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FIELD EVALUATION OF DIFFERENT MANUAL INJECTION METHODS FOR CONTROLLING RED PALM WEEVIL, *Rhynchophorus ferrugineus* (OLIVIER) COMPARED WITH A MECHANICAL DEVISE

Abd-El-Hady, A. A.[1]; Laila R. El Gohary[1] and F. M. Abd-El-Hady[2]
[1]Faculty of Agric. Mansoura University, Mansoura, Egypt.
[2]Plant Protection Research Institute, Agric. Res. Center Giza - Egypt.

ABSTRACT

Field experiments were carried out to evaluate the efficiency of five manual trunk injection methods for controlling red palm weevil, Rhynchophorus ferrugienus (Olivier). Fifteen date palms with different status of infestation (5 limited, 5 moderated and 5 severe) for each method was injected by Chloropyrifos 48% EC at rate of 0.3%.

One of the most effective manual injection methods was compared with a mechanical device using Phenothoate 50% EC solution at the rate of 0.3%. Data showed that, the manual method was more successful than mechanical device. The manual method caused 100% recovery in the lowest level of infestation only, while it caused 80% recovery at the other two levels of infestation.

INTRODUCTION

The red palm weevil (RPW) *Rhynchophorus ferrugienus* (Olivier) is the most serious pest of cultivated palm trees species, it was first recorded in Egypt by Saleh (1992). The harmful stage of RPW is the larvae which feeding on the tissues of the trunk making tunnels in all direction (Henery, 1917 and Butani, 1975). The translocation of offshoots is considered the main factor governing the spatial distribution pattern of RPW individuals. On the other hand, reliable infestation sources, 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 for a long time (El-Sebaey, 2004a). Injection method by insecticides was considered the best measurement of controlling the pest (El-Sebaey 2004b). The infestation of RPW is effectively controlled by chemical method, all holes in the trunk of infested palm and plugged. Then a hole just above the infested region is drilled and a suspension of insecticides poured into it (Nair, 1986 and Girgis *et al*, 2002). compared between four trunk injection methods to remedy the infested palm trees with RPW. (Abdalla and Khatri, 2000) used an electric drill with a bit 40cm long and 1.9cm diam. To make a hole in palm trunk.

The present study aimed to evaluate five different manual trunk injection methods for controlling *R. ferrugineus*, more over, comparing the mechanical injection (by published mechanical devise) with the best manual method for controlling RPW.

MATERIALS AND METHODS

Evaluation of different injection methods:

Field experiments were carried out at Belbis district, Sharkia Governorate Egypt during March to November 2010 to evaluate the efficiency of five manual trunk injection methods for controlling *R. ferrugineus*.

Fifteen infested date palms 10-15 years old were applied with Chloropyrifos (pyrifos El Naser 48% EC) diluted in water at ratio of 0.3% for each method. The experiment was applied on 75 infested date palms. Five of each status of infestation, limited, moderated and severe were selected for each method. The differentiation between these statuses depended on the quantity, color and odor of fluid oozed out. Quantity of damaged fibers, depth, width and direction of cavities made by larvae. The infested palms were marked, the degree of infestation and the replicate number and date of application were recorded.

These methods are as follows:

(1) The first method, 3-6 holes were used for insecticide injection. The holes were made in the trunk at the edge of infestation area in a half circular shape or in crescent shape (above and in the lateral edges of infestation).

(2) The second method, 3-5 holes were made, one in the center of infestation (in the attack point) and one or two holes high and down the first one.

(3) The third method, the insecticide solution was injected in 7-15 holes covered the infested area of palm trunk inside and around till reached the uninfected tissues (solid tissues).

(4) The fourth method was similar to the previous one but the insecticide solution was injected in the holes using plastic tube (20-25 cm long and 1.5 cm diameter) inserted inside each hole.

(5) The fifth method was similar to the fourth one but the tubes were held in the beginning of the holes.

In these methods the holes were 20-30 cm long each, and were made by an iron pin (40 cm long and 2 cm diameter) and inclined at an angle of 30° down word from the horizontal.

The insecticide solution was poured into the hole by normal spray apparatus 5l size until saturation which indicated by the over flowing of the excess of injected solution from the hole opining nozzle. The trunk of the treated palm was sprayed with the same solution and the holes were sealed with cement of mud. The injected palms were examined and the recovery rate was recorded after two weeks of treatment.

Comparing the mechanical injection with the best manual method for controlling (RPW):

This experiment (the second experiment) was carried out on 30 infested palm trees (15 status/method). Each method was represented by different status of infestation (5 limited, 5 moderated and 5 severe).

A. In the manual method phendal 50% EC (phenothoate) solution at the rate of 0.3% was injected by normal spray apparatus (5L size) in through

7-15 holes covering the infested area, inside and around it. Holes were made as mentioned before in the third manual method by using an iron pin.

