EMPACT OF THE AGGREGATION PHEROMONE TRAPS BAITED WITH FERMENTED FOOD MATERIALS ON THE ATTRACTION OF THE RED PALM WEEVIL, *Rhynchophorus ferrugineus* (OLIVIER) IN EGYPT

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Abstract

The aggregation pheromone traps of the red palm weevil, *Rhynchophorus ferrugineus* (Olivier, RPW) is an essential method for integrated pest management in field trials. Experiments were carried out on date palm plantations at (Abo-Nagi) El-Kassasein district, Ismailia Governorate, Egypt during one year (2012). Three baited pheromone traps with different food materials were tested. Adding date fruits to pheromone was the best bait to attract RPW where the number of weevils captured was 1005 adults representing 41.75% of the total catch compared to sugarcane and pheromone, which caught 807 adults, represented 33.53% of the total catch. Traps with ethyle acetate caught the least number 595 adults representing 24.72% of the total catch. The obtained results obviously indicated that numbers of captured adults were high significantly increased in traps supplied with dates than other food materials. Accordingly it is recommended to add date fruits to the pheromone traps. Generally, to achieve more capturing effectiveness of aggregation pheromone traps helping in controlling red palm weevil, it is necessary to use traps with holes and funnel without cover and placed at ground and supplied with fermented date fruits.

Keyword: *Rhynchophorus ferrugineus* (Olivier), pheromone traps, dates, sugarcane.

INTRODUCTION

The red palm weevil, *Rhynchophorus ferrugineus* (Olivier) (Order: Coleoptera, Family: Curculionidae) was first recorded in Egypt in date palm plantations at Sharkia and Ismailia Governorates by Saleh (1992).

Eggs are laid in the leaf petioles of date palm trees. Hatching larvae (grubs) enter the tunnel through the soft wood of the heart of the trunk and feed voraciously causing destruction of the palm where they complete their life cycle. Many generations can be passed throught in the same palm tree. Therefore, neither grubs nor damage caused can be directly seen. By time, a brownish viscous liquid can be seen oozing from small holes in the trunk of the tree. Often, the attack by the weevil is only discernible when the palm has been extensively damaged.

The aim of the study was to evaluate the attraction of the weevil by different fermented materials to assess the most effective ones.

MATERIAL AND METHODS

1. Attraction of the weevil to different fermented materials

At El- Kassasein district (Abo-Nagi), Ismailia Governorate, 5 faddans in which date palm trees were extensively distributed was chosen for one year (2012) experminte, nine pheromone traps were randomly distributed where the distance between each two traps was 100 m. The experimental design was a randomized complete blocks design and the trap shape (holes and funnel without cover) at height on ground level placed near 5 date palm tree trunks. Varieties being, Zaghloul, Hayani, Samani, Bent-Esha and Amry.Attracting of fermented substances were tested and three replicates for each attraction for pheromone only and two fermented matters.A total of 9 traps were placed for the trapping period from 1/1/2012 until 31/12/2012 (Fig.1).

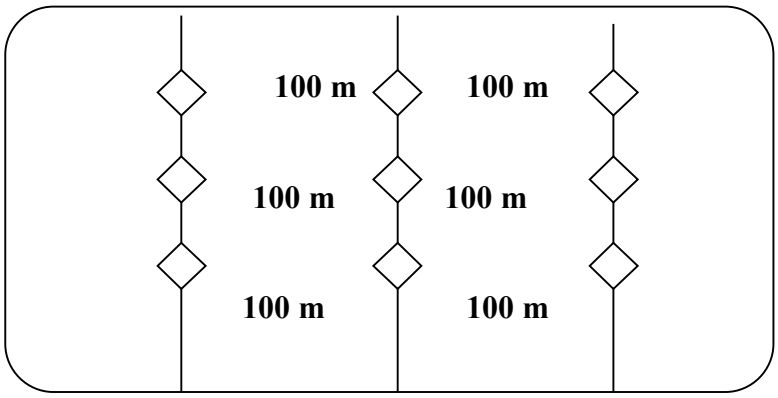

Fig.1.A diagram showing the distribution of aggregation pheromone traps in date palm orchard at El-Kassasein district, Ismailia Governorate

The experimental design was a complete randomized blocks design with three treatments of fermented types (type 1: ethyl acetate (kairomone) and pheromone, type 2: sugarcane cubes and pheromone and type 3:Fruit dates and pheromone) using three replicates in each treatment, traps were sited on ground surface. Changes in the population density were determined by numbers of captured *R. ferrugineus* adults based on aggregation pheromone traps in selected area. The number of collected weevils caught in the pheromone traps was counted weekly and sexed. Kairomone (ethyl acetate) and pheromone capsules in each trap were renewed every 15 days, while the soap water solution was renewed weekly.

