



ASSESSMENT OF HOUSE SPARROW *PASSER DOMESTICUS* DAMAGE TO SINGLE AND DOUBLE WINTER CULTIVATIONS UNDER FIELD CONDITIONS

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ABSTRACT

The ultimate goal of this study is to find out the most suitable combinations of adjacent crops that reduce house sparrows damage. The experiments were established using single and double combinations of four wintery crops. Namely, soft wheat, hard wheat, sunflower, and barley. The double cultivations were designed by growing varying crops nearby a fixed one crop as follows 1- (soft wheat alone), (soft wheat- near sunflower), (soft wheat near – barley), and (soft wheat near – hard wheat) 2- (barley alone),(barley- near soft wheat), (barley near - hard wheat), and (barely- near sunflower) 3-(hard wheat alone),(hard wheat- near barley), (hard wheat near – sunflower), and (hard wheat near – soft wheat).

The experimental results revealed the following; the damage percentage of house sparrows to soft wheat was 25.9%, but when grown nearby sunflower, barley, and hard wheat the soft wheat damage reached 5.9%, 25.9%, and 33.3%, respectively. In single cultivation of barley, house sparrows damage was 8.2%, but when grown nearby soft wheat, hard wheat and sunflower, the barley damage reached 13.5%, 1.7% and 1.2%, respectively. Single cultivation of hard wheat house sparrows damage was 0.0%, while when grown adjacent to barley, sunflower, and soft wheat, the hard wheat damage reached 0.0%,0.0% 3.8%, respectively. In single cultivation of sunflower, house sparrows damage was 20.2%, while when grown nearby, barley, soft wheat, and hard wheat, the sunflower damage reached 9.5%, 10.2% and 36.3%, respectively.

Results obtained from this study revealed the following: 1- sunflower could be grown nearby barley and / or soft wheat, but away from hard wheat; 2- barley could be grown nearby sunflower and /or soft wheat, but away from hard wheat; 3- soft wheat could be grown nearby sunflower, but away from hard wheat; 4- hard wheat could be grown nearby barley or sunflower, but away from soft wheat. These concomitant cultivations can be successfully practiced by small growers to protect their main crops from house sparrows attack naturally and effectively without using any pest control compounds and without any extra costs as well.

Keywords: *Passer domesticus*, House sparrow, Damage, Crops, Soft wheat, Hard wheat, Barely, sunflower, Adjacent crops.

INTRODUCTION

House sparrow *Passer domesticus* is the most common and destructive bird in Egypt that causes huge damage to many standing cereal and sunflower crops (Abdel Gawad et al 2004; El-Dananory 2006; Hassan 2008; Abbasy et al 2012).

In Egypt, cereal and sunflower productivities usually is not enough for local consumption (The World Bank, 2017). Reasonably, to increase grain and sunflower yields we need to decrease crop damage by, major pests specially house sparrow in agriculture fields.

Using chemical compounds to get rid of house sparrows is not the proper solution because they have a very high reproduction rate that can fill the

same space/ fields as long as the three essentials of life and survival are still available (food, shelter and water). At the same time this action can pollute the environment producing adverse effects on biodiversity of birds, locally, regionally and on global scale (Kale et al 2012). Therefore, there is a need to develop alternative eco-friendly solutions to avoid irreversible harm to the environment. In this line, an investigation was conducted by Omar et al (2011). They concluded that, combined cultivations of sunflower and sorghum appeared to be effective in reducing damage of house sparrow. This method is economically and environmentally accepted. However, limited researches were carried out on the combined cultivations of cereal and sunflower crops (Galel 1998; Lopez et al 2011 and Olowe & Adebimpe 2009).

This study aims to assess the damage caused by house sparrows in single and combined cultivations of soft wheat, hard wheat, barley and sunflower under field conditions. In addition, to evaluate the efficiency of combined cultivations in reducing crop damage which could play an acceptable role in the integrated management of bird populations and reduce their damage to important crops in Egypt.

