EFFECT OF DATES (Phoenix dactylifera L.) ON RENAL BIOCHEMICAL AND HISTOLOGICAL PARAMETERS OF BROILER CHICKS EXPERIMENTALLY INFECTED WITH INFECTIOUS BURSAL DISEASE VIRUS

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ABSTRACT

Total number of (80) birds (Ross 308) at one day old were purchased from local hatchery in the area. The birds were subdivided into four equal groups (no.=20) and were supplied with basal scientific diet. Palm date (PD) was supplied to G3 and the birds were challenged with virulent Infectious Bursal Disease Virus (IBDV). G4 was treated with palm date 3 days prior to challenge age. G2 was challenged without supplementation of PD while G1 was not supplied with PD neither challenged with IBDV. Inclusion rate of PD was 10%. The challenged age was at 33 days old. Blood serum was assayed five days post infection period for evaluation the effect of PD supplied as well the effect of IBDV on the kidney as manifested by serological investigation of urine, uric acid and creatinine level in the blood. The recorded data were compared with histological study of kidney to all groups. The study showed that birds possess peculiar physiological characters that made serological study with the exception of creatinine as a monitor for the health status is unfair. Histopathological study remains more accurate judgment.

Key words: Date palm, Kidney, Urea, Creatinine, Uric Acid, IBDV, Histopathology, Broiler Chicks.

Introduction

In recent years there have been qualitative leaps in poultry industry aimed for reducing the marketing time of the birds with high performance productivity as represented by feed conversion ratio (FCR), weight gain and feed intake. This new strategy aims to fill the shortage of protein needed for human requirements after the abrupt increase in population all over the world country for the extent to live exceptional conditions called food security. The lines of this strategy include early feed supply of newly hatched chicks in order to initiate early digestive tract development, hyperplastic absorptive villi and well developed immune system (1,2,3,4).

The use of an alternate in the component of poultry diet have been tried in order to reduce the cost of feed supply as well as to participate in supplying human being for their critical shortage for grains as corn and wheat (5,6). Recently a new trend towards the use of palm dates (Phoenix dactylifera L.) as substitutes instead of grains. Palm date is highly cultivated in tropical and subtropical countries and is regarded as the cheapest agricultural product in these areas (7,8). Fruits of palm dates are the most commonly used in possessing a high source of energy containing 72-80% of sugar at maturity (9).

Palm date have a wide range of medical properties and can be used as a natural feed additive to reduce the enteric pathogenic bacteria that is the main cause for disease condition resulting in high economic losses in poultry industry (10,11). In addition date serves as a good natural antioxidant and could be considered a functional food or ingredient (12,13). This is due to the presence of a high phenolic content that scavenge free radicals which acts as anti-oxidant and anti-mutagenic compounds (14,15). As a result palm date can be used as a medical protective for liver, kidney, cardiovascular system, prevent protein denaturation, DNA damage and lipid peroxidation (16, 17, 18).
Our study will pay a special attention for palm date as a feed additive and natural anti-microbial drug. The kidney will be taken as a model for investigation. The study will adopt two separate lines, serological study through investigation of urea, uric acid and creatinine level in blood serum, the second line will be through histological study. Poor references are available to support this study or to be used for comparison because of limited information concerning blood profile of chicken (19).

**Materials and Methods**

A total number of (80) chicks type (Ross 308) at the age of one day old were purchased from local hatchery in the area. They were allotted into four sub-groups. The birds were supplied with basal scientific ration in addition to 10% whole grinded dry palm date type Zahdi (Phoenix dactylifera). Palm date was supplied to G3 and the birds were challenged with virulent Infectious Bursal Disease Virus (IBDV). G4 was treated with palm date 3 days prior to challenge age. G2 was challenged without supplementation of PD while G1 was not supplied with PD neither challenged with IBDV. Inclusion rate of PD was 10%.

The birds were exposed to oral infection with highly virulent Infectious Bursal Disease Virus (IBDV) at the age of 33 day old. Infection was done by collection of grossly representative infected bursae with local field strain. The collected samples were homogenized, tissue suspension was centrifuged for a period of ten minutes at a rate of 2500 revolution per minute, supernatant fluid was aspirated, penicillin and streptomycin were added at a rate of two thousands IU and two mg per 1 ml respectively. Five birds from each group were sacrificed 5 days post infection period (PIP) to monitor any differences between treated and non-treated groups through evaluation of blood serum related to different groups. The parameters adopted in evaluation were creatinine, urea and uric acid.

### Table-1: Distribution of chicks with their treatment.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Treatment</th>
<th>Challenge</th>
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</thead>
<tbody>
<tr>
<td>G1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G2</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>G3</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>G4</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

- : Not given date palm  
+ : Treated with 10% palm date.  
Number of birds = 80 birds.

PD was supplied to G3 and the birds were challenged with virulent Infectious Bursal Disease Virus (IBDV). G4 was treated with palm date 3 days prior to challenge age. G2 was challenged without supplementation of PD while G1 was not supplied with PD neither challenged with IBDV. Inclusion rate of PD was 10%.

**Serological study**

The technique followed was according to kits manufacturers. And the kits for serum urea, creatinine and uric acid were purchased from LINEAR CHEMICALS L.U. Barcelona, Spain.

