Effect of Bermuda Grass *Cynodon dactylon* Extracts on Cotton Leaf Worm, *Spodoptera littoralis* Boisduval (Lepidoptera: Noctuidae)

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ABSTRACT

Bermuda grass, *Cynodon dactylon* (L.) extracts were tested on cotton leaf worm, *Spodoptera littoralis* (Boisd.). Five solvents were used in preparing of these extracts, (i.e., methanol, petroleum ether, acetone, diethyl ether and distilled water). Distilled water was used as polar solvent. The results showed that extracts of non-polar solvents were more effective than water. Methanol extract resulted in highest number of giant larvae. Methanol and diethyl ether extracts resulted in the highest number of deformed pupae.

Acetone extract caused highest number of mortalities, followed by diethyl ether and methanol extracts. Methanol extract proved to be the most efficient on fertility of *S. littoralis*. All extracts had a slight effect on the larval and pupal stages duration compared with control. Larval and pupal weights were affected in the same manner also. It was concluded that all extracts caused a disturbance in hormonal balance in the larvae.

**Keywords:** *Spodoptera littoralis, Cynodon dactylon*

INTRODUCTION

Bermuda grass, *Cynodon dactylon* (L.) (Fam. Geramineae) has shown to play different roles biologically, physiologically, insecticidaly in animal control (Mueller and Dumas, 1987; Chang, 1986; and Singh et al., 2008). Walter (1962) isolated four components from *C. dactylon*. These include B. sitosteral, B. sitosteryl, D. glucoside and palmitic acid. Negulescu and Pisoji (2008) found that this grass also contains selenium and arsenic selenium.

Effect of this grass on fall army worm larvae and the relationship of its quality to the larval developmental parameters was studied by Lynche et al. (1983 and 1986). Cynodon plant was also used to investigate host associated genetic differentiation and developmental and reproductive traits in fall armyworm strains (Pashly, 1986; and Pashly et al., 1995). Excellent work was experimentally done on consumption, utilization, biology and economic injury levels of fall army worm on Bermuda grasses by Jamjanya (1987) and Jamjanya and Quisenberry (1988). This grass was also used as host plant for *Spodoptera exempta* (Walker) in biological control studies using highly effective strains of *Bacillus thuringiensis* (Broza et al., 1991).

The present paper is concerned with demonstrating the effect of five extracts of Bermuda grass using different non-polar and polar solvents on morphogenetic and fertility of *Spodoptera littoralis* Boisd.

MATERIALS AND METHODS

Experimental animals:

Larvae of the cotton leaf worm *S. littoralis* were obtained from culture bred and constantly maintained for several years under laboratory conditions according to
the procedure of El–Ibrashy and Chenouda (1970). They were fed on fresh castor-oil leaves and kept at 30±1°C and 65 ± 5% RH. The tested larvae were individually placed in glass vials (10x2.7 cm each). Tightly covered with muslin mesh for daily inspections and weightings.

**Preparation of plant extracts:**

Bermuda grass, *C. dactylon* (Fam. Geramineae) was planted in clay soil in the experimental plots at National Research Center. After one month, grass was collected and the leaves were separated from roots. Plant leaves were allowed to dry for ten days at room temperature. Dried leaves were separated manually and crashed by house hold grinder. Hundred grams crashed plant leaves were soaked in 200 ml of each solvent as methanol, petroleum ether (60-80), acetone, diethyl ether and distilled water for 48 hours, with continuous stirring. Filtration was then carried out through very fine gauze. All extracts were kept in a dry cold place.

**Treatments:**

Castor-oil leaves discs (2 cm diameter) were prepared using cork corer and each was weighted. By micro pipette one (µl) of each extract was applied to each caster oil disc. A new moulted 4th instar larva was located on each disc. The experimental discs were then placed individually in cups (120 ml) and each was weighted before and after introducing the larvae, during the first 24th hour. (El- Gammal et al., 1988). After 24th the larvae were fed on untreated castor leaves. The percents of mortalities were calculated in the end of the experiment.

**Statistical analysis**

Data were analyzed by analysis of variance (one way classification ANOVA) and followed by a least significant difference (L.S.D at 5%) (SAS Institute Inc., 2003).

**RESULTS**

The obtained data showed that the highest number of mortalities occurred when acetone (7), methanol (5), diethyl ether (5) followed by water (3) and petroleum ether extracts were used (Table 1). Data also proved that non polar extracts affected the hormonal balance of treated larvae resulted in occurrence of deformed and giant larvae. The highest numbers of giant larvae were when methanol extract (12) was used. The highest number of deformed larvae was found after using water, acetone and petroleum ether extract.

The number of laid eggs were highest when water was used followed by diethyl ether, petroleum ether, acetone.

<table>
<thead>
<tr>
<th>Extracts</th>
<th>Alive</th>
<th>*Mortalities</th>
<th>Deformation</th>
<th>Giant larvae</th>
<th>No. of laid eggs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>12</td>
<td>0.0</td>
</tr>
<tr>
<td>Petroleum ether</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>10750</td>
</tr>
<tr>
<td>Acetone</td>
<td>6</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>9516</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>12543</td>
</tr>
<tr>
<td>Water</td>
<td>13</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>15533</td>
</tr>
<tr>
<td>control</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>22564</td>
</tr>
</tbody>
</table>

*20 larvae were used in each extract treatments.

**Mortality was calculated when larvae reached at adult emergence.**
Statistical analysis (Table 2) revealed that both methanol and water reduced the time of 4th instar larvae compared with control. These durations were 4.933 and 4.850 compared with 5.450 days, respectively. The fifth instar larval durations by three non polar extracts (i.e., methanol, petroleum ether and diethyl ether) were not significantly different from the control. As far as the sixth instar and the prepupal stages, data revealed that all extracts had significantly reduced durations compared with the control. The longevity of the pupal stage was similar among affected by methanol, petroleum ether and acetone extracts resembling the control.

