EFFICIENCY OF CERTAIN PLANT EXTRACTS AGAINST *CERATITIS CAPITATA* (WIED.) AND *BACTROCERA ZONATA* (SAUNDERS) (DIPTERA: TEPHRITIDAE)

HANAFY, A. H.[1], ANAS A. AHMED[1], A. M. Z. MOSALLAM[2] AND A. M. IBRAHIM[1]

1. Plant Protection Research Institute, El-Sabahia, Alex.
2. Plant Prot. Res. Inst., ARC, Dokki, Giza

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Abstract

Extracts of six wild plants of *Ambrosia maritima, Allium sativum, Mentha spicata, Myoporum pictum, Nerium oleander* and *Rosa gallica* were examined as contact toxic substances against 3-day old pupae and 2-day old adults of both *Ceratitis capitata* and *Bactrocera zonata*. Extracts of *R. gallica leaves* and *A. sativum* bulbils were the most efficient against pupae of *C. capitata* and *B. zonata*, respectively. On the other hand, leaves extract of *N. oleander* was the most effective against adults of both *C. capitata* and *B. zonata* recording the highest cumulative mortality (after 72 hours) of 55.93 and 90.00%, consecutively. As a general trend, adults of *B. zonata* were more susceptible to the tested extracts than that of *C. capitata*.

Key words: Plant extracts- *Ceratitis capitata*-*Bactrocera zonata*-Plant extracts.

INTRODUCTION

Fruit flies such as *C. capitata* and *B. zonata* cause serious damage in fruits of several hosts especially citrus, apricot, peach, mango and guava causing severe reduction in both quantity and quality of infested fruits in Egypt and in many countries.

Generally, fruit flies (allover the world) were controlled with the chemical pesticides that caused many healthy, environmentally and economically problems for man, natural enemies and fruit-producer countries. For this reasons many researchers used the plant extracts as naturally-safe materials for controlling insects (Rajendran & Gopalan, 1979, Smith & Secoy, 1981, Steffens & Schmutterer, 1982, Barakat *et al.*, 1985, Chan & Tam, 1985, Guirguis *et al.*, 1989, Kelany *et al.*, 1991, El-Abgy *et al.*, 1997, Pandey & Singh, 1998, Di Ilio *et al.*, 1999, El-Doksch & El-Sebae, 2005, El-Doksch & El-Sherif, 2005 and Fetoh *et al.*, 2005).

The aim of this work is to evaluate the insecticidal activtity of certain plant extracts against both pupal and adult stages of the two species of tephritid fruit flies *C. capitata* and *B. zonata*.

MATERIALS AND METHODS

1- Insect Used

The two stages of pupae and adult used for treatments were obtained from cultures of the laboratory strains of both *C. capitata* and *B. zonata* that mass reared according to Awadallah and El-Hakim (1983) and Afia *et al.* (2005), respectively.

2- Plant Extracted

The insecticidal effect of aqueous dilutions of certain parts of six wild plant species (Table, 1) was tested against the two stages of the studied insects. The parts of the tested plants collected from the field of Horticulture Research Institute were air-dried under laboratory conditions of 25 ±3°C and 70 ± 5% R.H. Afterthat, 20 gm of each were ground with ethanolic extraction (300 ml of commercial ethanol alcohol 75% for each plant) using Sockcehlt unit.

Table 1. List of plant species under investigation.

	Scientific name	Family	Common name	Used part
1	*Ambrosia maritima*	Compositae	Absinthe	Flowers
2	*Allium sativum*	Liliaceae	Garlic	Bulbils
3	*Mentha spicata*	Labiatae	Spearmint	Leaves
4	*Myoporum pictum*	Myopaceae	Bazromia	Flowers
5	*Nerium oleander*	Apocynaceae	Nerium	Leaves
6	*Rosa gallica*	Rosaceae	Rose	Leaves

3- Procedure

Thirty individuals replicated three times (10 individuals/ replicate) of both pupal (3-day old) and adult (2-day after emergence) stages of the two tephritid species were sprayed with 0.5 ml of different aqueous concentrations of the tested extracts using an atomizer instrument. Three concentrations (5,10 and 20%) were used for adults, sprayed in tubes (10 cm in length and 2 cm in diameter), whereas pupae were treated in Petri dishes (9 cm in diameter) with four concentrations of 25, 50, 75 and 100 %. The individuals of untreated control were sprayed with tap water. After 3 hours of treatment, pupae were put in clean Petri dishes to emergence, whereas adults, were transferred by an aspirator to clean small cages provided with sugar and water for feeding and examined after 24, 48 and 72 hours of treatment. For both pupae and adults, the dead individuals were recorded. Pupal mortality was corrected with Abbott's formula (1925). Both LC_{50} and LC_{90} values of the tested extracts were obtained from dosage-mortality regression lines drawn according to the method of Bliss (1938). The relative efficiency as toxicity index was calculated according to Sun

