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Some environmentally safe methods evaluating for wheat fields protection from bird damage

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Abstract
Safe environmental methods were carried out to protect the wheat fields from bird damage during the 2023/2024 wheat season at Shiblanga, Benha district, Qalyubia Governorate. The wheat deterrent practices (scarecrows and reflecting colored plastic strips) were used. Observed results showed the damage in wheat fields used as untreated start at the second week passed of the panicles emergence (filled with wheat ears), causing 20.49 % and 14.26% damage percentage for fields nearby buildings, crops & vegetables, and nearby orchards. Also, distance (10 m.) from the border of wheat fields was considered to have the highest damage percentage than other distances (20 & 30 m.). Moreover, it completely absents during the 1st and 2nd weeks in all tested wheat fields. The house sparrow damage wheat crop was also significantly decreased by the use of these scaring tools (coloured and aluminium reflective stripes) compared with control. It was possible to determine that the aluminum reflective stripes were the most effective way to frighten birds. In these wheat fields, it is best to apply for damage control strategies against house sparrows in late February in wheat fields in these areas.

Keywords: Bird damage, wheat crop, deterrent practices

Introduction

The most damage caused by birds to wheat fields occurred within the milky and dough stages and was low within the mature stage (El-Deeb, 1991) [4]. Damage due to birds considerably differed among the different varieties of wheat and broad bean regarding their internal and external characters (Lokma, 1992) [12]. Soliman (1993) [16] showed the dough stage has a high susceptibility to bird attacks, followed by the milk stage, while the Maturity stage was the least preferable for different crops. The house sparrow is one of the most important agricultural pests in the cultivated areas in Egypt. consume many crops, especially cereal grains such as sorghum and wheat, rice, grapes, broad bean, and sunflowers (Metwally *et al.*, 1995 and Omar, 2010) [13, 14]. House sparrows cause damage to wheat crops during their ripening stages. The highest accumulative losses occurred after 36 days. The bird loses the wheat when it is most depleted at the period between 20 and 36 days after the panicles have completely emerged. The initial damage was recorded after twelve days (Khattab *et al*., 2001) [10]. (Khidr and Yacoub, 2021) [11] reported that wheat fields near by houses had the highest values of losses; whereas, wheat fields around orchards recorded the lowest values of damage**.**

Materials and methods

The study was conducted in Shiblanga area, Benha Center, Qalyubia Governorate, Egypt. The study was conducted in 2023–2024 (November to April). The predominant bird species found were the House Sparrow, *Passer domesticus*, *niloticus* Nicoll MJ; Bonhote, JJL (1909); and the Masked Crow, *Corvus corone* L. (Passeriformes: Corvidae). Damage to wheat crops by House Sparrows, was the focus of this study. We used geographic information, A wheat field (or patch) was defined as an area near orchards or buildings.
Based on a first visit to each field, it planned the date for sampling to coincide with the ripening crop in each field, when damage by House Sparrow was expected. Study sites included 1 untreated (control) and two fields' treatments in the (2023–2024) wheat season.
The selected field were divided into two divisions to assess bird damage. The first division was used as control, and the second division was used as visual deterrent practices different (Traditional scarecrows, reflecting and colored stripes, and some pictures of prey birds in the form of anthropomorphic figures) at two different heights in an attempt to reduce bird damage. To compare the different environmentally safe bird damage protection methods, the assessment study of bird damage was conducted in the treated and control fields **.**In wheat fields at the mature stage, sampling was done according to the methods adopted by poche *et al*. (1982) [15]. Twenty-five spots were chosen randomly, in each treated field and in the control, using a wooden frame (40×40). The number of infested ears was counted, and the amount of damage on each ear was scored according to Hamelink (1981) [8] by using the following equation:

$$\% \text{ Damage intensity} = \frac{i_1 \times S_1 + i_{11} \times S_2 + \ldots\ldots\ldots\ldots\ldots i_v \times S}{N} \times 100$$

i = damage incidence expressed by the number of damaged ears per severity class.
($_1$= 0; $_{11}$ = 25 %; $_{111}$ = 50 %; $_{1v}$ = 75 %; $_v$ = 100 % grain missing).
S= damage severity for each class
I= 1, 2, 3, et c.
N= total number of samples.

Statistical analysis

The obtained data were subjected to the analysis of variance. The values of L.S.D. at 0.05 were used to compare the means of treatments according to Steel and Torrie (1984) [17].

