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ORIGINAL ARTICLES

Evaluation of Different Aggregation Pheromones Technique Used For Trapping Red Palm Weevil *Rhynchophorus ferrugineus*

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ABSTRACT

Field and laboratory treatments were carried out to evaluate of different technique of the aggregation pheromone used in attracting red palm weevil in palm plantations at Ismailia Governorate, Egypt. Results showed that the use of pheromone sac mixture with glycerin (carrier material) ,pesticide and ethyl acetate attracted adult of RPW and there are insignifmicant differences between attraction with aggregation pheromone standard (pheromone + Ethyl acetate+ water +insect iced killed). The use of this technique led to provision in the use of pheromone costs by reduce the number of examination number .This pheromone technique is examined once each two month compared aggregation pheromone standard which requires eight examination.

Key words: Red palm weevil- injection –control –injection

Introduction

Date palm, Phoenix dactylifera L. (Palmacae) is the most common and widely cultivated in the arid regions of the Middle East and North Africa. Abdel-Megeed, *et al*. (2004) Arab countries however, contain 78.3% of the total world date palm trees which demonstrate 75% of the production. The red palm weevil is one of the major and destructive pests of palm trees. progressively spread to Gulf states and crossed the red sea into North Africa as the latest record since 1992 in Egypt. RPW males produce an aggregation pheromone comprising 4-methyl-5-nonanol (ferrugineol), 4-methyl-5-nonanone (ferrugineone, the less abundant compound) (Hallet *et al*., 1993a) and 3-methyl-4-octanol (phoenicol, the minor compound) (Rochat *et al*., 1993). The most abundant compound, ferrugineol attracts both sexes (Hallet *et al*., 1993b). As with other weevil species (Rochat *et al*., 1991, Tinzaara *et al*., 2007), the RPW aggregation pheromone is more attractive when it is emitted in the presence of host plant volatiles, and mass trapping with lures combining the two odour sources is used in management programs of this pest (GiblinDavis *et al*., 1996; Hallet *et al*., 1999). In addition,Oehlschlager *et al*., (1993 and 1998) developed a trapping system using bucket traps containing the aggregation pheromone,and then several trap designs were described that would attract and capture adults of *R.ferrugineus*. Both virgin and mated individuals of both sexes are captured using this method, but in all field tests the majority of adults caught were mated females (Avand-Faghih, 1996; Avand-Faghih *et al*., 2005; Faleiro *et al*., 2000; 2003; El-6HSabay, 2003). Traps provided with ethyl acetate were more effective than regular traps provided with food for weevils attraction. In addition, ethyl acetate saved food costs and time of maintenance (approximated 70% of the total cost of trap application)..The present work aimed to evaluate of different technique aggregation pheromones, used with red palm weevil to reduce costs and increase the efficiency of pheromone**.**

Materials and Methods

Laboratory experiments to evaluate the toxicity of carrier material pheromone of adult red palm weevil was carried out in Dr. Yousry El-Sebay Laboratory Researches of red palm weevil at Kassasin, Ismailia Governorate,. Also field experiments were conducted to evaluate the modified pheromone. The experimental design was a randomized complete design with four replicates in each treatment and distance between traps was about 100 m. Number of collected weevils caught in the pheromone traps was counted weekly, sexed, and grouped into date record contains two weekly figures. The mixture(pheromone sac mixture with glycerin (carrier material) ,pesticide and ethyl acetate) and standard pheromone changed by another fresh one every 8 week

1- Materials used:

A-The standard pheromone used pheromone “Ferrugineol” is a synthetic pheromone lures(a mixture of 4 - methyl –5 - nanol and 4 – methyl – 5 - nanone (9:1))imported from Chem Tica Natural, Costa Rica was used

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for the present field trials. Pheromone sac and ethyl acetate were hung underside the trap top surface. Liquid soap was mixed with trap water used in the inside bucket trap.

B-Pheromone sac one or two or three and four was mixed with100 gm glycerin, 10 cm ethyl acetate (Kairamone) and 2 cm insecticides (karat). The previous components were mixed carefully together after glycerin become liquid by heating, than poured in 4 plastic cups all concentration pheromone (4 Traps) equal in size and kept in a refrigerator ready for use.

