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A new Record and Severe Infestation of the *Maladera modesta* (Fairmaire, 1881) (Coleoptera: Scarabaeidae) on Medicinal, Aromatic and Ornamental Plants in Some Different Regions of Egypt

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ABSTRACT

Maladera modesta (Coleoptera: Scarabaeidae) infesting many plants and has become a serious pest since 2016 on citrus and strawberry crops, The adults feed on the leaves, buds and flowers of several plants The C-shaped larvae (white grubs) feed on roots The study was conducted as a part of a comprehensive baseline survey and population density of *M. modesta* infesting medicinal, aromatically and ornamental plants in a different region (Rawdat Al-Nil Park, Al-Firdaws Compound for the Armed Force, International Park and Nubaria) and studied the of *M. modesta* at (Giza and Beheira) during two successive seasons. The results indicated that the twenty-four plants are more infected by *M. modesta*. The population density recorded that, the general weekly mean number of *M. modesta* was more abundant at Beheira Governorate than recoded at Giza Governorate throughout two successive seasons 2021 and 2022. The statistical analysis of the total mean number of *M. modesta* showed a significant difference at <0.0001 for two different locations. At Giza Governorate showed that the adults recorded its highest levels of infestation in the months (June, October, September, July, Augusta, May, April, November and March) However, the months of January, February and December, insect population was absent. At Beheira Governorate, showed that the adults recorded their highest levels of infestation in the months of (June, Augusta, July, September, April, May, October and March), and the months of January, February, November and December, insect population was absent.

INTRODUCTION

Medicinal & aromatic and ornamental plants occupy a high position due to their importance in their entry into the medical field. Medicinal and aromatic plants are grown in Egypt for the purpose of local consumption as the content of nutrients, also includes volatile oils and vitamins necessary to build the human body. They are also grown for the purpose of export to generate revenue in the hard currency of the country. Ornamental plants are called beauty plants, and they help create many job opportunities. The importance of ornamental plants is to increase and maintain air humidity in the place where

it is placed. Adding special beauty to home decor. Eliminate negative vibes and boost positive energy. Air purification and removal of toxic gases. These plants are infected with many pests that feed on roots, and vegetative or reproductive organs such as Thysanoptera and Heteroptera, including the Thripidae, Miridae, Pentatomidae and Pseudococcidae families), whereas others cause erosion or tunnels on heads (Noctuidae), or infested leaves (beetles) or roots (Elateridae) (Conti, 2003). El-Gendi (2007) in Egypt, recorded eighteen insect species on marjoram and chamomile. *Nysus cymoides* Schill, *Nezara viridula* L., *Lygus gomellatus* H.S., *Nesidiocoris tenuis* Reut., *Bourletiella horttensis* (Fitch), *Empoasca decipiens* Paoli, *Trupanea stellata* Fuessly, *Myzus persicae* (Sulz.) and *Aphis gossypii* Glover were the main insect pests on chamomile. Mona's (2010) Survey of twenty-two pest species, from one mite species and ten predator species, were recorded on sweet marjoram at Giza and North Sinai governorates, while only seventeen pest species, one mite species and nine predator species were found on sweet basil at both governorates. Thirteen species of insect pests belong to eight families and five orders were recorded on *Calendula* plants. Twelve insect pests belonging to nine families under six orders were recorded on chamomile plants (Solaiman, 2015). A new record and one of the economically important insect pests, it follows the order Coleoptera and the family Scarabaeidae attack a wide range of hosts (botanicals) Alfieri (1976), Ahrens, 2004 (Pest cause Great economic losses in many countries of the world, and crops are attacked several economic crops such as grains, legumes, small fruit plants and shrubs and trees are characterized by a seasonal presence, high density, and severe damage in the north and southern India (Bahatnagar *et al.*, 2004; Mehta *et al.*, 2010 As well as attacking weed plants (Tashiro, 1987). larvae and adults destroy plants and spread with high density and high activity from the month of March to the month of July and feed on the vegetative growth of fruit trees and different forests (Falach & Shani, 2002) and (Keith 2005). Complicated by the presence of larvae below the surface of the soil and their active feeding on living roots (Veeresh, 1974). The life cycle of an insect includes two generations per year in which overwintering larvae develop into pupae and adults, and begin to emerge at the beginning of April, when they mate and lay eggs (Harari *et al.*, 1994). The insect was recorded in Iran in 1970 and spread in the eastern regions Middle East and some regions of Asia, Pakistan, Afghanistan and India (Ahrens, 2000), and in Libya and Yemen (Ahrens, 2004). It was first recorded in Jordan in 1994 and in high densities by light traps during the period May - September, where it is found in high concentrations on potato tubers, causing economic losses on this crop (Katbeh-Bader & Enrico, 1999).