Results

The work was carried out to evaluate some environmentally safe methods to reduce bird damage in wheat fields. The damage caused by house sparrows on wheat fields nearby buildings, fields, orchards, crops, and vegetables with different distances from the border under study areas during 2023/2024.

Data in Table (1) and Fig (1&2) show the damage caused by house sparrow individuals on wheat fields nearby buildings, fields, orchards, crops and vegetables with different distances from the border in the study areas during 2023-2024. It has been observed that the highest total damage was recorded in fields nearss by buildings (20.49%) of wheat nearby buildings, crops, and vegetables, followed by fields near by orchards (14.26%). On the other hand, the results revealed the highest mean percentage of damage caused by sparrow house was in 10 m. (12.125 and 6.938 %), while the least damage was in 30 m. distance for wheat fields nearby buildings, crops & vegetables, and fields near by orchards, respectively. Also, the house sparrow damage to wheat was decreased gradually from 10 m. towards the middle of the field, till to 30m from the side of the distance were (12.125, 2.0125, and 1.275 %) and (6.938, 2.363, and 1.4 %), for 10, 20, and 30 m, for wheat fields nearby buildings, crops & vegetables, and fields nearby orchards, respectively.

Table 1: Damage percentage of House Sparrow with different distance on untreated wheat crop at Shiblanga, Benha district, Qalyubia Governorate during 2023/2024 season

Treatments	Distance (m)	Degree of damage %					
		0.25	0.5	0.75	100	Total damage	Mean
Fields nearby buildings, crops and vegetables	10 m	9.5 a	16 a	15 a	8 a	48.5 a	12.125 a
	20 m	3. 25 b	3 e	1.8 d	0 c	8.05 e	2.0125 d
	30 m	2.25 b	2.1 e	0.75 d	0 c	5.1 f	1.275 d
	Mean	5 ab	6.97 c	5.85 b	2.67 b	20.49 c	5.1375 b
Fields nearby orchards	10 m	11 a	8.5 b	5.25 b	3 b	27.75 b	6.938 b
	20 m	3 b	3. 5 e	1.95 d	1 c	9.45 e	2.363 d
	30 m	2. 5 b	1.6 e	1.5 d	0 c	5.6 f	1.4 d
	Mean	5.5 ab	4.53 d	2.9 c	1.33 c	14.26 d	3.565 c
L.S.D.$_{0.05}$	-	1.624	2.179	2.619	1.78	10.37	2.516

