Cost Benefit Analysis of Red Palm Weevil, *Rhynchophorus ferrugineus* Control in Date Palm Trees Farms at Sharkia Governorate, Egypt

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Abstract

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The red palm weevil, RPW, *Rhynchophorus ferrugineus* (Olivier) is considered a dangerous palm pest in Egypt. Field trials were conducted at new Selhia district, Sharkia Governorate, Egypt during two seasons, 2022/2023 and 2023/2024. Results obtained showed that the palm trees infestation rate reached 17.95 and 19.44% in farm 1, 26.28 and 23.33% in farm 2; 28.84 and 26.11% in farm 3, in the two seasons, respectively. Whereas, the infestation rate reached 26.92 and 31.11% in the control farm without mass trapping of adult weevils, in the two seasons, respectively. The infestation rate with RPW increased from 46.42% in the 2022/2023 season to 53.57 % in the 2023/2024 season. Statistical analysis showed a highly positive significant difference between RPW infestation rate in date palm trees in farms with pheromone traps and the infestation rate in the control farm (without pheromone traps). Statistical analysis of date palm yield showed no significant difference between low and moderate weevil infestation in the two growing seasons. Generally used mass pheromone traps in IPM to control RPW, considered as a dangerous date palm pest in Egypt.

Keywords: *Rhynchophorus ferrugineus* (Olivier), date palm, aggregation pheromone, cost benefit analysis, pests control.

Introduction

Rhynchophorus ferrugineus (Olivier) (Coleoptera: Curculionidae) is danger pest for date palm trees farms and first recorded in Egypt (Abbas, 2019; Saleh & Gouhar,1993) .Pheromone technology has been widely used to manage *R. ferrugineus* in commercial date plantations in Saudi Arabia (Faleiro *et al*., 2010). The *R. ferrugineus* aggregation pheromone traps has been used in Saudi Arabia since 1994 as part of RPW management designed to suppress populations through the mass trapping and killing of adult weevils, applied in conjunction with insecticides applications to infested *P. dactylifera* plantations (Faleiro *et al.,* 2011). Pest suppression technologies used include biological control, baited pheromone traps, host plant resistance, eradication of infested plants, and pesticides application (Faust, 2008; Mukhtar *et al.,* 2011). The annual removal of date palms infested with RPW ranged from 1 to 5% in the Middle East at a cost from $5.18 to $25.92 million, respectively (El-Sabea *et al.,* 2009).

In Egypt, the infestation rate of date palm trees with red palm weevil covered all 26 governorates with rate from 2 to 35%. Date palm is considered of economic importance in Bahria, Siwa oases and Aswan with infestation rate exceeding 20% (Abbas, 2019). More recently (2022), lost date palms loss due to RPW in Egypt reached USD 213 million (FAO, 2024).

This study aimed to conduct a cost benefit analysis for the control of red palm weevil, *R. ferrugineus* (Olivier) in date palm farms at Sharkia Governrate, Egypt.

Materials and Methods

Field trials

Field trapping procedures were conducted based on number of RPW adults captured weekly by the baited aggregation pheromone traps.The bucket traps were distributed uniformly in the selected severely infested area at new Selhia during two seasons (from April, 2022 until March, 2024).

Trap design and related components

The traps were placed tightly in the soil surface. The used traps consisted of a plastic bucket (9 liters in size). The bucket was punctured around its wall with four holes 2.5 cm in diameter,15cm from the bottom. A mixture of 4-methyl-5-nonanol (nine parts) and 4-methyl-5-nonanone (one part) was used in the field trials. Pheromone sac was hanged underside the trap top surface (Hallet *et al.,* 1993). Selected kiromone was used as a synergist to activate the potent ability of releasing ethyl acetate blooms. Ethyl acetate bottles, however were hanged from the underside surface of the trap top releasing chemicals through a fine plastic tube. A pesticide (Bestban 48% EC) was mixed with trap water inside bucket traps to prevent the escape of captured weevils.

Monitoring the RPW adults population

Monitoring the number of captured *Rhynchophorus ferrugineus* (Olivier) adults based on aggregation pheromone traps distributed uniformly in the selected area. Number of collected weevils caught in the pheromone traps was counted weekly, sexes was determined and grouped into monthly counts. All traps were maintained weekly. Ethyl acetate kiromone within

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each trap were changed weekly and pheromone capsules within each trap were changed every two months.

