Rates and Effects of Bird Damage on Grain Yield of Oil Sunflower Seedlings

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Abstract: Damage caused by birds to agricultural areas around the world causes significant economic losses for farmers. Because of urbanization for agricultural purposes or afforestation for environmental regulation increases the natural habitat for birds, the rate of agricultural products affected by bird damage is also increasing. Especially birds are causing considerable damage to sunflower seeds. In this study, it was aimed to determine the effects of 10 different oil sunflower seedlings (Pioneer63F73, Pioneerp64LL05, Pioneer64LC108, PioneerPR64G46, Coral, Golsun, Şems, Aga1301, Duna ve Bosfora) grown under controlled and uncontrolled conditions on grain yield. It is also aimed to determine the effect of this damage on grain yield. At the end of the study; Maximum bird damage was determined as 51.19% in Pioneer 64LC108 variety, while the lowest bird damage was 9.94% and 11.7% in Bosfora and Şems varieties respectively. Bird damage as a mean of all varieties resulted in a reduction by approximately 35.1% in grain yield. It has been determined that Bosfora and Şems varieties, which are early inclined and concave of the table structure, are affected less by bird damage and yield losses are lower.

Keywords: sunflower, bird damage, variety, seed yield

Yağlık Ayçiçeği Çeşitlerinde Oluşan Kuş Zararı Miktarları ve Verime Etkileri

Öz: Dünya genelinde kuşların tarımsal alanlara vermiş olduğu zarar, çiftçiler açısından önemli ekonomik kayıplara neden olmaktadır. Tarımsal amaçlı kullanılan arazilerde şehirleşme veya çevre düzenlemesi amacıyla yapılan ağaçlandırma, kuşlara ait doğal yaşam alanlarını arttırdığı için, bu arazilerde yetiştirilen ürünlerin kuş zararından etkilenme oranını da artırmaktadır. Özellikle kuşlar, ayçiçeği yetiştiriciliği yapılan arazilerde ayçiçeği tohumuna önemli derecede zarar veren canlılardır. Bu çalışmada, kontrollü ve kontrolsüz şartlarda yetiştirilen 10 farklı yağlık ayçiçeği çeşidinde (Pioneer63F73, Pioneerp64LL05, Pioneer64LC108, PioneerPR64G46, Coral, Golsun, Şems, Aga1301, Duna ve Bosfora) kuş zararının tespiti ve bu zararın tane verimine olan etkisi belirlenmeye çalışılmıştır. Çalışma sonunda; kuş zararı en fazla %51.19'luk oranla Pioneer64LC108 çeşidinde belirlenmiş, en düşük kuş zararı ise Bosfora ve Şems çeşitlerinde sırasıyla %9.94 ve % 11.7 olmuştur. Tüm çeşitlerin ortalaması olarak kuş zararı tane veriminde yaklaşık olarak %35.1 oranında bir azalmaya neden olmuştur. Mevcut içerisinde, erkenci, tabla yapısı eğik ve iç bükey olan Bosfora ve Şems çeşitlerinin kuş zararından daha ez etkilendikleri ve verim kayıplarının daha düşük olduğu tespit edilmiştir.

Anahtar Kelimeler: *Ayçiçeği, kuş zararı, çeşit, tane verimi*

INTRODUCTION

Along with the fast growing world, people have come to a state competing with time, causing them to need much more energy in their daily life. And they provide this energy from fat, carbohydrate and protein. Among these three basic nutrients, fat is the most energy-releasing one. Herbal oil supplies approximately 90% of oil consumption of Turkey (Demirci et al., 1991). 50% of these herbal oils are obtained from sunflower because of its high rate of fat and quality of cooking oil (Kaya, 2003). Although soil structure of sunflower has the capability of adaptation to climate and ecological factors, it causes productivity loss depending on noncontinuous current output and some physical loss. Due to the decrease in the production of oil seeds, herbal oil deficit occurs in a critical ratio. In order to meet the deficit in the country, herbal oil raw materials are imported on yearly basis and cause currency loss in large quantities (Kaya, 2002).