Total No. of untreated examined plants =500

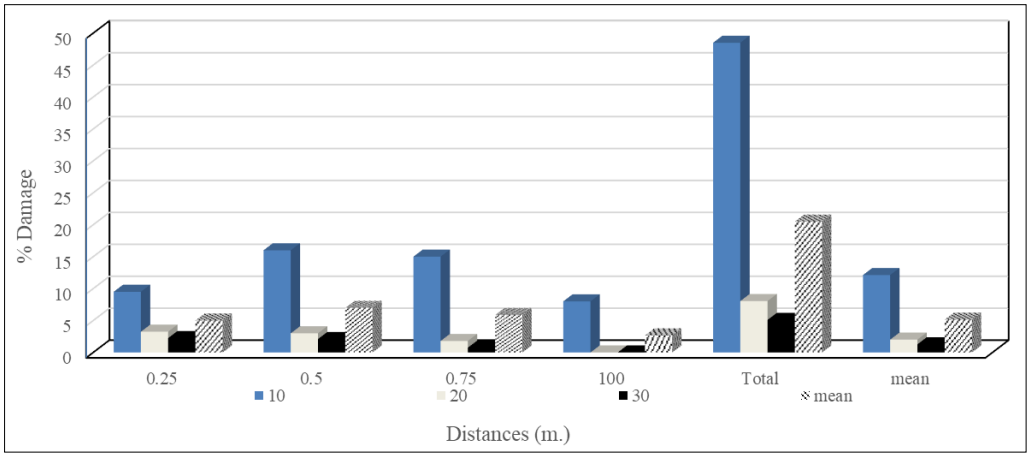

Fig 1: Untreated wheat fields nearby buildings, crops and vegetables

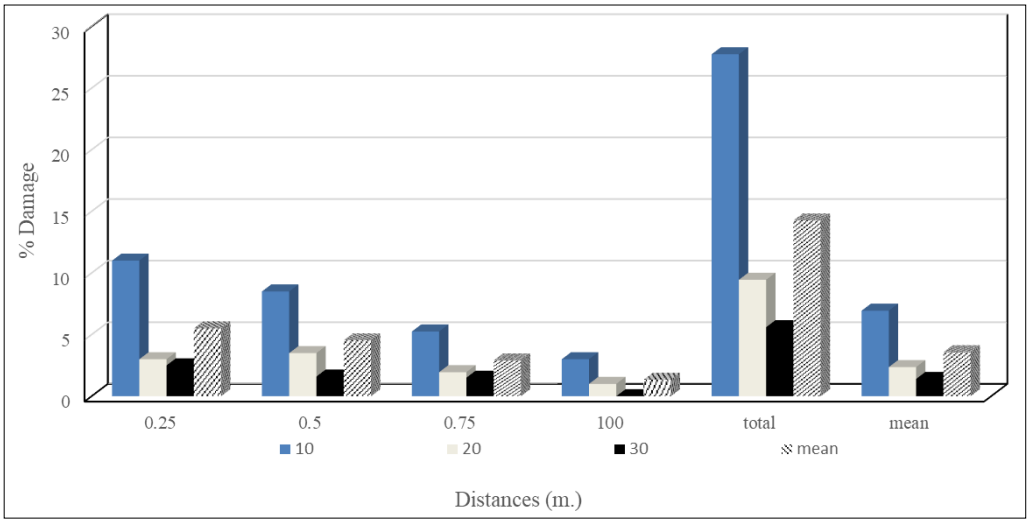

Fig 2: Untreated wheat fields nearby orchards

Data in Tables (2 & 3) & Fig (3, 4 & 5, 6) showed that the mean percentage of sparrow damage in wheat fields using visual bird deterrent practices (traditional scarecrows, reflecting stripes) reached 4.8 & 3.937 %, total damage for wheat fields nearby buildings, crops & vegetables and fields nearby orchards, respectively. While, the mean damage percentage of sparrow in wheat fields using traditional scarecrows, colored stripes reached 6.7 & 4.484 %, for wheat fields nearby buildings, crops & vegetables and fields nearby orchards, respectively.

Table 2: Damage percentage of House Sparrow with different distance on wheat crop using traditional scarecrows and reflecting stripes at Shiblanga, Benha district, Qalyubia Governorate during 2023/2024 season

Treatments	Distance (m)	Degree of damage%					
		0.25	0.5	0.75	100	Total damage	Mean
Fields nearby buildings, crops and vegetables	10 m	2.4 ab	2.6 a	4.2 a	2 a	11.2 a	2.8 a
	20 m	0.25 bc	2.2 a	0.75 b	0 b	3.2 cd	0.8 bcd
	30 m	0 c	0 c	0 b	0 b	0 e	0 d
	Mean	0.88 bc	1.6 ab	1.65 b	0.67 b	4.8 c	1.2 bc
Fields nearby orchards	10 m	3.15 a	1.6 ab	1.20 b	1.8 a	7.75 b	1.9375 ab
	20 m	1.35 abc	1 c	0.9 b	0.0 b	2.8 cd	0.7 cd
	30 m	0.8 bc	0.0 c	0.0 b	0.0 b	0.8 de	0.2 cd
	Mean	1.77 abc	0.867 bc	0.7 b	0.6 b	3.937 c	0.98425 bcd
L.S.D.$_{0.05}$	-	2.032	1.117	1.5002	0.868	2.449	1.0687

Use traditional scarecrows and reflecting stripes

Table 3: Damage percentage of House Sparrow with different distance on wheat crop using traditional scarecrows or colored stripes at Shiblanga, Benha district, Qalyubia Governorate during 2023/2024 season

Treatments	Distance (m)	Degree of damage%					
		0.25	0.5	0.75	100	Total damage	Mean
Fields nearby buildings, crops and vegetables	10 m	4.8 a	3.5 a	2.7 ab	3.2 a	14.2 a	3.55 a
	20 m	2.1 b	1.1 bc	1.2 bc	0 c	4.4 cd	1.1 bc
	30 m	1.5 b	0 c	0 c	0 c	1.5 d	0.375 c
	Mean	2.8 b	1.53 bc	1.3 bc	1.07 b	6.7 bc	1.675 bc
Fields nearby orchards	10 m	2.6 b	2.4 ab	3.45 a	0 c	8.45 b	2.1125 ab
	20 m	1.6 b	1.7 bc	0 c	0 c	3.3 cd	0.825 bc
	30 m	1.4 b	0 c	0 c	0 c	1.4 d	0.35 c
	Mean	1.867 b	1.367 bc	1.25 bc	0 c	4.484 cd	1.121 bc
L.S.D.$_{0.05}$	-	1.368	1.619	2.029	0.612	3.407	1.5012