C-Bucket traps used were inserted slightly in the soil surface. A number of round holes were made to allow adult weevils to enter inside the trap safely and easy .The used design traps commonly consist of plastic bucket (9 liter in size). The bucket was punctured around its wall with 4 holes each of 2-5 cm diameter at 15 cm from the bottom

2-Experimental Design:

1- Laboratory Experiment insecticide:

1- Evaluation toxicity of mixtures glycerin with insecticide karat as follows:
a- 50 gm glycerin
b- 50 gm glycerin+ 2 cm karat
c- 50 gm glycerin+ 4 cm karat
d- 50 gm glycerin+ 6 cm karat

Bioassay experiments:

Serial concentrations of each compound were transferred to plastic cups (100 cc)/ 50 gm with perforated covers. Five adults / replicate were introduced into the cups using 5 replicates for each concentration. The mortality percentage recorded during one day of treatment.

2-Experimental design in field:

A-Evaluation of different concentrations of aggregation pheromone captured of R. ferrugineus:

The experimental design was randomized complete block design with standard pheromone trap(pheromone + Ethyl acetate+ water +insect iced killed) and ,one sack or two sac or three and four sac pheromone /100 gram glycerin + 10 ml ethyl acetate + 2 cm karat divided four traps A total of 20 traps were installed for a trapping during period 1/3/2011 until 31/6/2011.

B-Evaluation of different concentrations of ethyl acetate aggregation pheromone captured of red palm weevil of R. ferrugineus:

The experimental design was a randomized complete block design with standard pheromone trap, (pheromone + Ethyl acetate+ water +insect iced killed) and (100 gm glycerin /4 sac) ,with 3 ml ethyl acetate,or 6 ml ethyl acetate and 10 ml ethyl acetate. A total of 16 traps were installed for a trapping during period 1/3/2012 until 15/5/2012.

Statistical analysis:

Using a computer program at Costat, Correlation (S.A.S, 1985).

Results and Dissection

Experiment

1. Evaluation toxic of different mixture glycerin with different pesticide karat:

Data presented in Table (1) and Fig (1) Indicate that effect of four tested compounds glycerin without pesticides, with 2ml, 4ml, and 6 ml insecticide. The adult treatment caused mortality 100% of all treatment during four hours. In general the higher concentration of insecticide the higher rate of mortality

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Table 1: Toxicity of the carrier pheromone with different concentrations of the insecticide and without insecticide of red palm weevil of *R. ferrugineus*.

Time	2 ml insecticide	4 ml insecticide	6 ml insecticide	Without insecticide
1 hour	50 %	60%	70%	20%
2 hour	70%	80%	100%	30%
4hour	100%	100%	100%	100%

Fig 1: Toxicity of the carrier pheromone with different concentrations of the insecticide and without pesticide mixture of *R. ferrugineus.*

2- Experimental in flied:

A- Evaluation of different concentrations of aggregation pheromone of red palm weevil *R. ferrugineus*:

Results show that there were significant differences of catch weevils in different concentration of pheromone with carried and aggregation pheromone standard. Date indicated in (Table (2) and (Fig. 2and 3), that, the captured numbers were 190, 140,74,51and 137 weevils in4 sec 100 gm /4 traps, 3 sec 100 gm /4 traps,2 sec 100 gm/4 traps. 1 sec 100 gm 4 trap and standard Pheromone +ethyl acetate respectively. The analysis results showed that in4 sec 100 gm/4 trap, significant difference comparing with 3 sec 100 gm /4 traps and standard aggregation pheromone and highly significant with 2 sec 100 gm/4 traps and 1 sec 100 gm/4 traps attractive adults red palm weevil *R. ferrugineus*.

