AF-743
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RESEARCH ARTICLE Indian Journal of Agricultural Research, Volume Issue : ()

Damage of the Egyptian Fruit Bat (*Rousettus aegyptiacus*) at El-Dakhla Oasis, New-Valley Governorate, Egypt

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10.18805/IJARe.AF-743

ABSTRACT

Background: The Egyption fruit bat, *Rousettus aegyptiacus,* is considered a harmful pest that attacks agricultural crops, especially ripe fruits, causing economic losses. It is widespread in African sahara desert, Egypt, Pakistan and Northern India. This pest causes damage to many vegetables and fruits. The measuring of damage percentage will aid in the protection of these crops from bats attacking.

Methods: The losses caused by Egyptian bats were estimated during two years (2019 and 2020) in many fruit orchards (date palm, citrus, apricot and mango) in reclaimed lands at Butt village, Dakhla Oasis, New-valley Governorate, to achieve integrated management of bat populations.

Result: Only one species the Egyptian fruit bat, *R. aegyptiacus*, has been recorded with 167 individuals attacking fruit orchards. The highest average losses (11.1%) were found in date palms, from August to Oct., while the lowest (4.7%) were found in Apricot, during June and July. The second-highest losses were 7.6% in mango from June to August. The damage began from December to March in citrus with an average loss percent of 7.0%. Therefore, bat dens must be monitored and dealt with to limit their populations and reduce their losses to these value crops in El-Dakhla Oasis.

Key words: Apricot, Citrus, Date palm, Fruit bat, Fruit damage, Mango.

INTRODUCTION

Bats are about 1300 species, representing 20% of the world animals. Approximately 70% of the species feed totally or partly on insects, Voigt *et al.* (2011) and Cox *et al.* (1991). Bats play a role in crop development in nature by spreading plant seeds, pollinating flowers and fertilizing the soil (Ganeshaiah *et al.,* 2001). However, some bat species are harmful to public health and agriculture. Drexler *et al. (*2012) and Kendra *et al. (*2019), reported that some bats are carriers of many pathogens that may be transported to humans and farm or wild animals. Species of the family Pteropodidae attack agricultural crops, especially ripe fruits causing economic losses. One species of this family; the Egyption fruit bat, *Rousettus aegyptiacus* (Megabats), spread in African sahara desert, the middle east, Mediterranean countries, Pakistan and Northern India (Kwiecinski and Griffiths, 1999 and Hulva *et al.,* 2012). In Egypt, Dietz (2005) reported that this species is found in the delta villages, Valley and Sinai Peninsula. *R. aegptiacus* lives in social colonies and roosts mainly in caves, abandoned buildings, hangars or even trees and attacks trees and plants at night. Benda *et al. (*2016) and Lucan *et al. (*2016) found that individuals of *R. aegyptiacus* species consume fruits in their diet and rarely consume pollen, leaves or flowers, they can travel large distances, up to 24 Km, in search for food. Bizerril and Raw (1998) reported that, according to plant crops available, food quality, season, need of energy and protein, the plant foods of this bat reach up to 54 plant species. Under free and non-choice studies, *R. aegptiacus* prefers fruits over vegetables. White mulberry was the highest accepted among seven fruit types and strawberry ranked the first among six vegetable types (Eisa, 2017).

Food of *R. aegyptiacus* consists largely of fresh fruits, like dates, figs or mangos, in the northern part of the species range, being mainly desert habitat (Del vaglio *et al.,* 2011 and Centeno-cuadros *et al.,* 2017). Moran and Keidar (1993) indicated that *R. aegptiacus* individuals consume commercial fruits, pear, apples, mandarins, pomegranate and litchi. Also, Korine *et al.* (1999) found that the bat feces collected from two roost sites, in the Carmel national park during winter, consisted of leaves and pollen, when fruit was absent and consisted mainly of fruits (87%) during the other seasons.

The Egyptian fruit bat has been classified as a pest conflicting with farmers leading to mass eradications in a number of areas (Hadjisterkotis, 2006).