Trapping of red palm weevil and infestation rate

An experimental trial was carried out in the date palm trees orchards at New Selhia district,Sharkia Governorate for mass trapping of RPW and determine infestation rate of date palm trees. For this purpose, four adjacent palm orchards of an equal area (each about 3 acres) were chosen.The RPW-infested trees were identified, labeled and recorded in all orchards before the installation of pheromone traps. A number of 6 pheromone-baited traps in the first three orchards (farms) at the rate of one, two and three traps/three acres were installed, whereas the fourth orchard (farm) was left without traps as control. All traps were inspected weekly and properly maintained. The number of caught weevils were recorded. At the same time, the newly formed infestations were surveyed and recoded.

Fruit date yield and RPW infestation rate

Fruit weights and their costs of five healthy and infested Hyani date palms trees were recorded during two successive seasons 2022 and 2024 in the date palm trees orchards at New Selhia district, Sharkia Governorate to evaluate the effect of red palm weevil infestation rate on date palm yield.

Cost of pheromone traps for the control of RPW infestation of date palm trees

Cost-benefit analysis equation compared the control cost and the value of increased date yield due to the control as proposed by Maaß & Kehlenbeck (2024):

Cost-benefit ratio= Present value (PV) of benefit/Present value (PV) of cost

Results and Discussion

Effect of mass trapping of RPW on the infestation rate of date palm trees

Data summarized in Tables 1 & 4 and Figure 1 shows total number of red palm weevil caught monthly per 1, 2 and 3 traps and the corresponding number of infested trees in each of the three farms with pheromone traps as compared with the fourth control farm (without pheromone traps). Results showed that in the 2022/2023 season, the infestation rates were 18.0, 26.3 and 28.8% in the first, second and third farms, where the adult weevils were mass trapped as compared to 26.9% infestation rate in the control farm without mass trapping of adult weevils. Analysis of the results yielded positive and highly significant differences between the infestation rate of the date palm trees in the farms with pheromone traps compared to the infestation rate in the control farm.

Data presented in Tables 2 & 4 and Figure 1 showed the total numbers of red palm weevil monthly caught in 1, 2 and 3 traps and the corresponding number of infested trees in the three farms with pheromone traps as compared with the control farm (without pheromone traps) during the 2023/2024 season. The RPW infestation rate reached 19.4, 23.3 and 26.1% in first, second and third farms, where the adult weevils were mass trapped, as compared to 31.1% infestation rate in the control farm without mass trapping of adult weevils by the pheromone traps. Statistical analysis of the results yielded positive and insignificant differences between infestation rate in date palm trees in farms with pheromone traps and the infestation rate in the control.

Results obtained in this study were in agreement with previous reports (Redha, 2008; Soroker *et al.,* 2005). Faleiro & Kumar (2008) showed that the very low and high levels of infestation can also be used to assess the performance of R. ferrugineus IPM programs that are in progress. Previous workers (Abd El-Wahab *et al.,* 2020; El-Shafei & Batt, 2024) found that the use of the funnel trap with a lid, and 4 holes on the lid, containing Rhyncho gel pheromone and dates as a food bait achieved the highest efficiency of attracting RPW adults in date palm farms.

Correlation between number of captured insects and number of damaged date palm trees

Results obtained (Tables 3 & 4 and Figure 1) showed that in 2022/2023 season, the correlation and regression coefficients of the number of infested palm trees were r = 0.287* and b =0.074, respectively, whereas both simple correlation and partial regression values were insignificant for the number of infested palm trees (r =0.265 n.s., b= 0.078) in the 2023/2024 season.

The number of captures increased by increasing the accumulated number of infested date palm trees. During the first season, the total number of captures was 675 and infestation rate of date palm trees was 46.4%, whereas the total number of captures was 766 and infestation rate of date palm trees was 53.6 % in the second season.

The results obtained in this study on the interaction between the number of insects caught in aggregation pheromone traps and damaged date palm trees were in agreement to what has been reported earlier (Abbas, 2000; Oehlschlager, 2004; Sujatha *et al.,* 2010; Vidyasager *et al.,* 2000), but disagrees with what has been reported by Rajapakse *et al.* (1998).

