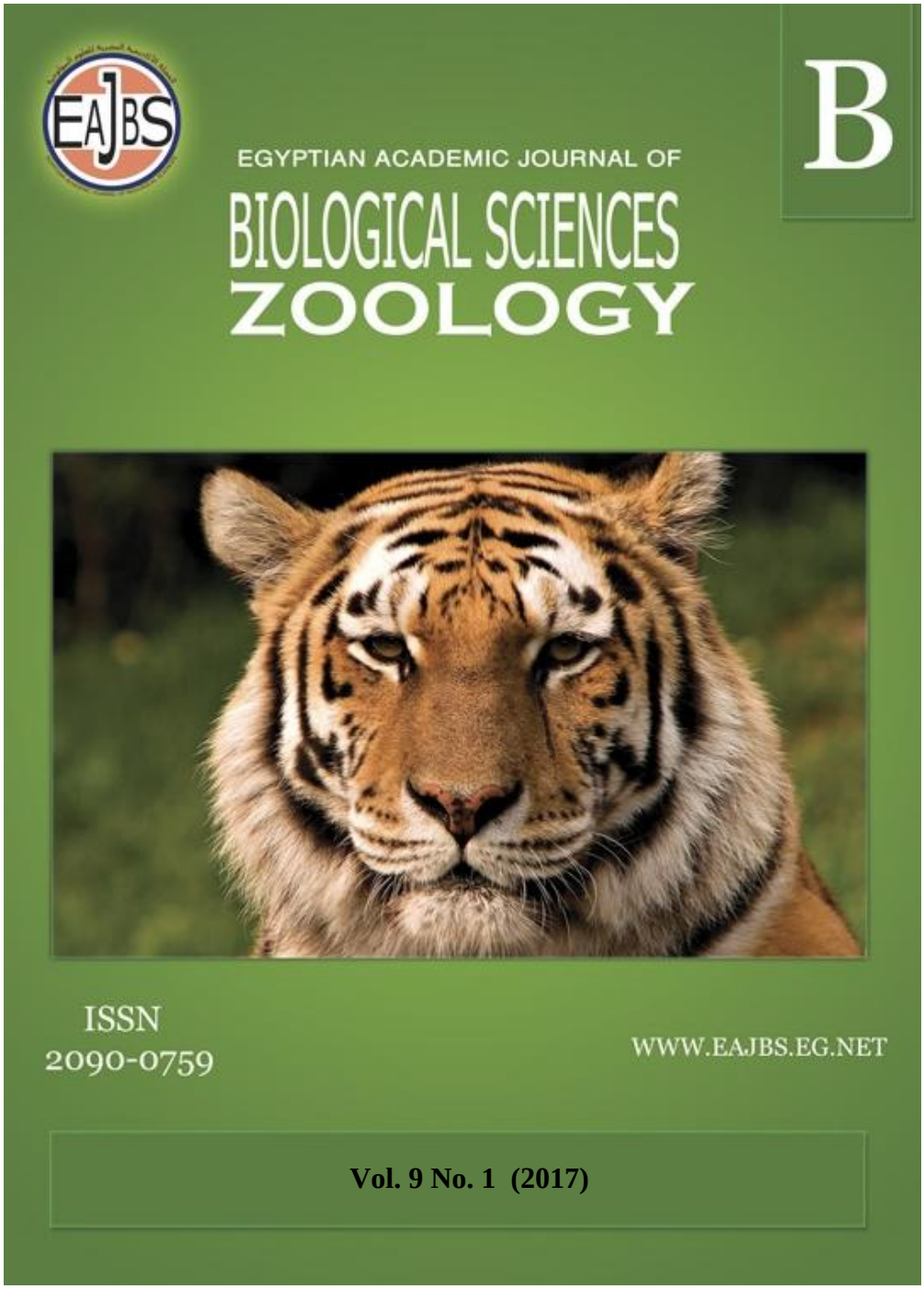

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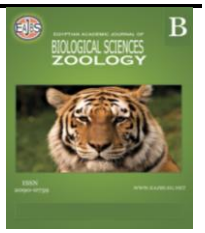

Impact of Wild Birds on Agriculture at Desert Reclaimed Lands With an Evaluation of Some Safe Damage Preventive Methods