(1950). On the other hand, the cumulative mortality during 72 hours after treatments was calculated for adults. Analysis of variance was conducted to test significance between treatments using " F" test and L.S.D. values according to Snedecor (1957).

RESULTS AND DISCUSSION

1- Toxicity against Pupae

Data in Table (2) and Figs. (1 and 2) indicate the contact toxic effect of the six tested plants to 3- day old pupae of both *C. capitata* and *B. zonata*. Based on LC_{50} and LC_{90} values, leaves extract of *R. gallica* was the most potent against pupae of *C. capitata* recording the lowest values of 46 and 74%, respectively. Whereas leaves extract of *M. pictum* was the least effective showing LC_{50} and LC_{90} values of 81 and 88%, consecutively. The other extracts had intermediate values of LC_{50} and LC_{90} that ranged between 52- 81 and 77- 88, successively. The slope values of the toxicity lines reveal that *M. pictum* had the steepest toxicity line and *M. spicata* had the flattest one. As shown in Table (2), the toxicity index of the tested plant extracts ranged between 56.79- 97.87% (at LC_{50}) and 84.09- 96.10% (at LC_{90}) from leaves extract of *R. gallica* that was considered the standard.

Respecting the toxic effect on *B. zonata*, the bulbils extract of *A. sativum* was the standard recording the lowest values of both LC_{50} and LC_{90} of 28 and 42, successively. The efficiency of the other tested extracts was descendingly arranged as *N. oleander*, *A. maritima*, *R. gallica*, *M. pictum* and *M. spicata*. The values of both LC_{50} and LC_{90} were 40, 62, 42, 68, 46, 70, 61, 74 and 78, 92, respectively. The corresponding values of toxicity index were 70.00, 67.74, 66.67, 61.76, 60.87, 60.00, 45.90, 56.76 and 35.90, 54.65% of the standard extract of *A. sativum*, consecutively. The slope values of toxicity lines of the six examined extracts ranged between 6.49- 18.18 indicated that *M. spicata* had the steepest toxicity line, but *A. maritima* had the flattest one.

Based on LC_{50} and LC_{90} values, *B. zonata* was more susceptible to *A. maritima*, *A. sativum*, *M. pictum* and *N. oleander* than *C. capitata*, but the reverse was true with *M. spicata*. The response of the two tephritid species to *R. gallica* was equal and nearly equal according to values of LC_{50} and LC_{90}, consecutively. In this respect, Rajendran and Gopalan (1979) stated that *A. sativum* had insecticidal properties against larvae of *Spodoptera litura*.

Table 2. Toxicity of certain plant extracts against 3-day old pupae of both *ceratitis capitat* and B. zonata

Plant extract	*C. capitata*					*B.zonata*				
	LC_{50}	LC_{90}	Slope	Toxicity index at LC_{50}	Toxicity index at LC_{90}	LC_{50} %	LC_{90} %	Slope	Toxicity index at LC_{50}	Toxicity index at LC_{90}
A. maritima	52	78	6.95	88 46	94 87	42	68	6.49	66 67	61 76
A. sativum	79	88	33.97	58 23	84 09	28	42	7 23	100	100
M. spicata	47	80	5 94	97.87	92 50	78	92	18 18	35 90	45 65
M. pictum	81	88	36 51	56 79	84 09	61	74	14 68	45 90	56 76
N. oleander	62	77	13 18	74 19	96 10	40	62	6 64	70 00	67.74
R. gallica	46	74	6 28	100	100	46	70	7.11	60 87	60 00