MATERIALS AND METHODS

1-Tested site

This study was conducted in the old land of Agricultural Experimental farm (50 Feddans) of the Faculty of Agriculture; Ain shams University, at Shalakan village, Qalubia Governorate during the winter season of 2016/2017. The experiments were established in the middle of the farm away enough (300 m at least) from bird nesting sites, human impacts, buildings and field borders. Each experiment was divided into plots (9m x 9m). Each plot treatment was divided into subplots (3m x 3m) was cultivated with one tested plant cultivar.

2- Tested plant cultivars

The designed experiments were cultivated with soft wheat (*Triticum durum* var. Sids 12), hard wheat (*Triticum turgidum* var. Beni-swafe 4) barley (*Hordeum vulgare* var. Giza126), and sunflower (*Helianthus annuus* var. Sakha 53). The commercial seeds were obtained from Seed Department of the Ministry of Agriculture, Giza Governorate.

3- Dates of crop planting and harvesting

These experiments were conducted during winter seasons in 2016/ 2017. Cereal crops were sown in Nov. of 2016 and were harvested in May of 2017. Sunflower crop was sown in Feb. 2017 and was harvested in May 2017.

4- Agricultural practices

Plant thinning, weeding, traditional irrigation, and harvesting were carried out manually according to the recommendation of the Egyptian Ministry of Agriculture.

5- Experimental design

Each two adjacent plots were cultivated with two different crops, while those of the control were cultivated with a single crop, while those of control were cultivated with single crop. Each adjacent two crops as well as their singles were a distance away from each other (about 15m). Entire single and double combinations were arranged as follows:

6- Assessment of house sparrows damage to different crops

6.1. Assessment of soft wheat damage and when cultivated adjacent to other crops.

These experiments included 4 treatments *i.e* (soft wheat nearby by sunflower), (soft wheat nearby hard wheat), (soft wheat nearby barley), and (soft wheat alone as control).

6.2. Assessment of hard wheat damage and when cultivated adjacent to other crops

These experiments included 4 treatments *i.e* (hard wheat nearby sunflower), (hard wheat nearby soft wheat), (hard wheat nearby barley), and (soft wheat alone as control).

6.3. Assessment of sunflower damage and when cultivated adjacent to other crops

These experiments included 4 treatments *i.e*. (sunflower nearby soft wheat), (sunflower nearby hard wheat), (sunflower nearby barley), and (sunflower alone as control).

6.4. Assessment of barley damage and when cultivated adjacent to other crops

These experiments included 4 treatments *i.e.* (barley nearby soft wheat), (barley nearby hard wheat), (barley nearby sunflower), and (barley alone as control).

Sampling and measurements

In each replicate (15 subplot) 150 ears or 10 heads were picked up randomly regardless of damage, height, or size. The damage was visually assessed depending on the missing grains or seeds in collected ears or heads. On the whole, 450 ears or 30 heads were taken in each. The percentages of damaged and undamaged crops were calculated according to the equation used by Tolba (1999):

$$\% \text{ Damage} = \frac{\text{No. of damaged samples}}{\text{No. of damaged} + \text{undamaged samples}} \times 100$$

RESULTS AND DISCUSSTION

Evaluation of house sparrow damage different crop

The ultimate goal of this study is to detect the most and least damaged crops, when grown in nearby fields. Therefore, several experiments were carried out to evaluate house sparrows damage to following winter crops soft wheat, hard wheat, sunflower and barely.

1.1 Assessment of soft wheat damaged by house sparrows when grown adjacent to other crop species

It is evident from **Table (1)** and **Fig. (1)** shown that, soft wheat is highly damaged by house sparrows (25.9 % damage) when grown singly. On the other hand, minimum damage occurred (5.9%) in soft wheat when grown nearby sunflower, while damage reached its minimum (33.3%) when grown nearby hard wheat, therefore it was realized that, soft wheat could be protected when planted nearby sunflower. On the contrary, it received very low protection from house sparrow damage when planted nearby barely or hard wheat.

Table 1. Percentage of crop damage caused by house sparrow to soft wheat, hard wheat, barley and sunflower under field conditions in winter season of 2017

Double combination	% Soft wheat crop damage
(soft wheat - soft wheat)	25.9%
(soft wheat - barley)	25.9%
(soft wheat - sunflower)	5.9%
(soft wheat- hard wheat)	33.3%

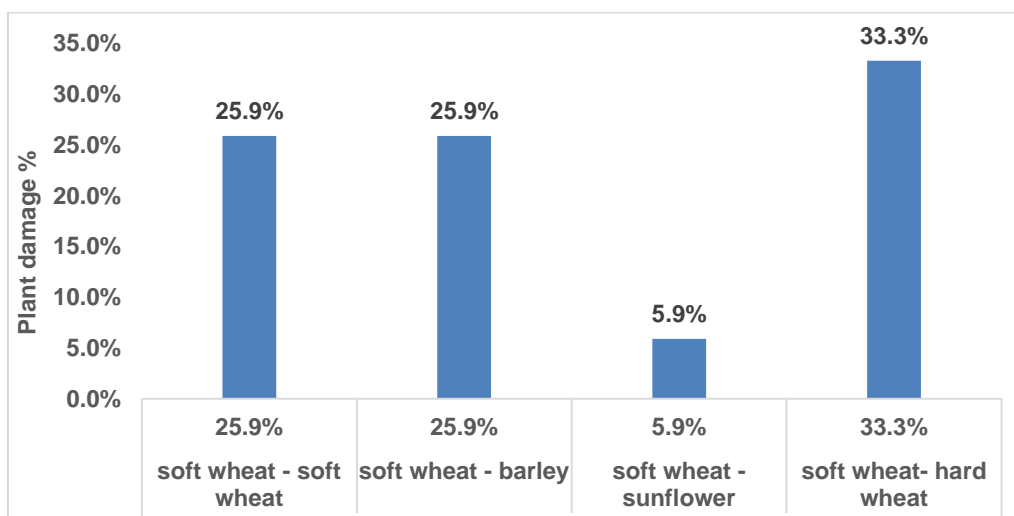


Fig. 1. Percentage of soft wheat damage caused by house sparrow when grown nearby soft wheat, barley, sunflower and hard wheat crops under field conditions in winter season of 2016 /2017.

1.2. Assessment of barley damaged by house sparrows when grown adjacent to other crops:

As shown in **Table (2)** and **Fig. (2)**, it could be noted that, barley is not a favorable crop for house sparrows since house sparrows damage recorded 8.2%. In this line, barley damage by house sparrows increased as much as 13.5% when grown nearby soft wheat and decreased as less as 1.2 % and 1.7 % when grown adjacent to sunflower and hard wheat, respectively. This result suggests that, sunflower and hard wheat could play a significant role for protecting barley crop when planted in nearby fields.

Table 2. Percentage damage caused by house sparrow to barley, soft wheat, hard wheat and sunflower under field conditions in winter season of 2017

Double combination	% barley crop damage
(barley -soft wheat)	13.5%
(barley - barley)	8.2%
(barley- sunflower)	1.2%
(barley - hard wheat)	1.7%