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ABSTRACT

Survey of wild bird species was done in El-Wady El-Gadid Governorate during years 2014 and 2015. Evaluation of some environmentally safe bird damage-prevention methods were carried out in rice, sorghum and wheat fields. The survey results showed that 15 bird species "Resident (Re) and Visitor (Vi)" were recorded; *Bubulcus ibis* (Cattle egret) (Re), *Vanellus spinosus* (Spur winged lapwing) (Re), *Spilopelia senegalensis* (Laughing dove) (Re), *Streptopelia decaocto* (Eurasian collared dove) (Re), *Motacilla alba* (White wagtail) (Vi) and *Passer domesticus* (house sparrow) (Re), were found in El-Kharga, El-Dakhla and El-Farafra, *Elanus caeruleus* (Black-winged kite) (Re), *Athene noctua* (Little owl) (Re), *Gallinula chloropus* (Moorhen) (Vi), *Ardeola ralloides* (The squacco heron) (Vi), *Merops persicus* (Blue-cheeked bee-eater) (Vi), *Egretta garzetta* (Little egret) (Vi), *Himantopus himantopus* (Black-winged stilt) (Re) and *Pycnonotus goiavier* (yellow-vented bulbul) were found in El- Dakhla. While *Coturnix ypsilophora* (The brown quail) (Re) was found in El-Kharga. Results also revealed that damage in rice by the house sparrow was high in Gharb-El-Mawhob. While laughing dove caused high damage in sorghum crop, but it did not cause damage in wheat, in El-Dakhla. There was significant decrease in house sparrow damage to rice by using three methods of bird scaring methods, i.e. balloon, metallic-coloured stripes and aluminium reflective stripes at three different hights. The damage of laughing dove to sorghum crop was also significantly decreased by the use of these scaring devises at different heights compared with control. It could be concluded that the best bird environmentally scaring method was the aluminium reflective stripes, at the height of 100 cm in rice fields and at 200 cm in sorghum fields.

INTRODUCTION

In recent years, crop yields decreased in newly reclaimed lands due to various factors like poor farm maintenance and agriculture methods, which are neither economic nor environmentally sustainable. Add to that, the large number of different migratory and native bird species attacking existing agricultural crops. The survey and count of beneficial and noxious birds in St Katherine were 33 species (White *et al*., 2009). El-Sherbiny *et al.*, (1994) showed that damage impact of birds on the rice, the highest bird damage was in Giza172 and Giza 176 varieties, while the lowest damage was in Giza 171. The birds feed mostly on grains, seeds, fruits and

greenvegetables (Pornpanomchai *et al.*, 2011). El-Said (2008) and Omar (2010) recorded that damage in sorghum and sunflower crop was caused by house sparrow attack.

Wilson (1999) and Omar (2010) recorded that damage in wheat crop was caused by house sparrow. Bird species like house crow have caused more damage to wheat, while pigeons and duck cause damage to pearl millet and sunflower. A maximum loss of 52% is recorded in the maize crops due to sparrows and parrot. The minimum damage was recorded for wheat crop, which was 17%, and crows caused most of the damage, which was recorded on the site in different district in China (Yang *et al.*, 2013). Pest birds damage usually controlled using chemical compounds that cause health hazards and environmental pollution. Some methods as scarecrow and stripes used to be promising in preventing bird damage to field crops (Omar, 2010). The use of camera flash, Linux based, and ultrasound devices were methods of birds frightening in agriculture field (Maheswaran *et al.,* 2016). Scaring is often used as a tool to chase geese away from fields, either as a mean to protect vulnerable crops or as part of goose management schemes to drive geese to accommodation areas (Caroline *et al.*, 2016).

The present work aims to carry out the following:

1- Survey of wild bird species in El-Wadi El-Gadid Governorate.
2- Damage assessment of birds to rice, wheat and sorghum crops.
3- Evaluation of some environmentally safe bird damage control methods.

This study was carried out in different district of El-Wady El-Gadid Governorate.

MATERIALS AND METHODS

Survey Study:

Description of experimental area:

This work was conducted in four farms (Ten Feddans each) at four districts (El-Kharga, El-Dakhla, Gharb El-Mawhob and El-Farafra) of El-Wady El-Gadid Governorate. Field crops were rice, sorghum and wheat.

Survey and count of wild birds:

Bird survey was conducted during 2014 & 2015 seasons in the four farms for 4 days every month. Several pictures were taken every day, using 16-pixel camera, for one-hour period after sunrise and another hour before sunset, in each location. Each bird species were identified according to Thomson (1964). Number of different species was recorded in each picture within each site.