2- Cumulative Mortality of Adults

The cumulative mortality of 2-day old adults of both *C. capitata* and *B. zonata* sprayed with the examined plant extracts was shown in Table (3). Statistical analysis of variance of the obtained data revealed that there were high significant differences between the treated and untreated individuals. In case of *C. capitata* the differences between the six tested extracts were insignificant, but in case of *B. zonata,* the extract of *A. maritima* significantly varied with the others. Leaves extract of *N. oleander* was the most efficient to newly emerged adults of both *C. capitata* and *B. zonata* showing the highest values of cumulative mortality (after 72 hours) of 55.93 and 90.00%, whereas flowers extract of *A. maritima* recorded the lowest % cumulative mortalities of 45.19 and 57.41, respectively. The other extracts showed intermediate values of cumulative mortality that ranged between 46.29- 49.26% (in case of *C. capitata*) and 79.63- 87.41% (in case of *B. zonata*). Data in Table (3) show that adults of *C. capitata* were more tolerant to the tested extracts than that of *B. zonata,* where the grand averages of cumulative mortality for the six tested extracts were lower with *C. capitata* than that recorded with *B. zonata.* In this respect Barakat *et al.* (1985) reported that the acetone extract of black pepper was the most effective against *C. capiata* adults. Recently, Fetoh *et al.* (2005) evaluated different concentrations of ethanolic- leaves extract of *Calotropis procera* against adults of *Dacus ciliatus* and *B. zonata.* They stated that the extract was effective against the two species and *B. zonata* was more susceptible than *D. ciliatus.*