Use Traditional scarecrows or colored stripes

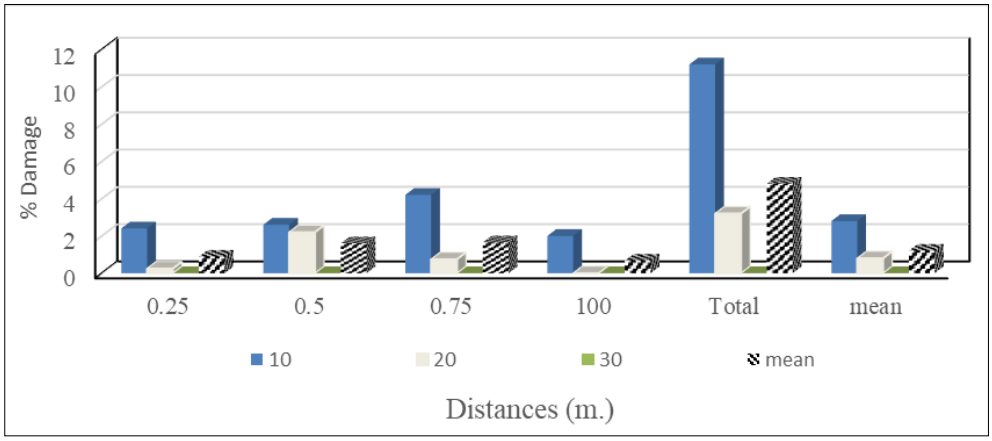

Fig 3: Treated wheat fields nearby buildings, crops & vegetables use traditional scarecrows & reflecting strips

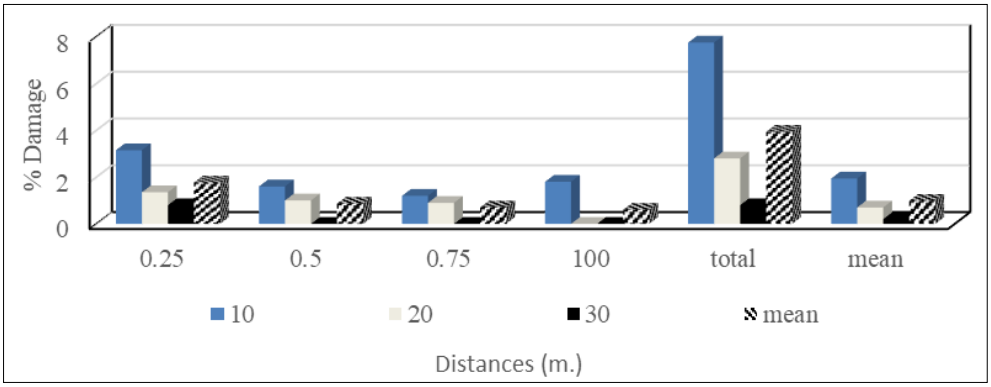

Fig 4: Treated wheat fields nearby orchards use traditional scarecrows & reflecting strips

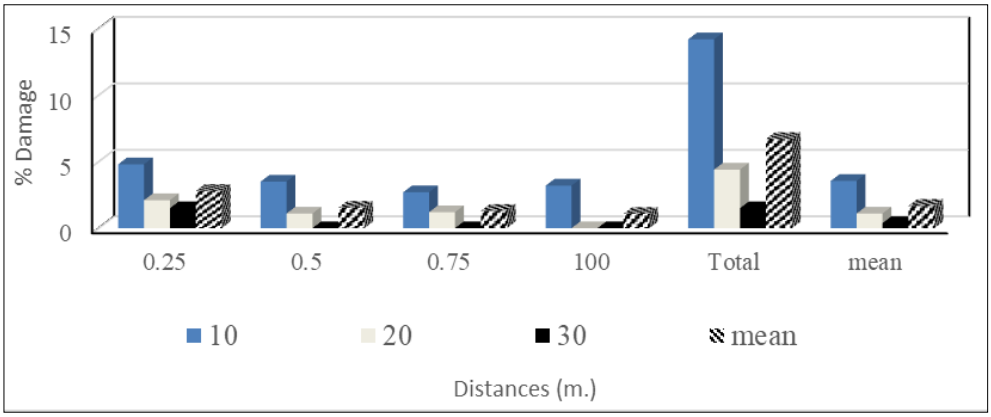

Fig 5: Treated wheat fields nearby buildings, crops & vegetables use traditional scarecrows & colored strips

