

Losses of tomato crop by wild birds in El-Beheira and Matrouh governorates, Egypt

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ABSTRACT

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Some wild bird species cause losses and damage to many agricultural crops, especially vegetable crops such as tomato. Such problem leads to reduce the sustainable development efforts and economic loss for the farmers. This research aims to estimate the losses of tomato fruits due to wild birds, with providing some recommendations to reduce these losses. The hooded crow (*Corvus cornix sardonius* Kleinschmidt, 1903) and house sparrow (*Passer domesticus niloticus* Nicoll and Bonhote, 1909) are major pests for many crops in Egypt. In this study during the growing season 2020, Bird damage assessment in tomatoes carried out in three agricultural districts (Abou-Hommous and Elqahir districts) in El-Beheira Governorate and (Elhamam district) in Matrouh Governorate was studied nearby buildings, trees and field crops habitats. Birds attacked tomato during the different Stages of maturity (The flowering stage - Immature green stage - Typical mature green stage - Breaker stage - Turning stage - Pink stage - Light red stage - Red stage - Over-ripe stage) during the twelve weeks from starting the flowering stage until the end of harvest with mean values (1.04 1.33 0.67 % in Abou-Hommous district and 1.83 2.50 1.00 % in Elqahir district at El-Beheira Governorate), and (1.50 1.92 0.79 % in Elhamam district at Matrouh Governorate) nearby buildings, trees and field crops habitats in all respectively. In conclusion, the highest damage caused by wild birds in tomatoes was recorded in the Light red stage during the 9th week, from starting the flowering stage are recorded (9.50%) nearby trees habitat in Elqahir district. Thus, we recommend to harvest tomato crops in the pink stage and left it until ripe, and avoid reaching the highest loss rate

Keywords: losses, damage, wild bird, vegetable crops, tomato.

INTRODUCTION

Tomato is one of the most important vegetable crops in Egypt, which grown all year round in Egypt. However, production faces some problems in summer season due to depredation of birds, high temperature and insect born virus's diseases prevailing in these months. Moreover, tomato is an essential dietary component; it contains a high level of lycopene, an antioxidant that might reduce the risks associated with several types of cancer (Srinivasan, 2010). Birds love tomatoes and are attracted to their color so the ripening tomatoes easily catch the eye of birds and appear easy pickings into their skins. Khattab *et al.*, (2001) mentioned that the birds attacked the roots of seedlings or seeds after sowing and horticultural crops such as tomato, strawberry and apple during the maturing stage and marketing and caused damage with highest values 10.57, 5.57 and 5.48% at the third week from the beginning of the harvest of each crop respectively. Senar *et al.* (2016) cleared that the evaluated damage to commercial crops caused by the monk parakeet, *Myiopsitta monachus*, in

the Baix Llobregat agricultural area (1,024 ha) bordering the city of Barcelona, Spain. Average crop loss was 0.4% for tomatoes, 28% for corn, 9% for red plums, 36% for round plums, 37% for pears, 17% for persimmons, and 7% for quinces. Hassan (2008) reported that, hooded crow bird caused damage on tomato at Sharkia, Qalubia and Ismailia Governorates with total value 5%, the highest percentage of damage at Ismailia Governorate followed by Qalubia Governorate and Sharkia Governorate. Abbasy *et al.* (2012) mentioned that losses in tomato recorded high peak (19.44 & 14.54 %) followed by (18.78 & 13.73 %) during 3rd and 4th weeks at vegetable & field crops respectively. The lowest losses recorded during 7th and 1st weeks (8.83 & 11 %) followed by (9.69 & 13.56 %) in tomato nearby crops & vegetable respectively. Khattab *et al.*, (2002) revealed that hooded crow attacks tomato during the maturity stage and caused damage with highest value 10.57 % at the third week from the beginning of the harvest. Shwiff (2009) reported that, damage to crops by birds and rodents could reduce total crop yield and increase pest control costs. This ultimately reduces the production output of the

agricultural sector and all other linked sectors and could potentially have significant total economic impacts, and generally, total estimated revenue lost annually in the 10 counties due to bird and rodent damage to 22 selected crops ranged from \$168 million to \$504 million (in 2009 dollars). As well as, total estimated number of jobs lost annually in the 10 counties associated with the occurrence of bird and rodent damage to 22 selected crops ranged from 2,100 to 6,300. Therefore, the objective of current study is to estimate bird damage to tomatoes at El-Beheira and Matrouh Governorate.

