

Estimating the Damage of Birds to Wheat, Gurma Melon and Cowpea Crops During the Ripening Period at Sharkia Governorate, Egypt

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Abstract

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The damage caused by birds to wheat crop is increasing during the ripening stage. The house sparrow, *Passer domesticus niloticus* is the main bird pest that attacks wheat spikes during the ripening stage (milk, dough, and mature levels) during 2020 and 2021 seasons. The 6th week of the ripening period suffered the highest damage in all samples compared with other weeks. The samples collected from the field edge showed the highest damage, with 13.05 and 6.75% yield loss during 2020 and 2021, respectively. The samples collected at 6 m from borders didn't show any damage. The statistical analysis indicated that there were significant differences between the tested distances in all weeks of the ripening stage during 2020 and 2021 seasons. The gurma melon fruits were attacked by hooded crow, *Corvus corone* during the ripening stage and the mean proportion of damaged fruits reached 9.47% at the 6th week of fruit development. The special features of the gurma melon plants made it easy for hooded crows to land and take off, thus the birds attacked the crop at any point in the field, thus there was no significant difference between the fruit damage level and distance from the field border. Cowpea was an attractive crop for many bird species such as pigeons and house sparrows. Birds did attack the cowpea pods during the ripening stage, with 6.97% damage during this stage.

Keywords: Damage, birds, house sparrow, hooded crow, wheat, gurma melon, cowpea.

Introduction

The Problems related to wild bird's injuries to agriculture crops are considered more communal in recent decades. Birds can cause damage to many agriculture crops (Attia, 2013; DeGrazio, 1978; Micaelo *et al.*, 2023). The extent and degree of damage is highly variable according to the location and growth stage (Issa, 2018). Quantitative and qualitative damage can reach 60% (Rizk *et al.*, 2020), and crop losses amount to millions of dollars (Anderson *et al.*, 2013).

Cereal crops have an important role in global food security and wheat is the most important one (Laskowski *et al.*, 2019). In Egypt, wheat production usually is not enough for local consumption (The World Bank, 2017), accordingly, there is a need to increase production and decrease losses, including losses due to bird damage. The proportion of wheat damage caused by birds reached 13.09% at Sharkia Governorate, 9.19% at Ismailia Governorate, 15.7% at Sohag Governorate and 25.9% at Qalubia Governorate (Attia, 2006; Hassan *et al.*, 2022; Yaacoub *et al.*, 2019).

The Gurma melon, also known as seed or Nubian melon, *Citrullus lantus* var. *colocynthoides* (Elsebaie *et al.*, 2022) is a variety of watermelon cultivated in Egypt for seeds only. The fruit components consist of 65.35% pulp, crude protein 0.84%, moisture 94.55% and seed 4.9%, the pulp is creamy in color with a highly slight sweet taste (Salama, *et al.*, 2019). In recent years farmers began to grow it for many reasons, especially for its tolerance to salt and drought, thus it is a suitable crop for the newly reclaimed fields. Furthermore, it has an economic significant because Egypt exports a considerable amount of its seeds (El-Shabrawy & Hatem,

2008). Gurma melon, *Citrullus lantus* var. *colocynthoides* fruit is attractive to birds attack, such as the house crow, *Corvus splendens*, common myna, *Acridotheres tristis* and house sparrow, *Passer domesticus* (Manzoor *et al.*, 2013).

Cowpea, *Vigna unguiculata* (L.) Walp., a leguminous crop whose green pods and grains are constitute a good part of the human diet in Egypt (Issa *et al.*, 2019; Gonçalves *et al.*, 2016). The high protein content in the green pods and dry seeds make it a target for some bird species such as pigeons and house sparrows (Issa *et al.*, 2019; Kale *et al.*, 2014).

The objective of the current study was to estimate bird damage to wheat, cowpea, and Gurma melon plants during the ripening period at Sharkia Governorate, in an effort to develop a program to reduce birds damage to these important crops.