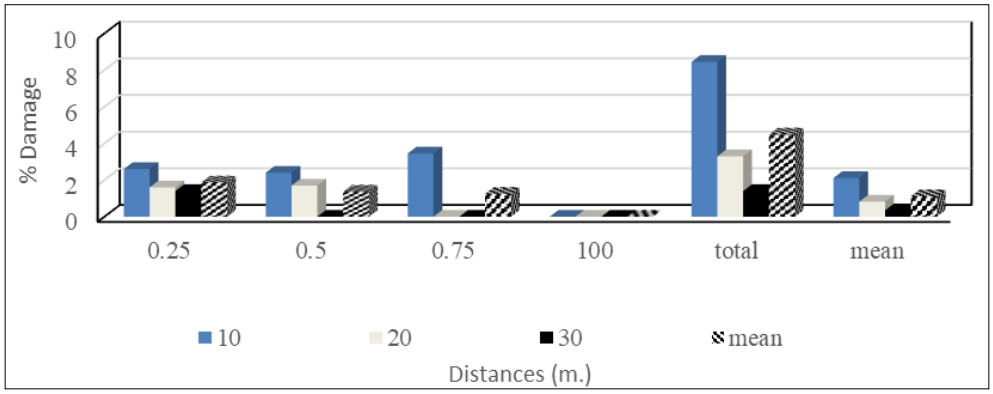

Fig 6: Treated wheat fields nearby orchards use traditional scarecrows & colored strips

Addition to Data of Tables (4, 5 & 6) & Fig (7 ,8 & 9) that highlighted the high losses caused by House Sparrow in untreated wheat fields recorded during 4th and 5th weeks (10.8 &11.2 %) followed by (6.8 & 7.5 %) in fields nearby buildings, crops & vegetables and fields nearby orchards, respectively. Also, recorded during 6th and 7th weeks (3.15 & 2.85%) followed by 5th & 6th weeks (2.2 & 2.45 %) as in Table (5) in treated fields with traditional scarecrows and reflecting strips that nearby buildings, crops & vegetables and fields nearby orchards respectively. Moreover, the damage reach to 3.3 & 4.3% and 2.1 & 2.6% at 6th & 7th weeks for wheat fields nearby buildings, crops & vegetables and fields nearby orchards (Table 6). Meanwhile, it completely absents during the 1st and 2nd weeks in all tested wheat fields.

Table 4: Weekly damage percentages caused by House Sparrow in untreated wheat fields at Shablanga, Benha district, Qalyubia Governorate during 2023/2024 season

Weeks	% Damage			
	A	B	Total	Mean
1st	0 c	0 c	0 d	0 c
2nd	0 c	0 c	0 d	0 c
3rd	7.5 b	4.25 bc	11.75 c	3.245 bc
4th	10.8 b	6. 8 bc	17.6 bc	8.8 b
5th	11.2 b	7.5 b	18.7 b	9.35 b
6th	10.25 b	5.8 bc	16.05 bc	8.025 b
7th	8.75 b	3. 4 bc	12.15 bc	6.075 bc
Total	48.5 a	27.75 a	76.25 a	38.125 a
Mean	6.929 b	4.107 bc	10.893 c	5.4465 bc
L.S.D.0.05	6.393	4.367	3.316	5.584

A=Fields nearby buildings, crops and vegetables. B=Fields nearby orchards

Table 5: Weekly damage percentages caused by House Sparrow in wheat fields using traditional scarecrows and reflecting stripes at Shablanga, Benha district, Qalyubia Governorate during 2023/2024 season

Weeks	% Damage			
	A	B	Total	Mean
1st	0 e	0 e	0 d	0 f
2nd	0 e	0 e	0 d	0 f
3rd	1.3 de	0.25 de	1.55 c	0.775 ef
4th	1.5 cd	0.8 de	2.3 c	1.15 def
5th	2.4 bcd	2.2 b	4.6 b	2.3 bcd
6th	3.15 b	2.45 b	5.6 b	2.8 b
7th	2.85 bc	2.05 bc	4.9 b	2.45 bc
Total	11.2 a	7.75 a	18.95 a	9.45 a
Mean	1. 6 cd	1.107 cd	2.707 c	1.3535 cde
L.S.D.0.05	1.279	0.994	1.279	1.145

A: Fields nearby buildings, crops and vegetables. **B:** Fields nearby orchards.