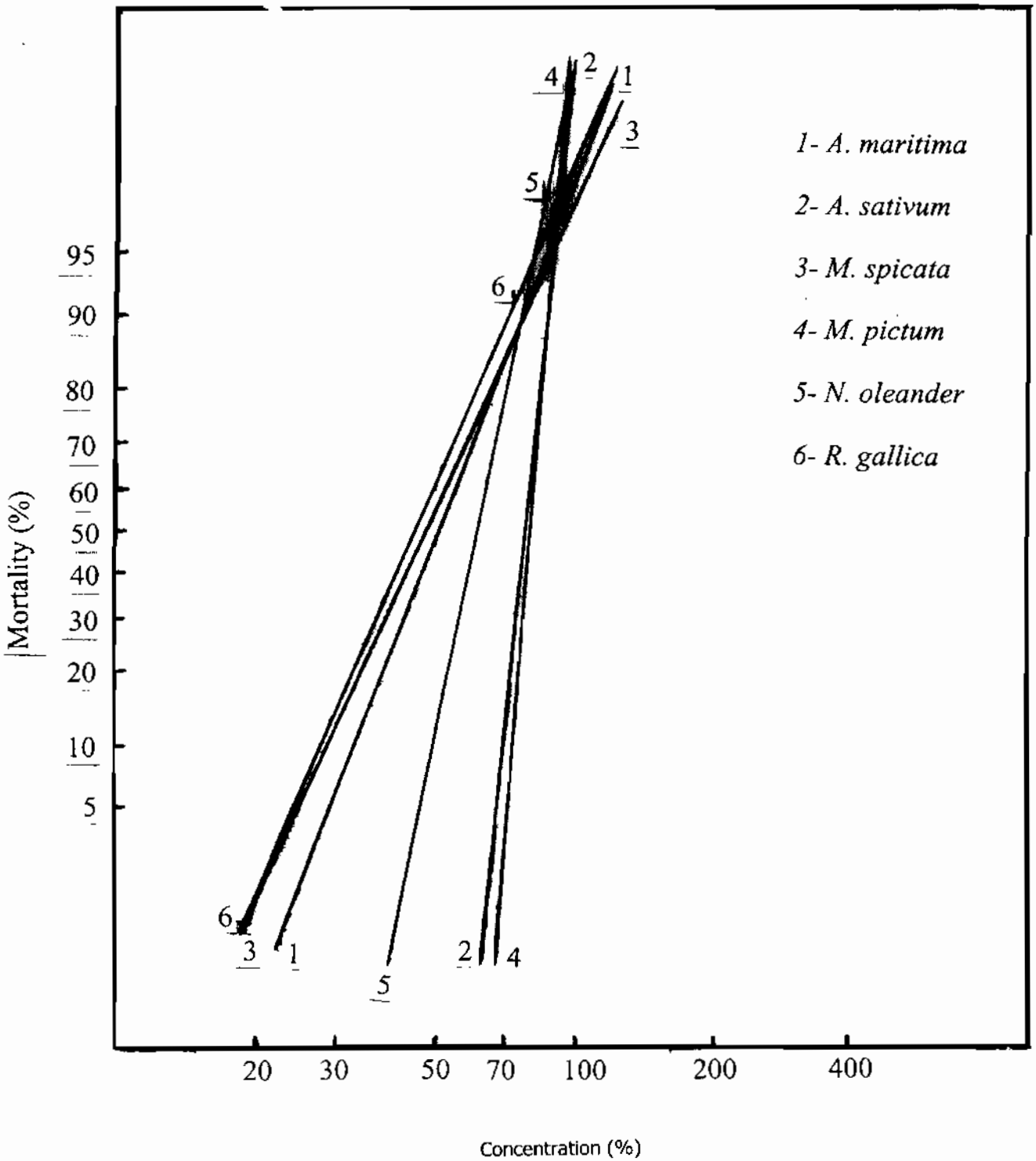

Fig. 1. LC-P Lines of six plant extracts against 3-day pupae of *Ceratitis Capitata*.

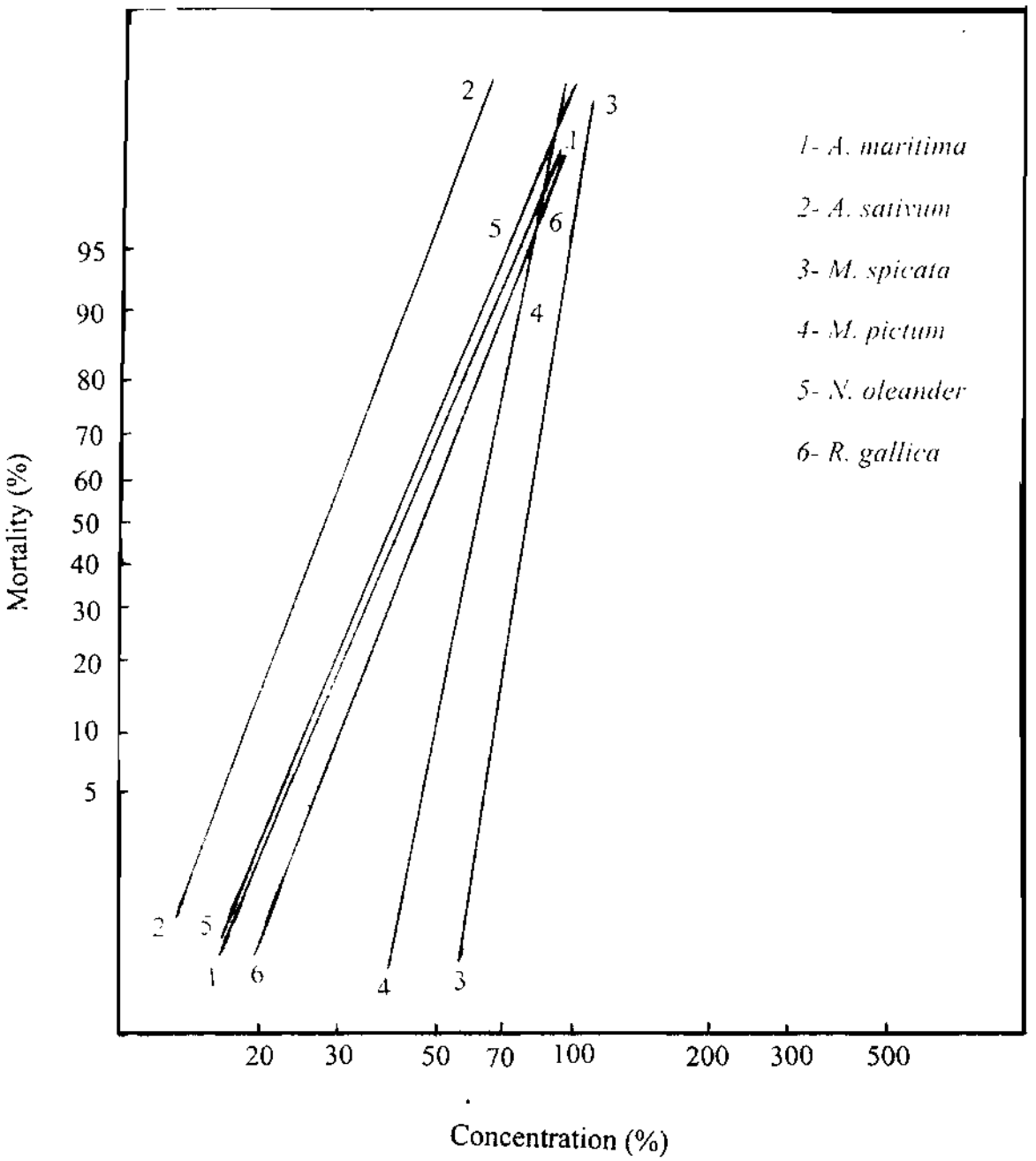

Fig. 2. LC-P Lines of six plant extracts against 3-day pupae of *Bactrocera Zonata*.

