CONTROL OF RED PALM WEEVIL *RHYNCHOPHORUS FERRUGINEUS.* OLIV. IN EGYPT.

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Abstract

Field trails, revealed that moving within country can be recommended, for offshoots protection against the red palm weevil *Rhynchophorus ferrugineus.* Oliv. By applying the following mixtures viz ; Confidor (75 ml/100 liters), Oshin (125 g/100 liters) or Actara (35 g/100 liters), mixed with 250g mud/liter and dipped for 15 minutes before translocation and recultivation. Protection technique can be obtained during 11-13 weeks through translocation.Trunk base can be treated with the different following chemicals dissolved in kerosene viz ; Cidial (3ml/1 liter), Dursban (3ml/1 liter), followed by Basudin (3ml/1 liter).

INTRODUCTION

Red Palm Weevil (RPW), Rhynchophorus ferrugineus. Oliv, is one of the most destructive pest in the Arabian Peninsula and some other countries during the last 20's years. The red palm weevil is native in Asia and spread out mainly by imported and translocated infested offshoots. Moving of offshoots is represent a serious problem when moving to ideal new agrosystem palm's. In Egypt, and since 1993, uptill 2002 RPW population dispersal from 2 governorates thus covering 16 governorates The translocation of offshoots is considered the main factor governing the spatial distribution pattern of RPW individuals. On the other hand, reliable infestation sources were encountered during the last ten years, when the investigation of the trunk is considered it appears that many of infested trunk base harbored reliable numbers of RPW survives in this part situated just under the ground level. This part lasts alive after removing infested palm trees just above the ground level for a long time due to annual roots and moistens soil.

MATERIALS AND METHODS

In order to reduce as far as possible the number of RPW weevils survivors in the field mainly in certain invisible, specially in hidden sources which represents the initial new infestations, such as removing infested root and translocation of infested offshoots within the countries, or new ideal agro ecosystem. Two experiments were conducted; the first was carried out for getting rid of the hidden sources of infestation within the roots, while the second experiment was carried out for protecting the newly offshoots when moves within countries. Through the Middle East Red Palm Weevil Program in collaboration with Peres Center for Peace, experiments were conducted at infested area in ;Ismailia governorate ; Qasassin district, during 2000-2003 .

First experiment: Protection of offshoots (1 – 2 years)

Tested chemicals: Confidor 35% SC (imidaclopride) at 75ml/100 Liters of water (1-[(6-chloro-3-pyridinyl)methyl]-*N*-nitro-2 imidazolidinimine) ,Oshin (MTI), 20% SG (dinotefuran) at 125g/100 liters of water (*N*-methyl-*N*'-nitro-N"-[(tetrahydro-3-furanyl) methyl] guanidine, Actara 25% WG (thiamethoxam), at 35g/100 liters (3-[(2-chloro-5-thiazolyl) methyl] tetrahydro -5-methyl-*N*-nitro-4*H*-1,3,5-oxadiazin-4-imine , Al-systin 48% SC (triflumuron) at 25 ml/100 liter s of water (2-chloro-*N*-[[[4-(trifluoromethoxy) phenyl]amino]carbonyl] benzamide ,Diazinon 60% EC, at 300ml/100lit (*O,O*-diethyl *O*-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl] phosphorothioate, and Dursban 48% EC, at 300ml /100liters of water .(*O,O*-diethyl *O*-(3,5,6-trichloro-2-pyridinyl) phosphorothioate .

Tested Material: Seventy healthy offshoots (1-3 years old), were prepared, cleaned, marked and divide into 7 groups. Each group (ten offshoots) were dipped in one of the chemical solutions (Fig.1) prepared in metallic container mixed with 250gm of mud/one liter of solution (the whole body except the head) for 15 minutes, left in an open air for 24 hours ,and when dried the mixture of mud and chemical covered the whole offshoots with protected film. Control was done by the same method without mixed chemical. Treated offshoots, were recultivated in the soil under metallic green house , and covered with plastic net measured 2 x 6 meter. Each treated group was artificially infested with newly emerged weevils (30 males and 30 females). Weekly inspection was carried during one month. Every month, new reinfestation

was done (when no symptoms appears) by the same number of new weevils. Artificial infestation was repeated for 4 months. Infested offshoots were eliminated and desiccated to count the different alive stages of insect.