Table 6: Weekly damage percentages caused by House Sparrow in wheat fields using traditional scarecrows or colored stripes at Shablanga, Benha district, Qalyubia Governorate during 2023/2024 season

Weeks	% Damage			
	A	B	Total	Mean
1st	0 c	0 b	0 e	0 d
2nd	0 c	0 b	0 e	0 d
3rd	1.8 bc	0.75 b	2.55 d	1.275 cd
4th	2.1 bc	1.1 b	3.2 cd	1.6 bcd
5th	2.7 bc	1.9 b	4.6 cd	2.3 bc
6th	3.3 b	2.1 b	5.4 bc	2.7 bc
7th	4.3 b	2.6 b	6.9 b	3.45 b
Total	14.2 a	8.45 a	22.65 a	11.325 a
Mean	2.029 bc	1.207 b	3.2357 cd	1.61786 bcd
L.S.D.0.05	2.916	2.859	2.139	1.896

A: Fields nearby buildings, crops and vegetables. **B:** Fields nearby orchards

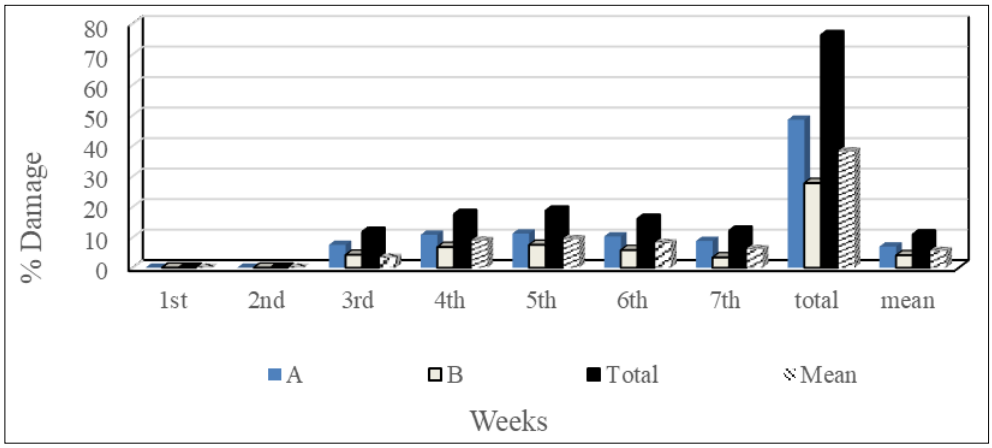

Fig 7: Untreated wheat fields nearby buildings, crops & vegetables (A) and nearby orchards (B)

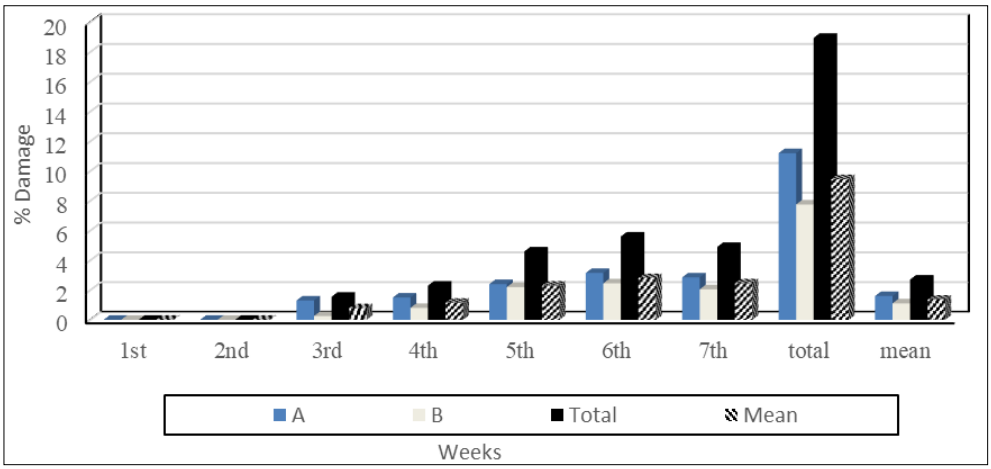

Fig 8: Treated wheat fields nearby buildings, crops & vegetables (A) and nearby orchards (B) use traditional scarecrows & reflecting strips