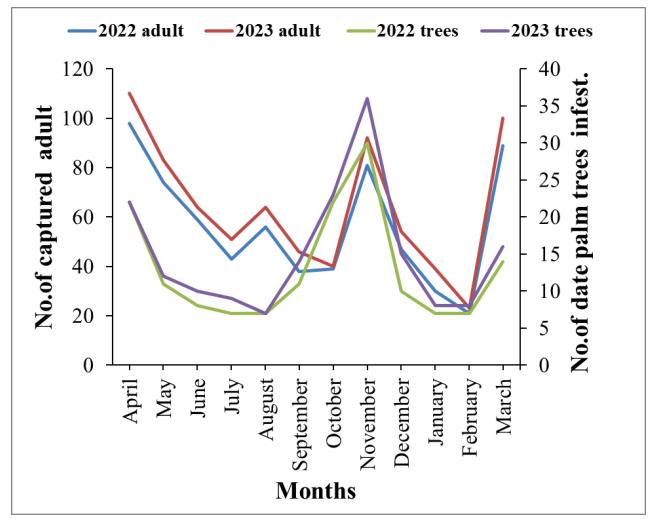

Figure 1. The number of red palm weevil adults captured, and number of removed infested date palm trees during the 2022/2023 and 2023/2024 growing seasons.

Table 1. Monthly number of *Rhynchophorus ferrugineus* caught in sex pheromone traps and the corresponding number of infested palm trees in two treatments, with and without traps, at New Salhia district, Sharkia Governorate, Egypt, during the 2022/2023 season.

	Total number of weevils caught/6 traps in three farms and corresponding number of infested trees																General	
	Farm 1				Farm 2				Farm 3				Farm 4					
	No. of weevils/ one trap			No. of infested trees	No. of weevils/ 2 traps			No. of infested trees	No. of weevils/ 3 traps			No. of infested trees	Without traps			No. of infested trees	Total No. of weevil trapped	Total No. of infested trees
Month	♂	♀	Total		♂	♀	Total		♂	♀	Total		♂	♀	Total			
April 2022	3	10	13	4	11	14	25	6	18	22	40	7	6	14	20	5	98	22
May 2022	2	6	8	2	6	11	17	3	13	20	33	3	8	8	16	3	74	11
June 2022	2	5	7	1	6	8	14	2	11	15	26	3	6	6	12	2	59	8
July 2022	2	2	4	1	4	6	10	2	8	12	20	2	3	6	9	2	43	7
Aug. 2022	3	4	7	1	3	9	12	2	10	13	23	2	5	9	14	2	56	7
Sep. 2022	2	3	5	3	4	4	8	3	6	9	15	2	3	7	10	3	38	11
Oct. 2022	1	2	3	4	2	5	7	5	4	8	12	6	7	10	17	7	39	22
Nov. 2022	3	7	10	5	9	11	20	7	12	23	35	9	2	14	16	9	81	30
Dec. 2022	3	3	6	2	4	7	11	3	9	12	21	3	3	6	9	2	47	10
Jan. 2023	1	2	3	1	2	5	7	2	6	8	14	2	3	3	6	2	30	7
Feb. 2023	1	1	2	1	2	3	5	2	5	5	10	2	1	3	4	2	21	7
March 2023	4	7	11	3	10	13	23	4	16	21	37	4	8	10	18	3	89	14
Total	27	52	79	28	63	96	159	41	118	168	286	45	55	96	151	42	675	156
Mean/ month	2.3	4.3	6.6	2.3	5.3	8.0	13.3	3.4	9.8	14.0	23.8	3.8	4.6	8.0	12.6	3.4	56.3	13.0
Standard error	±0.3	±0.8	±1.0	±0.4	±0.9	±1.0	±1.9	±0.5	±1.3	±1.8	±3.0	±0.7	±0.7	±1.0	±1.5	±0.7	±7.1	±2.2
%	34.2	65.8		18.0	39.6	60.4		26.3	41.3	58.7		28.8	36.4	63.6		26.9		

Table 2. Monthly number of *Rhynchophorus ferrugineus* caught in sex pheromone traps and the corresponding number of infested palm trees in two treatments, with and without traps, at New Salhia district, Sharkia governorate, Egypt during 2023/2024.