The insect entered Iraq through the random importation of seedlings ornamental plants from neighbouring countries, in which the insect is infested huge economic losses and the death of many seedlings in most Baghdad nurseries The death rate of shrub rose seedlings was about 70-80% registered. The pest was first reported in Iraq in 2015 (Al-Jassany *et al.*, 2016) recorded this pest for the first time in Iraq during the year 2015-2016, They stated that adults are present from March to June, larvae stay in the soil for 6-7 months feeding on roots, causing damage leading to death of plants. They recorded the grubs in the soil planted with rose, olive, citrus, jasmine, Nerium, Christ thorn and cypress. The pest was first reported in Egypt in 2016 (Hedaya and Abdel-Aziz 2016) *Maladera insanabilis* (Brenske, 1894), (Coleoptera, Scarabaeidae, Melolonthinae, Sericini): A New Horticultural Pest In Egypt found in Nobarria and Alhamam districts, North Coast infesting new soil sand. Nehal (2021) Seasonal fluctuations of the scarab beetle, *Maladera castanea* that infest strawberry plants in the field were conducted during the 2019/2020 season. The obtained results revealed that the highest population of scarabs was recorded in October, and April, with averages of (61.2, 57.0, beetle/trap) under field conditions, The behaviour of the adult scarabs to the preferred color and the activity periods was studied. The results

showed that the white colour was the most preferred one for the beetles, recording 37.0 ± 2.6 adults/hour. The adults were assumed to have night activity during the period from 06:00 pm to 12.00 midnight, where the average number of *M. castanea* scarabs was recorded as 226.2 ± 8.1 adults/trap. The drying process for three weeks showed a 100% decrease in the population, while the starvation process recorded a 90% decrease; after all, a 100% decrease was recorded after four weeks.

The study aimed to survey and population dynamics of *M. modesta* upon some medicinal, aromatic and ornamental plants as new hosts.

MATERIALS AND METHODS

Experiment Survey of different medicinal, aromatic and ornamental plants infested with *Maladera modesta* Fig (1) was carried out at Cairo Governorates (Rawdat Al- Nil Park), Giza Governorate (Al-Firdaws Compound for the Armed Forces) Fayoum Governorate (Fayoum International Park) and Beheira Governorate (Nubaria) during Jan. 2021 to Dec., and the same work made in second season 2022. This insect feeds on the growing apex and new leaves of plants. Fig. (2). The number of plants sampled in each region varied according to their availability. Water traps were used to record the numbers of this pest throughout the study weekly period in Giza and Beheira Governorates from Jan., to 2021 Dec., and the same work was made in the second season 2022. Also, White plastic dishes are used where white plastic dishes contain water two-thirds with a little diesel. An Fadden area requires about 28 traps/faddan at a rate of 1 trap/150 m² to be placed between the rows of trees. Fig (3)