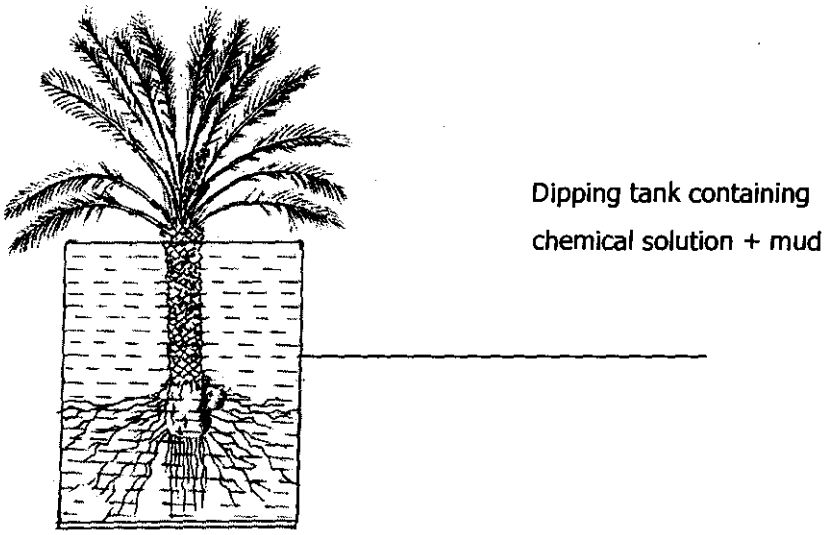

Fig 1. Offshoots dipping treatment

Second experiment: treatment of infested roots (Base Trunk)

Tested chemicals: Cidial 50% EC (phenthioate) at 300 ml/100 liters; ethyla-[(dimethoxy phosphinothioyl) thio] benzeneacetate; Stemex (nafthalin 18% + anthrathine 3%) at 300 ml/100 liters; Basudin 60% EC (Diazinon) at 300 ml/100 liters, *O, O*-diethyl *O*- [6-methyl-2-(1-methylethyl) -4-pyrimidinyl] phosphorothioate, Dursban 48% EC (chlorpyrifos) at 300 ml/100 liters *O,O* -diethyl *O*- (3,5,6-trichloro-2-pyridinyl) phosphorothioate, Qiuck 90% SP (Methomyl) at 300 g/100 liters, methyl *N*-[[(methylamino) carbonyl] oxy] ethanimidothioate.

Tested Material: Field trails were conducted to the trunk base of the infested removed palm trees.

Sixty infested trunk bases were chosen in the field, represented 12 treatments. Six treatments were applied on chemicals dissolved in water and another six treatment were carried out on chemicals but dissolved in kerosene. Each treatment represented 5 replicates. Each infested root (Trunk Base) was opened deeply from the upper part in different positions by sharp axe to facilitate the solution to penetrate the trunk base tissues downward to the lower part where the different stages of weevils are survive, Fig. (2). Chemicals were dissolved in water. Chemical solution was applied at the rate

ranged from 5- 10 liters/ root (according to the size of the root), and poured into the openings of the root until saturation. Control experiment was carried out on 5 roots by only water.

The previous experiment (five replicates for each chemical) was repeated by the same chemicals but dissolved in kerosene and controlled by five replicates of roots treated with only kerosene .

After two weeks latter treated roots were picked up by a loader machine and cut down into some cuttings allowing inspecting the different alive insect stages inside the roots in different tested chemicals.

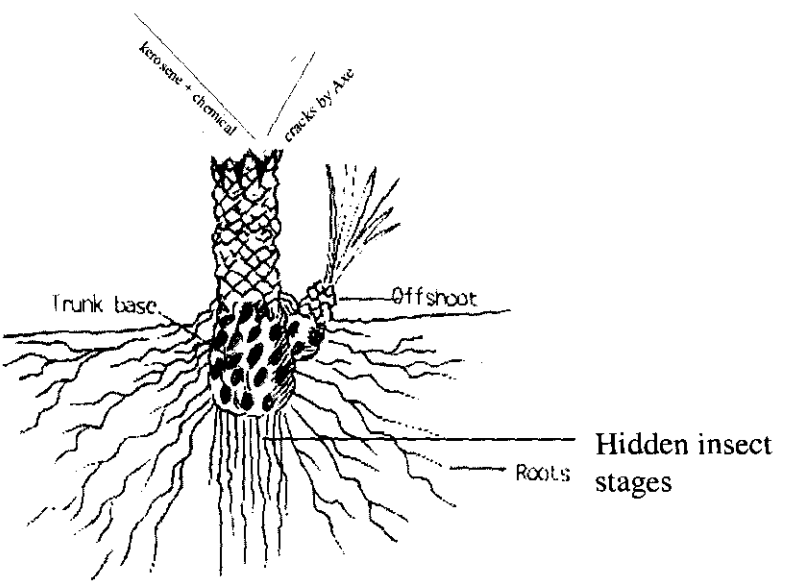

Fig. 2. Treatment of the trunk base under ground level

RESULTS AND DISCUSSION

First Experiment : (Protection of offshoots)

Data presented in Table (1), show the effect of tested coated chemicals on the period of liable infestation .

