Egypt. Acad. J. biolog. Sci., 2 (2): 171-175 (2009) **A. Entomology**
Email: egyptianacademic@yahoo.com **ISSN: 1687–8809**
Received: 30/11/2009 **www.eajbs.eg.net**

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

Noeman B. AREF
Pests and Plant protection Dept., National Research Center, Giza, Egypt.

ABSTRACT

Bermuda grass, *Cynodon dactylon* (L.) extracts were tested on cotton leaf worm, *Spodoptera littorals* (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. littorals.* 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 Pisohi (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 distillated 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 obtained when methanol and diethyl ether extracts (3) were used. On the other hand, the lowest number of giant 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 (1): Biological parameters of Bermuda grass, *C. dactylon* (L.) extracts with different solvents on 4th instar larvae of *S. littoralis*

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

*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 larvae 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. littorals* 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*

Extracts	Larval duration (in days ± SE)			Pupal stage (in days ± SE)	
	4th instar	5th instar	6th instar	prepupa	Pupa
Methanol	4.933±0.07^{b}	5.733±0.12^{b}	9.188±0.36^{b}	3.0±0.24^{a}	24.154±0.59^{b}
Petroleum ether	5.550±0.16^{a}	5.450±0.11^{b}	9.048±0.22^{b}	3.8±0.27^{a}	24.250±0.55^{b}
Acetone	5.350±0.11^{a}	5.833±0.19^{ab}	8.722±0.28^{b}	2.944±0.21^{a}	24.222±0.42^{b}
Water	4.850±0.11^{b}	6.150±0.11^{a}	9.150±0.21^{b}	2.350±0.15^{a}	26.20±0.53^{a}
Diethyl ether	5.450±0.19^{a}	5.700±0.11^{b}	9.368±0.28^{b}	2.474±0.21^{a}	25.684±0.47^{ab}
control	5.450±0.11^{a}	5.684±0.11^{b}	10.316±0.36^{a}	1.579±0.16^{b}	24.263±0.42^{b}
F. values	4.845**	3.565**	3.656**	6.416**	3.413**

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

Extracts	Body Weight (g ± SE)				
	4th instar	5th instar	6th instar	prepupa	Pupa
Methanol	0.029±0.001^{a}	0.164±0.005^{a}	0.675±0.017^{a}	0.444±0.014^{a}	0.351±0.018^{a}
Petroleum ether	0.032±0.004^{a}	0.158±0.004^{ab}	0.658±0.015^{a}	0.423±0.010^{ab}	0.352±0.009^{a}
Acetone	0.028±0.001^{a}	0.139±0.004^{cd}	0.523±0.013^{c}	0.399±0.011^{bc}	0.336±0.011^{ab}
Water	0.031±0.002^{a}	0.133±0.004^{d}	0.589±0.018^{b}	0.393±0.011^{bc}	0.303±0.004^{c}
Diethyl ether	0.025±0.0^{a}	0.132±0.006^{d}	0.572±0.015^{b}	0.377±0.009^{c}	0.320±0.008^{bc}
control	0.030±0.005^{a}	0.147±0.004^{bc}	0.556±0.016^{bc}	0.369±0.011^{c}	0.319±0.011^{bc}
F. values	1.170^{ns}	9.190**	13.475**	6.348**	3.644**

*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 extracts, 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 Jamajanya (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

Azmy, N. M. (1964). Studies concerning neurosecretion in the Khapra beetle *Trogoderma granarium* Everts. Ph.D. Thesis Uni. of London, 430pp

Azmy, N. M. (1975). The effect of farnesol on *Trogoderma granarium* Everts. Zeitshrift fur Angewandte Entomologie, 78:75-82.

Broza, M.; Brownbridge, M.; Hamal, M. and Sneh, B. (1991). Control of the African armyworm, *Spodoptera exempta* Walker (Lepidoptera: Noctuidae) in Kenyan fields with highly effective strains of *Bacillus thuringiensis* Berliner. Bio-Control Science and Technology, 1 (2):127-135.

Chang, N.T. (1986). Quantitative utilization of selected grasses by fall army worm (Lepidoptera: Noctuidae) larvae. Chinese J. Econ. Entomol., 6 (2): 163 - 175.

El-Gammal, A.M.; Karrar, A.H.; Mohamed, M.T. and Ghoneim, K.S. (1988). Antifeedant effects of some wild plants in eastern diserts of Egypt and Sudan to *Schistcerca gregaria* (Orthoptera: Acrididae). J. Fac. Education, Ain-Shames Univ. 13:251-263.

El-Ibrashy, M. T. and Chenouda, M.S. (1970). Cholinesterase activity in *Spodoptera littoralis* Boisd. in relation to development and metamorphosis. Zeitschrift fur Angewandte Entomologie. 65:146-156.