MATERIALS AND METHODS

Damage assessment in tomato:

Bird damage assessment in tomatoes was conducted weekly during stages of maturity from starting the flowering stage until the end of harvest (The flowering stage - Immature green stage - Typical mature green stage - Breaker stage - Turning stage - Pink stage - Light red stage - Red stage - Over-ripe stage), under the field condition in three agricultural districts (Abou-Hommom and Elqahir districts) in El-Beheira Governorate and (Elhamam district) in Matrouh Governorate was studied nearby buildings, trees and field crops habitats. Three treatments in each location were randomly chosen, and twenty samples were chosen randomly from each treatment, each consisting of 10 consecutive plants in one row, established for assessment of damage, the same method of Hamelink (1981) was followed and the damage and undamaged berries were counted and the percentage calculated as follow:

Damage % = No of damaged plants \times 100 / Total no of damaged and undamaged plants.

RESULTS AND DISCUSSION

Tomato (*Solanum lycopersicum* L.) belongs to the Solanaceae family just like eggplant, pepper, potato. It is one of the most consumed foods because of its high content in nutrients such as vitamins and minerals that are important for human well-balanced diets. As the tomato crop provides nourishment to the sick and their caregivers in the shadow of the ungrateful corona virus in Egypt and world. Birds love tomatoes and are attracted to their color so the ripening tomatoes easily catch the eye of birds and appear easy pickings into their skins.

Tomatoes show wounds that appear to have been made by very small daggers with sizeable holes often evident, exposing the pulp. Damage

begins just as fruit begins to ripen and continues throughout the ripening stage (William, 2012) as depicted in Figure 1.

Data in Table 1 and Figure 4 show that the highest damage caused by wild birds in tomatoes was obtained in the Light red stage during the 9th week (Figure 2), from starting the flowering stage are recorded (3.50 4.50 2.50 % in Abou-Hommom district and 6.00 9.50 3.50 % in Elqahir district at El-Beheira Governorate), and (4.50 6.50 2.50 % in Elhamam district at Matrouh Governorate) nearby buildings, trees and field crops habitats in all districts respectively.

While the lowest losses recorded during the 6st week from starting the flowering stage that were 0.50 1.00 0.50% in Abou-Hommom district and 0.50 2.00 0.50% in Elqahir district at El-Beheira Governorate, and 1.00 1.50 0.50 % in Elhamam district at Matrouh Governorate nearby buildings, trees and field crops habitats in all districts respectively.

However, no damage was recorded in the flowering stage during the 1st, 2nd and 3rd weeks and in immature green stage during the 4th week and in typical mature green stage during the 5th week from starting the flowering stage in all plants (Figure 3).

On the other hand, birds attacked tomato during the twelve weeks from starting the flowering stage to end harvest causing losses with mean values (1.04 1.33 0.67 % in Abou-Hommom district and 1.83 2.50 1.00 % in Elqahir district at El-Beheira Governorate), and (1.50 1.92 0.79 % in Elhamam district at Matrouh Governorate) nearby buildings, trees and field crops habitats in all respectively.

When comparing the fields' location among three districts with three different habitats (beside buildings, trees and field crops) there were highly significant differences between trees in Elqahir district (9.5 %) and Elhamam district (6.5 %) and Abou-Hommom district (4.5 %) in the 9th week nearby trees. While nearby building recorded (6.0 %) in Elqahir district and (4.5 %) in Elhamam district and (3.5 %) in Abou-Hommom district in the 9th week, While the lowest losses recorded nearby field crops with values (2.5 %) in Abou-Hommom district and (2.5 %) in Elhamam district and (3.5 %) in Elqahir district in the same week as well.

The total highest damage caused by wild birds in tomatoes was recorded (22.00 30.00 12.00 %) with average (21.33 %) in Elqahir district followed by (18.00 23.00 9.50 %) with average (16.83 %) in Elhamam district, followed

by (12.50 16.00 8.00 %) with average (12.17 %) in Abou-Hommos district, beside buildings, trees and field crops habitats in all districts respectively.

The results were in agreement with many authors such as Attia (2013) showed that, damage caused by wild birds recorded (18.63 and 15.35 %) followed by (18.03 and 14.48 %) in the 3rd and 4th weeks at El-Tel El-Kbeer and Fayed districts respectively, while the lowest losses recorded during 7th and 1st weeks it were (9.72 and 10.49 %) (10.11 and 12.76 %) at Fayed and El-Tel El-Kbeer districts respectively. Khattab *et al.* (2002) revealed that hooded crow attacks tomato during the maturity stage and caused damage with highest value 10.57 % at the third week from the beginning of the harvest. Hassan (2008) cleared that, hooded crow bird caused damage on tomato at Sharkia, Qalubia and Ismailia Governorates with total value 5%, the highest percentage of damage at Ismailia Governorate followed by Qalubia Governorate and Sharkia Governorate. Mostafa *et al.* (2008) mentioned that, birds attacked tomato during maturity stage with values 5.72, 7.64, 8.36, 7.60, 7.77, 6.49 and 5.04 % during the seven weeks from starting maturing and marketing.