Although there are many problems affecting the yield of sunflower cultivation, the birds are one of the most important pests that cause yield losses of land held for years in sunflower cultivation. This is because they are constantly moving in the form of large flocks, they are able to eat oily seed that can cause serious degradation. It can be said that the preference of sunflower seeds by birds is due to their easy accessibility and high nutritional value (Linz et al., 1995; Linz et al., 2011). In sunflower farming, the damage caused by birds is 38% on average. If the places in which the cultivation is done are close to settlements, woodland, forests, lakes, reeds, waterholes, this damage can increase by 50-60% on average (İlter, 1982). The herbal characteristics of the varieties in terms of the damage they give to the sunflower are also a very important factor. In this type of study with different varieties, sunflower trays standing vertically parallel to the soil and excessive concave trays were found to be less affected by bird damage (Miller, 1987). Sağlam and Önemli (2005) used Sunbred 281 variety, short and long steep top, Super-25 medium height and steep top, and Pioneer 6482 varieties with tall and inclined tops, in a study, they conducted to determine the harm that birds gave to different sunflower varieties. As a result, they found that the most damage given by the birds was to the

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Sunbred 281 range with the steep top, while the least damage occurred in the Pioneer 6482 range with the inclined top. In the 1980s oil of high-quality and efficient hybrid varieties were initiated to be developed, which would reduce bird damage the most. In these studies, species with a thick fibrous body with concave tops, high antioxidant crust, long stem and long brache leaves, more than 15 cm between the stem distance and the table and looking downward as resistant to bird damage were obtained (Gross et al., 1991).

In this study, it was aimed to determine the harmfulness of seed yield of birds and the effect of variety characteristics on bird damage by growing 10 different hybrid sunflower cultivars in Kavak district of Samsun province.

MATERIALS and METHODS

Working Area

This study was carried out on the land belonging to private property in the center of Kavak district of Samsun province in 2016. Kavak is a town located on the Samsun-Ankara highway and 51 km away from the city of Samsun. The county has a height of 600 meters from the sea and has a forested and rugged terrain. Because it is higher than sea level, continental climate is seen. The summers are warm and the winters are cold. The maximum amount of rain falls in the spring. Altitude above sea level of the experiment is 633 m. It is located between 41°04'35.0 "north latitude 36°02'51.3" east longitude and there are settlements and wooded areas around it (Anonyms, 2017).

Material

Pioneer63F73, Pioneer64LC108, PioneerP64LL05, Coral, Şems, PioneerPR64G46, Goldsun, Aga1301, Duna and Bosfora varieties were used in the experiment as a materials. Some general characteristics of the varieties are given below.

Pioneer63f73 and Coral variants; early, with high efficiency potency, high tolerance to stress conditions, can be trained in any kind of soil, table structure has oblique and convex features.

Pioneer64LC108, PioneerP64LL05 and PioneerPR64G46 variants; medium early, high tolerance to stress conditions, high yield, can grow in any kind of soil structure, table structure has oblique and convex features.

Goldsun; early, medium-sized, resistant to laying and drought, has a highly efficient and feature curved table structure.

Aga1301; medium-early, high-efficiency, resistant to stress conditions and has a semi-curved tray feature.

Dina; early, high-efficiency, resistant to drought and environmental conditions, has a slightly downward curved and convex tray feature.

Bosfora; early, high tolerance to stress conditions, high yield, can grow in any kind of soil structure and the table structure has a curved and concave feature.

Şems; very early, high-yielding, high adaptability, drought resistant, slightly tilted and concave surface.

Methods

The experiment was laid out in three replications based on the "Randomised Completed Blocks Design" (Yıldız and Bircan 1991). The distance between the rows was determined as 70 cm, and the distance over the rows was determined as 35 cm (Kara, 1986). The area of the experimental plots was 11.2 m² and 30 kg of 20-20-0 compound fertilizer was given with the plantation. Two shots were made to fight weeds. The tables were harvested when they dried and matured. After flowering 10 tray randomly selected from each plot passing through fine mesh onion bag protected from bird damage and the yield values were calculated from the plots and grain yield values damaged by the birds were obtained from the randomly selected 10 trays which were not taken precaustions against bird damage. The bird damage rate was found as a percentage of the average of these two values. A sample image of the experiment and photographs of the table damaged by the birds are given in Figure 1.