Table 1. Effect of different coated chemicals on the protection period of offshoots against RPW, under field conditions ,during 2002-2003 at Ismaielia Governorate.

Chemicals	% Infested off shoots (protected period in weeks)														
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Confidor	0	0	0	0	0	0	0	0	0	0	0	0	20	60	100
Oshin	0	0	0	0	0	0	0	0	0	0	0	40	80	100	
Actara	0	0	0	0	0	0	0	0	0	0	20	60	100		
Al-Systen	0	0	0	30	40	70	100								
Basudin	0	0	0	10	30	60	100								
Dursban	0	0	0	0	30	60	80	100							
Control	0	20	60	100											

The most effective chemical Confidor showed 14 weeks as protected period under the stress of monthly obligation of artificial infestation 2,4 and 6 offshoots were infested after 14 weeks , 4 after 15 weeks and 6 after 16 weeks, respectively . Oshin showed infestation symptoms after 13 weeks in 4 offshoots, 4 after 14 weeks and 2 after 15 weeks, Actara showed 2 offshoots after 12 weeks, 4 after 13 and 4 after 14 weeks). While the lowest periods of protection figures were practically found in each of Al-Systen , Basudin (after 4 weeks and lasted 8 weeks to kill all of ten in the two chemicals) ,and Dursban (symptoms started in the 5th week and lasted 9 weeks in all ten offshoots).

Accordingly, It could be concluded that, for offshoots protection when move within country, the following mixture could be applied ; Confidor (75 ml/100 liters of water), Oshin (125 g/100 liters of water) or Actara (35 g/100 liters of water), mixed with 250 g mud / liter and dipped for 15 minutes before translocation and recultivation.

Cabello,*et al.* (1997) , El-Ezaby (1997),Muthuraman,(1984) and Rajamanickam,*et al.* (1995) carried out control experiments in the laboratory and field with some similar chemicals for injection method but no reliable results on offshoots protection were performed.

Second Experiment: (trunk base): Data presented in Tables (2 and 3), showed the effect of different chemicals in their water and kerosens solutions on the reduction of different stages of RPW inside the infested palm roots.

a-Water solution (Table 2): The most effective chemical on the larval stage was demonstrated by Cidial (57.1%) , followed by Basudin (53.6%), Dursban, Quick and Stemex,(49.2, 46.7 and 44.2% , respectively). While the most effective chemical on pupal stage (55.6%) was by Basudin , followed by Dursban (48%), Quick (42.7%) , Cidial (37.2%) and Stemex (31.1%). Efficiency on adult stage was relatively equal among the four tested chemicals; Dursban, Basudin , Cidial and Quick (represented , 26.3, 25.7, 25.5, and 23.5%). Except Stemex which gave the lowest percent of mortality (13.8%).

Table 2. Percent mortality of different stages of RPW inside treated roots (base trunk) with chemicals dissolved in water .

Chemical	Number of stages inside roots								
	Larvae			Pupae			Adult		
	Live	Total	mortalty%	Live	Total	mortality %	Live	Total	mortalty%
Cidial	60	140	57.1	54	86	37.2	35	47	25.5
Stemex	91	163	44.2	62	90	31.1	50	58	13.8
Basudin	52	112	53.6	32	72	55.6	52	70	25.7
Dursban	67	132	49.2	26	50	48.0	56	76	26.3
Quick	97	182	46.7	39	68	42.6	52	68	23.5
Control (water)	155	155	0.0	56	57	1.8	41	41	0.0

In general from above mentioned data , the effect of all chemicals were higher on larval and pupal stages, while were very low on the adult stage .

b- kerosene solution: (Table 3): In the second application of the same five chemicals when dissolved in kerosene ,results were different. kerosene improved the effect of all tested chemicals.

Complete mortality (100%) was obtained against larval stage by Cidial and Dursban followed by Basudin (99%), Quick (77%) and Stemex (57.1%). Also same results on the pupal stage; 100% mortality was obtained by Cidial, Basudin, Dursban, and 78.7% was given by Quick, while Stemex gave 54.8 %. Dursban was found to be the most effective one in this respect on the adult stage (97.6%) followed by Cidial Basudin and Quick (95.6 ,95.2 and 76.9% respectively), but Stemex showed 31.2%. Water as a solvent gave 0, 1.7, and 0% mortality, while kerosene gave 47.1, 52.4, and 61.3% mortality on larval, pupal, and adult stages, respectively.