However, these results agree dis with, Khattab *et al.* (2002) mentioned that the birds attack the red and green fruit, the mean of damage was highly significant, and the lowest damage was 3.14 % at red fruit tomatoes at six week and 2.98 % at green tomato.

CONCLUSION

At the end of our study, we noted that tomato crop is prone to bird's attacks that lead to decrease qualitative and quantitative tomato crops. This study provides information for ornithologists to carry out future studies to avoid bird damage on tomatoes, and the farmer to better monitor and protect tomato cultivation. This research contributes to identifying the causes of losses in tomato crop and developing some recommendations to avoid this loss. Firstly, birds attack the tomato crop and due losses it requires with in the of modern means in agriculture, such as greenhouse, or fellow an agricultural cycle until the losses are distributed among the different crops in the case of the open crops, which represent about 95% in Egypt. Secondly, reducing fences such as trees and windbreaks around cultivated fields, as they are a roost for birds and their reproduction. Thirdly, interest in bird control during the maturity stage, with mechanical means and repellents. Encouraging

research in the field of pest control especially wild birds, as Egypt is the fifth largest producer of this crop in the world, and despite that, it exports only 3% because of the loss in production and marketing. Finally, the state must adopt a regulatory strategy for growing tomato in governorate that do not have paths for bird migration to avoid damage in open crops. Whereas, the highest damage is in the light-red stage can be harvested tomato crops in the pink stage and left it until ripe.

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Figure 1. Show the wounds that appear to be small daggers because wild birds (William, 2012).



Figure 2. Damage caused by harmful wild bird species in tomatoes crop.



Figure 3. No damage was recorded during the flowering stage, immature green stage and typical mature green stage.

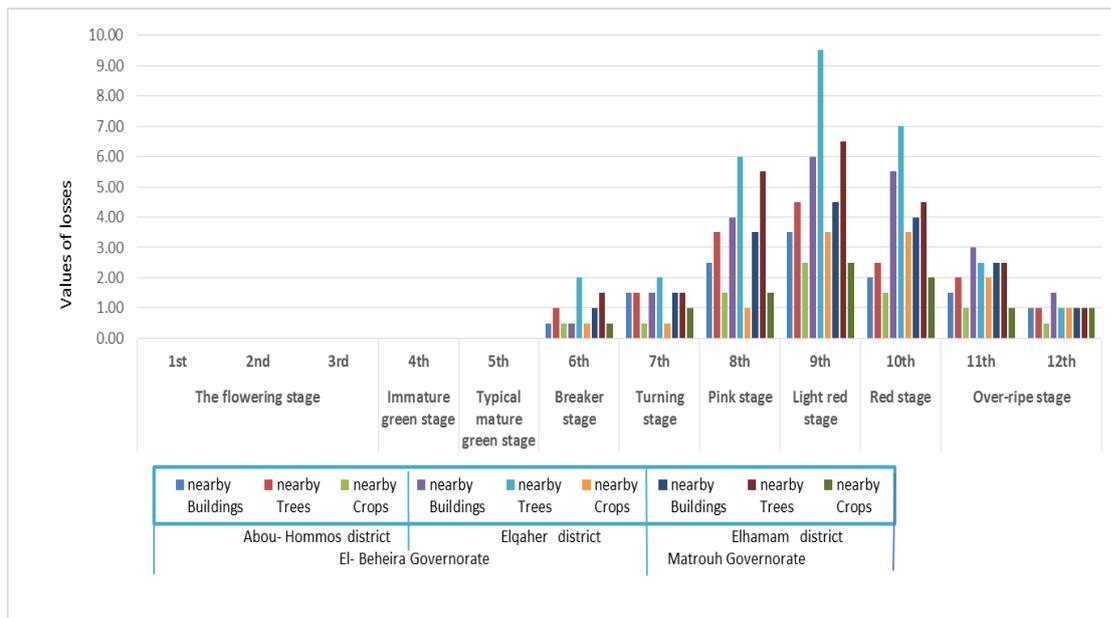


Figure 4. Damage percentages of fruits caused by some wild bird species in tomato crop in different districts nearby different habitats at El-Beheira and Matrouh Governorates.

Table 1. percentage of losses in tomato by wild bird species at El-Beheira and Matrouh Governorates.