Materials and Methods

These experiments were conducted at two separate locations: at Ezweleen village, El-Husseinieh district and El-Masaheed village, Saan El-Hajar district, Sharkia Governorate, Egypt, during the growing 2020 and 2021 seasons. Summer and winter crops were chosen to carry out these experiments.

Assessment of birds' damage to bread wheat

Bird damage assessment in wheat fields was carried out during the winter 2020 and 2021 seasons. Three plots, one feddan each cultivated with wheat crop were selected randomly in aforementioned locations. Twenty samples were collected from each plot at different distances from the field edge (0, 2, 4 and 6 m). The samples were collected weekly,

starting from spikes emergence until harvest. Sampling was carried out according to the methods developed by Poche *et al.* (1982). A square wooden frame 0.5 × 0.5 m was used for sampling from the selected fields. The numbers of damaged and undamaged ears that were included within the frame were recorded. The ear damage was scored as different categories according to De-Haven (1974) as follows: 1= 10 % average damage (1-20 % damage), 2= 30 % average damage (21-40% damage), 3= 50 % average damage (41-60% damage), 4= 70 % average damage (61-80% damage), 5= 90 % average damage (81-100 % damage). The percentage of damage was calculated as follows:

$$\text{Damage \%} = \frac{\text{undamaged} \times 0.0 + 10\% \text{ damage} \times 0.1 + 30\% \text{ damage} \times 0.3 + 50\% \text{ damage} \times 0.5 + 70\% \text{ damage} \times 0.7 + 90\% \text{ damage} \times 0.9}{\text{Total investigated ears}} \times 100$$

Assessment of birds' damage to gurma melon

Birds' injury to gurma melon fruits were induced during summer season 2020, throughout fruit development till harvesting. Three gurma melon fields in different locations-one feddan each- were monitored for birds damage. Twenty samples were collected weekly at four distances from the field's edge (0, 2, 4 and 6 m) in the direction of the center of the experimental field. The sample included fruits from twenty successive plants at the same distance from the edge, and the fruits were inspected to estimate fruits damage. The proportion of damage (%) was calculated by the following formula according to De-Haven (1974):

$$\text{Damage (\%)} = \frac{\text{No. of damaged fruits}}{\text{Total No. of examined fruits}} \times 100$$

Assessment of birds' damage to cowpea

Assessment of birds' damage to cowpea plants was achieved during the summer 2020 season, from milky stage till harvest. Three replicates of one feddan each cultivated with cowpea were selected in Ezweleen Village, Husseinieh district, Sharkia Governorate. Samples were collected weekly at four distances from the edge toward the center of the experimental field, (0, 2, 4 and 6 m). The samples consisted of twenty successive plants at the same distance from the edge were inspected directly in the field and the damage level was recorded. The proportion of damage was calculated by the following formula according to De-Haven (1974) as above:

Statistical analysis

Statistical analysis of all data was done by using the statistical software CoStat (2005). The differences between treatments were compared using Duncan's multiple range tests at P=0.05 (Duncan, 1955).

Results and Discussion

Birds damage to wheat

Results obtained (Table 1, Figure 1) revealed that the birds damage to the wheat crop increased throughout the ripening stage. The house sparrow, *Passer domesticus niloticus* was

the main bird pest that attacked wheat spikes during the ripening stage (milk, dough, and mature spikes), during both 2020 and 2021 seasons. The 6th week of the ripening stage showed the highest damage. Results showed that the birds damage to wheat ears at the edge of the field during 2020 season was the highest in 6th week of the ripening stage (29.03%), followed by the 5th week (19.93%), whereas there was no damage during the 1st and the 2nd week of ripening for the edge samples. In general, Damage was highest for the edge sample (13.05%), followed by the samples at 2m from the edge (1.07%), with no damage 6 m from the edge. The birds damage to wheat plants during the 2021 season were slightly less than in the first season (2020). The proportion of damage at the field's edge were 17.03% & 16.84% during the 6th and 5th weeks of ripening, respectively. The mean birds damage reached 6.75% and 0.58% at 0.0 and 2m from the edge, respectively.

