

INFLUENCE OF SOME PLANT EXTRACTS ON CERTAIN BIOLOGICAL ASPECTS OF *SESAMIA CRETICA* LED. UNDER LABORATORY CONDITIONS

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Abstract

The influence of some plant extracts belonging to different families using different polarity solvents on certain biological aspects of 2nd larval instar of *S. cretica* larvae was investigated under laboratory conditions of 31 °C & 60 R.H.. The extracted plants were tooth pick, *Ammi visnaga* Lam (Family: Umbelliferae), coffee tree, *Coffea arabica* (L. Rubiaceae) , pomegranate *Punica granatum* L. (Punicaceae) and taro *Arum colocasia* (Araceae). Data obtained showed that acetone pomegranate extract and hexan tooth pick extract caused the highest mortality percentage (88% & 85% than control). In addition, acetone coffee, acetone pomegranate and hexan tooth pick extracts caused shorter mean of larval duration, 22, 22 and 23 days, respectively. The shortest pupal duration 7 days was due to hexan tooth pick and acetone coffee extract treatments. While the shortest adult longevity (8 days) due to the treatment of hexan tooth pick extract. Also, some deformations were found in *S. cretica* larvae and pupae as a result of treatment with acetone coffee extract (30 and 33%, respectively). The composition of the tested plants were obtained from some scientific sites on the wide world web.

From the previous results, it could be concluded that plant extracts proved to be a safe alternative pest control trend rather than traditional pesticides.

INTRODUCTION

Maize (*Zea mays* L.) is one of the most important grain crops in Egypt, as it conforms to wheat in its economic importance. It plays, also an important role in several industries important to Egypt's economy as corn oil, fructose sugar and starch production. The use of natural products from plant origin is a new trend which may prove efficient for pests' control. In order to avoid the hazards caused to the environment due to the repeated use of conventional chemical insecticides that are commonly used for corn borers control (Tawfik *et al.* 1974 and Hiremath *et al.* 1997).

The Pink stem borer, *Sesamia cretica* Led. (Lepidoptera, Noctuidae) is destructive to corn crop in Egypt it attacks corn plants which define as the king of the cereal crops not only in Egypt but also all over the world (Abul Nasar, *et al.*, 1968).

The use of natural products from plant origin is new trend which may prove efficient for pests control, on one hand, and to preserve the environment from

contamination with harmful toxicants, on the other hand these natural products are mainly plant extracts which prove to have deleterious effects on target insect in several ways (Zhao, *et al.*, 1998).

The composition of the tested plants were obtained from some scientific sites on the wide world web.

MATERIALS AND METHODS

1. Insects

The tested insects were collected from the Farm of Agriculture Faculty, Benha University at Moshtohor and reared on pieces of tender parts of maize plant stem under conditions of 31 (29 – 33) °C and 60 (55 – 65)% R.H inside incubator.

2. Extracts preparation

Four plants from different families were chosen in the present experiments to study the influence of their toxic activity on *S. cretica* biology.

The scientific & english names and the used parts of the plants are shown in the following table .

Scientific name	Family	English name	used part
1. <i>Ammi visnaga</i> Lam	Umbelliferae	Tooth pick	flower
2. <i>Coffea Arabica</i> L.	Rubiaceae	Coffee tree	Granules of seeds
3. <i>Punica granalum</i> L.	Punicaceae	Pomegranate	shell
4. <i>Arum colocasia</i>	Araceae	Taro	peel

All plants were left to dry in the laboratory. Dried parts from the last plants were grained in high speed electric blender Afifi *et al.*, 1988 and Yacoub, 2006. The dried powder were mixed with different polaritic solvents (Hexan, methanol, acetone and water) at ratio 1gm powder : 2 cm³ solvent, and were blended in blender for 15 minutes then filtered.

The obtained solutions were freezed at – 5 °C until used. The solvent was evaporated by using electric fan. A volume of 500 ml water was mixed with the residue of the dried extract after adding emulsifier to obtain emulsion of the desired extract 10% W/V, Sadek (2003).

3- Laboratory experiments

Laboratory experiments were carried out to study the influence of the previously mentioned extracts as toxic activity against 4th instar of *S. cretica* larvae in the laboratory (31 °C & 60% R.H.), the experiments were carried out by using dipping method. The tender pieces of maize stem were dipped for 10 seconds in the extracted

solutions, the treated pieces were left in shade to be air dried. Forty larvae were kept in plastic cups and divided into 4 replicates of 10 larvae per each replicate.