B. In the mechanical method a device was used. The device consists of two main parts:

1. Boring device:

- The boring part consists of: frame, binding bar, binding chain and boring bar with bring bit having total mass of about 8 kg.
- The frame made of longitudinal cross-section tube 60×30×3 mm with total mass of 1.2 kg and 80 cm length.
- Data cable link chain using a binding chain about date palm trunk with 2 m length to be suitable for maximum trunk diameter. It is fixed on the right end of the frame.
- Binding bar has a screw bolt and nut with 22 mm diameter and 350 mm length. The chain attached with it to make strong frame about date palm trunk.
- Boring bar, has a hollow shaft with bring bit 16 mm and steel arm 30 cm length.

The boring bar has 750 mm length, 9 mm inside diameter and different outside diameters 19, 25, 16.5 and 16 mm, respectively. There are five nozzles 5 mm to insecticide discharge. The binding bar turning anti clockwise in a fixed tube in the frame mid to make holes with recommended deep and angle from horizontal manually. (Morad and Eliwa 2008).

2. Injection hand pump:

In this method (1-3) bores were made by the boring device and 0.3% phenothoate solution was injected in all direction.

In the two methods the phenothoate solution at ratio of 0.3% were injected in all holes and bores and in the infested palm trunk around the infested area. The amount of solution (liter) and the time of treatment were recorded. After two weeks the treated palms were observed and the recovered one were recorded.

The treated palm was considered recovery when the fluid oozed is limited and odorless, drying of the infested site. Sometimes, lateral dissection showed no alive larvae.

RESULTS AND DISCUSSION

Results revealed that the insecticide solution injected in 7-15 holes covering the infested area of palm trunk inside and around it till reaching the uninfected tissues (solid tissues) was the most effective one. Showed that, the second and fourth methods of trunk injection gave the lowest percentage of recovered infested palm trees, they were 40%. Where the recovered percentage of palm trees treated with second method were 80% in limited status, 20 and 20% in moderated and severe status, the recovered percentage of fourth methods were 60, 40 and 20% in the three different status, respectively. Recovery of palm trees of first method was 53.33%, and the percentage of infested palm trees which recovered were 100, 40 and 20% to the three statuses (limited, moderated and severe) respectively. Third and

fifth methods caused the highest percentage of recovered infested palm trees, they were 100%.Generally, both third and fifth methods gave a good contact of insecticides with the pest inside the infested area of the tree and therefore, the third and the fifth were the best methods for remedy the infested palm trees and can be recommended for the control of RPW infesting in Egypt.

Girgis et al (2002) compared between four trunk injection methods to remedy the infested palm trees with RPW. The differentiations between them were depending on depth, width, directions of cavities made by larvae and number of hoes. A hole is making by an iron pin (40cm long and 2.5cm diam.). The fourth method (7-13 substitutive holes and 15-20cm depth) was the best one for remedy the infested palm trees.

Comparing the mechanical device with the one of the best manual methods (third method) for controlling RPW:

Obtained results are presented in Tables (2 and 3). Data revealed that the manual method was more successful than the mechanical device. The manual method caused 100% recovery regardless the status of infestation. The mechanical device caused 100% recovery in the lowest level of infestation only, while it caused 80% (Table 2). Recovery at the other two status of infestation.

Table (1): Effect of different trunk injection methods on various status of infestation with RPW using chloropyrifos.

Method	Rep.	Status of Infestation						Mean of recovery, %
		Limited		Moderated		Severe		
		No. of holes	Recovery %	No. of holes	Recovery %	No. of holes	Recovery %	
First	1	3	100	5	40	6	20	53.33
	2	3		6		6		
	3	5		6		6		
	4	5		5		6		
	5	4		6		6		
Second	1	3	80	5	20	5	20	40
	2	3		5		5		
	3	3		5		5		
	4	3		5		5		
	5	3		5		5		
Third	1	7	100	8	100	15	100	100
	2	7		10		12		
	3	7		8		13		
	4	7		9		14		
	5	7		11		15		
Fourth	1	7	60	10	40	15	20	40
	2	7		9		12		
	3	7		11		12		
	4	7		11		15		
	5	7		10		14		
Fifth	1	7	100	9	100	15	100	100
	2	7		11		13		
	3	7		8		15		
	4	7		10		12		
	5	7		11		14		

The manual method required significantly more holes compared with the mechanical device (10 and 1.60, respectively). The manual methods required significantly less solution than the mechanical device (5.93 and 9.67, respectively). In regard to the required time for treatment, it was no significant differences between the two methods (Table 3).