The results of the research were statistically analyzed by using the SPSS computer program and the differences between the mean values were checked by Duncan Multiple comparison test according to their significance levels (Turan, 1995).

Figure 1. Sunflower trays that are covered with a bag and damaged by birds

RESULTS and DISCUSSION

The mean values and variance analysis the results of yield loss values and loss rates caused by birds in different oil sunflower varieties are given in Table 1. According to the results obtained, statistical significance was determined at $p<0.01$ level both in control plots and among varieties such as values of grain yield determined by the damage of the birds and birds damage rates.

Table 1. The values of grain yield, bird damage grain yield and bird damage rate determined in different sunflower varieties

Oil Sunflower Varieties			Grain Yield (kg da^{-1})	Bird Damage Grain Yield (kg da^{-1})	Bird Damage Rate (%)
Coral			281.52 b	202.95 b	26.2 e
Pioneer63F73			300.95 a	178.47 c	40.7 c
PioneerP64LL05			283.33 b	164.62 e	41.9 c
Pioneer64LC108			301.43 a	147.14 f	52.0 a
Goldsun			275.71 c	163.33 e	40.8 c
Şems			245.91 e	217.19 a	11.7 f
Aga1301			275.62 c	164.52 e	40.3 c
Duna			309.05 a	169.57 d	45.1 b
Bosfora			241.43 f	217.38 a	09.9 f
PioneerPR64G46			266.57 d	180.97 c	32.1 d
Average			**278.15**	**180.61**	**34.07**
Variance Analysis		**sd**			
Significant Level	**Variety**	**9**	**	**	**
	Error	**9**			

The difference between the averages shown in different letters in the same column is significant at ** 1%

While in the control plots protected against bird damage, the highest yields were obtained from Duna, Pioneer 64LC108 and Pioneer63F73, these are followed by PioneerP64LL05, Coral, Goldsun, Aga1301 and PioneerPR64G46 in turn. At least Bosfora and Şems were obtained from varieties. While the yield of the Bosfora and Şems (217.38 and 217.19 kg) sunflower varieties exposed to bird damage was more than PioneerPR64G46, Pioneer63F73, Duna, PioneerP64LL05, Aga1301 and Goldsun varieties, (202.95, 180.97, 178.47, 169.57, 164.62, 164.52 and 163.33 kg da^{-1}), the lowest grain yield was obtained from Pioneer64LC108 (147.14 kg) type (Table 1, Figure 2). When the rate of bird damage is estimated,