Assessment of bird damage studies:

To compare between the three environmentally safe bird damage preventive methods an assessment study of bird damages were conducted in the treated and control fields during 2014 and 2015 seasons. The rice fields were in Gharb El-Mawhob, sorghum (short stem) and wheat fields were in El-Dakhla. In rice and wheat fields at the mature stage, twenty-five spot were chosen randomly, on two diagonal lines in each treated field and in the control, using a wooden frame (30 cm in diameter). The frame was laid around rice plants, and the number of rice ears within the frame was counted. The number of infested ears was counted and the amount of damage on each ear was scored according to the following categories: no damage 0%, light damage 25%, moderate damage 50%, severe damage 75% and complete loss 100%. The mean percent damage per crop was calculated according to Hamelink (1981), using the following equation:

$$\% \text{ Damage} = \frac{\text{Mean damage percentage in treated plots}}{\text{Mean damage percentage in treated plots} + \text{Mean percentage in untreated plots}} \times 100$$

Bird Damage Preventive Methods:

Three bird damage preventive methods were evaluated: balloon network, metallic coloured stripes and aluminium reflective stripes at the newly reclaimed land of El-Wady El-Gadid (Gharb El-Mawhob) in a rice field, and in El-Dakhla in a sorghum field. Three levels of heights above ground were used for each method: 75, 100 and 125 cm for rice crop and 175, 200 and 225 cm for sorghum crop.

RESULTS

Survey of wild birds:

Data in Table (1) show the presence of 14 species of bird in the study areas. It also show the common name, the scientific name and the number of individuals recorded for each species in each area.

Table 1: Wild bird species recorded in El-Wady El-Gadid during 2014 and 2015.

Location	Common Name	Scientific Name	Resident (Re) & Visitor (Vi)	No. of Individuals
El-Kharga, El-Dakhla and El–Farafra	Cattle egret	*Bubulcus ibis*	Resident	50
	Spur winged lapwing	*Vanellus spinosus*	Resident	100
	Laughing dove	*Spilopelia senegalensis*	Resident	100
	Eurasian collared dove	*Streptopelia deacaocto*	Resident	50
	White wagtail	*Motacilla alba*	Visitor winter	5
	House sparrow	*Passer domesticus*	Resident	100
El-Dakhla	Black-winged kite	*Elanus caerruleus*	Resident	5
	Little owl	*Athene noctua*	Resident	10
	Moorhen	*Gallinula chloropus*	Visitor winter	5
	The squacco heron	*Ardeola ralloides*	Visitor fall & spring	3
	Blue-cheeked bee-eater	*Merops persicus*	Visitor summer, fall & spring	10
	Little egret	*Egretta garzetta*	Visitor summer, fall & spring	15
	Black-winged stilt	*Himantopus himantopus*	Resident &Visitor winter	10
	Yellow-vented bulbul	*Pycnonotus goiavier*	Resident	10
El-Kharga	The brown quail	*Coturnix ypsilophora*	Resident	5

Assessment of bird's damage to some crops:

Bird damage to rice, sorghum and wheat crops were caused by two bird species (the house sparrow and the laughing dove) in different districts of El-Wady El-Gadid Governorate.

Data in Table (2) show that the average damage percentages caused by house sparrow to rice crop, at Gharb El-Mawhob, was 43.09% and 33.19% during 2014 and 2015 seasons, respectively.

Table 2: Average damage percentage of house sparrow to rice, in Gharb El-Mawhob, and of laughing dove to sorghum and wheat in El-Dakhla during 2014 & 2015.

Locations and years / Crop	Gharb El-Mawhob		El-Dakhla	
	2014	2015	2014	2015
Rice	43.09	33.19	-	-
Sorghum	-	-	40.62	29.43
Wheat	-	-	4.36	3.56

The same table shows the average damage percentages caused by laughing dove to sorghum crop, at El-Dakhla, was 40.62% and 29.43% during 2014 and 2015 seasons, respectively. Moreover, it also shows the average damage percentage caused by sparrow to wheat crop, at El-Dakhla, was 4.46% and 3.56% during 2014 and 2015 seasons, respectively.

Evaluation of Mechanical Bird Damage-Preventive Methods

Data in Tables (3a & 3b) show that the percentage of sparrow's damage in rice field, using the three tested bird damage preventive methods, i.e. balloon, metallic-coloured stripes and aluminium reflective stripes at three different heights; 75, 100 and 125 cm during 2014 & 2015 seasons in Gharb El-Mawhob. The balloon caused significant decrease of damage at height 75, 100 and 125 cm compared to control, but the best height to decrease of damage was at height 100 cm. Ornamental stripes petition caused significant decrease of damage at height 75, 100 and 125 cm compared to control, while the best height to decrease of damage was at height 100 cm. Aluminium reflective stripes caused significant decrease of damage at heights 75, 100 and 125 cm compared with control, while the best height to decrease of damage was at height 100 cm . Aluminium reflective stripes caused high significant decrease of damage in rice more than the use of balloon and ornamental stripes petition.