	Total number of weevils caught/6 traps and corresponding number of infested trees																General	
	Farm 1				Farm 2				Farm 3				Farm 4					
	No. of weevils/one trap			No. of infested trees	No. of weevils/2 traps			No. of Infested trees	No. of weevils/3 traps			No. of infested trees	Without traps			No. of infested trees	Total No. of weevils	Total No. of Infested trees
Months	♂	♀	Total		♂	♀	Total		♂	♀	Total		♂	♀	Total			
April 2023	6	9	15	4	13	15	28	5	20	23	43	7	10	14	24	6	110	22
May 2023	4	6	10	3	8	11	19	3	14	21	35	2	8	11	19	4	83	12
June 2023	3	5	8	2	6	9	15	3	12	15	27	3	5	9	14	2	64	10
July 2023	3	3	6	1	4	7	11	2	8	15	23	3	4	7	11	3	51	9
Aug. 2023	4	4	8	1	6	8	14	2	13	13	26	2	6	10	16	2	64	7
Sep. 2023	3	3	6	3	4	5	9	3	7	11	18	3	5	8	13	5	46	14
Oct. 2023	1	2	3	5	2	5	7	4	3	9	12	5	7	11	18	9	40	23
Nov. 2023	3	8	11	7	10	14	24	9	13	24	37	9	6	14	20	11	92	36
Dec. 2023	3	5	8	3	3	8	11	3	10	12	22	4	4	9	13	5	54	15
Jan. 2024	2	3	5	2	3	5	8	2	7	10	17	2	3	6	9	2	39	8
Feb. 2024	1	1	2	1	1	2	3	1	5	7	12	3	3	3	6	3	23	8
March 2024	5	8	13	3	12	14	26	5	17	22	39	4	10	12	22	4	100	16
Total	38	57	95	35	72	103	175	42	127	181	311	47	71	114	185	56	766	180
Mean	3.2	4.8	7.9	2.9	6.0	8.6	14.6	3.5	10.6	15.1	25.9	3.9	5.9	9.5	15.4	4.7	63.8	15.0
Standard error	±0.4	±0.7	±1.1	±0.5	±1.1	±1.2	±2.3	±0.6	±1.5	±1.7	±3.0	±0.6	±0.7	±0.9	±1.6	±0.8	±7.8	±2.4
%	40.0	60.0		19.4	41.1	58.9		23.3	40.8	58.2		26.1	38.4	61.6		31.1		

Table 3. Monthly mean numbers of infested palm trees, infestation rate (%) and number of *Rhynchophorus ferrugineus* adults captured by pheromone traps placed in date palm orchards at New Salhia district, Sharkia governorate, Egypt, during two successive 2022/2023 and 2023/2024 seasons.

	2022/2023							2023/2024							General	
	No. of captured adults			No. of date palm				No. of captured adults			No. of date palm					
					Infested		Infest-ation rate (%)					Infested		Infest-ation rate (%)		
Month	♂	♀	Total	Healthy	No.	Accum-ulated		♂	♀	Total	Healthy	No.	Accum-ulated		Total	No. of infested trees
April 2023	38	60	98	400	22	22	5.5	49	61	110	244	22	22	9.0	208	44
May 2023	29	45	74	378	11	33	2.9	34	49	83	222	12	34	5.4	157	23
June 2023	25	34	59	367	8	41	2.2	26	38	64	210	10	44	4.8	123	18
July 2023	17	26	43	359	7	48	1.9	19	32	51	200	9	53	4.5	94	16
Aug. 2023	21	35	56	352	7	55	1.9	29	35	64	191	7	60	3.7	120	14
Sep. 2023	15	23	38	345	11	66	3.2	19	27	46	184	14	74	7.6	84	25
Oct. 2023	14	25	39	334	22	88	6.6	13	27	40	170	23	97	13.5	79	45
Nov. 2023	26	55	81	312	30	118	9.6	32	60	92	147	36	133	24.5	173	66
Dec. 2023	19	28	47	282	10	128	3.5	20	34	54	111	15	148	13.5	101	25
Jan. 2024	12	18	30	272	7	135	2.6	15	24	39	96	8	156	8.3	69	15
Feb. 2024	9	12	21	265	7	142	2.6	10	13	23	88	8	164	9.1	44	15
March 2024	38	51	89	258	14	156	5.4	44	56	100	80	16	180	20.0	189	30
Total	263	412	675	244	156			308	455	766	64	180			1441	336
Mean	21.9	34.3	56.3	327	13	86	4.1	25.8	38.0	63.8	161.9	15	97.1	10.0	120.1	28
±S.E.	±2.8	±4.4	±7.1	±13.9	±2.2	±13.8	±0.73	±3.5	±4.4	±7.8	±16.3	±2.4	±16.3	±1.9	±112.0	±4.6
%	39.0	61.0	46.8		46.4			40.2	59.4	53.2		53.6			100	100

