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Controlling Greater Date Moth *Arenipses sabella* Hamp. [Lepidoptera: Pyralidae] using combine controlling methods (IPM approach) comparing to chemical control at El-Baharia Oasis, Egypt

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Abstract

Date palm trees *Phoenix dactylifera* L. is an essential tree all over Egypt, especially in Oases were the main clusters for variety as siwe which is the main source for income there. With expansion of planting of palm filed for producing with more quality and quantity for local market and exporting, which facing many challenges, one of them is pests infesting date palm fruit led to losses in the yield like Greater Date Moth (GDM) *Arenipses sabella* as it causes up to 30% losses. It infects flowers, newly formed fruits and fully mature fruit (Tamr). The experiment carried out at El-Baharia Oasis studying using combine of controlling measures (IPM) comparing with chemical control for controlling GDM population with environmental sustainability and safe production. The paper exam palm leaves/ bunches, fallen dates for larva, and light traps for adults.

Using sequences of agriculture practices – natural enemies – bio-pesticide to see how it reduces the population compared with the common chemical pesticide used in the palm orchards. This IPM gives a reduction in population density almost like using chemical control. Reduction for infestations from 5 – 7% in bunches, %37 – 40% in fallen dates, and 8 – 9% in light traps to 0 – 1% in bunches, 3 – 4% in fallen dates, and 2 – 7% in light traps at the second year of treatment. From the obtained results applying the combine program as shown in the experiment for safe dates and keeping the stainability of the environment.

Keyword: Date palm, *Phoenix dactylifera*, Greater Date Moth, *Arenipses sabella*, IPM, Agriculture practices, Bio-pesticides, Natural enemies, *Trichogramma* sp., Chemical pesticide, Chlorpyrifos, Phosphorus.

Introduction

Date palm trees *Phoenix dactylifera* L. (*Arecales: Arecaceae*) are distributed all over Egypt with main clusters in western oases. Where variety Sewi/Saidi (semidry) has domination of other varieties. With about 20% of Egypt date production, and more than 60% of oases economy, with ability for storage and manufactory in many ways. **(MALR, 2021)**

It's a primary source of food and by-products, and ecological base for oases' agriculture, making it the main fruit tree and the best crop to be cultivated (**Bekheet and El-Sharabasy 2015**).

Date yield fluctuated from year to another due to environmental condition, land serves, previous year production, and pests' status. Among many pests' attack date palm trees and fruits comes the greater date moth (GDM) *Arenipses sabella* as the first pest attack the date palm. (**Hussain, 1963; Kehat and Greenberg, 1969).**

With expanding palm plantation with sewi and new foreign with high return varieties like Madjoul. Controlling key pests of the area is more important than ever. GDM *Arenipses sabella* is one of these key pests of date palm in this area as it attacks the floral parts (male and female), early formed fruits, pre- and post-harvesting phases. Consequently, production significantly decreases. (**Gameel, 2017**).

The eggs were generally laid on the inner and outer sides of the tip of the spathes and on the young leaflets, which were also damaged by larvae (**FAO, 1974**). The larvae cause various types of damage to palms. It attacks the frond, spathe and date bunches. During March and early April, the larva mines into the tip of the unopened spathe. **(Al Antary and Al-Khawaldeh, 2014)** The examination of 182 spathes on 30 palms in Basra (Iraq) showed an infestation of 49% among spathes and 70% among palms (**Hussain, 1963, 1974**). The larvae feed sometimes on the dropped fruits in the top of the tree. In high infestation all fruits will be damaged. Sometimes the insect attacks new leaves (**El-Haidari and Al- Hafidh, 1986**). When infestation is heavy, the whole bunch will be withered and fruit shriveled and dried, but remained attached to strand (**FAO, 1974**).

Using sequences of procedures that begin with agricultural practices, then the release of natural enemies (biological) *Trichogramma* sp. (**Alrubea 2017**), and finally use of bio-pesticide comparing to the effect of using two chemical pesticides alternately to control the infestation of GDM.

The study aims to give the one step closer to IPM program to control GDM with the efficiency of palm GAP and natural resources in controlling GDM population and infestation as cheapest controlling method comparison to using chemical pesticides to avoid resistance and minimize environment contamination gaining more clean and safe food and sustainability for coming generation.

Materials and Methods:

Locations:

The experiment was carid out at El-Wahat El-Baharia, southeast of Giza governorate with 365km. Two old palm farms (more than 15 – 20 years) and the whole study area in the location consisted of mature fruit-bearing palm trees of the variety Sewi. Data were

randomly collected every two weeks (twice a month) for three successive years.

Experiment:

Sampling:

The date palm trees, and the field ground (Fallen dates) were examined for any present or infestation of GDM. Using light traps for adults and hand examination for the larvae and pupa (palm crown and fallen dates). There were 3 light traps for the adults and five bunches from every tree were examined, stem, trunk for the larvae and pupa. The distance between every two traps where about 50 m. Randomly 100 dropped date fruits were gathered from the ground and examined for larvae.