Table 3. Mortality of different stages of RPW inside treated roots (trunk base) with chemicals dissolved in kerosene .

Chemical	Number of stages inside roots								
	Larvae			Pupae			Adult		
	Live	Total	mortality %	Live	Total	mortality %	Live	Total	mortality%
Cidial	00	98	100	00	53	100	3	68	95.6
Stemex	36	84	57.1	19	42	54.8	53	77	31.2
Basudin	1	102	99.0	00	96	100	3	63	95.2
Dursban	00	112	100	00	83	100	1	41	97.6
Quick	20	87	77.0	13	61	78.7	12	52	76.9
Control (kerosene)	36	68	47.1	43	82	47.6	38	62	40.3

Generally , and when interacting the data shown in Table 4, using kerosene as a solvent for the tested chemical solution showed highly figures expressed as percentages of mortality on all stages within the infested roots (trunk base).The synergist of action of kerosene was demonstrated through three directions; first its function as a good carrier for the chemicals throughout the wooden fibers i.e. deeply inside the infested roots; second, its physical action on the wood as a dehydrated substance which caused wood dryness faster than insect survive; and the third character is its effect on dehydration and toxic action on the cuticle of the insects. Such resultsis consider a guideline to control the insect in its hidden source inside trunk base and that may reduce the number of new infestation to new trees in the future. (Giblin and Howard, 1989).

Table 4. Comparison between the effect of water solution and kerosene solution of different chemicals on the reduction of RPW stages in the treated roots.

Chemical	Reduction %					
	Larval stage		Pupal stage		Adult stage	
	Water solution.	Kerosen solution	Water solution.	Kerosen solution	Water solution	Kerosen solution
Cidial	57.1	100	37.2	100	25.5	95.6
Stemex	44.2	57.1	31.1	54.8	13.8	31.2
Basudin	53.6	99.0	55.6	100	25.7	95.2
Dursban	49.2	100	48	100	26.3	97.6
Quick	46.7	77.0	42.7	78.7	23.5	76.9
Control	0	47.1	1.8	47.6	0	40.3

Data presented in Table (5), show the results of statistical analysis using combined analysis, which supported the previous figures. The response of the different stages was strongly significant for either water or kerosene solution of the same chemical. On the other hand chemicals gave different efficiency and statistical analysis

supported such results. Even when study the interaction between effect of solvent on different stages and each solvent in the different chemicals, which showed highly significant effect.

Table 5. Analysis of variance of the effect of three combined factors (Solvent x chemical x stages) on the protection of offshoots against RPW.

Variance due to	D.F.	Tss	Mss	F.	P 1%
Stages	2	1515.86	757.93	23.1**	5.18
Chemicals	5	12068.86	2413.77	73.59**	3.51
Solvents	1	18498.6	18498.6	563.98**	7.31
Stages X Chemicals	10	444.55	44.5	1.36	2.99
Stages X Solvent	2	363.14	181.57	5.54**	5.18
Chemical X Solvent	5	1797.34	359.47	10.95**	3.51
Error	10	328.51	32.8		
Total	35	35016.86			

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مكافحة سوسة النخيل الحمراء فى مصر

يسرى السباعى

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى- الجيزة - مصر

اجريت الدراسات الحقلية بغرض حماية فسائل النخيل اثناء نقلها من الاصابة بحشرة سوسة النخيل وكذلك علاجها اذا كانت مصابة وغير ظاهرة وايضا شملت الدراسة تقييم بعض المبيدات على احد مصادر الاصابة المختفية وهى جذور اشجار النخيل المصابة بعد قطعها

دلت النتائج المتحصل عليها الاتى :

١- انه يمكن استخدام مركبات كونفيدور(٧٥مل/١٠٠لتر ماء) ، اوشين (١٢٥جم/١٠٠ لتر ماء) ، اكتارا (٣٥جم/١٠٠ لتر ماء) عن طريق غمر الفسائل فى محلول من المبيد مع اضافة ٢٥٠جم من التربة الزراعية لكل لتر من المحلول وتركها لمدة ١٥ق ثم نقلها بأمان حيث تظل مقاومة للاصابة لمدة تتراوح من ١١ – ١٣ اسبوع لحين زراعتها .

٢- للحد من مصادر الاصابة المختفية والتى تتجدد سنويا يمكن استخدام محلول مبيدات دورسبان – سيديال – باسودين مذابة فى الكيروسين لمعاملة جذور النخيل المتخلفة بعض قطع الاشجار المصابة وذلك عند عمل شقوق بالجزء العلوى بواسطة البلطة وصب محلول المبيد بها حتى التشبع