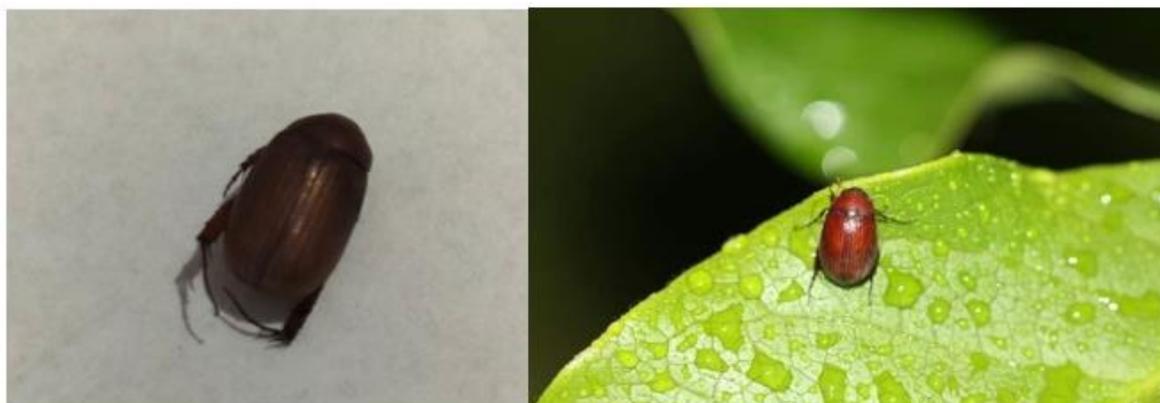


Fig (1): adult of *Maladera modesta*

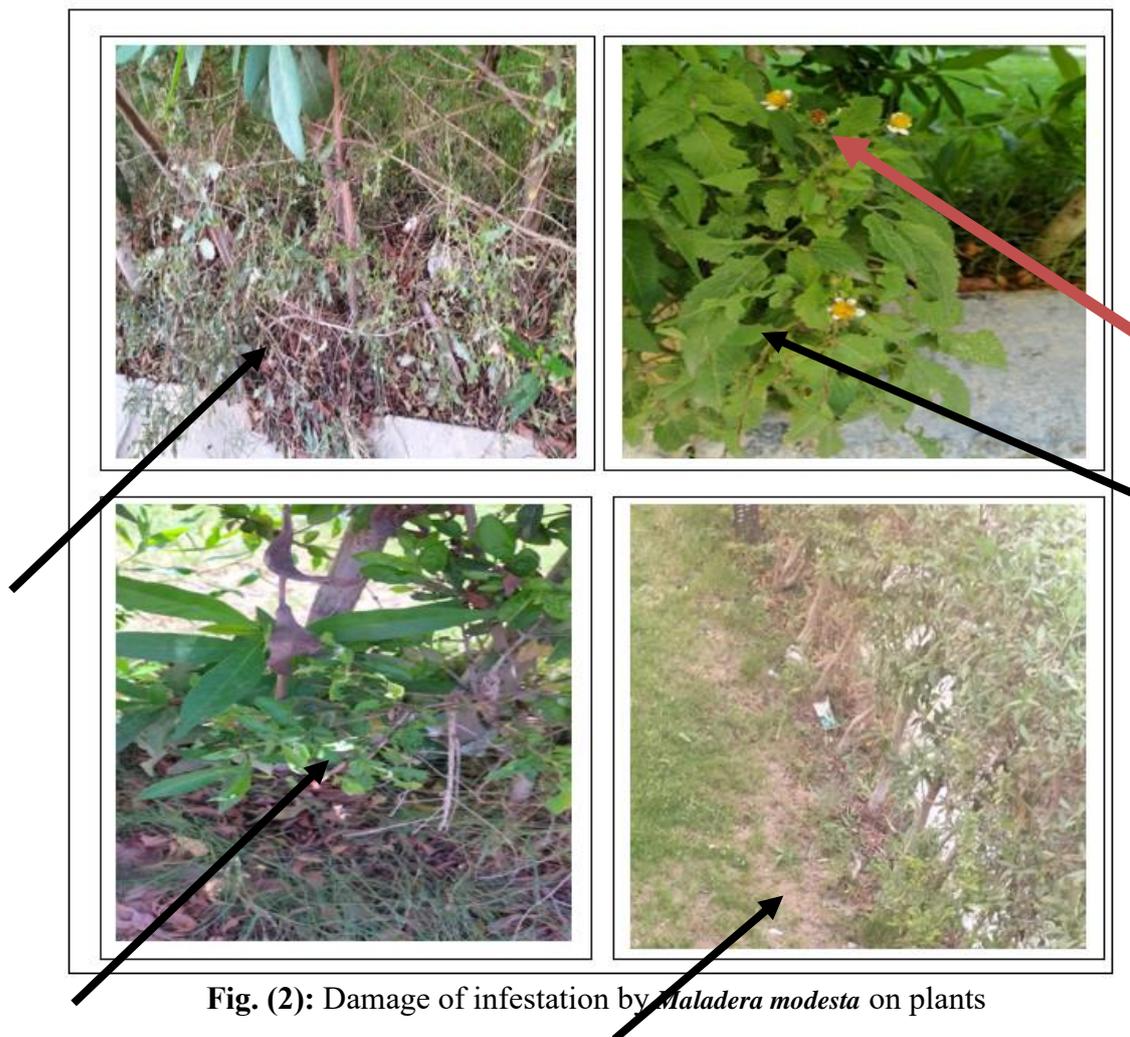


Fig. (2): Damage of infestation by *Maladera modesta* on plants



Fig. 3: the trap catches the adult of *Maladera modesta*

RESULTS AND DISCUSSION

Data in (Table 1) showed that the survey of *M. modesta* recorded 10 aromatic and medicinal plant species in 5 families and 35 ornamental plant species in 23 families at different Governorates throughout two successive seasons 2021 and 2022.

Survey of *M. modesta* Infesting Some Medicinal, Aromatic and Ornamental Plants:

The results indicated that the twenty-four plants are more infected by the *M. modesta* (*Dodonaea viscosa*, *Duranta erecta*, *Matricaria chamomilla*, *Ocimum basilicum*,

Cassia javanica, *Salvia leucantha*, *Pelargonium zonale*, *Murraya exotica*, *Bidens pilosa*, *Pittosporum tobira*, *Tecoma stans*, *Ambrosia maritime*, *Mentha piperita*, *Mentha viridis*, *Chrysanthemum coronarium*, *Conocarpus erectus*, *Citrus aurantium*, *Azadirachta indica*, *Tropaeolum majus*, *Coriandrum sativum*, *Spathodea nilotica*, *Vinca rosea* *Jasminum grandiflorum*, *Hibiscus sabdariffa* and *Origanum marjorana*). From (Table 1), the results confirm that this insect feeds on the growing apex and new leaves of plants.

Table (1): Survey of *M. modesta* on some medicinal, aromatic and ornamental plants at different Governorates throughout two successive seasons 2021 and 2022.

plant classification	English Name	Family	Scientific Name	Abundance degree			
				Cairo	Giza	Fayoum	Beheira
				Rawdat Al-Nil Park	Al-Firdaws Compound for the Armed Forces	International Park	Nubaria
Ornamental	sea ragweed	Asteraceae	<i>Ambrosia maritime</i>	-	+	+	
Ornamental	chrysanthemum	Asteraceae	<i>Chrysanthemum coronarium</i>	-	+	-	+
Ornamental	common marigold	Asteraceae	<i>Calendula officinalis</i>	-	-	-	-
Medicinal and aromatic	wild chamomile	Asteraceae	<i>Matricaria chamomilla</i>	+	++	++	+
Medicinal and aromatic	garden mint	Lamiaceae	<i>Mentha viridis</i>	+	+	+	+
Medicinal and aromatic	Coriander	Apiaceae	<i>Coriandrum sativum</i>	-	-	-	+
Ornamental	Grapefruit	Rutaceae	<i>Citrus aurantium</i>	+	++		++
Ornamental	Neem	Meliaceae	<i>Azadirachta indica</i>		+	+	+
Medicinal and aromatic	common sage	Lamiaceae	<i>Salvia officinalis</i>	-	-	-	-
Medicinal and aromatic	Rosemary	Lamiaceae	<i>Rosmarinus officinalis</i>	-	-	-	-
Medicinal and aromatic	Sweet marjoram	Lamiaceae	<i>Origanum marjorana</i>	-	+	-	-
Medicinal and aromatic	Sweet basil	Lamiaceae	<i>Ocimum basilicum</i>	++	++	-	+
Medicinal and aromatic	Mint	Lamiaceae	<i>Mentha piperita</i>	+	+	-	+
Medicinal and aromatic	Geranium	Geraniaceae	<i>Pelargonium zonale</i>	+	+	-	-
Ornamental	Rosa	Rosaceae	<i>Rosa hybrid</i>	-	-	-	-
Ornamental	bird of paradise	Streliziaceae	<i>Strelitzia reginae</i>	-	-	-	-
Ornamental	pink shower	Caesalpiniaceae	<i>Cassia javanica</i>	+	++	+	-
Ornamental	white mulberry	Moraceae	<i>Morus alba</i>	-	-	-	-
Ornamental	Pegunny	Fabaceae	<i>Bauhinia hookeru</i>	-	-	-	-
Ornamental	black mulberry	Moraceae	<i>Morus nigra</i>	-	-	-	-
Ornamental	phoenix flower	Fabaceae	<i>Delonix regia</i>	-	-	-	-
Ornamental	Italian cypress	Cupressaceae	<i>Cupressus sempervirens</i>	-	-	--	-
Ornamental	coastal she-oak	Casuarinaceae	<i>Casuarina equisetifolia</i>	-	-	-	-
Ornamental	African tulip tree	Bignoniaceae	<i>Spathodea nilotica</i>	-	+	-	-
Ornamental	Bottlebrushes	Myrtaceae	<i>Callistemon cztrmus</i>	-	-	-	-
Ornamental	Hollyhock	Malvaceae	<i>Althaea rosae</i>	-	-	-	-
Ornamental	garden nasturtium	Tropaeolaceae	<i>Tropaeolum majus</i>	+	+	-	-
Ornamental	Mexican bush sage	Lamiaceae	<i>Salvia leucantha</i>	-	++	+	+
Ornamental	bright eyes	Apocynaceae	<i>Vinca rosea</i>	+	+	-	-
Ornamental	Lantana	Verbenaceae	<i>Lantana camara</i>	-	-	-	-

Supplement Table (1)

plant classification	English Name	Family	Scientific Name	Abundance degree			
				Cairo	Giza	Fayoum	Beheira
				Rawdat Al-Nil Park	Al-Firdaws Compound for the Armed Forces	International Park	Nubaria
Ornamental	Oleander	Apocynaceae	<i>Nerium oleander</i>	-	-	-	-
Ornamental	Yucca	Asparagaceae	<i>Yucca gloriosa</i>	-	-	-	-
Ornamental	Copperleaf	Euphorbiaceae	<i>Acalypha wilkesiana</i> ;	-	-	-	-
Ornamental	great bougainvillea	Nyctaginaceae	<i>Bougainvillea spectabilis</i>	-	-	-	-
Ornamental	broadleaf hopbush	Sapindaceae	<i>Dodonaea viscosa</i>	+++	+++	+++	+++
Medicinal and aromatic	Roselle	Malvaceae	<i>Hibiscus sabdariffa</i>	-	-	-	+
ornamental	Arabian jasmine	Oleaceae	<i>Jasminum sambac</i>	+	++	-	-
Ornamental	Royal jasmine	Oleaceae	<i>Jasminum grandiflorum</i>	-	+	-	-
Ornamental	Arrowhead	Araceae	<i>Syngonium podophyllum</i>	-	-	-	-
Ornamental	yellow trumpetbush	Bignoniaceae	<i>Tecoma stans</i>	-	+	+	+
Ornamental	Cairo morning glory	Convolvulaceae	<i>Ipomoea palmate</i>	-	-	-	-
Ornamental	Malabar nut	Acanthaceae	<i>Adhatoda vasica</i>	-	-	-	-
Ornamental	orange jasmine	Mutaceae	<i>Murraya exotica</i>	-	++	-	-
Ornamental	black-jack	Asteraceae	<i>Bidens pilosa</i>	-	++	++	-
Ornamental	Skyflower	Verbenaceae	<i>Duranta erecta</i>	++	+++	++	-
Ornamental	Buttonwood	Combretaceae	<i>Conocarpus erectus</i>	+	++	+	+
Ornamental	mock orange	Pittosporaceae	<i>Pittosporum tobira</i>	+	++	-	-

Infestation degree (+ = (1 to 10 leaves) few, ++ = (10 to 20 leaves) moderate, +++ = (20 to 100 high infestation leaves).

Population Dynamics of *M. modesta* Infesting Some Medicinal, Aromatic and Ornamental Plants with Water Trap.

In the beginning, the general weekly mean number of *M. modesta* was more abundant at Beheira Governorate (44.9 individual / one water trap) than those recorded (41.8 individual / one water trap) at Giza Governorate throughout two successive seasons 2021 and 2022. (Irrespective of varieties of plant). The statistical analysis of the total mean number of *M. modesta* showed a significant difference at <0.0001 for two different locations whereas the T value was equal (30.15). (Fig. 4).

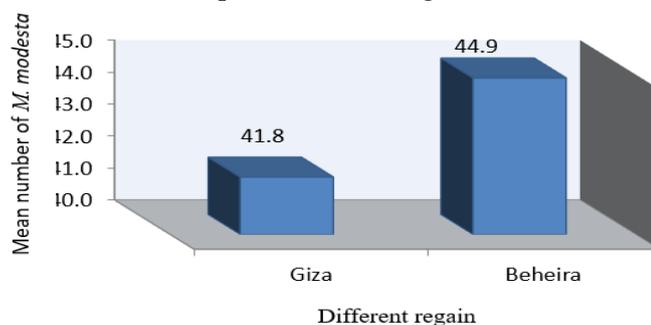


Fig. (4): population dynamics of *M. modesta* infesting some medicinal, aromatic and ornamental plants using water traps at different regains (Giza and Beheira) Governorates throughout two successive seasons 2021 and 2022.

Giza Governorate:

The numbers of adult *M. modesta* were weekly recorded. The data obtained from (Fig. 5), showed that the adults recorded their highest levels of infestation in the months (June, October, September, July, August, May, April, November and March) with respective averages of (103.0, 78.0, 76.8, 70.2, 48.5, 45.5, 33.3, 18.7 and 11.5). However, in the months of January, February and December, the insect population was absent.