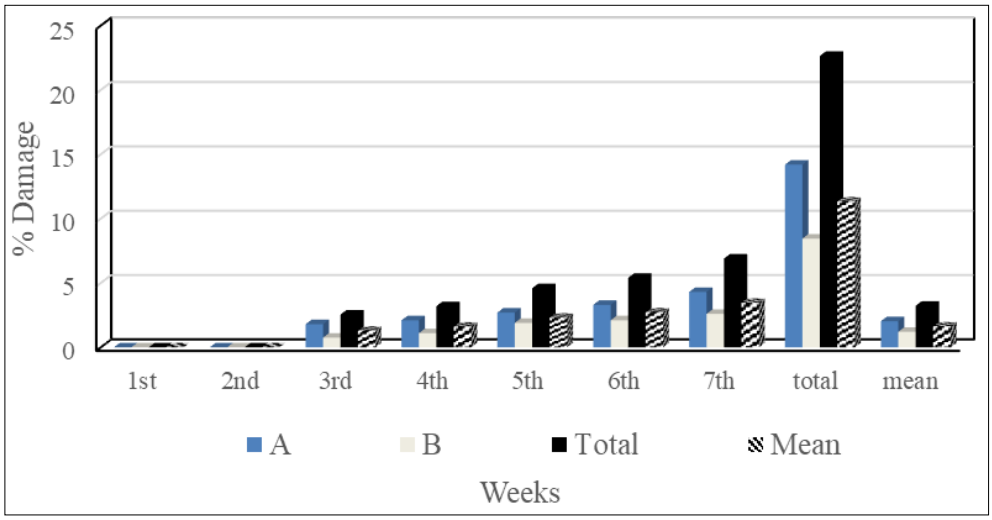

Fig 9: Treated wheat fields nearby buildings, crops & vegetables (A) and nearby orchards (B) use traditional scarecrows & colored strips

Discussion

These results are in agreement with those obtained by El-Bakoury (1981) [2] and (Khidr and Yacoub, 2021) [11] that stated the losses caused by the house sparrow was concentrated beside the field edge and low gradually towards the middle of wheat fields. Addition, Khidr and Yacoub (2021) [11] reported that wheat fields nearby houses were the highest values of losses; whereas, wheat fields around orchards recorded the lowest values of damage. Also, Metwally *et al.* (1995) [13] observed that average of bird damage to wheat varied according to the type of habitats and the highest bird losses occurred in crops nearby buildings. Tolba (1999) [18] showed that the highest damage was recorded in the first 10 meters and decreased gradually towards the field center wheat. El-Danasoury (2006) mentioned that highest total percentage of damage caused by *Passer domesticus niloticus* individuals on wheat fields nearby buildings and orchards. Kandil and Mobarak (2017) [9] stated that average damage percentages caused by sparrow to the wheat crop at El-Dakhla were 4.46% and 3.56% during the 2014 and 2015 seasons, respectively.

Worldwide, birds are considered the most destructive pests of soybean during the sprouting and seedling stages. pigeon, Columba livia Gmelin causes heavy damage in newly sown soybean fields in northeast India, due to adverse side effects of chemicals on ecosystem and protection of the *S. chinensis* by laws; use of reflective ribbons and protecting nets are very common practices to prevent the bird damage in soybean (Firake *et al.*, 2016) [6]. There was not damage in wheat due to the farmer usage of some methods to scaring birds. These findings contradict those of El-Said (2008) [5], who noted that house sparrows were to blame for the damage done to the wheat crop. House sparrow caused losses in wheat field due to the attacking birds near the building and nesting habitats of trees (Omar, 2010) [14].

Scaring is so far the tool a farmer has to deter geese from foraging on vulnerable crops. Methods of scaring such as gas cannons, flags, scarecrows, and subdivision of fields by strings on poles (Gosser *et al*., 1997) [7].

Decrease in harmfulness of best bird on rice and sorghum crops may be due to the used visual deterrent practices different used in control; balloon, ornamental stripes petition, and aluminium reflective stripes as repellant of birds. The present results are coincident with (Tolba, 2006 and Omar, 2010) [14, 19] who reported that using plastic bags, plastic net and stripes plus periodical shooting decreased sparrow damage. The North American Bluebird Society (2012) used some methods to sparrow control as regular monitoring, nest box cage traps and multi-bird trapping. The best way to control sparrow problems is by covering broken windows in upper stories with wire plastic, mesh, wood or sheet metal, to keep sparrows out of poultry houses and feeders, screen them and plug any gaps bigger than 2 cm. Ware farm buildings and houses, garages can effectively be blocked to sparrows by hanging plastic stripes (10-15 cm wide) the full-length of open doorways. To stop animals from roosting, fasten old net wraps to the upper superstructure of livestock shelters using tacks or lath pieces (Agriculture Alberta and Forestry, 2015). Scaring is often used as a tool to chase geese away from fields, either as a means to protect vulnerable crops or as part of management schemes to drive geese to accommodation areas. Scaring devices are hence, active scaring by humans is often employed (Caroline *et al.*, 2016) [1].

