

EFFECT OF SOME PLANT EXTRACTS ON CITRUS MEALY BUG *PLANOCOCCUS CITRI* (RISSO)

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(Manuscript received 31 October 2010)

Abstract

Pulp of sour orange fruit; *Citrus aurantium v. amara* extracted in water and petroleum ether, leaves of lantana; *Lantana salvifolia* extracted in acetone and leaves of Herb Robert; *Geranium robertianum* extracted in water at different concentrations 3, 4 and 5% were tested under laboratory conditions against Citrus mealy bug *Planococcus citri* (Risso) (Pseudococcidae: Homoptera) which is one of the most wide spread insects infesting horticulture crops either inside or outside greenhouses.

Data demonstrated that sour orange extracted in petroleum ether the highest reduction in the population of the different stages of the mealy bug being 97.01% after 8 days from treatment with the assayed materials at 5% concentration. While lantana extract in acetone, pulp of sour orange and leaves of Herb Robert extracted in water achieved intermediate reductions in bug population. Also, LT_{50} values were determined for the different treatments and it ranged from 2.32 to 3.75 days for leaves of Herb Robert extracted in water and pulp of sour orange extracted in water, respectively.

INTRODUCTION

In order to avoid the hazards caused to the environment due to the repeat use of traditional chemical insecticides that are commonly used. For this, using natural products mainly plant extracts as one of the insect control methods becomes a must which proof to have deleterious effect on target insect El-Sayed (1982), Awadallah *et al.*, (1984).

Sour orange extracts were evaluated in controlling *Sesamia cretica* Led. (Lepidoptera: Noctuidae), and they found to have toxic effect throughout its different stages Yacoub, *et al.*, (2010)

Citrus mealy bug *Planococcus citri* (Risso) (Pseudococcidae: Homoptera) is one of the most wide spread mealy bugs infesting horticulture crops cultivated either inside or outside greenhouses.

Damage of this pest appears by sucking plant sap which causes yellowish leaves turning to brown then they dry and fall, due to their toxic saliva. Besides, it secretes the honey dew which is considered a suitable mean for the growth of the sooty mold fungi. Also, it causes malformation to the tips and leaves of the plant and the cottony wax

secretion of the insect different stages causes a disfigure to the plant, which is considered the fortune of the ornamental.

The present study aimed to assay the efficacy of extracts on *Planococcus citrus* (Risso) infestation. Also, laboratory studies were conducted to find out LT_{50} values.

MATERIALS AND METHODS

A laboratory experiment was conducted to evaluate some plant extracts used in controlling the *P. citrus* infesting croton (*Codiaeum* sp.) Fam.: Euphorbiaceae

Preparation of material

Extracts were prepared according to Emara *et al.*, (1994) by adding 500 ml boiling water to 50 gm of grained leaves of Herb Robert, while pulp of sour orange fruit were squeezed without seeds.

Dry Lantana leaves (50 gm) were prepared by adding 500 ml acetone then stirred for 15 min in high electric blender after stoppering the container tightly.

Several experimental tests were done to chose the suitable concentrations in which they were 3, 4, 5% for all the plant extract used in the study.

Also, some pulp of sour orange fruit were squeezed without seeds and were extracted by petroleum ether solvent following the previous method. Each solvent was then evaporated by using electric fan until dryness.

The scientific and English name of the plants used and their parts are shown in the following table:

Scientific name	English name	Part used
<i>Citrus aurantium v. amara</i>	Sour orange	Pulp
<i>Lantana salvifolia</i>	Lantana	Leaves
<i>Geranium robertianum</i>	Herb Robert	leaves

Laboratory trial:

Samples of infested croton leaves were collected randomly from infested shrubs (each consisted of 8 leaves / treatment) , kept in paper bags and transferred to the laboratory. Leaves were sprayed by using the previous mentioned concentrations (3, 4, and 5%) for the four plant extracts used in the study. Treated leaves were kept in a paper envelopes and insepectation was conducted every 48 hours by counting the different stages of *P. citri* by the aid of stereomicroscope. Also, a pre count was taken for each treatment as in index.

Statistical analysis:

Reduction percentages were calculated in all treatments according to Stafford and Summers (1963) equation:

$$\% \text{ reduction} = \frac{\text{Pretreatment count} - \text{Post treatment count}}{\text{Pretreatment count}} \times 100$$

If (F) values were significant, calculated and L.S.D. were calculated by the aid of Costat computer program.

Estimation of LT₅₀:

Laboratory experiments were conducted to clarify the toxic effect of the extracts. The total number of samples were divided in 4 replicates. LT₅₀ values at 5% confidence limits and slope regression lines were represented and interpreted using probit analysis statistical method of Litchfield and Willcoxon (1949).

RESULTS AND DISCUSSION

Effect of assayed materials:

Results in Table (1), showed that the pre spraying counts ranged between 39.75 – 123, 45 – 123 and 28.5 – 52 for all treatments at different concentrations 3, 4 and 5%, respectively. Also, all results indicated that all treatments of plant extracts caused significant differences among them in three concentrations used.