The statistical analysis of the data obtained showed that there was a significant difference between the damage rate (%) at different distances from the field edge during all weeks of ripening stage in both seasons. In general, it was shown that there was no significant birds damage during the 1st and 2nd week of ripening stage at all studied distances from the field edge, and damage started in the 3rd week of ripening mainly at the edge and 2 m from the edge with much less damage at 4 and 6 m away from the edge, especially in the first season.

These results agree with what has been reported by Hassan *et al.*, (2022), who mentioned that bird's injury is variable according to crop type and distance from the field's edge. Issa *et al.*, (2019) reported that the house sparrow *Passer domesticus niloticus* attacks wheat crop, causing the highest damage rate on the 6th week of ripening stage (14.82%) at Sharkia governorate. Kandil & Mobarak (2017) showed that the average damage rate caused by house sparrow to wheat crop, at El-Dakhla, was 4.46% and 3.56% during 2014 and 2015 seasons, respectively. The high damage recorded during the first season of this study (2020) can be attributed to many perching sites (common reed, shrubs and small trees) at the field edges which led to more severe attack by birds, whereas in the 2nd year, the farmers pruned the border plants, and consequently the perching sites were reduced.

Birds damage to gurma melon

The gurma melon crop is cultivated in Egypt for seed consumption and exports. There are many pests causing a significant effect on productivity and birds, especially the hooded crow (*Corvus corone*), that attacks the gurma melon fruits during the ripening stage, causes significant loss.

Results obtained (Table 2 and Figure 2) indicate that a significant damage occurred by the hooded crow to gurma melon fruits at EL-Husseinieh district fields during the 2020 season. The highest mean damage rate (%) occurred during the 6th week of fruit development (9.47%) followed by week 5 (6.49%) and week 4 (2.98%), whereas in the 1st, 2nd & 3rd weeks there was no damage.

The highest damage of gurma melon fruits in week 6th may be due to the fact that fruits reached the full ripening stage and due to wilted leaves it was easier to spot the fruits by the hooded crow (*Corvus corone*). In addition, the fruits

contained 94.55% moisture and during hot summer (August) the hooded crow needs water badly.

The statistical analysis showed that there were no significant differences in the damage caused by the bird between different distances to the field edge during the study period because birds can land and take-off easily in the entire field without any restrictions. However, there were significant differences between different weeks during fruit development period (ripening stage).

The results obtained in this study were in agreement to what has been reported by Manzoor *et al.* (2013) in Pakistan, who indicated that house crow (*Corvus splendens*), common myna and house sparrow (*Passer domesticus*) caused a serious damage resulting to economic losses in watermelon (*Citrulus lanatus*) during the ripening stage. Issa & El-Bakhshawngi (2018) revealed that the plants with heavy foliage form a shade that protects fruits from birds attack, and the damage start to increase when the leaves start to wither.

Table 1. The damage rate (%) in wheat ears due to birds attack during 2020 and 2021 growing seasons.