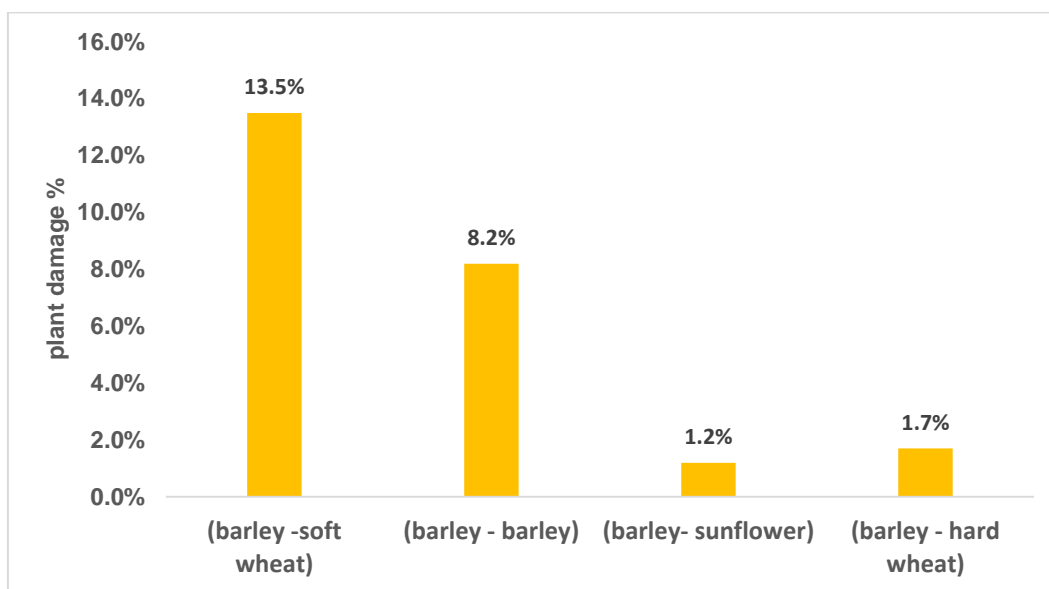


Fig. 2. Percentage of barley damage caused by house sparrow in when grown nearby soft wheat, barley, sunflower and hard wheat under field conditions in winter season of 2017.

1.3. Assessment of hard wheat damaged by house sparrows when grown adjacent to other crop

Table (3) and **Fig. (3)** present damage percentage of house sparrow to hard wheat when grown alone or nearby other tested crops. The results indicated that, hard wheat grown alone was unfavorable to house sparrows since their damage reached nil %. Moreover, hard wheat did not affected when planted nearby barley, and sunflower 0.0% damage for both. However, when planted nearby soft wheat, damage to hard wheat reached 3.8%.

Table 3. Percentage of crop damage caused by house sparrow to hard wheat, soft wheat, barley and sunflower under field conditions in winter season of 2017

Double combination	% hard wheat crop damage
(hard wheat -soft wheat)	3.8%
(hard wheat - barley)	0.0%
(Hard wheat - sunflower)	0.0%
(hard wheat- hard wheat)	0.0%

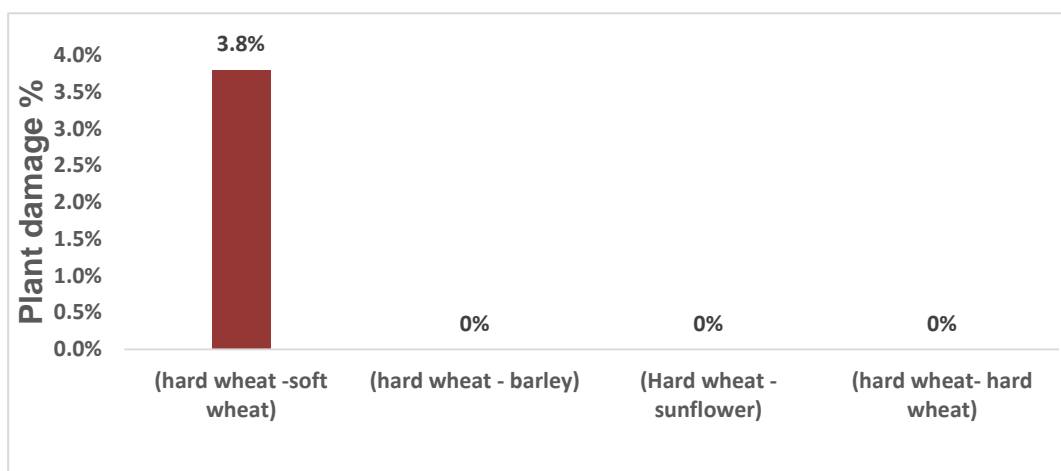


Fig. 3. Percentage of hard wheat damage caused by house sparrow when grown nearby soft wheat, barley, sunflower and hard wheat, crops under field conditions in winter season of 2017

1.4. Assessment of sunflower damage by house sparrows when grown adjacent to other crop species

When Table (4) and Fig. (4) indicated that, sunflower alone was highly damage by house sparrows with a recorded damage 20.2%. Also, it appeared that, sunflower can be affected negatively or positively by other surrounding crops. In this respect, sunflower damaged by house sparrows was depressed when combined with soft wheat and barley recorded damage of 10.2% and 9.5%, respectively. On the other hand, damage to sunflower elevated up to 36.3% when planted nearby hard wheat. Thus, sunflower could be protected when planted nearby barley and or soft wheat. On

the contrary, sunflower was greatly injured when adjacent to hard wheat.