Date palms were irrigated with underground water, and the cultivar planted in the farms was mostly Siwi/Saidy planted for more than 15 to 20 years.

Treatment techniques:

In the first location we used combination of different treatment together in sequence and harmony: 1) agriculture practices (crown and soil Agricultura practices), 2) biological control (*Trichogramma* sp), 3) bio pesticide (Tracer 24%). Applying them in synchronize to get the most of all of them to control the GDM, as follow:

Table (1) A program of sequential practices (IPM) to control GDM throw the year with different methods of control:

No.	Month	Agriculture practices	Bio-pesticide	Biological agent
1	November	Managing offshoots Winter practice (fertilization)	Spray	
2	December	Winter practice (fertilization) Palm Clean (Pruning – Thorning – Arranging)	Spray	
3	January	Palm Clean (Pruning – Thorning – Arranging)	Spray	
4	February	Pollen collection / Pollination Managing offshoots	Spray	Release
5	March	Pollen collection / Pollination Managing offshoots	Spray	
6	April	Pollination / Thinning and Bending Managing offshoots	Spray	
7	May	Thinning and Bending / Bagging	Spray	Release
8	June	Thinning and Bending / Bagging	Spray	
9	July	Agriculture practice		
10	August	Agriculture practice		Release
11	September	Yield harvest / Managing offshoots	Spray	
12	October	Yield harvest / Managing offshoots	Spray	

Treatment in the shaded boxes can be applied or not, according to the circumstances and need of the situation at the time.

In the second location using two different chemical pesticides to avoid forming insecticide resistance for chemical pesticide. Chinook 35% SC (Imidacloprid) and Clorzane 48% EC (Chlorpyrifos). Spray one time for a month in the first week beginning from February to July then in October and November to avoid date yield contamination with pesticides as it needs about 15 – 30 days PHI **(El-Tokhy and Amer, 2017) (Attia *et al.*, 2019)**. The spraying from palm crown down to stem base considering covering all palm parts especially palm fiber on palm crown.

Table (2) The sequential use of chemical pesticides to control GDM throw the year.

No.	Month	Chemical pesticide
1	November	Chinook
2	December	Clorozane
3	January	Chinook
4	February	Clorozane
5	March	Chinook
6	April	Clorozane
7	May	Chinook
8	June	Clorozane
9	July	----
10	August	----
11	September	Chinook
12	October	Clorozane

Treatment in the shaded boxes can be applied or not, according to the circumstances and need of the situation at the time.

Statistical analysis:

The collected data were subjected to one way ANOVA as outlined by **Gomez and Gomez (1984)**. Pairwise comparison was run using Tukey method.

Results and Discussion:

Data present in Fig 1 showed population fluctuation in the first year with two mean peaks during April and September. Under El-Wahat ElBaharia palm orchard conditions in 2019 there were large number of GDM as a larva in bunches and fallen dates and as adults in light traps. The infestation ranged between 37 - 40% of the collected samples of fallen date, 5 - 7% of bunches and 8 - 9% in light traps (15 April). With applications of the combine controlling methods and chemical pesticide treatments in the second (2020) and third (2021) years of the Experiment. A significant decrease in infestation in both locations. In first year of treatment 2020 infestation decreased to 12% of fallen dates, 2% bunches and 3% in light traps for the combine control methods and 8% of fallen date, 1% of bunches and 2% in light traps for chemical pesticides (15 April) (Fig. 2).

In the third year 2021 (Fig. 3) infestation decreased to 3% of fallen dates, 1% bunches but increased to 7% in light traps for the combine control methods and 4% of fallen date, 0% of bunches and stayed at 2% in light traps for chemical pesticides (15 April).

During the first year of experiment (2019) there were no significant differences in infestation of the bunches between combine location and chemical pesticide except during 1 July to 15 August, and from 15 May to 15 September at fallen dates, and 15 February and 1 and 15 August, and 1 October may be because there was closer palm tree in the Chemical plot. By applying the treatment from the second year had insignificant difference between combine control and chemical control for the branches for the two years except on 15 February in both two years (2020 and 2021). For fallen dates we had significant differences on 1 March, 1 May, 1, 15 April, and from 15 September to 1 November in 2020 while the significant differences were on 1 march only in 2021. Meanwhile in light traps the difference was on 15 February and 1 March during 2020 and only 1 March during 2021.

These results match with **Badawi *et al.*, 1979** about A. sabella population fluctuation during the year. The results of chemical pesticides agreed with **Alsaedi 2022** who study the effect of chemical pesticide on GDM Control in Basra, Iraq. And with **Alrubeai *et al*, 2014; Alrubeai, 2017 and Salwa *et al.*, 2019** that showed that using natural enemies had an effect in reducing GDM population in Siwa, and **Imam 2012** who used sanitation and bio-pesticides and **Al-Jubouri 2007** that tried to use IPM to control fruit dropping pests. With the great and swift results of using chemical pesticide for controlling *A. sabella* but face the risk of insect resistance and contamination of fruits and environments with the residue, and being able to conduct matching results to the chemical pesticide using nonchemical methods that are cheaper and more sustainable and environmental friendly and can be done easily by the farmers without sophisticated and all it takes is more attention to the filed with Agriculture practices and clean. This IPM approach we show is one step closer to control date palm pests with caring to the environment.