**Histopathological study**

Tissue samples were taken from the kidney five days post infection period from all groups and was processed according to Luna, 1968, (20).

**Statistical analysis**

The data were expressed as the means and standard deviation and then they were subjected to statistical analysis using one way analysis of variance (ANOVA). The Tukey's Post Hoc test was followed to identify levels of significance when comparing means. Confidence intervals of 95% were used, so differences were considered significant at p<0.05. JASP statistical software was used to perform statistical tests (21).

**Result and Discussion**
Table-2 showed that there were significant differences in the levels of creatinine between different groups, G1 showed higher level (p<0.05) than G2 (0.615 ± 0.218,0.308 ± 0.000) respectively, and no significant differences between G1 and G4. G4 differs significantly from G3 (treated groups). This uncontrolled and fluctuated results may be explained for the fact that creatinine level in the blood depend upon several factors among which the size of muscle, fasting, excitement and the active physiological state, this is in agreement with (22). The low level of creatinine in G4 may be attributed to long period of palm date supply which have the ability to counteract the effect of injurious agent as IBDV. This in agreement with M. S. Hammed (23). The protective effect of palm date to the kidney is related to its high content of anti-oxidant component such as vitamin E, vitamin C and melatonin that are the basis of nephro protection (24,25).

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>0.615 ± 0.218 AC</td>
</tr>
<tr>
<td>G2</td>
<td>0.308 ± 0.000 B</td>
</tr>
<tr>
<td>G3</td>
<td>0.769 ± 0.000 A</td>
</tr>
<tr>
<td>G4</td>
<td>0.385 ± 0.089 BC</td>
</tr>
</tbody>
</table>

Table-3 showed that urea level in G1 (11.52 ± 0.624) lower significantly (p<0.05) than G3 (14.32± 1.948) while other groups (G1,G2 and G4) showed no significant differences. Infectious bursal disease virus is considered as highly injurious agent to kidney and is of specific tropism to this organ causing severe damage to kidney parenchyma and dysfunction of this organ leading to elevation of blood urea (26). This disagreed with Rahmani et.al (2014) who mentioned that palm date contains some antioxidant which play important role to reactive oxygen species clearance (25). The data reviled no effect of palm date supply in protection of the kidney as associated with IBDV.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>11.52 ± 0.624 B</td>
</tr>
<tr>
<td>G2</td>
<td>12.40 ± 0.905 AB</td>
</tr>
<tr>
<td>G3</td>
<td>14.32± 1.948 A</td>
</tr>
<tr>
<td>G4</td>
<td>12.54 ± 0.339 AB</td>
</tr>
</tbody>
</table>

Uric acid is the major end product of protein metabolism in poultry, this is because birds are uricotelic and lack of uricase enzyme (27). Few literatures are available with regard to uric acid concentration in the blood that results from break down of purine amino acid, it depends upon the nature of feed taken (28).Clinically the estimation of serum creatinine is considered superior to that of blood urea nitrogen as a measure of kidney function, this is because it depends upon the nature of feed taken (29). This explained our data as shown in table-4 in which there were no any significant differences in all groups because they have subjected to the same source in feed
supply. Also the result showed that PD have no effect on uric acid excretion because of their absence to uricase enzyme (27).

<table>
<thead>
<tr>
<th>Table-4 uric acid 5 day PIP.</th>
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<tbody>
<tr>
<td>Group</td>
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<tr>
<td>------</td>
</tr>
<tr>
<td>G1.</td>
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<tr>
<td></td>
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<tr>
<td>G2.</td>
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<tr>
<td></td>
</tr>
<tr>
<td>G3.</td>
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<td>G4.</td>
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</table>

**Pathological study**

In spite of no significant differences between G1 and G4 serologically in all estimated parameters, figure 1 showed normal histological picture of kidney parenchyma while G4 showed congested blood vessels with glomerular atrophy (Figure 1, Figure 2).

![Figure 1](image1.png)

Figure 1. G. 1. No treatment + no Challenge (showed normal histological appearance) H and E 100X.
Figure 2. G4 pre-treated followed by Challenge (kidney showed congested blood vessel (arrow) with moderate glomerular atrophy (arrow head) H and E 400X. In the other hand G2 that had been challenged but not treated showed wide areas of inflammatory cell infiltration, tubular epithelial tissue with massive necrosis and blood vessels congestion (Figure 3).

Figure 3. G2 no Treatment and Challenged, Kidney: wide areas of inflammatory cell infiltration (arrow), tubular epithelial tissue with massive necrosis (double arrow) blood vessels congestion (arrowhead) H and E 100X.

G3 showed more inflammatory cells infiltration as manifested by hyper cellularity of glomerular cells in comparison to G4, this may be attributed to pre-medical treatment of G4 (three days earlier) (Figure 4).
Figure 4. G3: Treatment followed by Challenge histomorphology picture showed hypercellularity of glomeruli cell (arrow) H and E 400X.

The study concluded that creatinine is more representative than urea and uric acid in evaluation of the health status of the kidney, but still histopathological study is more indicative. Moreover, palm date have been proved to be of moderate effect in protecting the treated groups. Further studies are needed to confirm our results.

References:


