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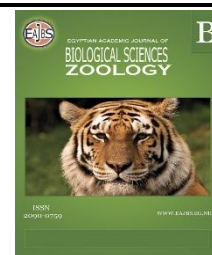


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## Depredation of Common Bulbul to Guava Fruits and Some Methods to Reduce Its Damage

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### ABSTRACT

The common bulbul, *Pycnonotus barbatus arsinoe* (Lichtenstein) is one of the main wild birds that causes loss of guava crops in Egypt, in addition to some other birds, such as Sardinian Hooded crow, *Corvus cornix sardonius* (Trischitta) and House sparrow, *Passer domesticus niloticus* (Nicoll & Bonhote). Assessing bird damage in guava orchards was the aim of the current study. It also aims to reducing the bird damage in guava crop by using some methods of bird manual scaring. The most of the damage was noticed to the fruits was due to the common bulbul, as dagger and triangular marks and deep gouges were present on the fruits where the bird fed. Birds also preferred ripe fruits than unripe fruits, and the upper branches sustain more harm to tree fruits than the side and bottom branches. The highest percentage of damage by wild birds at the end of a full season are recorded (5.28%) nearby buildings (location I), followed by (4.60 %) nearby field crops (location III), while the lowest losses recorded (1.27%) nearby orchard (location II). Also, the 5th week recorded highest damage during harvest season in all locations with average (3.23 %). The amount of bird damage at the site was found to be reduced by using manual scaring methods (location II) when manual scaring practices were mainly used with value (74%) as compared to location I and III.

### INTRODUCTION

Most researchers confuse the guava (*Psidium guajava* L.) fruits damaged by the common bulbul and mistakenly think it is because house sparrow. The red-vented bulbul (*Pycnonotus cafer*), which belongs to the family Pycnonotidae, is present in the river Indus plains and some areas of Province Sind and Baluchistan (observed in fields, parks, and orchards) Zohaib *et al.* (2021). Because of its omnivorous habits, the house crow seriously damages maturing fruits. By eating fruit, causing damage that makes it vulnerable to infection, and necessitating the harvesting of fruit before it is completely ripe, birds lower the yield of crops. Yodha *et al.* (2023). Red-vented bulbul and rose-ringed parakeet were the frugivorous species that caused harm to the guava crop. Shiels *et al.* (2018) 97% of birds

consumed invasive yellow guava (*Psidium guajava*), which made up 30% of their diet on average. Given that 66% of the birds had intact guava seeds and that each bird had an average of three undamaged seeds, parakeets may be spreading yellow guava seeds. Hussain and Vashishat (2021) also claimed that guava fruit is attacked by house crows, making it unfit for sale. Above the guava orchard, a sizable flock of parakeets was observed. Issa and El-Bakhshawngi (2018) reported that the fifth week yielded the largest proportion of damage, which was 7.50%. Guava fruits were susceptible to fruit gnawing by house sparrows. In orchards close to field crops and poultry farms, the estimated bird losses were 4.64% and 4.79, respectively. Ahmad *et al.* (2012) stated that in a fruit orchard in Faisalabad, Pakistan, the rose-ringed parakeet (*Psittacula krameri*) preyed on citrus, guava, and mango during the unripe stages of the fruits. Sukhpreet and Tejdeep (2018) assessed bird damage in both protected and unprotected guava plantations which is the aim of the current investigation. Anderson *et al.* (2014) reported that the economic effects of bird damage to fruit crops have not received much attention, and most of that research has been on wine grapes. Marcon *et al.* (2021) reported various methods (such as scarecrows, kites, nets, etc.) which were employed to keep bird flocks away from the fruit orchard. Assessing bird damage in guava orchards was the aim of the current study. It also aims to reducing the bird damage in guava crop by using some methods of bird manual scaring.

## MATERIALS AND METHODS

### Study Sites:

The present study was conducted in Makram village, in Abou-Hommos city, Beheira governorate, Egypt, it is one of the most important governorates of Egypt in guava (*Psidium guajava* L.) cultivation.

### Assessment of Bird Damage to Guava:

The field was monitored in the morning and evening to observe birds attacking the fruit. Two feddans cultivated with guava trees were selected in Makram village in Abou-Hommos city at Beheira, governorate, Egypt.

When the fruits in the 2023 season reached the ripening stage (September to November), an evaluation of bird damage to guava was conducted in Makram village across three agricultural treatments, (location I) nearby buildings, (location II) nearby orchard, and (location III) habitats for field crops in the area. Ten trees from each location were randomly selected for sampling, five from the field's periphery and five from the middle, and weekly observations were made for eight weeks starting from the start of the mature stage. Every week, the number of fruits on each tree was counted at harvest. The fruits that had been dropped and damaged by birds were gathered and removed in accordance with Issa and El-Bakhshawngi (2018). The following formula was applied to get the damage percentage:

Damage (%) = No. of damaged fruits / Total No. of examined fruits  $\times$  100

### Bird Manual Scaring Methods:

Manual scaring techniques were used primarily at location II. Workers in the guava orchard used a variety of hand frightening techniques, such as drums, loud noises, crackers, and scare crows, to frighten the birds away and decrease damage to the fruit crops. Bird manual scaring techniques were not used at locations I and III. To determine the percentage damage from the specified places, differences in yield at various locations were discovered.

### Statistical Analysis

The statistical program IBM SPSS, STATISTICS 20 was used for analyzing all the collected data, and Duncan's multiple range test was used to assess regional variations at the  $P < 0.05$  level of significance. Duncan (1955).

## RESULTS AND DISCUSSION

Common bulbul, a kind of frugivorous bird, has been observed to harm guava fruit at some sites. Photo (1). Although entire fields may be affected, damage is greatest around field edges. The typical bulbul damage pattern on guavas looked like deep gouges, triangle markings, and big daggers (Photo 2). Small flocks of common bulbul were observed hovering at ripening stage, Photo (3). We also noticed that the percentage of ripe fruits increased after the irrigation, which increases the percentage of loss in some weeks. As well as, the damage was concentrated at the top of trees (Photo 4).

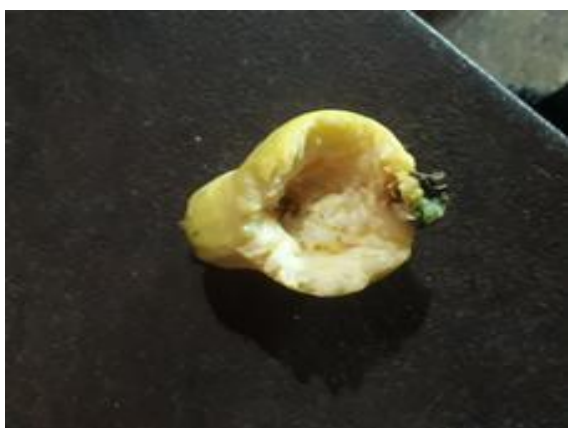
Data in Table (1) and Figure (1), showed that, the mean percentage of damage in (location I) nearby buildings, caused by Common bulbul in guava fruit was recorded (3.04 %) periphery of the field, and (2.25%) middle of the field, with total damage (5.28%).



**Photo (1):** Common bulbul, were the Frugivorous bird species inflicting damage to guava fruit.



**Photo (2):** Show the large daggers, triangular marks and deep gouges because Common bulbul.



**Photo (3):** Common bulbul were observed hovering at ripening stage



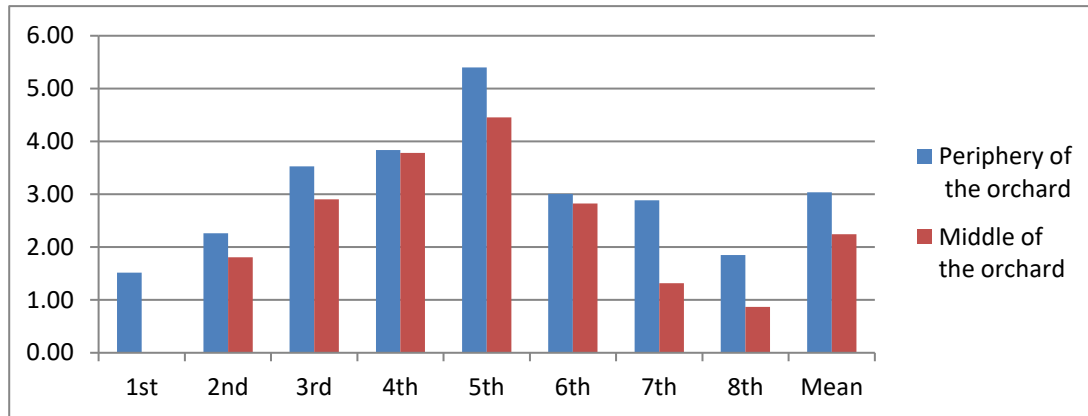
**Photo (4):** Damage was concentrated at the top of trees.



**Table 1:** Damage percentages caused by common bulbul in guava field in Abou-Hommos district at Beheira governorate, Egypt during season 2023 in (location I).

Weeks harvest stage	No. of examined trees	Periphery of the field			Middle of the field			Mean
		Total No. of fruits	No. of damaged fruits	Damage (%)	Total No. of fruits	No. of damaged fruits	Damage (%)	
1 <sup>st</sup>	10	66	1	1.52	79	0	0.00	<b>1.52</b>
2 <sup>nd</sup>	10	177	4	2.26	166	3	1.81	<b>4.07</b>
3 <sup>rd</sup>	10	170	6	3.53	172	5	2.91	<b>6.44</b>
4 <sup>th</sup>	10	443	17	3.84	317	12	3.79	<b>7.62</b>
5 <sup>th</sup>	10	389	21	5.40	404	18	4.46	<b>9.85</b>
6 <sup>th</sup>	10	299	9	3.01	283	8	2.83	<b>5.84</b>
7 <sup>th</sup>	10	208	6	2.88	228	3	1.32	<b>4.20</b>
8 <sup>th</sup>	10	108	2	1.85	115	1	0.87	<b>2.72</b>
Mean	10	232.50	8.25	3.04	220.50	6.25	2.25	<b>5.28</b>

P.f= Periphery of the field M.f= Middle of the field.

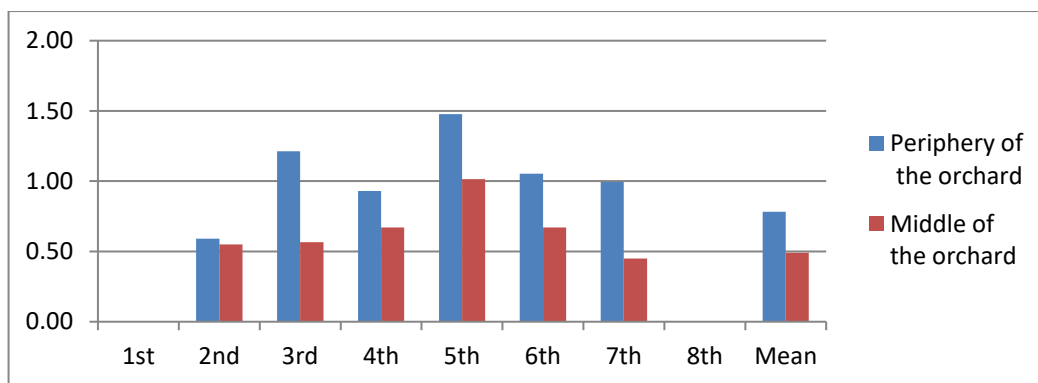
**Fig. 1:** Damage percentages of fruits caused by common bulbul in guava field in Abou-Hommos district at Beheira governorate, Egypt during season 2023 in (location I).

Data in Table (2) and Figure (2), showed that, the mean percentage of damage in (location II) nearby orchard, caused by common bulbul in guava fruit was recorded (0.78 %) periphery of the field, and (0.49%) middle of the field, with total damage (1.27%).

**Table 2:** Damage percentages caused by common bulbul in guava field in Abou-Hommos district at Beheira governorate, Egypt during season 2023 in (location II).

Weeks harvest stage	No. of examined trees	Periphery of the field			Middle of the field			Mean
		Total No. of fruits	No. of damaged fruits	Damage (%)	Total No. of fruits	No. of damaged fruits	Damage (%)	
1 <sup>st</sup>	10	60	0	0.00	71	0	0.00	<b>0.00</b>
2 <sup>nd</sup>	10	169	1	0.59	182	1	0.55	<b>1.14</b>
3 <sup>rd</sup>	10	165	2	1.21	177	1	0.56	<b>1.78</b>
4 <sup>th</sup>	10	430	4	0.93	447	3	0.67	<b>1.60</b>
5 <sup>th</sup>	10	406	6	1.48	394	4	1.02	<b>2.49</b>
6 <sup>th</sup>	10	285	3	1.05	298	2	0.67	<b>1.72</b>
7 <sup>th</sup>	10	201	2	1.00	222	1	0.45	<b>1.45</b>
8 <sup>th</sup>	10	98	0	0.00	98	0	0.00	<b>0.00</b>
Mean	10	226.75	2.25	0.78	236.125	1.5	0.49	<b>1.27</b>