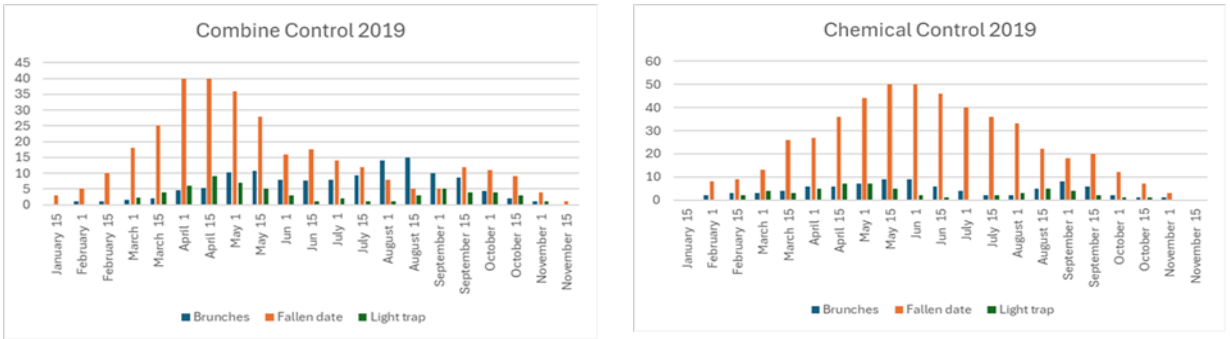

Fig. (1) Population density of A. sabella during the 1st year (2019) in both locations of the Experiment.

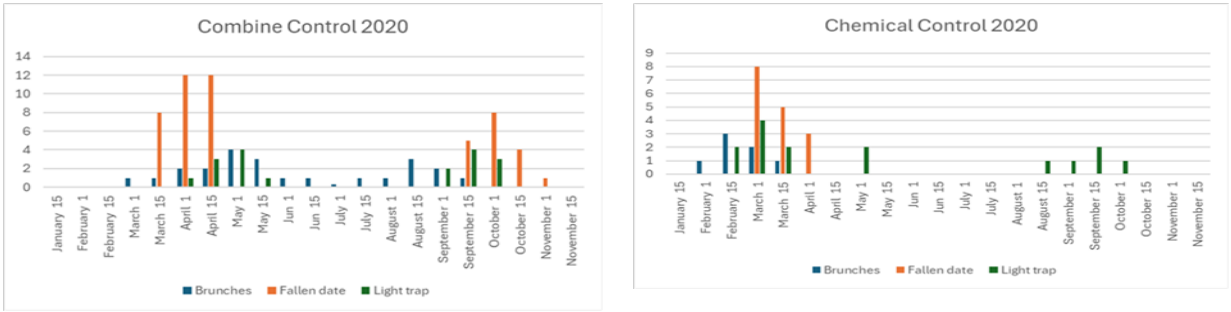

Fig. (2) The effect of controlling methods on population density combine on and chemical on in the first year of treatment 2020.

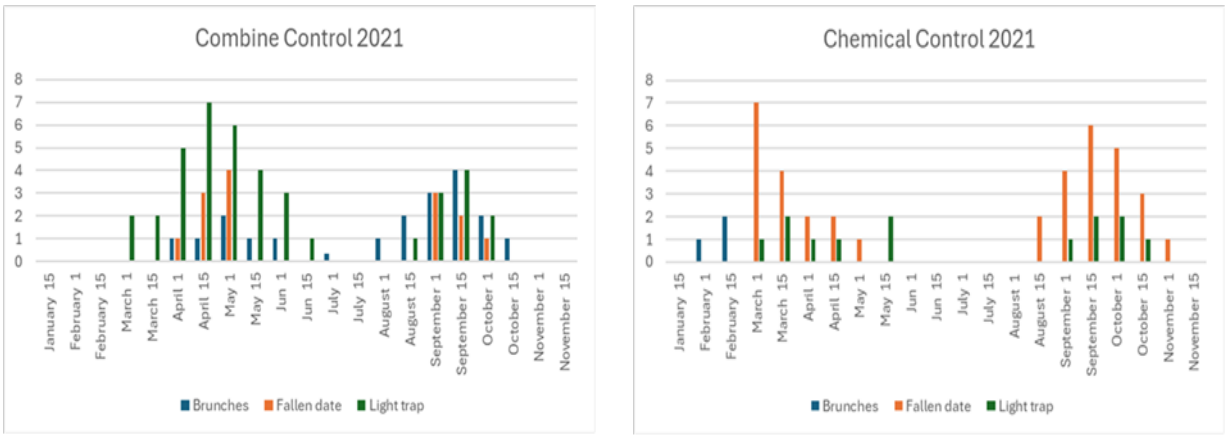

Fig. (3) The effect of controlling methods on population density combine on and chemical on in the second year of treatment 2021.

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