Ripening stage (weeks)	Season	Distance from the field's edge (meters)					Total	Mean	SE	LSD _{0.05}
		Edge	2.0	4.0	6.0					
1 st	2020	0.00 b	0.00 b	0.00 b	0.00	0.00	0.00 b	0.00	0.00	
	2021	0.00 b	0.00a	0.00 a	0.00 a	0.00	0.00 b	0.00	0.00	
2 nd	2020	0.00 b	0.00 b	0.00b B	0.00	0.00	0.00 b	0.00	0.00	
	2021	0.00 b	0.00 a	0.00 a	0.00 a	0.00	0.00 b	0.00	0.00	
3 rd	2020	10.51 abA	0.25 b B	0.00 bB	0.00 B	10.76	2.69 ab	2.61	6.38	
	2021	1.63 bA	0.09 aB	0.00 bB	0.00 aB	1.72	0.43 b	0.40	1.02	
4 th	2020	18.83 abA	1.69 a B	0.00 bB	0.00 B	20.52	5.13 ab	4.58	11.72	
	2021	4.99 abA	0.59 aB	0.00 bB	0.00 aB	5.55	1.39 ab	1.21	2.82	
5 th	2020	19.93 abA	1.81 a B	0.00 bB	0.00 B	21.74	5.43 ab	4.85	12.45	
	2021	16.84 aA	1.31 aB	0.11 bB	0.00 aB	18.26	4.57 a	4.10	11.64	
6 th	2020	29.03 aA	2.66 a B	0.13aB	0.00 B	31.82	7.96 a	7.05	19.41	
	2021	17.03 aA	1.51 aB	0.35 aB	0.02 aB	18.91	4.73 a	4.11	11.72	
Total	2020	78.30	6.41	0.13	0.00	84.84	21.21	-		
	2021	40.49	3.50	0.46	0.02	44.47	11.12	-		
Mean	2020	13.05 A	1.07 B	0.02 B	0.00 B	-	-	-	4.69	
	2021	6.75 A	0.58 B	0.08 B	0.003 B	-	-	-	2.96	

Means followed by the same capital letter(s) in the same row or the same small letters in the same column are not significantly different at P=0.05, based on Duncan's multiple range test.



Figure 1. Degree of damage caused by house sparrow in wheat ears, moderate damage (left), heavy damage (right).

Birds damage to cowpea

Cowpea in Egypt is attacked by many bird species such as pigeon and house sparrow. Results obtained in this study (Table 2, Figure 3) indicate that the mean bird damage to cowpea pods was 6.97%. During the ripening stage, the highest mean damage occurred during the 6th week (4.70%) followed by the 5th week (2.27%). There was no damage by birds during the first four weeks of ripening stage at any studied distance from the field edge. Damage by birds to cowpea pods occurred only during the last two weeks of the ripening stage.

Results obtained are in line with those reported by Kattab (1993), who revealed that wild bird's damage in peas reached 11.1 & 9.5% at old land and newly reclaimed area. Issa *et al.*, (2019) reported that pigeons and house sparrow were the main pests of cowpea pods, and the highest damage rate occurred during the 5th week of the ripening stage (13.32%). They also stated that birds attack cowpea pods during the filing stage until harvest and may lead to complete crop loss, thus farmers had to harvest the crop as soon as it matures. Kale *et al.* (2014) mentioned that pigeons damaged the peas crop causing a 42% loss.

Table 2. The extent of damage caused to gurma melon fruits and cowpea pods by the hooded crow during the ripening stage of the 2020 growing season.

Fruit ripening stage period (weeks)	Crop	Distance from the field edge (meters)					
		0.0	2.0	4.0	6.0	Total	Mean
1 st	Gurma melon fruits	0.00 c	0.00 b	0.00 b	0.00 c	0.00	0.00 d
	Cowpea pods	0.00 b	0.00 b	0.00 c	0.00 c	0.00	0.00 c
2 nd	Gurma melon fruits	0.00 c	0.00 b	0.00 b	0.00 c	0.00	0.00 d
	Cowpea pods	0.00 b	0.00 b	0.00 c	0.00 c	0.00	0.00 c
3 rd	Gurma melon fruits	0.00 c	0.00 b	0.00 b	0.00 c	0.00	0.00 d
	Cowpea pods	0.00 b	0.00 b	0.00 c	0.00 c	0.00	0.00 c
4 th	Gurma melon fruits	5.18 bA	2.17b AB	1.08 bB	3.49 bAB	11.92	2.98 c
	Cowpea pods	0.00 b	0.00 b	0.00 c	0.00 c	0.00	0.00 c
5 th	Gurma melon fruits	6.16 bAB	9.52 aA	4.45 aB	5.82 bB	25.95	6.49 b
	Cowpea pods	1.71 bA	3.77 aA	2.38 bA	1.21 bA	9.07	2.27 b
6 th	Gurma melon fruits	11.05 aA	11.15 aA	5.85 aA	9.83 aA	37.88	9.47 a
	Cowpea pods	4.53 aA	5.90 aA	5.60 aA	2.79 aA	18.82	4.70 a
Mean	Gurma melon fruits	3.73 A	3.81 A	1.89 A	3.19 A	-	-
	Cowpea pods	1.04 A	1.61 A	1.33 A	0.67 A	-	-
Total	Gurma melon fruits	22.39	22.84	11.38	19.14	75.75	18.94
	Cowpea pods	6.24	9.67	7.98	4.00	27.89	6.97