P.f= Periphery of the field M.f= Middle of the field



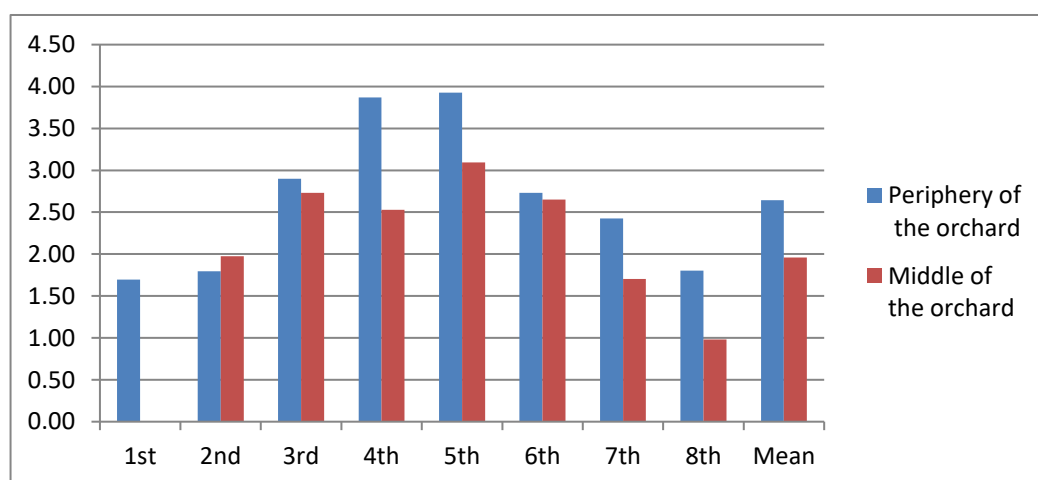
**Fig. 2:** Damage percentages of fruits caused by common bulbul in guava field in Abou-Hommos district at Beheira governorate, Egypt during season 2023 in (location II).

Data in Table (3) and Figure (3), showed that, the mean percentage of damage in (location III) nearby orchard, caused by common bulbul in guava fruit was recorded (2.64%) periphery of the field, and (1.96%) middle of the field, with total damage (4.60%).

**Table 3:** Damage percentages caused by common bulbul in guava field in Abou-Hommos district at Beheira governorate at Egypt during season 2023 in (location III).

Weeks harvest stage	No. of examined trees	Periphery of the field			Middle of the field			Mean
		Total No. of fruits	No. of damaged fruits	Damage (%)	Total No. of fruits	No. of damaged fruits	Damage (%)	
1 <sup>st</sup>	10	59	1	1.69	80	0	0.00	1.69
2 <sup>nd</sup>	10	223	4	1.79	152	3	1.97	3.77
3 <sup>rd</sup>	10	207	6	2.90	183	5	2.73	5.63
4 <sup>th</sup>	10	336	13	3.87	356	9	2.53	6.40
5 <sup>th</sup>	10	382	15	3.93	388	12	3.09	7.02
6 <sup>th</sup>	10	293	8	2.73	264	7	2.65	5.38
7 <sup>th</sup>	10	206	5	2.43	235	4	1.70	4.13
8 <sup>th</sup>	10	111	2	1.80	102	1	0.98	2.78
Mean	10	227.13	6.75	2.64	220.00	5.13	1.96	4.60