Table 4. Percentage of crop damage caused by house sparrow to sunflower, soft wheat, hard wheat and barley under field conditions in winter season of 2017

Double combination	% sunflower crop damage
(sunflower sunflower)	20.2%
(sunflower -soft wheat)	10.2%
(sunflower- barley)	9.5%
(sunflower- hard wheat)	36.3 %

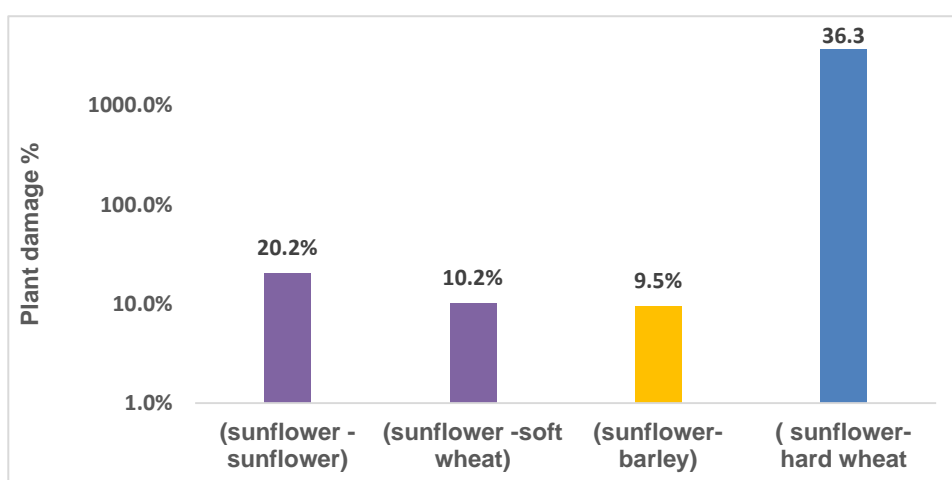


Fig. 4. Percentage of sunflower damage caused by house sparrow when grown nearby sunflower, soft wheat, barley and hard wheat crops under field conditions in winter season of 2017

As stated above, the present work supports an evidence of dual effects of concomitant cultivations on the damage of arable crops by house sparrows. Similar evidences were reported by **Lopez et al (2001)** in case of sunflower and maize; **Olowe and Adebimpe (2009)** and **Omar et al (2011)** in case of sunflower and sorghum. Phonologically, this concept is accepted when nearby crops were to be timed to coincide with the occurrence of anthesis and maturing stages i.e. sowing two different crops at different time (**Lopez et al 2001**).

The above obtained results proved that, house sparrows can switch their feeding preference to combined cultivations according to the morphological structure, the ripening stage, the size and nutritional contents of seeds/grains as well as the age and physiological demands of birds. Some workers attributed this behavior to ease of handling by birds, structure of seeds or grains, nutritional materials for breeding progeny, and proteins and fatty acids/ oil requirement for to maximize energy intake (**Schluter 1982; Diaz 1994; Schaefer et al 2003 and Hayslette & Mirarchi, 2001**).

As the subject of crop damage is considered, **El-Deep (1991), Soliman (1993) and Abbassy et al (2012)** indicated that the different monocrops of wheat, barley, broad bean, rice, and maize, exhibited a highly dough damage (5.98%) followed by milky stage (3.18%) while mature stage recorded the lowest damage (2.56%) by house sparrows. Accordingly, the accumulative damage to field crops at harvesting stage was, therefore, the highest level as recorded in the present study. However, this finding lacks the information about the surrounded cultivations. This information has been elucidated in this study.