Locations		Percentage of losses %									
		El-Beheira Governorate						Matrouh Governorate			
		Abou-Hommos District			Elqahir District			Elhamam District			
Stages of maturity		Habitats	Nearby Buildings	Nearby Trees	Nearby Crops	Nearby Buildings	Nearby Trees	Nearby Crops	Nearby Buildings	Nearby Trees	Nearby Crops
The flowering stage	1 st Week		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2 nd Week		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3 rd Week		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Immature green stage	4 th Week		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Typical mature green stage	5 th Week		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Breaker stage	6 th Week		0.50	1.00	0.50	0.50	2.00	0.50	1.00	1.50	0.50
Turning stage	7 th Week		1.50	1.50	0.50	1.50	2.00	0.50	1.50	1.50	1.00
Pink stage	8 th Week		2.50	3.50	1.50	4.00	6.00	1.00	3.50	5.50	1.50
Light red stage	9 th Week		3.50	4.50	2.50	6.00	9.50	3.50	4.50	6.50	2.50
Red stage	10 th Week		2.00	2.50	1.50	5.50	7.00	3.50	4.00	4.50	2.00
Over-ripe stage	11 th Week		1.50	2.00	1.00	3.00	2.50	2.00	2.50	2.50	1.00
	12 th Week		1.00	1.00	0.50	1.50	1.00	1.00	1.00	1.00	1.00
Mean			1.04	1.33	0.67	1.83	2.50	1.00	1.50	1.92	0.79
Total			12.50	16.00	8.00	22.00	30.00	12.00	18.00	23.00	9.50
Average				12.17			21.33			16.83	

خسائر محصول الطماطم بسبب الطيور البرية في محافظتي البحيرة ومطروح بمصر

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الملخص العربي

تسبب بعض الطيور البرية أضراراً وفقد للعديد من محاصيل الخضار مثل الطماطم، مما يجعل هذا الفقد عقبة في طريق التنمية المستدامة في مصر حيث أنه يتسبب في فقد المزارعون والدولة جزءاً من غذائها التي يعتمد عليها شعباً بدرجة كبيرة، هذا ويعتبر كل من الغراب البلدي (*Corvus cornix sardonius*) وعصفور النيل الدوري (*Passer domesticus niloticus*) من أهم الآفات الرئيسية لكثير من المحاصيل في مصر. ويهدف هذا البحث إلى تقدير الفاقد من ثمار الطماطم بسبب الطيور البرية مع تقديم بعض التوصيات لتقليل تلك الخسائر. في هذه الدراسة تم تقييم الأضرار الناجمة عن الطيور البرية على محصول الطماطم في مصر موسم النمو ٢٠٢٠ م في ثلاث مناطق وهي (منطقة أبو حمص ومنطقة القاهرة) بمحافظة البحيرة، (منطقة الحمام) بمحافظة مطروح، حيث تم دراسة تأثير ثلاث بيئات رئيسية مجاورة للحقل المنزوع بالطماطم وهي (مباني، أشجار، محاصيل حقل)، وتبين أن الطيور تهاجم محصول الطماطم خلال أطوار النضج المختلفة وهي (طور التزهير - طور الثمار الخضراء غير الناضجة - طور النضج الأخضر النام - طور بداية التلوين - طور التحول - الطور الوردي - طور النضج الأحمر الفاتح - طور النضج الأحمر - طور النضج الأحمر الزائد) وذلك على مدار اثني عشر أسبوعاً من بداية التزهير حتى نهاية الحصاد مسجلة خسائر بمتوسط قيم (١,٠٤ - ١,٣٣ % بمنطقة أبو حمص)، (١,٨٣ - ٢,٥٠ - ١,٠٠ % بمنطقة القاهرة) وذلك جوار المباني، الأشجار ومحاصيل الحقل بمحافظة البحيرة على التوالي. بينما سُجلت المتوسطات (١,٥٠ - ١,٩٢ - ٠,٧٩ % بمنطقة الحمام) محافظة مطروح جوار المباني، الأشجار ومحاصيل الحقل على التوالي. وسجلت أعلى خسارة في طور النضج الأحمر الفاتح في الأسبوع التاسع من بداية التزهير بنسبة خسارة (٥٠.٩%) جوار الأشجار بمنطقة القاهرة. وتتمثل خلاصة ذلك البحث في أن معدل الخسارة الأعلى بسبب الطيور البرية في محصول الطماطم كان في طور النضج الأحمر الفاتح في الأسبوع التاسع من بداية التزهير بنسبة خسارة (٩,٥٠%) جوار الأشجار بمنطقة القاهرة وبالتالي يمكن التوصية بجني محصول الطماطم وهو في طور النضج الوردي وترك الثمار حتى تكتمل التلوين وتجنب الوصول إلى نسبة الخسارة الأعلى.

الكلمات الإسترشادية: فقد، خسائر، طيور برية، محاصيل الخضار، الطماطم.