Table 4. Simple correlation and simple and multiple regression of different population parameters affected by number of infested date palm trees and number of *Rhynchophorus ferrugineus* captured by pheromone traps placed in date palm orchard at new Salhia district, Sharkia Governorate, Egypt, during two successive 2022/2023 and 2023 /2024 growing seasons.

		2022/2023			2023/2024		
X	Y	*r.*	*p.*	*b.*	*r.*	*p*	*b*
Males	infested palm trees	0.214	0.130 ns	0.140	0.236	0.093 ns	0.159
Females	infested palm trees	0.326	0.019 *	0.134	0.274	0.0496 *	0.135
Total		0.287	0.041 *	0.074	0.265	0.057 ns	0.078

r = correlation coefficient, b = regression coefficient, P = probability, *=significant, n.s.= not significant.

Table 5. Control methods of red palm weevil, *Rhynchophorus ferrugineus* and their cost (US$) in date palm trees plantations at new Salhia district, Sharkia governorate, Egypt, during 2022/2023 growing season.

	Farm 1 (with 1 trap)		Farm 2 (with 2 traps)		Farm 3 (with 3 traps)		Farm 4 (Control without traps	General	
Month	Cost of pheromone traps	No. of infested trees	Cost of pheromone traps	No. of infested trees	Cost of pheromone traps	No. of infested trees	No. of infested trees	Cost of pheromone traps	No. of infested trees
April 2022	12.21	4	24.43	6	36.64	7	5	74.09	22
May 2022	2.63	2	5.27	3	7.89	3	3	15.79	11
June 2022	11.22	1	22.45	2	33.67	3	2	67.34	8
July 2022	2.54	1	5.08	2	7.62	2	2	15.25	7
August 2022	10.32	1	20.65	2	30.97	2	2	61.94	7
September 2022	3.08	3	6.16	3	9.23	2	3	18.45	11
October 2022	8.61	4	17.22	5	25.83	6	7	51.65	22
November 2022	1.97	5	3.94	7	5.91	9	9	11.82	30
December 2022	8.52	2	17.03	3	25.55	3	2	51.09	10
January 2023	2.04	1	4.07	2	6.11	2	2	12.22	7
February 2023	8.51	1	17.01	2	25.52	2	2	51.03	7
March 2023	2.44	3	4.88	4	7.32	4	3	14.63	14
Total	74.09	28	148.19	41	222.26	45	42	445.3	156
Mean	6.17	2.33	12.35	3.42	18.52	3.75	3.5	37.11	13
±Standard error	±1.17	±0.41	±2.34	±0.49	±3.50	±0.68	±0.67	±7.04	2.19
%	16.64	17.95	33.28	26.28	49.92	28.85	26.92	100	100

Cost of pheromone traps to reduce RPW infestation rate of date palm trees

The results obtained related to total number of red palm weevils caught in orchards with 1, 2 and 3 pheromone traps and the corresponding number of the infested trees in the three orchards as compared with the control (without pheromone traps) are summarized in Table 5 and illustrated in Figure 2-A. Results showed that during the 2022/2023 season the RPW infestation rate of date palm trees reached 17.95, 26.28 and 28.85% in the first, second and third orchards, where the adult weevils were mass trapped as compared to 26.92% infestation rate in the control orchard (without mass trapping of adult weevils) one year after the use of the pheromone traps.It can also be concluded that the cost of pheromone traps were 4.09, 148.19 and 222.26$ in the three orchards, respectively.