P.f= Periphery of the field M.f= Middle of the field



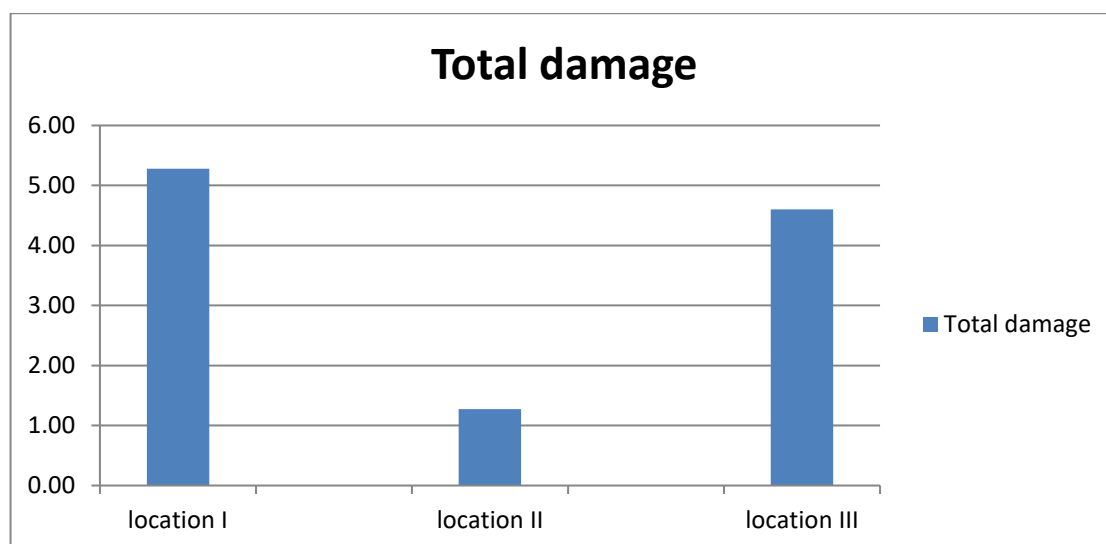
**Fig. 3:** Damage percentages of fruits caused by common bulbul in guava field in Abou-Hommos district at Beheira governorate at Egypt during season 2023 in (location III).

Data in Table (4) and Figure (4), showed that, the total highest damage caused by common bulbul in guava fruit was recorded (5.28%) in (location I) nearby buildings, followed by (4.60%) in (location III) nearby field crops, while the lowest losses recorded (1.27%) nearby orchard (location II).

**Table 4:** Percentage of losses damage caused by common bulbul in guava fruit at three locations at Beheira governorate.

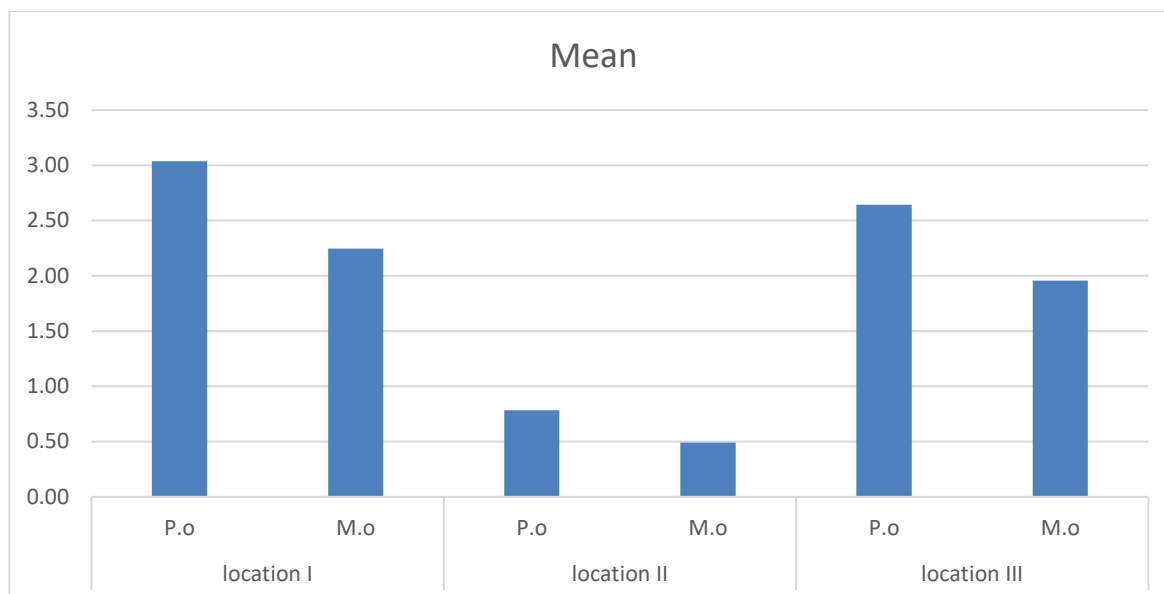
Weeks harvest stage	No. of examined trees	Nearby buildings (location I)		Nearby orchard (location II)		Nearby field crops (location III)		Mean
		Damage (%) of P.f	Damage (%) of M.f	Damage (%) of P.f	Damage (%) of M.f	Damage (%) of P.f	Damage (%) of M.f	
1 <sup>st</sup>	10	1.52	0.00	0.00	0.00	1.69	0.00	0.54 <sup>f</sup>
2 <sup>nd</sup>	10	2.26	1.81	0.59	0.55	1.79	1.97	1.50 <sup>de</sup>
3 <sup>rd</sup>	10	3.53	2.91	1.21	0.56	2.90	2.73	2.31 <sup>bc</sup>
4 <sup>th</sup>	10	3.84	3.79	0.93	0.67	3.87	2.53	2.60 <sup>ab</sup>
5 <sup>th</sup>	10	5.40	4.46	1.48	1.02	3.93	3.09	3.23 <sup>a</sup>
6 <sup>th</sup>	10	3.01	2.83	1.05	0.67	2.73	2.65	2.16 <sup>bcd</sup>
7 <sup>th</sup>	10	2.88	1.32	1.00	0.45	2.43	1.70	1.63 <sup>cd</sup>
8 <sup>th</sup>	10	1.85	0.87	0.00	0.00	1.80	0.98	0.92 <sup>ef</sup>
Mean	10	3.04	2.25	0.78	0.49	2.64	1.96	1.86
Total damage		5.28 <sup>a</sup>		1.27 <sup>b</sup>		4.60 <sup>a</sup>		3.72