Table 3a: Effect of three bird damage preventive methods at three different heights in rice crop during 2014.

Heights (cm) / Methods	Control	75cm	100cm	125cm	LSD
Balloon	43.09	29.01	25.42	26.53	5.99
Metallic-coloured stripes		22.25	11.85	16.17	4.76
Aluminium reflective stripes		13.73	4.84	10.58	3.70
LSD	-	5.42	4.46	4.74	-

Table 3b: Effect of three methods as control at three different heights on rice crop to scaring birds during 2015.

Heights (cm) / Methods	Control	75cm	100cm	125cm	LSD
Balloon	33.62	30.88	24.70	26.53	3.30
Ornamental stripes petition		29.85	25.24	32.57	2.68
Aluminium reflective stripes		25.20	12.63	16.62	2.94
LSD	-	3.47	2.63	2.79	-

Data in Tables (4a & 4b) showed that the percentage of laughing dove damage in sorghum field by using three methods of scaring birds i.e. balloon, ornamental stripes

petition, and aluminium reflective stripes at three different heights; 175, 200 and 225 cm, during 2014 & 2015 seasons, in El-Dakhla.

The balloon caused significant decrease of damage at height 175, 200 and 225 cm compared to control, but the best high to decrease of damage was at height 200 cm. Ornamental stripes petition caused significant decrease of damage at heights 175, 200 and 225 cm compared to control, while the best height to decrease of damage was at height 200 cm. Aluminium reflective stripes caused significant decrease of damage at height 175, 200 and 225 cm compared to control, while the best height to decrease of damage was at height 200 cm. Aluminium reflective stripes caused high significant decrease of damage sorghum more than the use of balloon and ornamental stripes petition at each height.

Table 4a: Effect of three methods as control at three different heights on sorghum crop to scaring birds during 2014.

Heights (cm) / Methods	Control	175cm	200cm	225cm	LSD
Balloon	43.15	40.18	36.77	38.77	1.91
Ornamental stripes petition		30.25	17.27	27.69	2.92
Aluminium reflective stripes		19.45	6.48	15.56	0.97
LSD	-	1.81	0.98	2.76	-

Table 4b: Effect of three methods as control at three different heights on sorghum crop to scaring birds during 2015.

Heights (cm) / Methods	Control	175cm	200cm	225cm	LSD
Balloon	40.63	35.55	33.27	33.73	2.41
Ornamental stripes petition		25.91	12.96	19.74	0.91
Aluminium reflective stripes		14.95	3.23	11.31	0.53
LSD	-	0.91	2.30	0.91	-

DISCUSSION

Our survey of wild bird species in the studied area to know kinds of wild birds and their effects on agriculture has results agree with El-Deeb *et al*. (1995) and Wilson (1999) recorded the some beneficial and noxious bird species in both old and newly reclaimed lands at Sharkia governorate. Porter and Cottridge (2001) recorded the species of birds in Egypt and Middle East and described them. El-Danasoury (2002) recorded that surveyed bird species during four years seasonally. On the other hand (El-Danasoury, 2006 and Bonnah, 2007) surveyed the hooded crow on date palm, caswarina, and Poinciana tree, on electricity wire at Shandaweel Agricultural Research Station, Sohag governorate, Upper Egypt. Bird surveys and distance sampling in St Katherine protectorate, South Sinai, Egypt in 2007 were possible by White *et al.,* (2009) who recorded 33 species, some of them were similar to the species in our study. Number of birds surveyed in St Katherine Protectorate, south Sinai, Egypt in 2006, 2007 and spring 2008 were 25 species (Matthew *et al.*, 2008). A survey of beneficial birds' species and noxious birds' species was done in farm of faculty of Agriculture, Al-Azhar University, Assiut governorate (Omar, 2010). The damage in rice and sorghum crops may be due to abundance of food to birds and dereliction of periodical control. These results agree with El-Sherbiny *et al.* (1994) who recorded that the damage of rice was due to house sparrow. Pornpanomchai *et al.* (2011) and Klosterman *et al.* (2012) stated that the sunflower damage and corn damage were due to the increase of birds which feed mostly on grains, seeds, fruit,