1.1. Trap type description:

The used traps common were the plastic buckets (9 liters in size). The bucket was punctured around its wall with four holes each of 2.5 cm in diameter at 15 cm

from the bottom applying funnel without cover 8 cm in diameter on the top of bucket traps and placed on ground surface (Fig. 2).

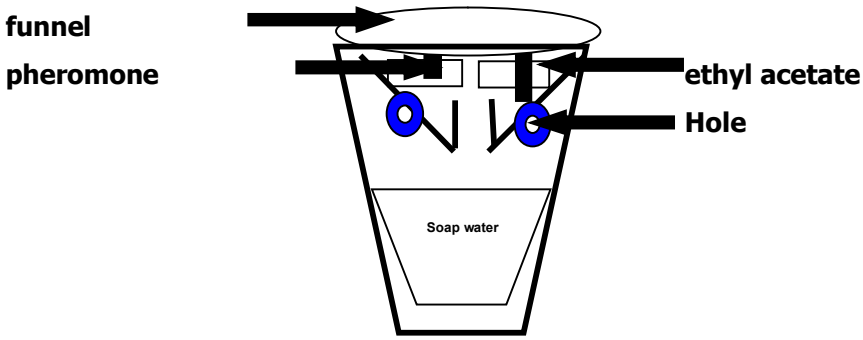

Fig. 2. Diagramm of trap type 1

1.2. Synthetic aggregation pheromone lures:

The commercially used pheromone "PO28 Ferrolure+" is a synthetic pheromone lure, (a mixture of 4-methyl–5-nonanol and 4–methyl–5-nonanone (9:1). Purity of both > 95%. Components used were imported from ChemTica International S.A., Costa Rica. Pheromone sac was hanged on the underside of trap top surface. The pheromone releases its active chemicals blames through a plastic membrane. Release Rate (3-10 mg /day). Minimum 700 mg / lure total mixture from 400 and 1500 N/tube, Bubble formulation one lure per pack. Colorant and stabilizer added. Respectively under laboratory conditions of 27°C and 50% R.H. under identical conditions. (Hallet, *et al*., 1993).

Selected Kairomone was used as a synergist to activate the potent ability of releasing ethyl acetate blooms. However, ethyl acetate bags were hanged from the underside surface of the trap top releasing chemicals through a fine plastic tube (as 100 and 128 mg/d).

1.3. Ethyl acetate (Kairomone) and pheromone:

1 liter water, 5 g yeast and Emix insecticide 35% S.C. (6-chloro-3-pyridytmethyl) - N- nitroimidazalidin- z ylideneamine). Adult weevils captured in traps were removed, counted and sexed weekly.

1.4. Sugarcane cubes and Pheromone:

Sugarcane cubes were 15 pieces 10 cm lenghth impressed for 24 hrs in aqueous solution of 5 g yeast suspended in 1 liter of water. Pieces were dipped for 3 minutes in the tested insecticide solution (Emix, 35% S.C.which mentioned above).

1.5. Fruit dates and pheromone:

An amount of 500 gs of date fruits were impressed for 24 hrs in an aqueous solution of 5 g yeast suspended in 1 liter of water. Then were dipped for 3 minutes in

insecticide solution (Emix, 35%S.C. which mentioned above). The poisoned bait (sugarcane stem, dates fruits and insecticide) was changed weekly oweing to its dehydration. Ethyl acetate kairomone and pheromone capsules within each trap were replaced by another new fresh one monthly.

1.6. Killing materials

Liquid soap was mixed with trap water and used inside the bucket trap.

2. Statistical Analysis

The obtained results were statistically analysed using a computer program at Costat, Correlation (S.A.S., 1985).

RESULTS AND DISCUSSION

1. Effect of weevil attraction by different fermented materials:

1.1. Evaluation of the efficiency of pheromone traps supplied with food materials

Data in Table (1) and illustrated by Fig. (3) present the weekly numbers of both adult sexes captured in baited traps supplied with different food materials and with aggregation pheromone placed in date palm tree orchards in Abo-Nagi farm, El-kassassein district, Ismailia Governorate, during 2012 season.