Results obtained (Table 6, Figure 2-B) summarizes the total monthly number of red palm weevil caught in the 1, 2 and 3 traps per orchard and the corresponding number of the infested trees in the three orchards with pheromone traps as compared with the control orchard (without pheromone traps) during the 2023/2024 season. The date palm trees infestation rate reached 19.66, 23.03 and 26.40 % in first, second and third orchards, whereas it reached 30.89% in the control orchards (without mass trapping of adult weevils after one year). The cost of pheromone traps reached 67.12, 134.25 and 201.38$ in the three orchards, respectively, which is in agreement with previous reports (Abbas, 2019; Carpenter *et al.*, 1995; El-Sabea *et al.,* 2009).

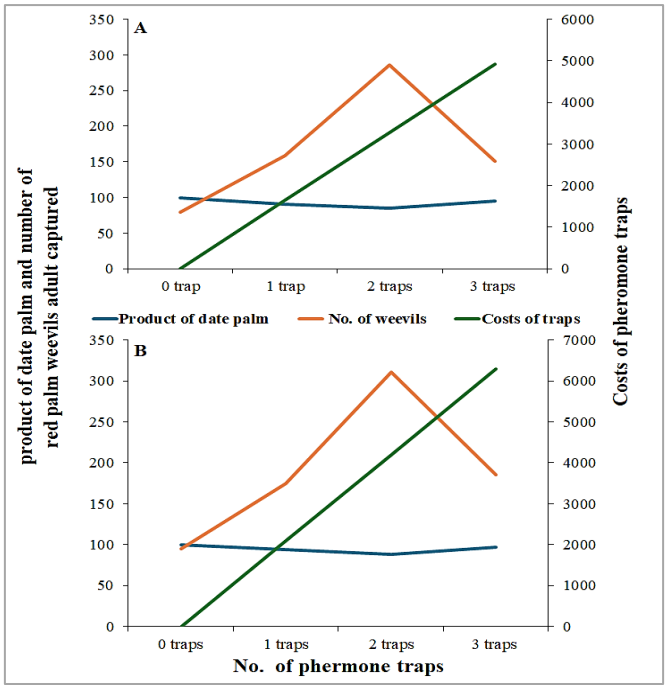

Figure 2. Total number of RPW, *R. ferrugineus* caught in sex pheromone traps, their cost by US dollar and product of date palm trees yield at new Salhia district, Sharkia Governorate, during the (A) 2022/2023 and (B) 2023/2024 growing seasons.

Table 6. Control methods of red palm weevil, *Rhynchophorus ferrugineus* and their cost (US$) in date palm trees plantations at new Salhia district, Sharkia Governorate, Egypt, during the 2023/2024 growing season.

	Farm 1 (with 1 trap)		Farm 2 (with 2 traps)		Farm 3 (with 3 traps)		Farm 4 (without traps)	General	
Month	Cost of pheromone traps	No. of infested trees	Cost of pheromone traps	No. of infested trees	Cost of pheromone traps	No. of infested trees	No. of infested trees	Cost of pheromone traps	No. of infested trees
April 2023	8.46	4	16.92	5	25.37	7	6	50.73	22
May 2023	1.95	3	3.90	3	5.85	2	4	11.71	12
June 2023	8.94	2	17.89	3	26.83	3	2	53.67	10
July 2023	1.95	1	3.89	2	5.84	3	3	11.68	9
August 2023	8.92	1	17.83	2	26.75	2	2	53.50	7
September 2023	1.95	3	3.89	3	5.84	3	5	11.68	14
October 2023	8.43	5	16.87	4	25.30	5	9	50.60	23
November 2023	2.43	7	4.86	8	7.30	9	10	14.59	34
December 2023	8.43	3	16.87	3	25.30	4	5	50.60	15
January 2024	2.59	2	5.19$	2	7.78	2	2	15.57	8
February 2024	11.38	1	22.76	1	34.15	3	3	68.29	8
March 2024	1.69	3	3.38	5	5.07	4	4	10.14	16
Total	67.12	35	134.25	41	201.38	47	55	402.76	178
Mean	5.59	2.92	11.19	3.5	16.78	3.92	4.67	33.56	14.83
±Standard error	±1.08	±0.52	±2.16	±0.55	±3.24	±0.62	± 0.76	±6.48	2.32
%	16.67	19.66	33.33	23.03	50.0	26.40	30.89	100	100

Effect of RPW infestation rate on date palm yield

Results obtained (Table 7) showed the effect of the low and medium infestation rate with red palm weevil on yield of date palm, during the 2022/2023and 2023/2024 seasons. The mean yield per healthy date palm varied between 95 kg in the first season to 97 kg in the second season. At low RPW infestation the mean yield/date palm was 90 kg in the first season and 94 kg in the second season. However, with medium infestation the mean yield/date palm reached 85 kg in the first season and 88 kg in the second season.The cost of harvest in the control orchard (without traps) was 230.65$ in the 2022/2023 season and 228.67 $ in the 2023/2024 season.Whereas the cost of RPW control with traps reached 504.05$ in the first season and 407.72$ in the second seson. The cost–benefit ratio was 0.686 and 0.641% in the two seasons, respectively. Analysis between the production of healthy and infested palms during one season showed insignificant difference. The results obtained in this study were in agreement with previous reports (Abbas & Gadalla, 2015; El-Rehawy, 2010; Knight, 2008; Vargas *et al.,* 2008).

It can be concluded from the results obtained in this study, are a useful component to adopt in large scale IPM strategies for the red palm weevil.

Table 7. Effect of RPW infestation level on date palm yield.

Seasons	No. of date palms	Mean yield/palm (Kg) and their cost ($)		
		Low infestation	Moderate infestation	Healthy date palms
2022/23	5	90 kg/ 46.13$	85 kg/ 43.57$	95 kg/ 48.69$
2023/24	5	94 kg/ 45.73$	88 kg/ 42.82$	97 kg/ 47.19$

الملخص

عرفة، ألفت وم.م. عبد الحافظ. 2025. تحليل التكاليف والفوائد لمكافحة سوسة النخيل الحمراء في مزارع أشجار نخيل البلح بمحافظة الشرقية، مصر. مجلة وقاية النبات العربية، 43(4):494−500. https://doi.org/10.22268/AJPP-001354

تعدّ سوسة النخيل الحمراء من أخطر آفات النخيل في مصر. أجريت التجارب الحقلية في مزارع نخيل البلح في منطقة الصالحية الجديدة بمحافظة الشرقية، مصر، خلال موسمين متتاليين 2023/2022 و 2024/2023. بيّنت النتائج المتحصّل عليها أنّ النسبة المئوية لأشجار النخيل المصابة بلغت 17.95 و 19.44؛ 26.28 و 23.33؛ 28.84 و 26.11%، في المزارع الأولى والثانية والثالثة للموسمين الزراعيين، على التوالي. بينما بلغت النسبة المئوية للاصطياد المكثف للحشرات الكاملة 26.92 و 31.11%، في أشجار النخيل المصابة في المزرعة بدون مصائد للحشرات الكاملة للسوسة، في الموسمين، على التوالي. زادت نسبة الأشجار المصابة بالسوسة من 46.42% في الموسم الأول إلى 53.57% في الموسم الثاني. أسفر التحليل الاحصائي عن وجود فروق موجبة وعالية المعنوية بين حدوث الإصابة في أشجار النخيل في المزارع المزوّدة بالمصائد الفرمونية ونسبة الإصابة في الشاهد بدون مصائد. كما أوضح التحليل الاحصائي أنه لا توجد فروق معنوية بين إنتاج النخيل السليم والمصاب (إصابة منخفضة ومتوسطة) خلال الموسمين. يعدّ استخدام الاصطياد المكثف بالمصائد الفرمونية من أهم طرائق المكافحة المتكاملة لسوسة النخيل الحمراء، والتي تعدّ حالياً أخطر آفة تصيب نخيل البلح في مصر.

كلمات مفتاحية: سوسة النخيل الحمراء، نخيل البلح، المصائد الفرمونية، تحليل التكلفة والمنافع، مكافحة الآفات.

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