Table 2: *Evaluation of different concentrations of aggregation pheromone captured of red palm weevil R. ferrugineus.*

Date	4 sec 100 gm/4 trap	3 sec 100 gm/4 trap	2 sec 100 gm/4 trap	1 sec 100 gm/4 trap	Pheromone +ethyl acetate.
15 /3/2011	31	23	16	10	9
31 /3/2011	23	19	16	17	21
15 /4/2011	20	21	7	8	30
30 /4/2011	32	24	8	3	17
15 /5/2011	24	14	9	3	10
31 /5/2011	23	16	5	6	17
15 /6/2011	15	14	10	4	23
30 /6/2011	22	8	3	0	11
Mean	23.75a	17.37b	9.25c	6.37c	17.25b

L.S.D =5.15

b- Evaluate different concentrations of ethyl acetate aggregation pheromone captured of red palm weevil, R. ferrugineus:

Results show that there were significant differences of catch weevils in different concentration of ethyl acetate with carried indicated in (Table (3) and (Fig. 4), The captured numbers were 122, 38, and 23weevils in10 ml et ethyl acetate, in6 ml ethyl acetate, and in3 ml ethyl acetate respectively ,

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Table 3: Evaluation different concentrations of ethyl acetate aggregation pheromone captured of red palm weevil *R. ferrugineus*

Date	Mixture with 10 ml.	Mixture with 6 ml	Mixture with e 3 ml
15 /3/2012	24	17	4
31 /3/2012.	24	7	6
15 /4/2012.	22	4	5
30/4/2012	18	8	4
15 /5/2012	34	2	3
Mean	24.4a	7.6b	4.4b

L.S.D =5.15

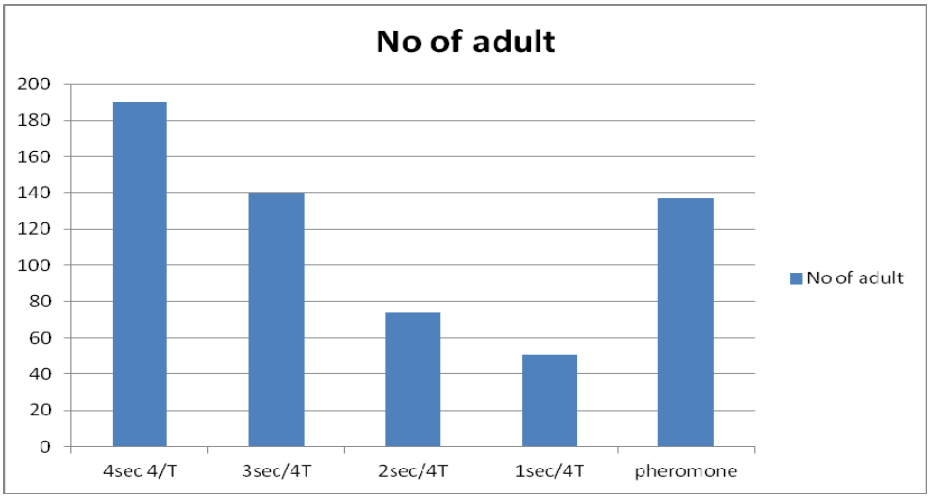

Fig. 2: Number of captured adult of red palm weevil , *R. ferrugineus* with different concentrations of aggregation pheromone.

Fig. 3: Adult of red palm weevil captured.

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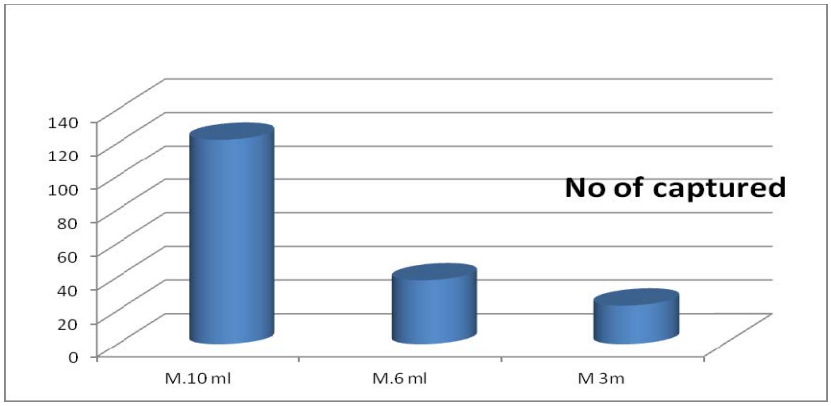

Fig. 4: Number of adult captured of red palm weevil of R. ferrugineus with different concentrations of ethyl acetate.

The results completed results agreement that El sebay (2003) In addition, ethyl acetate saved food costs and time of maintenance (approximated 70% of the total cost of trap application)

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