1.1.1. Food types

Adding date fruits to pheromone was the best bait to attract RPW where the number of weevils captured was 1005 adults representing 41.75% of the total catch compared to sugarcane stem and pheromone, which caught 807 adults represented 33.53% of the total catch. Traps with ethyle acetate caught the least number 595 adults represening 24.72% of the total catch.

Data agreed with Faleiro and Satarkar (2005) who reported that addition of food bait helped maintained the trapping efficiency of the pheromone lure. Kalleshwaraswamy *et al.* (2006) reported the lowest numbers of weevils captured in traps where no food bait was used and Al-Saoud (2007) found that the number of RPW captured in the 16 traps was 1752 insects for pheromone and dates but 181 insects for pheromone alone with significant differences approximately 10 to 32 times, respectively. Results disagreed with Muralidharan *et al.* (1999) who found significant number of weevils of RPW attracted to bucket pheromone traps baited with sugarcane, followed by coconut excerpt. Date fronds were the least preferred bait. The capture rate was reduced by trapping by 75.17% within 3 years. Abbas (2000) confirmed that sugarcane stem plus pheromone was the best bait to attract RPW showing 677 adults (35.19 % of the total catch) compaired with 256 adults (13.31 %) for pheromone only. Faleiro and Satarkar (2002) found that the highest weevil

captures were recorded when pineapple was used as food bait (12.22 weevils per trap), followed by sugarcane (7.7 weevils per trap). Weevil captures declined to 59.06 per pineapple and 26.71 sugarcane. The same authors (2005) found that oil palm fruit proved to be poor bait for RPW as it adversely affected the efficiency of the pheromone trap. Kalleshwaraswamy *et al.* (2006) stated that the highest weevil capture could be obtained if pineapple was used as food bait with lure in synthetic aggregation pheromone lure. Oehlschlager (2007) described new natural food bait, ethyl acetate and moist that is more effective than sugarcane in capture of *R. palmarum* in pheromone traps. Al-Saoud (2011) found that date palm pieces caught the least number (23.8) of weevils per trap.

1.1.2. The population and sex ratio relatively to food materials:

Results in Table (1) revealed that the highly number of males of weevils was recorded in traps with dates 1005 (404 ♂ representing 40.20% and 601 ♀ representing 59.80% of total captured) followed by steem sugarcane 807 (348 ♂ representing 43.12% and 459 ♀ representing 56.88%) and the least number was recorded during pheromone only 595 (240 ♂ representing 40.34% and 355 ♀ representing 59.66%).

Data agree with Soroker *et al*. (2005) who recommended traps with ferrugineol pheromone supplemented with ethyl acetate and a fermenting mixture of dates to monitor weevil infestation and reduce the RPW populations by mass trapping. The sex ratio of trapped adults during 3 years of study was significantly female-biased (2.5:1). Al-Saoud and Aziz Ajlan (2013). Results disagreement with that obtained by Posado and Aaran (1991), Rajamanickam *et al. (*1995), Abbas (2000), El-Sebay (2003), Kalleshwaraswamy *et al*. (2006), Muthiah and Nair (2007), Al-Saoud (2011) and Al-Saoud (2013) .

Table 1. Monthly average number of *R. ferrugineus* (Oliv.) adults captured in nine pheromone funnel traps, without cover and with four holes top with food attractive material (dates , sugarcane and ethyl acetate) placed on ground level in date palm orchard at Abo-Nagi farm,El-Kassassein, Ismailia Governorate during 2012 season.

Food attractive materials	Traps with dates					Traps with steam of sugarcane					Traps with ethyle acetate				
Date	M.	F.	Total	% of ♂	Accu. No.	M.	F.	Total	% of ♂	Accu. No.	M.	F.	Total	% of ♂	Accu. No.
Jan.	1	2	3	33.33	3	3	4	7	42.86	7	2	5	7	28.57	7
Feb.	5	6	11	45.45	14	4	9	13	30.77	20	5	5	10	50	17
Mar.	50	65	115	43.48	129	28	30	58	48.28	78	33	35	68	48.53	85
April	59	85	144	40.97	273	54	58	112	48.21	190	38	40	78	48.72	163
May.	48	57	105	45.71	378	49	58	107	45.79	297	35	35	70	50	233
Jun.	58	61	119	48.74	497	45	56	101	44.55	398	33	37	70	47.14	303
Jul.	38	53	91	41.76	588	33	36	69	47.83	467	20	29	49	40.82	352
Aug.	21	47	68	30.88	656	25	25	50	50	517	11	21	32	34.38	384
Sep.	30	68	98	30.61	754	30	51	81	37.04	598	23	41	64	35.94	448
Oct.	26	35	61	42.62	815	23	23	46	50	644	10	24	34	29.41	482
Nov.	41	75	116	35.34	931	30	75	105	28.57	749	15	61	76	19.74	558
Dec.	27	47	74	36.49	1005	24	34	58	41.38	807	15	22	37	40.54	595
Total	404	601	1005a			348	459	807b			240	355	595c		
Mean	33.67	50.08	83.75			29	38.25	67.25			20	29.58	49.58		
Sex ratio%	40.20	59.80	100			43.12	56.88				40.34	59.66	100		
S.E.±	5.12	5.85	10.14			11.006	6.425	9.17			3.61	4.74	6.82		