Therefore, in order to gain a low percentage of crop damage by house sparrows and an optimum crop yield, concomitant cultivations would be recommended as follows:

- 1- Sunflower could be grown nearby barley and soft wheat, but away from hard wheat.
- 2- Barley could be grown nearby sunflower or soft wheat, but away from hard wheat.
- 3- Soft wheat could be grown nearby sunflower, but away from hard wheat.
- 4- Hard wheat could be grown nearby barley or sunflower, but away from soft wheat.

These concomitant cultivations can be successfully practiced by small growers to protect crops efficiently without any extra costs. Although, the current successful combinations showed to be promising for wider applications, yet other attempts

for other protective methods should be planted under future investigations, as well as research on different cultural practices to overcome problems of coordination between neighbor farmers.

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تقدير ضرر العصفور الدوري للمحاصيل الشتوية المنفردة والمزدوجة تحت الظروف الحقلية

[132]

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الموجز

في حالة زراعة القمح اللين المفرد كانت نسبة الضرر 25.9% ولكن في الزراعات المزدوجة كانت نسبة الضرر 5.9%، 25.9%، 33.3% عندما زرع مجاورا لدوار الشمس. والشعير والقمح الصلب علي التوالي، في حالة زراعة الشعير المفرد كانت نسبة الضرر 8.2% ولكن في الزراعات المزدوجة كانت نسبة في المحصول 13.5%، 1.7%، 1.2% عندما زرع مجاورا للقمح اللين والقمح الصلب ودوار الشمس علي التوالي، في حالة زراعة القمح الصلب المفرد كانت نسبة الضرر صفر %، ولكن وصلت نسبة الضرر صفر%، صفر %، 3.8% عندما زرع مجاورا للشعير ودوار الشمس والقمح اللين علي التوالي. في حالة زراعة دوار الشمس المفرد كانت نسبة الضرر في المحصول 20% ولكن وصلت نسبة الضرر الي 9.5%، 10.2%، 36.3% عندما زرع مجاورا للشعير والقمح اللين والقمح الصلب علي التوالي، يمكن زراعة دوار الشمس مجاورا للشعير و/أو القمح اللين ولكن بعيدا عن القمح الصلب. يمكن زراعة القمح اللين مجاورا لدوار الشمس ولكن بعيدا عن القمح الصلب. يمكن زراعة القمح اللين مجاورا للشعير و/أو دوار الشمس ولكن بعيدا عن القمح اللين.

الكلمات الدالة: العصفور الدوري، ضرر، محاصيل، القمح اللين، القمح الصلب، الشعير، دوار الشمس، المحاصيل المزدوجة

تهدف هذه الدراسة الي توعية المزارعين الي افضل الزراعات المزدوجة من المحاصيل حتي يقلل من الضرر الناتج من مهاجمة العصافير لها.

تم اجراء هذه الدراسة في الاراضي القديمة لمزرعة التجارب الحقلية (50 فدان) التابعة لكلية الزراعة بجامعة عين شمس والتي تقع في قرية شلقان- محافظة القلوبية خلال الموسم الشتوي 2107-2016. وتمت التجارب في منتصف المزرعة بعيدا عن اماكن تعشيش العصافير وبعيدا عن حواف الحقل.

تم اجراء التجارب للزراعات المنفردة والمزدوجة باستخدام اربعة محاصيل شتوية هي القمح اللين والقمح الصلب والشعير ودوار الشمس. وتم تصميم الزراعات المزدوجة باختيار محصول واحد تم زراعة مجاورا لمختلف المحاصيل الاخرى كما يلي: 1- (قمح لين مفرد للمقارنة)، (قمح لين مجاور لدوار الشمس)، (قمح لين مجاور للشعير)، (قمح لين مجاور لدوار الشمس). 2- (شعير مفرد للمقارنة)، (شعير مجاور للقمح اللين)، (شعير مجاور للقمح الصلب)، (شعير مجاور لدوار الشمس). 3- (قمح صلب مفرد للمقارنة)، (قمح صلب مجاور للشعير)، (قمح صلب مجاور لدوار الشمس)، (قمح صلب مجاور للقمح اللين). 4- (دوار الشمس منفرد للمقارنة)، (دوار الشمس مجاور للقمح اللين)، (دوار الشمس مجاور للقمح الصلب)، (دوار الشمس مجاور للشعير).