P.f= Periphery of the field. M.f= Middle of the field.



**Fig. 4:** Total damage caused by common bulbul in guava fruit at the three locations.

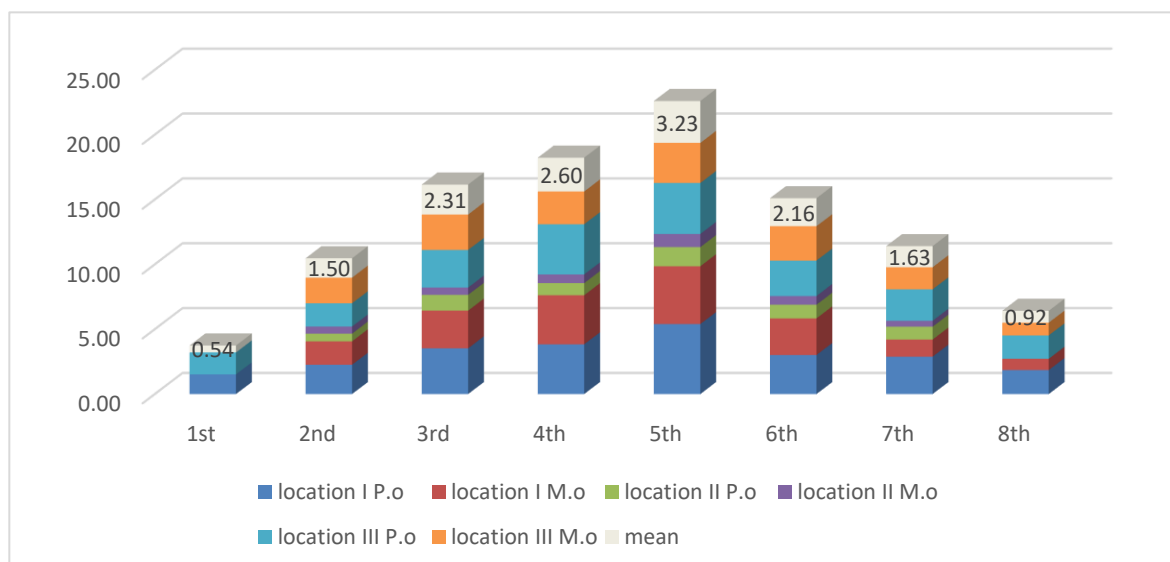
Comparing the middle and periphery of the field in three locations with three distinct habitats (field crops, buildings, and orchards), the results indicate that the periphery of the field were more vulnerable to bird depredation than the middle of the field, where was the highest loss with mean values (3.04 and 2.25%) location I, followed by (2.64 and 1.96%) location III, in Periphery and Middle of the field respectively. While the lowest losses recorded in location II with values (0.78 and 0.49%) in periphery and middle of the field, respectively (Table 4 and Fig. 5).