Results presented in data in Table 3 shows also that the weight of the different stages of *S. littoralis* had been variously affected by the *C. dactylon* extracts. All non polar and water extracts have equal effect on the weight of the fourth instar resembling the control. As far as the fifth instar is concerned water and diethyl ether had equal low effect. Petroleum ether and acetone had intermediate effect resembling the untreated insects.

### Table 2: Effect of *Cynodon dactylon* extracts on the duration of different stages of *Spodoptera littoralis*

<table>
<thead>
<tr>
<th>Extracts</th>
<th>Larval duration (in days ± SE)</th>
<th>Pupal stage (in days ± SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4th instar</td>
<td>5th instar</td>
</tr>
<tr>
<td>Methanol</td>
<td>4.93±0.07</td>
<td>5.73±0.12</td>
</tr>
<tr>
<td>Petroleum ether</td>
<td>5.55±0.16</td>
<td>5.45±0.11</td>
</tr>
<tr>
<td>Acetone</td>
<td>5.35±0.11</td>
<td>5.83±0.19</td>
</tr>
<tr>
<td>Water</td>
<td>4.85±0.11</td>
<td>6.15±0.11</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>5.45±0.19</td>
<td>5.70±0.11</td>
</tr>
<tr>
<td>control</td>
<td>5.45±0.11</td>
<td>5.68±0.11</td>
</tr>
<tr>
<td>F. values</td>
<td>4.845**</td>
<td>3.565**</td>
</tr>
</tbody>
</table>

### Table 3: Effect of *Cynodon dactylon* extracts on the weight (g ± SE) of different stages of *Spodoptera littoralis*.

<table>
<thead>
<tr>
<th>Extracts</th>
<th>Body Weight (g ± SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4th instar</td>
</tr>
<tr>
<td>Methanol</td>
<td>0.029±0.001a</td>
</tr>
<tr>
<td>Petroleum ether</td>
<td>0.032±0.004a</td>
</tr>
<tr>
<td>Acetone</td>
<td>0.028±0.001a</td>
</tr>
<tr>
<td>Water</td>
<td>0.031±0.002a</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>0.025±0.00a</td>
</tr>
<tr>
<td>control</td>
<td>0.030±0.005a</td>
</tr>
<tr>
<td>F. values</td>
<td>1.170**</td>
</tr>
</tbody>
</table>

*Means under each variety sharing the same letter in a column are not significantly different at P<0.05

However, methanol had rather high effect on the weight of this instar. The weight of the sixth instar was equally affected by water and diethyl ether. Petroleum ether and methanol have the highest effect on the weight of the pupa, while water caused low effect resembling the control. However methanol had high effect on the prepupal weight.
DISCUSSION

*C. dactylon* extracts showed to have similar properties to morphogenetics. When larvae of *S. littoralis* were fed on this grass extract, some developed to giant larvae and deformed pupae. Similar abnormalities resulted from some upset in the balance of hormones during development had been shown in other insects by previous workers (*Rhodnius*, Wigglesworth (1964) and *Trogoderma granarium*, Azmy (1975).

Also the present results proved that this grass extracts also played a great role on number of eggs laid.

A vast amount of data has been published on the neuron-endocrine reproduction relations in female insects showing maturation and oviposition are controlled by different levels of hormonal activity of neurosecretory system (Azmy 1964).

The present treatments also lead some times to death; consequently this grass extracts could be used as antifeeding or insecticide. This is in agreement with the findings of Lynch *et al.*, (1983) and Jamjanya (1987) in fall army worm.

More histological and physiological research work is needed to fine the characteristic features of each components of this grass extracts.

REFERENCES


ARABIC SUMMARY

تأثير مستخلص النجيل على دودة ورق القطن

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تم اختبار مستخلص نبات النجيل على بروتقات دودة ورق القطن العامل البرقوقي الرابع، خاصة على عملية التشكل الظهاري ووضع البيض. استخدم خمس مذيبات أربعة منها مذيبات غير قطبية في الميثانول و الدي كلورامين ايثير و الاستيروك و الداي ايثير وكذلك الخامس الماء كمذيب قطبي. أوضحت النتائج أن فاعلية المذيبات غير القطبية مع المستخلص كانت أكبر من الماء ؛ حيث اعطي الميثانول أكثر عدد من البروقات العاملة. إلا أنه مستخلص الداي ايثير كون أكبر عدد من العدارى المشروفة.

أما أكبر عدد من البروقات المتبعة نتج من المعاملة بمستخلص الأسيتون ثم مستخلص الداي ايثير ومستخلص الإيثانول معا ونفس النسبة لكن يلاحظ أن مستخلص الماء من أضعف المستخلصات في تأثيره على أطراف الأفة. أما من جهة تأثير المستخلصات على وضع البيض فإن المعاملة بمستخلص الإيثانول تمنع الفراشات المتكونة من وضع البيض مما يجعله في مقدمة المستخلصات المؤيدة على وضع البيض.

تأثر جميع المستخلصات ضعيف على طول فترة الأعاص البرقوقية وكذلك على أوزان البروقات والعدارى الناتجة.

يعزى تأثير هذه المستخلصات إلى تأثيرها على التناظر الهورموني داخل البروقات أو العداري حيث ظهرت بعض البروقات بصورة عقلية أو تكون عنادرا مشروهة أو نقص/إعدام وضع بيض في الفراشات المتكونة.