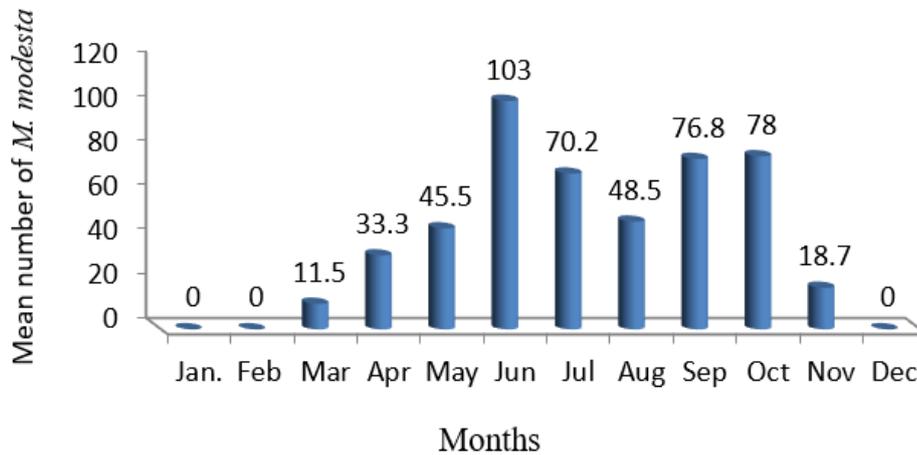


Fig. (5): Population dynamics of *M. modesta* adult on water trap at Giza Governorate throughout two successive seasons 2021 and 2022.

Beheira Governorate:

As well as the numbers of adult *M. modesta* were weekly recorded. The data obtained from (Fig 6) showed that the adults recorded their highest levels of infestation in the months (June, August, July, September, April, May, October and March) with respective averages of (110.8, 78.5, 78.4, 69.0, 60.2, 59.7, 32.7, and 28.5). However, in the months of January, February, November and December, The insect population was absent.

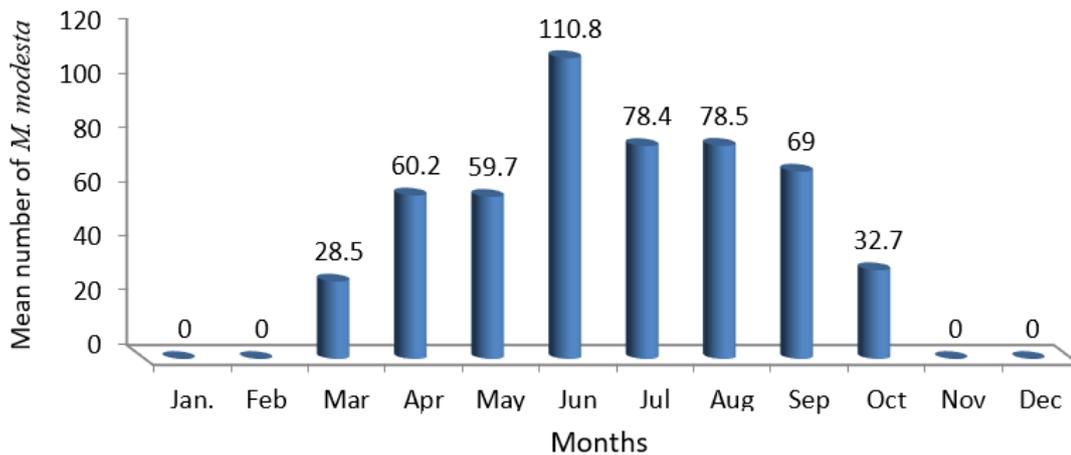


Fig. (6): Population dynamics of *M. modesta* adult on water trap at Beheira Governorate throughout two successive seasons 2021 and 2022.

These results are in general agreement with Solaiman, 2015 and Hedaya & Abdel-Aziz 2016 First reported in Egypt, a new record and one of the economically important insect pests, it follows the order Coleoptera and the family Scarabaeidae and attack a wide range of hosts botanicals). Falach & Shani, 2002, Keith 2005 and Nehal 2021. It destroys its larvae and its adults are plants, and it spreads with high density and high activity from

the month of March To the month of July and feed on the vegetative growth of fruit trees and different forests and the life cycle of an insect includes two generations per year in which overwintering larvae develop into pupae and adults, and begin to emerge at the beginning of April, when they mate and lay eggs.

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