**Fig. 5:** Mean damage caused by common bulbul in periphery and middle of the field in guava fruit at three locations.

P.f= Periphery of the field      M.f= Middle of the field

However, when compared to the other weeks, in locations I, II, and III, respectively (Table 4 and Fig. 6), the greatest loss during the fifth week was (5.40 & 4.46%, 1.48 & 1.02%, and 3.93 & 3.09%), with a mean value of 3.23%, due to common bulbul attacks in guava fruit during the ripen stage to end harvest.



**Fig. 6:** Highest loss in guava because common bulbul was recorded during the 5<sup>th</sup> week.

At location II, various manual scaring techniques, such as drumming, loud noises, crackers, and scare crows were used at the beginning of bird damage and continued until crop harvest. Bird manual scaring techniques were found to be effective in reducing bird damage in location II when manual scaring practices were primarily used, with a value of 74% as compared to locations I and III.



According to the statistical comparison, there was no discernible difference in the mean damage in fruit yield of guava at locations I and III, and the use of bird scare techniques reduced damage at location II.

These findings occurred similarly pattern of damage to guava fruit was previously described by Dulera and Nayi (2022). The fruit that the parakeets had already consumed is pecked at by the Western Koel, Brown-headed Barbet, Red-vented Bulbul, and House Crow. Issa and El-Bakhshawngi (2018) showed that the proportion of damage rose in orchards close to field crops and poultry farms, respectively, as the time passed from the first to the fifth week. Kiran Fatima *et al.* (2023) concluded that scaring and mechanical methods are more powerful tools used in reducing fruit damage (especially guava).

### Declarations:

**Ethical Approval:** This research was approved by ethics committee of Faculty of Agriculture, Al-Azhar University (SCI/ENTO/2023/9/4).

**Competing interests:** There are no competing interests to declare.

**Author's Contributions:** Mahmoud F. El- Sawy, analyzed and interpreted the scanning micrographs and wrote the manuscript.

**Funding:** No funding was received.

**Availability of Data and Materials:** The datasets utilized and analyzed during this investigation are available upon reasonable request from the corresponding author.

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## ARABIC SUMMARY

### نهب البلبل الشائع لثمار الجوافه وبعض الطرق للحد من أضراره

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البلبل الشائع من الطيور البرية الرئيسية التي تسبب خسارة لأشجار الجوافه في مصر بالإضافة الي بعض الطيور الأخرى مثل الغراب البلدي وعصفور النبل الدوري، تهدف تلك الدراسة الي تقدير الأضرار التي تسببها الطيور الي اشجار الجوافه. كما يهدف الي تقليل تلك الأضرار باستعمال بعض طرق اخافة وابعاد الطيور، وخلال الدراسة لاحظنا ان اغلب الضرر الحادث لثمار الجوافه يرجع الى طائر البلبل الشائع، وكان مظهر الإصابة للثمار عبارة عن طعنات خنجرية وعلامات مثلثية الشكل وحفر عميقة نتيجة تغذية الطائر عليها، كذلك لوحظ ان الطيور كانت تفضل الثمار الناضجة عن غيرها كما ان معظم الأضرار تركزت في الثمار المتواجدة في الأفرع العليا مقارنة بالمتواجدة علي الأفرع وسط الشجرة او السفلي منها.

سجلت نسبة الخسارة الأعلى في نهاية مرحلة الحصاد (28.5%) جوار مساكن (منطقة 1) تليها (60.4%) جوار محاصيل الحقل (منطقة 3)، بينما الخسارة الأقل سجلت (1.27%) جوار البساتين (منطقة 2). كما سجل الاسبوع الخامس اعلي اصابات في كل المواقع خلال مرحلة الحصاد بمتوسط كلي (3.23%). أيضاً سجلت الطرق الميكانيكية المختلفة التي تم استعمالها لإخافة الطيور وابعادها عن المكان فاعلية عالية حيث ادت الي خفض الضرر في (المنطقة 2) والتي تم استعمال تلك الطرق بها بنسبة (74%) مقارنة بالمنطقتين (1، 3).

الكلمات الإسترشادية: البلبل الشائع، الطيور البرية، فقد المحصول، طرق اخافة الطيور.