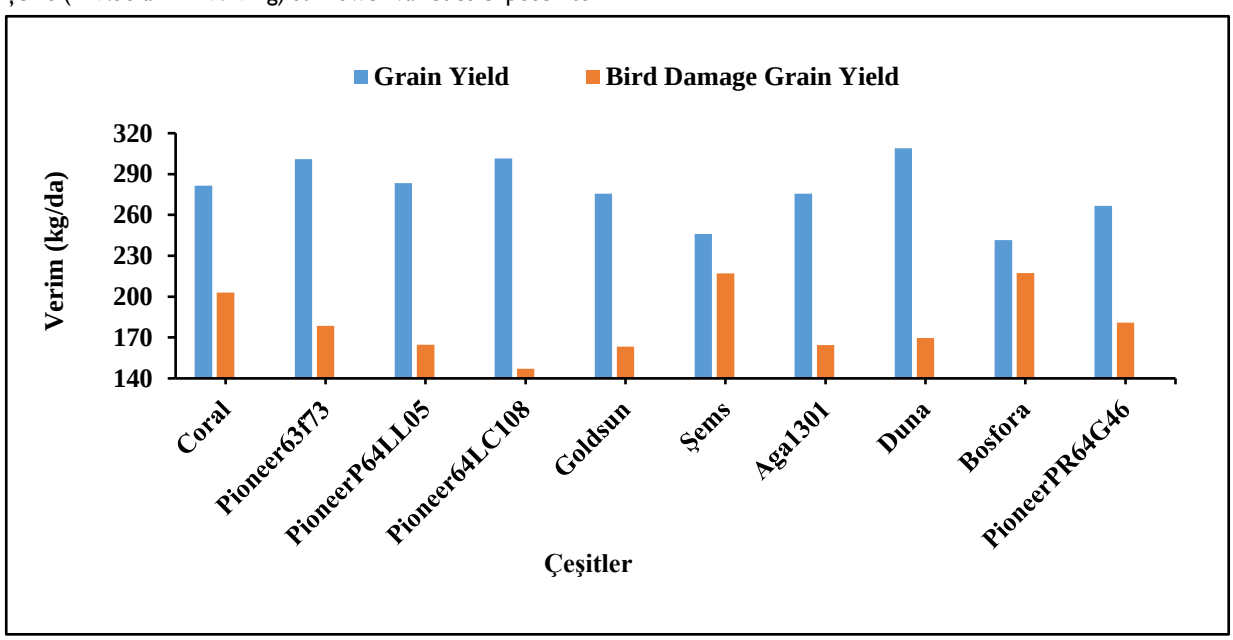

Figure 2. Average grain yield and average bird damage yield in different sunflower varieties values (kg da^{-1})

Pioneer64LC108 (52.0%) and Duna (45.1%) are the most abundant varieties. They are one of the most damage suffering varieties. Similarly, Bosfora (9.9%) and Şems (11.7%), which yielded the lowest grain yields, were the varieties which suffered form birds in terms of damage least. Herbal characteristics of the varieties are at the forefront here. The Bosfora and Şems varieties with inclined and concave tables took less damage. Sağlam and Önemli (2005) reported in a similar study that plant characteristics of varieties were more important in the

effect of bird damage on crops, especially those with sloping tablets, which were less affected. Likewise, some researchers have found that there are significant differences between varieties in terms of bird damage, and that especially oblique, concave and brachy leaves whose trays are parallel to the ground with ninety degrees angle make bird damage less (Gross et al., 1991; Çoşke and Ulukan 2005; Rauf et al., 2008). The results of research carried out earlier on the plant characteristics of varieties and the results of this research are similar. İlter (1982) found that about 50-60% of the bird damage rate was in areas with abundant forests and water, Schäckermann et al. (2014) found that the presence of long trees around the land where the sunflower cultivation was made would increase the risk of bird damage in the sunflower, so the products that birds can not feed in such places should be cultivated and the place of the fields should be planned according to the environmental conditions. It has been reported that birds grown in countries such as Australia, China, Europe, India, North America, Pakistan, Russia, South America and Ukraine, where sunflower cultivation has been made in the world, have caused great damage to sunflower fields (Linz et al., 1997). It has also been expressed that damage levels may be over 20 per cent in the places that birds are located intensely (Klosterman et al., 2011), where an average of 5% damage is an economically important threshold and can be compensated by farmers (Linz et al., 2010).

As a result, although the highest grain yield was obtained from the Duna, Pioneer64LC108 and Pioneer63F73 varieties under controlled conditions, it was observed that these varieties were severely reduced in grain yield due to bird damage in uncontrolled conditions. In the controlled conditions, the lowest grain yield was obtained from Bosfora and Şems varieties, while bird damage rates in the uncontrolled conditions of these varieties (9.9-1.7% respectively) were the least compared to the other varieties. According to these results, in order to minimize the damage of birds, it is necessary to use some physical and chemical methods as well as to select hybrid sunflower varieties having high adaptability to the region, inclined and concave tablets and it will be useful to make sunflower cultivation in the vicinity of the areas where there is no settlement and woodland as much as possible.

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