The analysis also revealed to, the three status of infestation (limited, moderate and severe) were affected significantly on the required number of holes, amount of solution and the mean time of treatment.

Table (2): Comparing the mechanical device with the third manual method for controlling RPW.

status of infestation	Rep.	Manual method				Mechanical device			
		No. of holes	Amount of solution (liter)	Time of treatment, minutes	Recovery %	No. of holes	Amount of solution (liter)	Time of treatment, minutes	Recovery %
Limited	1	7	3	12	100	1	6	18	100
	2	7	4	18		1	7	15	
	3	7	4	17		1	7	20	
	4	7	3	13		1	8	17	
	5	7	4	17		1	8	20	
Moderated	1	8	4	20	100	1	8	25	80
	2	9	5	23		1	8	30	
	3	10	6	26		2	11	25	
	4	10	7	28		1	10	25	
	5	11	7	29		2	10	30	
Severe	1	12	7	31	100	2	10	25	80
	2	15	10	40		3	15	35	
	3	14	8	35		2	12	29	
	4	15	10	29		2	11	27	
	5	12	7	31		3	14	38	

Table (3): Analysis of variance for comparing the mechanical device withthe third manual method.

Source		Holes		Solution		Time	
Method of treatment	Manual	10.00	a	5.93	b	25.27	a
	Device	1.60	b	9.67	a	24.60	a
status of infestation	Limited	3.80	c	5.40	c	16.70	c
	Moderate	5.60	b	7.60	b	26.10	b
	Severe	8.10	a	10.40	a	32.00	a

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التقييم الحقلي لطرق الحقن اليدوية المختلفة في مكافحة سوسة النخيل الحمراء مقارنة مع جهاز الحقن

علي علي عبد الهادي[1] – ليلي رجب الجوهري[1] – فايز محمد عبد الهادي[2]

١ – كلية الزراعة – جامعة المنصورة .

٢ – معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الجيزة – الدقي – مصر.

أجريت الدراسات الحقلية بغرض تقييم كفاءة خمس طرق يدوية مختلفة للحقن لمكافحة سوسة النخيل الحمراء. تم حقن عدد ١٥ نخلة مصابة تمثل ثلاث مستويات مختلفة من الإصابة(بسيطه – متوسطة – شديدة) لكل طريقة بمبيد كلوروبيروفوس ٤٨% EC بتركيز ٠.٣%.

وكانت طرق الحقن الخمس كالتالي :-

الطريقه الاولى: حقن محلول المبيد في ٣ – ٦ ثقوب في جذع النخلة علي شكل هلال او نصف دائرة أعلي و حول منطقة الإصابة.

الطريقه الثانيه: حقن محلول المبيد في ٣ – ٥ ثقوب واحد في مركز الإصابة. وواحد او اثنين أعلي وأسفل منطقة الإصابة.

الطريقه الثالثه: حقن محلول المبيد في ٧ – ١٥ ثقب في مركز الإصابة و حولها حتي الوصول إلي المنطقة السليمة.

الطريقه الرابعه: مماثلة للثالثة مع إستخدام أنبوبة بلاستيكية بطول من ٢٠ – ٢٥سم وقطر ١.٥سم تدفع بالكامل داخل مكان الإصابة.

الطريقه الخامسه: فكانت مثل الرابعة مع تثبيت الأنبوبة في فوهة ثقب الإصابة.

دلت النتائج المتحصل عليها علي أن:

أفضل طرق الحقن اليدوية كانت الطريقتين الثالثة والخامسة واللتي يتم فيهمـا حقـن محلـول المبيد حتي يغطي منطقة الإصابة بالكامل ويصل للأنسجة السليمة سواء عن طريق ضخ محلـول المبيد مباشرة أو في الأنبوبة المثبتة عند بداية فوهة الثقوب.

وقد تم مقارنة أحد طرق الحقن اليدوية الأكثر كفاءة وهي الطريقة الثالثة مع جهـاز الحقـن الميكانيكي بإستخدام مبيد فينثويت ٥٠% EC بتركيز ٠.٣%.

ودلت النتائج المتحصل عليها:-

أن إستخدام الطريقة اليدوية كانت أفضل من إستخدام جهاز الحقن الميكانيكي حيـث أعطـت الطريقة اليدوية نسبة شفاء كامل ١٠٠% بصرف النظر عن مستوي الإصابة بينما حقـق جهـاز الحقن المشار إليه نسبة شفاء كاملة ١٠٠% في حالة الإصابة البسيطه فقط في حين أن نسبة الشفاء كانت٨٠% في حالة الإصابة المتوسطة والشديدة.

قام بتحكيم البحث

أ.د / عادل عبد المنعم صالح — كلية الزراعة – جامعة المنصورة

أ.د / محمد محمد ابو سنه — مركز البحوث الزراعية