±2.89</td>
<td>0.709&lt;sup&gt;+&lt;/sup&gt;</td>
<td>0.1361</td>
</tr>
<tr>
<td>Gizzard</td>
<td>26.67&lt;sup&gt;c&lt;/sup&gt; ±2.89</td>
<td>23.33&lt;sup&gt;b&lt;/sup&gt; ±2.89</td>
<td>33.33&lt;sup&gt;a&lt;/sup&gt; ±7.64</td>
<td>2.989</td>
<td>0.9287</td>
</tr>
<tr>
<td>Liver</td>
<td>25.00&lt;sup&gt;c&lt;/sup&gt; ±5.00</td>
<td>26.67&lt;sup&gt;b&lt;/sup&gt; ±2.89</td>
<td>33.33&lt;sup&gt;a&lt;/sup&gt; ±12.58</td>
<td>0.1597&lt;sup&gt;+&lt;/sup&gt;</td>
<td>0.04615</td>
</tr>
</tbody>
</table>

Values are mean±SD.

Any two mean value(s) bearing different superscript(s) in a row are significantly different (P≤0.05).

KEY

A ≡ Sample without treatment (control).
B ≡ Sample treated with gum Arabic.
C ≡ Sample treated with gum Arabic and enzyme.

Table (3): Effect of feeding gum Arabic with or without Xylam on Chemical analysis of blood serum of broiler chicks:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatments</th>
<th></th>
<th></th>
<th>Lsd&lt;sub&gt;0.05&lt;/sub&gt;</th>
<th>SE±</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol (mg/dL)</td>
<td>116.67&lt;sup&gt;a&lt;/sup&gt; ±2.52</td>
<td>115.00&lt;sup&gt;b&lt;/sup&gt; ±4.58</td>
<td>114.00&lt;sup&gt;c&lt;/sup&gt; ±3.61</td>
<td>0.7325&lt;sup&gt;+&lt;/sup&gt;</td>
<td>0.2117</td>
</tr>
<tr>
<td>Uric acid (mg/dL)</td>
<td>2.77&lt;sup&gt;a&lt;/sup&gt; ±0.25</td>
<td>2.57&lt;sup&gt;b&lt;/sup&gt; ±0.40</td>
<td>2.67&lt;sup&gt;c&lt;/sup&gt; ±0.35</td>
<td>0.6834&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.1975</td>
</tr>
<tr>
<td>Alkaline phosphate (mg/dL)</td>
<td>86.00&lt;sup&gt;a&lt;/sup&gt; ±2.00</td>
<td>85.33&lt;sup&gt;b&lt;/sup&gt; ±3.06</td>
<td>83.33&lt;sup&gt;c&lt;/sup&gt; ±4.51</td>
<td>0.6693&lt;sup&gt;+&lt;/sup&gt;</td>
<td>0.1934</td>
</tr>
<tr>
<td>Ca (mg/dL)</td>
<td>7.43&lt;sup&gt;a&lt;/sup&gt; ±0.12</td>
<td>7.67&lt;sup&gt;b&lt;/sup&gt; ±0.15</td>
<td>7.93&lt;sup&gt;c&lt;/sup&gt; ±0.21</td>
<td>0.3283&lt;sup&gt;+&lt;/sup&gt;</td>
<td>0.09487</td>
</tr>
<tr>
<td>Total protein (gm)</td>
<td>4.37&lt;sup&gt;a&lt;/sup&gt; ±0.15</td>
<td>4.33&lt;sup&gt;b&lt;/sup&gt; ±0.32</td>
<td>4.33&lt;sup&gt;c&lt;/sup&gt; ±0.21</td>
<td>0.477&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.1378</td>
</tr>
</tbody>
</table>

Values are mean±SD.

Any two mean value(s) bearing different superscript(s) in a row are significantly different (P≤0.05).

KEY

A ≡ Sample without treatment (control).
B ≡ Sample treated with gum Arabic.
C ≡ Sample treated with gum Arabic and enzyme.
Fig (1): Effect of feeding Gum Arabic and Xylam on performance of broiler chicks:

**KEY**
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Fig (2): Effect of feeding Gum Arabic and Xylam on Dressing percentage and Non Carcasses Component of broiler chicks:

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Fig (3): Effect of feeding Gum Arabic and Xylam on Chemical analysis of blood serum of broiler chicks

KEY
A ≡ Sample without treatment (control).
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C ≡ Sample treated with gum Arabic and enzyme

DISCUSSION
In the present study the effect of application of Gum Arabic (0.6%) and Gum Arabic (0.6) with Xylam 500 enzyme revealed significant difference in the performance (BWG, FI) of broiler chicks. Although chicks fed with Gum Arabic and Gum Arabic with Xylam 500 enzyme recorded significantly (P < 0.05) the highest values of body weight compared to those fed on control group, chicks fed with GA recorded significantly (P < 0.05) the highest values of BWG compared to other tested group. These results were in line with the findings of Piray et al. (2007) who demonstrated significant increases in BWG in broiler recovering diets supplemented with prebiotics. Similar results were also demonstrated by Abd-Razig et al. (2010) who reported significant increase in body weight of hen from addition of graded levels of Gum Arabic in laying hens.

On the other hand, the results of this study disagreed with Sim and Soften (1999) who reported no significant difference in BWG and FI for using prebiotic and with Waldroup et al (2003) and Midill et al (2001) who found that dietary prebiotic supplementations did not significantly affect BW and BWG.

Chicks fed on control group consumed significantly (P< 0.05) more feed, while chicks group fed on diet containing GA and supplemented with Xylam 500 enzyme consumed significantly
(P > 0.05) the lowest value of feed. This might be due to increase of availability with GA and enzyme. These results disagreed with Sanchez and Ayaya (1998) who found that dietary prebiotic have been shown to increase FI and with El-kheir et al (2010) who found that supplementation of 15% GA in layer based diet increased diet FI.

REFERENCES


17. Sim s, M. D. and Soften,AE. Comparative effects of amannanoligo Saccharide and an antibiotic growth promoter on performance of commercial tom turkeys. 48th Western Poultry Disease Conf., Vancouver, Canada., 1999; 78-82.