Jamjanya, T. (1987). Consumption, utilization, biology and economic injury levels of fall armyworm, *Spodoptera frugiperda* (J.E.Smith), on selected Bermuda grasses. Dissertation Abstract, International B (Sciences and Engineering). 48(6)1590B.

Jamjanya, T. and Quisenberry, S. S. (1988). Fall armyworm (Lepidoptera: Noctuidae) consumption and utilization of nine Bermuda grasses. J. Econ. Entomol., 81(2):697-704.

Lynch, R.E.; Monson, W.G.; Wiseman, B. R. and Burton, G.W. (1983). Bermuda grass resistance to the fall armyworm (Lepidoptera: Noctuidae). Environ. Entomol. 12 (6):1837-1840.

Lynch, R.E.; Monson, W.G.; Wiseman, B.R.; Burton, G.W. and Gaines, T. P. (1986). Relationship of forage quality to developmental parameters of the fall armyworm (Lepidoptera : Noctuidae). Environ. Entomol., 15 (4):889-893.

Muellur, A. and Dumas, B.A. (1987). Host plants of the three cornered alfalfa hopper (Homoptera: Membracidea). Environ. Entomol., 16 (2): 513 – 518.

Negulescu, G.P. and Pisoschi, Z.M. (2008). Selenium and arsenic selenium-accumulator plants. The Romanian Academy, Series B: Chemistry, Life Sciences and Geoscience. 10 (1-2):3-6.

Pashley, D.P. (1986). Host-associated genetic differentiation in fall armyworm (Lepidoptera: Noctuidae): a sibling species complex. Ann. Entomol. Soc. Amer., 79 (6):898-904.

Pashly D. P.; Hardy, T.N. and Hammond, A. M. (1995). Host effects on developmental and reproductive traits in fall armyworm strains (Lepidop[tera: Noctuidae). Ann. Entomol. Soc. Amer., 88(6): 748-755.

SAS Institute Inc (2003). SAS/STAT Version 8.2. SAS Institute Inc., Cary, NC.

Singh, S.; Rai, P.K.; Jaiswal, I. D.; Rai, D.K.; Sharma, B. and Watal, G. (2008). Protective effect of Cynodon dactylon against (Stz) sterptozotocin induced hepatic injury in rats. J. Ecophysi., & Ocupational Health. 8 (3&4): 195-199.

Walter, E.D. (1962). Isolation of B. sitosteral, B. sitosteryl, D. glucoside and palmitic acid from coastel bermuda grass and orcard grass. J. Pharmacitical Sci., 52 (7):708

Wigglesworth, V.B. (1964). Hormones and insect growth: review. Adv. Insect Physiol., 2: 243-332.

ARABIC SUMMARY

تأثير مستخلص النجيل على دودة ورق القطن

نعمان بهاء الدين عارف
قسم آفات ووقاية النبات - المركز القومي للبحوث

تم اختبار مستخلص نبات النجيل علي يرقات دودة ورق القطن العمر اليرقي الرابع، خاصة علي عملية التشكل الظاهري ووضع البيض. استخدم خمس مذيبات اربعة منها مذيبات غير قطبية هي الميثانول و البتروليوم ايثر و الاسيتون و الداي اثيل اثير وكذلك الخامس الماء كمذيب قطبي. اوضحت النتائج ان فاعلية المذ يبات غير القطبية مع المستخلص كانت اكبر من الماء ؛ حيث اعطي الميثانول اكبر عدد من اليرقات العملاقة. إلا أنه ومستخلص الداي إيثل إيثر كون أكبر عدد من العذارى المشوهة.

أما أكبر عدد من اليرقات الميته نتج من المعاملة بمستخلص الأسيتون ثم مستخلص الداي إيثل إيثر ومستخلص الإيثانول معا وبنفس النسبة لكن يلاحظ أن مستخلص الماء من أضعف المستخلصات في تأثيره على أطوار الآفة. أما من جهة تأثير المستخلصات على وضع البيض فإن المغاملة بمستخلص الإبثاتول تمنع الفراشات المتكونة من وضع البيض مما يجعله في مقدمة المستخلصات المؤثرة على وضع البيض.

تأثير جميع المستخلصات ضعيف على طول فترة الأعمار اليرقية وكذلك على أوزان اليرقات والعذارى الناتجة.

يعزى تأثير هذه المستخلصات إلى تأثيرها على التوازن الهرموني داخل اليرقات أو العذارى حيث ظهرت بعض اليرقات بصورة عملاقة أو تكون عذارى مشوهة أو نقص/إنعدام وضع بيض في الفراشات المتكونة.