Table 3.Cumulative mortality of 2-day old adults of both *Ceratitis capitata* and *Bactrocera zonata* sprayed with certain plant extracts.

Plant extract	Conc. %	% Mortality after (hour)									
		C. capitata					*B. zonata*				
		24	48	72	Aver.	Grand aver.	24	48	72	Aver.	Grand aver.
A. maritima	5	13.33	46.67	83.33	47.78	45.19A	10.00	40.00	96.67	48.89	57.41B
	10	30.00	46.67	66.67	47.78		30.00	50.00	96.67	58.89	
	20	6.67	50.00	63.33	40.00		36.67	60.00	96.67	64.45	
A. sativum	5	10.00	50.00	63.33	41.11	46.29A	30.00	60.00	96.67	62.22	79.63A
	10	10.00	50.00	70.00	43.33		70.00	80.00	96.67	82.22	
	20	23.33	60.00	80.00	54.44		90.00	96.67	96.67	94.45	
M.spicata	5	16.67	56.67	73.33	48.89	47.78A	40.00	90.00	96.67	75.56	82.97A
	10	20.00	56.67	73.33	50.00		70.00	90.00	96.67	85.56	
	20	20.00	43.33	70.00	44.44		70.00	96.67	96.67	87.78	
M. pictum	5	13.33	56.67	73.33	47.78	49.26A	63.33	76.67	93.33	77.78	82.59A
	10	40.00	50.00	86.67	58.89		60.00	80.00	96.67	78.89	
	20	20.00	40.00	63.33	41.11		80.00	96.67	96.67	91.11	
N.oleander	5	13.33	63.33	70.00	48.89	55.93A	66.67	90.00	96.67	84.45	90.00A
	10	43.33	63.33	80.00	62.22		80.00	90.00	96.67	88.89	
	20	43.33	60.00	66.67	56.67		96.67	96.67	96.67	96.67	
R. gallica	5	16.67	36.67	76.67	43.34	49.26A	70.00	93.33	96.67	86.67	87.41A
	10	33.33	53.33	93.33	60.00		70.00	93.33	96.67	86.67	
	20	20.00	43.33	70.00	44.44		80.00	90.00	96.67	88.89	
Control	0	0	0	0	0	0B	0	0	0	0	0C
F. test						**					**

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كفاءة بعض المستخلصات النباتية ضد ذبابة فاكهة البحر المتوسط وذبابة ثمار الخوخ

أحمد حسين حنفي[١]، أناس عبد العزيز أحمد[١]، أحمد محمود زكي مسلم[٢]، عبد الحميد محمد إبراهيم[١]

١. معهد بحوث *وقاية النباتات- الصباحية- الإسكندرية*

٢. معهد بحوث *وقاية النباتات- مركز البحوث الزراعية*

تم اختبار تأثير مستخلصات ٦ نباتات برية هي البازروميا- الثوم- النعناع البلدي- الدمسيسة- التفلة- الورد البلدي الأحمر كمواد سامة بالملامسة ضد العذاري عمر ٣ أيام والأطوار الكاملة لحشرتي ذبابة فاكهة البحر المتوسط وذبابة ثمار الخوخ. كانت مستخلصات أوراق الورد الأحمر وفصوص الثوم الأكثر فعالية ضد عذاري ذبابة فاكهة البحر المتوسط وذبابة ثمار الخوخ علي الترتيب. ومن جهة أخري كان مستخلص أوراق التفلة الأكثر كفاءة ضد الحشرات الكاملة لذبابتي فاكهة البحر المتوسط وثمار الخوخ حيث سجل أعلي قيمة للموت التراكمي (بعد ٧٢ ساعة) وهي ٥٥,٩٣، ٩٠% علي التوالي. وكانت الحشرات الكاملة لذبابة الخوخ أكثر حساسية للمستخلصات المختبرة منها لذبابة فاكهة البحر المتوسط.