Conclusion

Human operated scaring techniques were shown to be the most effective methods for reducing bird populations in the field. Wild birds began attacked the wheat crop after the second week of the Panicles emergence. The dough stage recorded the highest. House sparrow damage to wheat crops was significantly reduced using these scare tools (colored lines and reflective aluminum) csompared to control. It was possible to determine that reflective aluminum lines are the most effective way to scare away birds. It is advisable to apply damage control programs against house sparrow at the late of February in wheat fields, in these areas.

References

1. Caroline ES, Jesper M, Ingunn MT, Jacob NN. Is it worthwhile scaring geese to alleviate damage to crops?–An experimental study. J. of Applied Ecology,2016:53:916–924.
2. El-Bakoury ASA. Studies on house sparrow *Passer domesticus* (L.) and its arthropodal fauna. Ph.D. Thesis, Fac. Agric., Assiut Univ. Egypt, 1981.
3. El-Dansoury. Studies on some wild bird species in Egypt. Ph. D. Thesis Faculty of Agric. Al-Azhar Univ, 2006.
4. El-Deeb HIH. Birds damage to some ripening field crops under different conditions in Egypt. Zagazig, J. Agric. Res,1991:18(3):835- 841.
5. El-Said MAA. Effect of plant density and phosphorus fertilization on some faba bean cultivars. M. Sc. Thesis faculty of agric., Assuit Univ., 2008, 87.
6. Firake DM, Bahere GT, Chandra S. An environmentally benign and cost-effective technique for reducing bird damage to sprouting soybean seeds,2016:188:74–81.
7. Gosser AL, Conover MR, Messmer TA. Managing problems caused by urban Canada geese. Berryman Institute Publication 13. Utah State University, Logan, 1997.
8. Hamelink. Assessing rat damage and yield losses in sugar cane, rice and maize. Book of rodent pests and their control. G.T.Z., A.I-III B/5, 1981.
9. Kandil RA, SA Mobarak. Impact of wild birds on agricultureat deserter claimed lands with anevaluation of some safe damage preventive methods. Egyptian Academic Journal of Biological Science, B/Zoology,2017:9(1):13-20.
10. Khattab MM, Gabr WM, Hussien SS, EL-Deeb HI. Damage chronology due to House sparrow to wheat varieties during its ripening stages under the ecosystem of newly reclaimed areas at Sharkia Governorate. Egypt. J. Appl. Sci.,2001:16(11):264-275.
11. Khidr EK, Yacoub NA. Damage in Wheat Fields Caused by The House Sparrow (*Passer domesticus niloticus* Nicoll and Bonhote, 1909) At Sharkia Governorate, Egypt. Egypt. Acad. J. Biolog. Sci.,2021:13(2):301-306.
12. Lokma HE. Per- Harvest losses due to birds in different varieties of broad bean and wheat. Zagazig J. Agric. Rec,1992:19(3):1449-1456.
13. Metwally AM, El–Deeb HH, Abd El–Aal S, Khataab MM. Birds damage to some ripening field crops under different conditions in Sharkia Governorate Al – Azhar J. Agric. Res.,1995:21:413–424.
14. Omar MMA. Studies on some wild birds in Assiut with special reference to harmful birds and its control. Ph.D. Thesis, Depart. of Agric. Zool. and Nematoda Faculty of Agric. Al-Azhar Univ, 2010.
15. Poche *et al*. Poche RM, Mian MU, Hoqie ME, Sultana P. Rodent damage and burrowing characteristics in Bangladesh wheat fields. J. Will. Manage,1982:46:139–147.
16. Soliman AM. Studies on arthropods associated with the harmful birds and their nests at Kafr El-Sheik Governorate. M.S, Thesis, Economic Entomology, Faculty of Agriculture Zagazig University. Issa *et al*. (2019) reported, in a wheat crop experiment that the house sparrow attacked the spikes of wheat with the highest percentage of damage during the 6th week when spikes emergence, 1993.
17. Steel RGD, JH Torrie. Principles and practices of statistics, 2nd Ed., McGraw Hill Co. Inc. New York, 1984, 9-107.

18. Tolba EFM. Some ecological aspects on housesparrow attacking various cropsin Assiut governorate. M.Sc. Thesis, Fac.Agric., Assiut Univ, 1999, 91-92.
19. Tolba EFM. Ecological studies on house sparrow, *Passer domesticus niloticus* (L.) and its control in Assiut governorate. Ph.D. thesis faculty of faculty of Agric., Assiut Univ, 2006.