Means followed by the same capital letter(s) in the same row or the same small letters in the same column are not significantly different at P=0.05, based on Duncan's multiple range test.



Figure 2. Degree of damage caused by hooded crow in gurma melon fruits, A: primary damage, B: primary damage followed by secondary damage.



Figure 3. Damage caused by pigeon to cowpea pods, A: moderate damage, B: heavy Damage.

الملخص

سلامة، محمد أحمد، محمد إبراهيم عامر، أحمد عبد الله غريب فرج، محمد عبد الله عيسى ومحمد عبد العال هندواوي. 2024. تقدير أضرار الطيور على القمح، البطيخ واللوبياء في محافظة الشرقية، مصر. مجلة وقاية النبات العربية، 42(4): 552-557. <https://doi.org/10.22268/AJPP-001281>. ازداد الضرر الذي تلحقه الطيور بمحصول القمح بشكل كبير خلال أسابيع مرحلة النضج. كان العصفور الدوري المصري (*Passer domesticus niloticus*) هو الطائر الضار الرئيسي الذي يهاجم سنابل القمح أثناء مرحلة النضج (اللبنّي، العجيني والنضج الكامل) خلال موسمي 2020 و 2021. سجلت في الأسبوع السادس والأخير من مرحلة النضج أعلى قيمة للضرر في جميع العينات مقارنة بالأسابيع الأولى من مرحلة النضج. أظهرت العينات عند حواف الحقل أعلى قيمة للضرر بنسبة 13.05 و 6.75% خلال موسمي 2020 و 2021، على التوالي. على الجانب الآخر، لم تظهر العينات على بعد 6 أمتار من حواف الحقل أي ضرر. أظهر التحليل الإحصائي وجود فروق معنوية بين المسافات المختبرة في جميع أسابيع مرحلة النضج خلال عامي 2020 و 2021. كذلك تعرضت ثمار بطيخ الكورما للهجوم من قبل الغراب المقنع (*Corvus corone*) خلال مرحلة النضج، وبلغ متوسط نسبة الثمار المتضررة 9.47% في الأسبوع السادس من مرحلة نضج الثمار. سمحت طبيعة نمو نباتات بطيخ الكورما للغراب المقنع بسهولة الهبوط والإقلاع، وبالتالي هاجمت الطيور هذا المحصول في أيّ موقع في الحقل، لذلك لم يكن هناك ثمة فروق ذات دلالة إحصائية في الضرر على مسافات مختلفة من حافة الحقل. كما شملت الدراسة اللوبياء، وهو محصول جذاب للعديد من أنواع الطيور مثل العصفور الدوري والحمام، حيث هاجمت الطيور قرون اللوبياء خلال مرحلة النضج وبلغت نسبة القرون المتضررة 6.97% من العدد الكلي للقرون التي تم فحصها خلال مرحلة النضج وعلى مسافات مختلفة من حافة الحقل.

كلمات مفتاحية: ضرر، العصفور الدوري، الغراب المقنع، قمح، بطيخ الكورما، اللوبياء.

عناوين الباحثين: سلامة، محمد أحمد*، محمد إبراهيم عامر¹، أحمد عبد الله غريب فرج¹، محمد عبد الله عيسى² ومحمد عبد العال هندواوي¹. (1) قسم وقاية النباتات، كلية الزراعة، جامعة الزقازيق، مصر؛ (2) معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الدقي، جيزة، مصر. *البريد الإلكتروني للباحث المراسل: m.abosalama949@gmail.com

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