To protect crops from bat attacks, the caves opening must be closed for three days, if the location of the caves is

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How to cite this article: Rizk, A.M., Ahmed, H.A.A. and El-Bakhshawngi, M.I.A. (2022). Damage of the Egyptian Fruit Bat (*Rousettus aegyptiacus*) at El-Dakhla Oasis, New-Valley Governorate, Egypt. Indian Journal of Agricultural Research. DOI: 10.18805/IJARe.AF-743.

Submitted: 26-05-2022 **Accepted:** 05-10-2022 **Online:** 28-10-2022

known. However, if the location of the caves is unknown and bat numbers are high, farmers should use lighting, nets and poison baits (Greenhall, 1970and Zainol *et al.,* 2018).

This research aimed to estimate the losses, caused by the Egyptian bat, to date palm, citrus, apricot and mango, with determination of the temporal pattern of loss, to achieve integrated management of bat populations in the New Valley Governorate, a land of sustainable agricultural expansion.

MATERIALS AND METHODS

Tested areas

Dakhla Oasis is one of the recent targeted agricultural expansion areas in Egypt. The presence of bats causes damage to agricultural crops that may reach the level of economic losses.

The Dakhla Oasis is located in the New Village Governorate (25.31°N 29.10°E), at a distance of 350 Km from the Nile River, between the Farafra and Kharga Oasis. Dakhla is a sandy land irrigated with underground well water. Butt village, is the most important agricultural village in Dakhla. It contains many cultivated field crops, vegetables and fruit orchards including date palms, citrus, apricots and mangos. Next to that, is a large forest, about 10,000 feddans irrigated with treated waste water.

Four separate orchards (mango, citrus, apricot and date palms) were chosen in Butt village. Within each orchard, two feddans of fruitful trees were selected. During the two years (2019 and 2020). The harmful bat species were surveyed and percentages of damage were estimated in each orchard.

Survey of bat species

During the study years resting bats caught from trees at night and any dead bats were collected and counted from orchard monthly. The species was identified according to Hoath (2009) and Dietz (2005).

Damage assessment

To determine the damage of bats in tested orchards, ten trees were selected randomly and numbered at the apricot, date palm, mango orchards and fifty trees for the citrus orchard in different places per faddan. With the onset of the fruiting season, the ground under the selected trees was cleaned. Weekly counting and weighting, of the fallen and infected fruit, as well as fruit infected upon picking up, was carried out until the end of the fruiting season Asran *et al.* (1985). The percentage of damage was calculated from the following equation:

$$\text{Damage per cent} = \frac{\text{Weight of damage fruits}}{\text{Total fruit weight per faddan}} \times 100$$

Statistical analysis

The obtained results were statistic using the statistical software (CoStat, 2005).

RESULTS AND DISCUSSION

Survey of bat species cleared that in all tested areas only Egyptian fruit bat, *Rousettus aegyptiacus,* belonging to family pteropodidae was recorded in all orchards. The mean number collected were 167 bats. It can be seen resting on trees, attacking fruits at night, or found dead under trees, during 2019-2020. Dietz (2005) reported that *R. aegyptiacus* is widely distributed in the Nile valley, Nile delta and at least in most oasis and Sinai Peninsula.

Data in Table 1 clear that *R. aegyptiacus* attack date palms, citrus, apricot and mango during the ripening stage, with different damage according to fruit type. The total average damage in date palm reaches 11.1% during 2019

Table 1: Damage per cent to some fruit orchards attacked by the Egyptian bat, *R. aegyptiacus,* in butt village, Dakhla Oasis during the two years 2019 and 2020.

Months	Damage%							
	Date palm		Citrus		Apricate		Mango	
	First year	Second year	First year	Second year	First year	Second year	First year	Second year
January	-	-	1.3^{b}	1.7^{c}	-	-	-	-
February	-	-	1.9^{b}	2.1^{b}	-	-	-	-
March	-	-	3.1^{a}	3.7^{a}	-	-	-	-
April	-	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-	-
June	-	-	-	-	1.4^{b}	1.9^{b}	0.1c	0.7b
July	-	-	-	-	3.1^{a}	3.0^{a}	3.4b	3.2a
August	1.2c	1.0c	-	-	-	-	4.3c	4.2a
September	3.7b	3.2b	-	-	-	-	-	-
October	6.1a	7.0a	-	-	-	-	-	-
November	-	-	-	-	-	-	-	-
December	-	-	0.2^{c}	0.0^{d}	-	-	-	-
Total	11.0	11.2	6.5	7.5	4.5	4.9	7.3	7.9