green vegetable of the crop plants, and grasses in North Dakota. Yang *et al.* (2013) said that the bird species like house crow caused more damage to wheat, while pigeons and duck cause damage to pectorl millet and sunflower, but loss recorded in the maize crops was due to sparrows and parrots and the damage was recorded for wheat crop by crows. Fruit loss due to birds is a long-standing and costly problem for many producers. Survey of Honeycrisp apple, blueberry, cherry, and wine grape growers in California, Michigan, New York, Oregon, and Washington was essential to estimate costs of bird damage and benefits of bird damage management (Anderson *et al*., 2013). Worldwide, birds are considered the most destructive pests of soybean during the sprouting and seedling stages. The spotted dove, *Spilopelia chinensis* (Scopoli) and occasionally feral pigeon, *Columba livia* Gmelin (Columbiformes: Columbidae) 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). There was not damage in wheat due to the farmer useage of some methods to scaring birds. These results disagree with El-Said (2008) who recorded that the damage in wheat crop was caused by house sparrow. House sparrow caused damage in wheat due to the attacking birds near the nesting habitats of trees and building (Omar, 2010).

Scaring is so far the only tool a farmer has to deter geese from foraging on vulnerable crops. Methods of scaring may include a variety of stationary devices such as scarecrows, flags, gas cannons, large farming equipment, and subdivision of fields by strings on poles (Gosser *et al.,* 1997).

Decrease in harmfulness of house sparrow and laughing dove on rice and sorghum crops may be due to the methods 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) who reported that using plastic net, plastic bags and stripes plus periodical shooting decreased sparrow damage. The North American Bluebird Society (2012) used the 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 exclusion, replacing or covering broken windows in upper stories with wire mesh, plastic, wood or sheet metal, screenkng poultry houses and feeders to completely exclude sparrows, sealing all openings larger than 2 cm (0.75 in.). Warehouses, garages and farm buildings can effectively be blocked to sparrows by hanging plastic stripes (10-15 cm wide) the full-length of open doorways. In livestock shelters, attach used net wraps with tacks or pieces of lath to the upper structures to prevent roosting (Agriculture Alberta and Forestry, 2015).

The camera, Linux based embedded board and ultrasound were methods to bid frightening in agriculture field in Matlab (Maheswaran *et al.,* 2016). 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 goose management schemes to drive geese to accommodation areas. Scaring devices are hence, active scaring by humans is often employed (Caroline *et al.,* 2016). In conclusion;

1- The best bird environmentally scaring method was aluminium reflective stripes, at the height of 100 cm in rice fields and at 200 cm in sorghum fields.
2- The mechanical method was used to reduce the use of harmful pesticides.
3- Respect of environment protection law to birds.

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ARABIC SUMMERY

تاثير الطيور البرية على الزراعة فى الاراضى الصحراوية المستصلحة مع تقييم بعض الطرق الامنة للحد من الخسائر

راندا عبد السميع قنديل – سها عبد الله مبارك
معهد بحوث وقاية النبات – مزكر البحوث الزراعية , الدقى, الجيزة, مصر.

تم حصر انواع الطيور البرية فى محافظة الوادى الجديد خلال عامى ٢٠١٤ و ٢٠١٥ . و ايضا تم تقييم بعض الطرق الامنة للحد من الخسائر التى تسببها الطيور فى حقول الارز و الذرة و القمح. و قد سجلت نتائج الحصر ١٤ نوعا من الطيور المقيمة و المهاجرة وهى ابو قردان و الزقزاق البلدى و اليمام البلدى و اليمامة المطوقة و ابو فصاد الابيض و العصفور الدورى و صقر كوهيه و بومة ابو قويق و دجاجة الماء و البلشون الذهبى و الوروار و البلشون الابيض و كرسوع ابو المغازل و السمان. و قد اظهرت النتائج ايضا خسائر عالية فى محصول الارز بسبب العصفور الدورى فى منطقة غرب الموهوب. بينما اظهرت فى منطقة الداخلة خسائر عالية فى محصول الذرة الرفيعة و لكن لا يوجد خسائر فى محصول القمح. و قد وجد نقص معنوى فى خسائر محصول الارز و محصول الذرة الرفيعة بعد استخدام ثلاث طرق امنة لاخافة الطيور على سبيل المثال البلون و شرائط الزينة العريضة الملونة و شرائح الالومنيوم العاكسة مقارنة بالكنترول على ارتفاع مختلفة. و بذلك يمكن تلخيص هذا بأن افضل الطرق المستخدمة بيئيا لاخافة الطيور هى شرائح الالومنيوم العاكسة عند ارتفاع ١٠٠سم لمحصول الارز و ٢٠٠ سم لمحصول الذرة الرفيعة.