Larval mortality were daily inspected until pupation by using formula:

$$\% \text{ Mortality} = \frac{\text{No. of dead larvae}}{\text{Total No. of larvae}} \times 100$$

Larval, pupal duration, and adults longevity (days) were calculated. Also, percentages larval, pupal malformations were estimated.

RESULTS AND DISCUSSION

1. Percentages mortality

Data presented in Table (1), showed the higher mortality percentage of 2nd instar larvae of *S. cretica* was due to using of acetone as a solvent for each of coffee granules, pomegranate and colocasia extracts achieving, 90, 88 and 69% mortality, respectively. While, in case of hexan tooth pick extract the mortality was 85% being the highest of all the remaining solvents.

On the contrary, water tooth pick and granules coffee extracts, also hexan pomegranate extracts and methanol colocasia extracts caused the least percentage mortality (50, 45, 45 and 48%, respectively).

The remaining treatments had intermediate effect ranged from 48 to 70% mortality resulting from methanol coffee granules and pomegranate extracts, respectively than control treatment which caused 8% mortality.

2 . Larval duration

As shown in table (1), all treatments caused significant shortage in larval duration when compared with that of the control (32 days). The shortest larval duration period (22 days) resulted from acetone coffee granules and acetone dry roman shell extracts. However hexan tooth pick extracts, resulted in a relatively short larval duration (23 days). The remaining treatments shortened the larval duration in which methanol pomegranate extract achieved (27 days), water colocasia & coffee granule and hexan pomegranate extracts caused (31 days).

3 . Pupal duration

All treatments significantly shortened the pupal duration (Table 1). The treatments could be classified in two groups, the first had the shortest period of all extracts, including hexan tooth pick, acetone coffee extract, acetone pomegranate and acetone colocasia extracts achieving 7, 7, 6.5, 8.5 days, respectively. While, the second group included the remaining treatments which caused different pupal duration ranging from 9 to 11 days, attending the least effect level when compared with the control which recorded 12 days, as pupal duration.

4. Adult longevity

All treatments caused significant reduction in adult longevity. The shortest one resulted from acetone granule coffee extract and hexan tooth pick extract being 7.5 and 8 days, respectively when compared with control (12 days). While, the remaining treatments ranged from 9 days (after treatment with hexan, & methanol coffee granules and methanol & acetone pomegranate extracts) to 11.5 days after water colocasia extract treatment as shown in Table (1).

5 . Larval malformation

As shown in table (1) the highest percentage of malformed larvae (30%) resulted from acetone coffee granules extract followed, insignificantly by hexan tooth pick extract (27%) and acetone pomegranate extract (23%), respectively, accordingly these extracts may be higher influence on the larvae of *S. cretica*. On the contrary, the lowest percentage of malformed larvae (8%) resulted from treatment by water colocasia extract. While, the remaining treatments could be classified into two groups, the first had intermediate effect (19, 17, 15, 13 and 13%) larval malformation and insignificantly among each other, in the same time they were significantly comparing with the control, These percentages of larval malformation were recorded when the larvae were treated with hexan granule coffee extract, acetone colocasia extract, methanol pomegranate extract, methanol tooth pick extract and water pomegranate extract, respectively. The second group had the least influence on larvae and it included water colocasia, water tooth pick, hexan colocasia, methanol granule coffee, hexan pomegranate and methanol colocasia extracts causing (8, 9, 10, 10, 11 and 11%) malformation and they were insignificantly with the control.

Malformations which were detected between the inspected larvae may be described as some destruction at abdomen and thorax region also moulting integument remain and moulting failure.

6. Pupal malformation

Data in Table (1) show that there are insignificant increases in the percentage of malformed pupae than control (6%) which occurred after methanol and water tooth pick, granules of coffee, and colocasia extracts also hexan and water pomegranate and hexan colocasia extracts, respectively. Treatments caused high significant deformations in the developed pupae were that of acetone coffee granules and hexan tooth pick extracts achieving 33 and 30% malformation, respectively.

The remaining treatments caused significant pupal malformation and could be fairly arranged ascendingly as follows: acetone colocasia extract (18%), hexan coffee granules extract (19%) acetone tooth pick extract (19%), methanol and acetone pomegranate extracts 21 and 25%, respectively).

Malformed pupae showed indentations at the ventral side. Also, blackish coloured in head regions and malformation at the former regions. Exuviae of larvae remaining in end of the abdominal region

The chemical components of tested plants

1. *Ammi visnaga* Lam

Its chemical component are

- Terpenes
- Terpene alcohols (bornol, linalol)
- Coumarin and related compounds

2. *Coffea arabica* L.