-Means followed by different letter (s) in the same column are significantly different at P≤0.05 according to Duncan's multiple range test.

and 2020 seasons. The highest percent of damage recorded in October (6.1% and 7.0%), while the lowest percent of damage was (1.2% and 1%) in August, during the two successive years, respectively. In citrus orchard the damage beginning in December (0.2%) in the first year, then increased greatly up (3.1% and 3.7%) in March at the two seasons, respectively. During January and February, the citrus damage recorded (1.9% and 2.1%) and (1.3% and 1.7%), during 2019 and 2020 seasons, respectively. In the two years, the total damage was 6.5 and 7.5, with average 7.0% for citrus. On the other hand, bats attack apricot and the damage percent was 1.4% and 1.9% in June and reached 3.1% and 3.0% in July, during the two successive years, respectively. The total damage per cent for apricot was 4.5 and 4.9%, during the first and second years, respectively. While the total damage of mango during the two years was 7.3% and 7.9%, with average 7.6%, the maximum per cent recorded in Aug. 4.3 and 4.2% and the minimum per cent was 0.1 and 0.7% during June and recorded 3.4 and 3.2% in July during the two successive years, respectively. Analysis of data revealed that there were significant differences for damage percentage between study months in all studied fruit orchards. Rizk and Eisa (2013) found that under non-choice food preference laboratory test, fruit bat, *R. aegyptiacus,* preferred guava, apple, date, tomato and carrot between different offered food, respectively. Indian flying fox, *Peteropus giganteus,* caused 18% losses in arecanut (*Areca catechu*) and the damage ranged between 12.5-22.3% at sapota, (*Achurus zapota*) during September and February on hill, chettalli region. The damage was 28% during August to guava in coastal, uppinangadi region Chakravarthy and Girish (2003).

Fig 1 showed the average percentage of loss in fruits arranged in ascending order for apricot (4.9%), citrus (7.0%), mango (7.6%) and date palms (11.1%). The highest percentage of loss in date palms (37%) could be due to the highest nutritional value contents in dates, as well as the high percentage of sugars that bats need before hibernating. On the other hand, the small size of mango is a factor in bats' attacking, it comes second in terms of losses (25%) after date palms. During the ripening of citrus fruits, the activity of bats decreased to enter the winter hibernation and the damage decreased at the beginning of bat's activity in march. These results agree with Fujita and Tuttle (1991). They found that *R. aegyptiacus* prefer ripe bissues and juiced fruits and the consumption reached 50-150% of total body mass/night, causing great hazards during growing season. Al-Robaae (1968) reported that *R. aegyptiacus* born from March to May in Egypt and hibernating from November to March and the females separate from males to deliver their young in April.

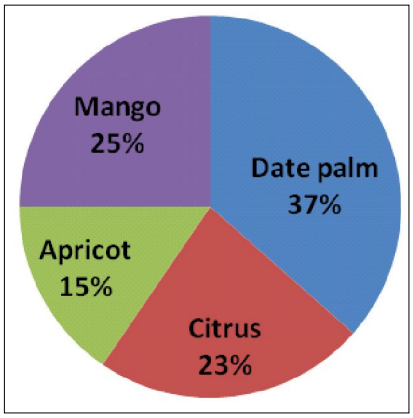

Fig 1: Average loses of fruits in different orchads at Butt village, Dakhla Oasis, by fruit bat during the two years 2019 and 2020.

CONCLUSION

Protecting fruit orchards from various pests is one of the most important measures to maintain agricultural sustainability and food security. The Egyptian fruit bat, *R. aegyptiacus*, caused the highest damage percentage in date palms followed by mango and citrus, while the lowest was found in apricots. The average percentage of losses during the two years depended on fruits ripeness, sugar percent and the activity of bats during the fruiting seasons. Therefore, bat dens must be monitored and dealt with to limit their populations and reduce their losses to these value crops in El-Dakhla Oasis, using the most ecological management methods to protect the environment and contribute to the sustainable agricultural development of these lands.

Conflict of interest: None.

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