Data in Table (2), indicated that lantana in acetone caused the higher percentage reductions which recorded throughout period of inspection from 2 days to 8 days, ranged from (34.59 – 79.84%), (38.1 – 90.48%) and (32.69 – 92.30%) for concentrations 3, 4 and 5%, respectively, followed by sour orange extract in petroleum ether causing (12.98 – 87.78%), (35.65 – 88.7%) and (55.22 – 97.01%) for the experimental concentrations used. While, the remaining treatments may be arranged descendingly order as Herb Robert extract in water (10.67 – 79.78%), (55.56 – 88.8%) and (28.07 – 92.98%) for 3, 4 and 5%, respectively. The next was sour orange extract in water (7.72 – 91.46%), (26.82 – 85.37%) and (29.11 – 87.34%), respectively. Statistically analysis in Table (1) revealed differences in responses to all treatment of plant extracts that proved highly significant among different concentrations.

LT₅₀ assessment:

LT₅₀ values – recorded after treating with the assayed materials – at 4% concentration were tabulated in Table (3) and illustrated in Fig (1). The shortest LT₅₀ value (highest efficacy) was obtained from treatment by Herb Robert extracted in water; 2.32 days. Intermediate values recorded from lantana extracted in acetone; 2.56 days and sour orange extracted in petroleum ether 2.70 days. While the least efficacy – longest LT₅₀ value – was obtained from sour orange extracted in water; 3.75 days.

Table 1. Effect of some plant extracts on *Planococcus citri* (Risso) after intervals of post spraying during 2010 season.

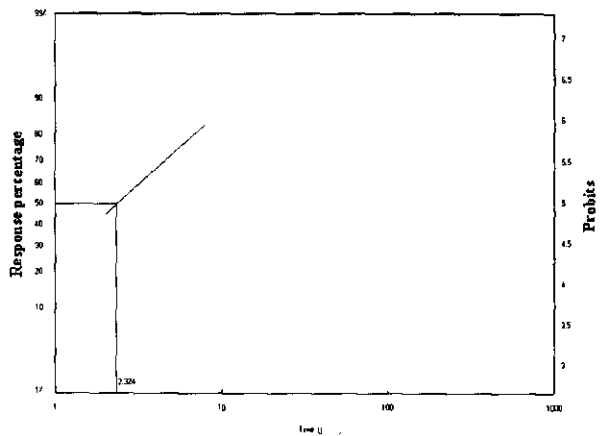
Treatments	Conc. %	Pre-Spraying count	Intervals of post-spraying counts				F value	L.S.D.
			2 days	4 days	6 days	8 days		
Herb Robert extracted in water	3	89	80.5	36	35.5	18	4.2	1.95
	4	45	20	21	8	5	1.6	0.96
	5	28.5	20.5	7.5	3	2	3.14	0.55
Lantana extracted in acetone	3	39.75	26	16	12	8	3.8	1.3
	4	63	39	11	7	6	1.2	1.88
	5	52	35	10.5	7.5	4	5.2	0.18
Sour orange extracted in Petroleum ether	3	65.5	57	42	19	8	3.6	0.58
	4	115	74	21	14	13	5.2	0.16
	5	33.5	15	6	6	1	2.6	1.8
Sour orange extracted in water	3	123	113.5	30.5	35.5	10.5	5.9	1.8
	4	123	90	68	23	18	1.5	0.95
	5	39.5	28	7	5	6	7.8	0.18

Table 2. Percentage reductions of *Planococcus citri* (Risso) at different intervals after being treated by some plant extracts under laboratory conditions throughout 2010 season.

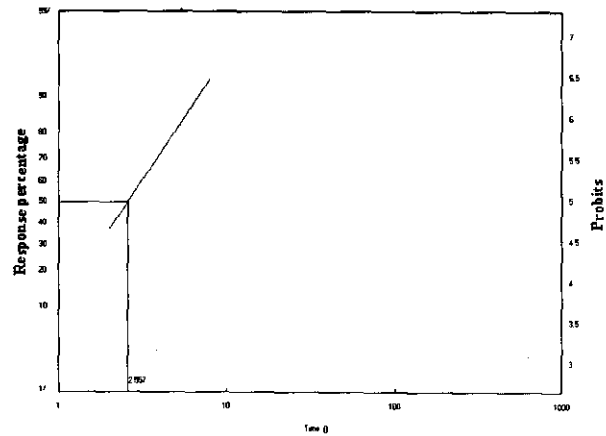
Treatments	Conc. %	% reduction of citrus mealy bug at different intervals after treatment			
		2 days	4 days	6 days	8 days
Herb Robert extracted in water	3	10.67	59.55	60.11	79.78
	4	55.56	58.33	82.22	88.80
	5	28.07	73.68	89.47	92.98
Lantana extracted in acetone	3	34.59	67.3	69.81	79.84
	4	38.1	84.13	88.80	90.48
	5	32.69	81.73	85.58	92.30
Sour orange extracted in Petroleum ether	3	12.98	35.87	71.00	87.78
	4	35.65	81.74	87.85	88.70
	5	55.22	82.09	82.09	97.01
Sour orange extracted in water	3	7.72	75.20	71.13	91.46
	4	26.82	55.7	81.3	85.37
	5	29.11	82.28	87.34	84.81