It contains caffeic acid, caffeine (1,3,7-trimethyl-xanthine), chlorogenic acid, eugenol, niacin, scopoletin, tannin, theobromine, tannic acid and theophylline, propanol, valerianic aldehyde, acetaldehyde and butanal

Schultes and Raffauf (1990), Hazenfratz, (1991)

3. *Punica granatum* L.

Ten compounds were isolated and elucidated as: gallic acid (1), methyl gallate (2), ellagic acid (3), (+) catechin (4), isoquercitrin (5), D-mannitol (6), ursolic acid (7), Oleanolic acid (8), beta-Sitosterol (9) and Daucosterol (10). Lei, *et al.*, (2003).

4. *Arum colocasia*

In addition to its acrid principle it contains a large proportion of starch, also, gum, albumen, saccharine matter, calcium and potassium salts, and extractive. When the acrid property is driven off by heat, the root yields a pure, delicate, amylaceous matter, resembling the finest arrowroot, very white and nutritive. That raphides of oxalate of calcium give to the corm its acidity has been asserted by Weber (1891).

The results obtained in this study are in agreement with that of Lamiri (2001) in which they found that essential oils from *Ammi visnaga* had an efficient against Hessian fly (Cecidomyiidae) in Morocco. Also, Mohamed and Abd El-Aziz (2005) stated that tooth pick extract had an insecticidal activity against compea beetle (*Callasobruchus maculatus*) in Egypt. While, Morsy *et al.* (1998) showed that acetone and methanol pomegranate extract had larvicidal activity against *Chrysomya albiceps* in Egypt.

Magalhaes *et al* (2008), in Brazil, stated the phenolics chlorogenic, caffeic acids and the alkaloid caffeine were found in coffee leaves inhibiting effect on egg-laying by the coffee leaf miner *Leucoptera coffeella*.

The pervious results are considered very important to clarify the influence of plant extracts in the integrated pest control against numerous of insects without any environmental pollution or using chemical pesticides.

Table 1. Effect of four plant extracts on some biological aspects of *S. cretica* 4th instar larvae.

Treatments	solvent	Mortality (%)	Larval duration (day)	Pupal duration (day)	Larval malformation %	Pupal malformation %	Adult longevity (day)
Tooth pick	Hexan	85	23	7	27	30	8
	Methanol	50	29	9.5	13	15	10.5
	Acetone	63	28	8	19	19	9.5
	Water	50	30	9	9	11	10
Coffee granules	Hexan	55	30.5	10.5	19	19	9
	Methanol	48	28.5	9	10	15	9
	Acetone	90	22	7	30	33	7.5
	Water	45	31	10	9	13	10.5
Pomegrante	Hexan	45	31	10	11	10	11
	Methanol	70	27	7.5	15	21	9
	Acetone	88	22	6.5	23	25	9
	Water	62	30	8.5	13	15	10
Taro	Hexan	58	29	9.5	10	14	11
	Methanol	48	30	10	11	10	10.5
	Acetone	69	27	8.5	17	18	9.5
	Water	49	31	11	8	10	11.5
Control	_	8	32	12	4	6	12
F value	_	_	15.87	13.9	14.02	9.55	14.23
LSD	_	_	2.91	1.53	7.12	8.43	1.23

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تأثير بعض المستخلصات النباتية والمبيدات على بعض النواحي البيولوجية لحشرة دودة القصب الكبيرة تحت الظروف المعملية

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تم دراسة تأثير أربعة مستخلصات النباتية - تتبع عائلات مختلفة - باستخدام مذيبات عضوية مختلفة القطبية على بعض النواحي الحيوية على العمر اليرقى الثانى لحشرة دودة القصب الكبيرة. وكانت المستخلصات المستخدمة هى لنباتات الخلة ومحبات نبات القهوة وأغلفة وقشر كل من الرمان والقلقاس على التوالى. أظهرت النتائج ان مستخلص الرمان بالاسيتون والخلة بالهكسان سببا أعلى نسب موت (88,85% على التوالى) بالإضافة الى ان مستخلصات القهوة بالاسيتون والرومان بالاسيتون والخلة بالهكسان قد حققوا أقصر عمر يرقى 22، 22، 23 يوما على التوالى. وكان أقصر عمر عدوى هو 7 أيام كنتيجة للمعاملة بمستخلصات الخلة بالهكسان ومستخلص القهوة بالاسيتون 30، 33% على التوالى. مكونات النباتات تم الحصول عليها من بعض المواقع العلمية من الشبكة الدولية للمعلومات.

من النتائج السابقة يمكن الاشارة الى ان المستخلصات النباتية قد أثبتت انها بديل امن فى مجال مكافحة الآفات بخلاف المبيدات التقليدية.