M=male F=female Accu.%=accumulation percentage %=percentage
S.E.±=standered error L.S.D.$_{0.01}$=0.3201 No=number ♂=male

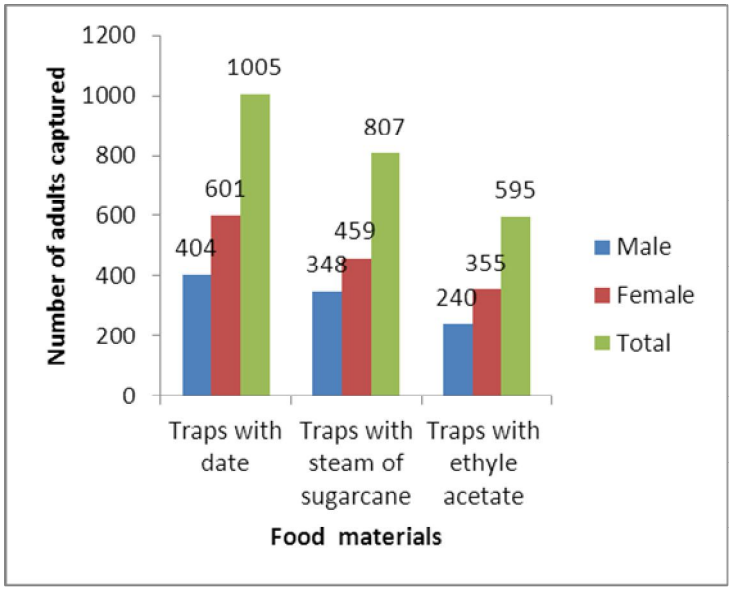

Fig. 3. Number of captured red palm weevil, *R.ferrugineus* (Oliv.) adults in pheromone traps supplied with dates, sugarcane and ethyle acetate placed in date palm orchard at Abo-Nagi farm, El-Kassassein, Ismailia Governorate during 2012.

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تأثير المواد الغذائية المتخمرة على أنجذاب حشرة سوسة النخيل الحمراء إلى المصائد الفيرومونية التجميعية فى مصر

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تعتبر المصائد الفيرومونية التجميعية طريقة ضرورية للمكافحة المتكاملة لسوسة النخيل الحمراء أجريت تجارب حقلية فى زراعات نخيل البلح بمنطقة أبوناجى، مركزالقصاصين ،محافظة الاسماعيلية ، مصرلمدة عام (2012) بأستخدام ثلاثة مواد غذائية متخمرة 0كانت أكثر المواد جذبا لسوسة النخيل الحمراء ثمار البلح مع الفرمون حيث كان التعداد 1005 حشرة بنسبة 41,75% من المجموع الكلى للحشرات التى تم أصطيادها مقارنة بعقل قصب السكر والفرمون حيث أصطادت 807 حشرة بنسبة 33,53% من المجموع الكلى للحشرات . فى حين أصطادت المصائد المزودة بالاثيل اسيتات أقل عدد من الحشرات 595 بنسبة 24,72% من المجموع الكلى للحشرات التى تم أصطيادها أوضحت النتائج المتحصل عليها وجود تأثيرعالى المعنوية لتعداد الحشرات فى المصائد المزودة بثمار البلح مع الفرمون أكثر من المواد الغذائية الاخرى من عقل قصب السكر والاثيل أسيتات 0ومن ثم يمكن التوصية بأضافة ثمارالبلح للمصائد الفرمونية .

عموماً للحصول على أعلى تأثير للاصطياد بالمصائد الفيرومونية التجميعية لمكافحة سوسة النخيل الحمراء لابد من أستعمال المصيدة (بفتحات وقمع وبدون غطاء) وتوضع على مستوى الأرضى وتزود بثمار البلح المتخمرة.