Fig 1: Probit – regression time showing response of *Planococcus citri* treated with different assayed materials

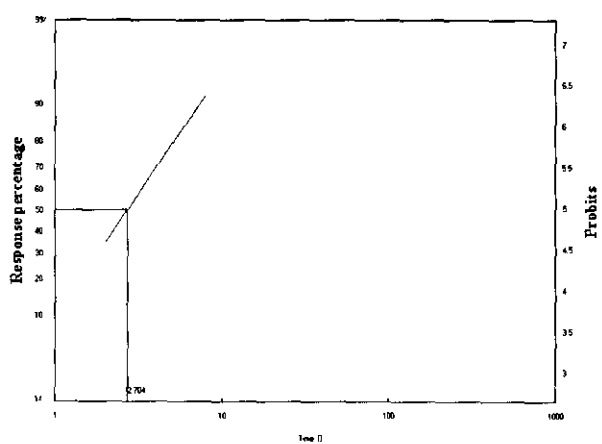
Herb Robert extracted in water



Lantana extracted in acetone



Sour orange extracted in Petroleum ether



Sour orange extracted in water

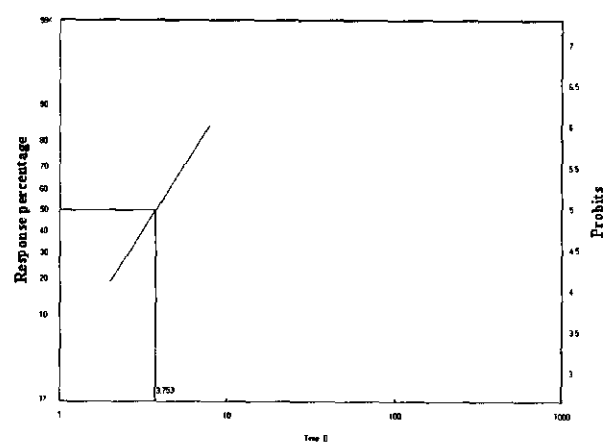


Table 3. LT₅₀ values for *Planococcus citri* larval feeding on maize plants treated by 4% concentration of different materials

Treatments	LT ₅₀ days at 4%	Slope	Confidence limits 0.05	
			LT ₅₀	Slope
Herb Robert extracted in water	2.32	1.81	-	-
Lantana extracted in acetone	2.56	3.02	-	-
Sour orange extracted in Petroleum ether	2.70	2.98	-	-
Sour orange extracted in water	3.75	3.17	3.36	4.14

These results were found in agreement with these obtained by Ibrahim *et al.*, (2001) stated that the monoterpene limonene showed deterrent and insecticide properties, which might used in pest control in organic agriculture. Hollingsworth (2005) who mentioned that aqueous solution of 1% Limonene against mealy bugs and scale insects in which it achieved acceptable results ranging 69 to 100% reductions. Also, Mesbah *et al.*, (2009) used five plant extracts against *Icerya seychellarum* (West.) and they found that camphor and rose extracts were superior reductions against mealy bug. Cloy *et al.*, (2009) mentioned that cotton seed, cinnamon and rosemary extracts caused 90% mortality to citrus mealy bugs.

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تأثير بعض المستخلصات النباتية على بق الموالح الدقيقى

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تم دراسة تأثير مستخلص لب ثمار النارج فى الماء والبتروليم ايثر، ومستخلص وأوراق اللانتانا فى الالسيون ، ومستخلص أوراق نبات العطر فى الماء بتركيز ٣، ٤، ٥% تحت الظروف المعملية ضد حشرة بق الموالح الدقيقى والتي تعتبر واحدة من أهم الحشرات واسعة الانتشار التى تصيب محاصيل الزينة داخل وخارج الصوب.

وأوضحت النتائج ان مستخلص لب ثمار النارج فى البتروليم ايثر أعلى نسبة خفض فى تعداد أفراد الحشرة المختلفة بعد ٨ أيام من المعاملة. بينما حقق كل من مستخلص أوراق اللانتانا فى الالسيون، مستخلص لب ثمار النارج فى الماء ومستخلص أوراق نبات العطر فى الماء نسب خفض متوسطة فى تعداد أفراد الحشرة. وكذلك تم حساب الوقت اللازم لقتل نصف التعداد المعامل حيث تراوحت من ٢,٣٢ الى ٣,٧٥ يوم لكل من مستخلص أوراق نبات العطر فى الماء ومستخلص لب ثمار النارج فى الماء على الترتيب.