

Design, Manufacture and Test of a Solar Powered Audible Bird Scarer

Turhan Koyuncu, Fuat Lule

Abstract—The most common domestic birds live in Turkey are: crows (*Corvus corone*), pigeons (*Columba livia*), sparrows (*Passer domesticus*), starlings (*Sturnus vulgaris*) and blackbirds (*Turdus merula*). These birds give damage to the agricultural areas and make dirty the human life areas. In order to send away these birds, some different materials and methods such as chemicals, treatments, colored lights, flash and audible scarers are used. It is possible to see many studies about chemical methods in the literatures. However there is not enough works regarding audible bird scarers are reported in the literature. Therefore, a solar powered bird scarer was designed, manufactured and tested in this experimental investigation. Firstly, to understand the sensitive level of these domestic birds against to the audible scarer, many series preliminary studies were conducted. These studies showed that crows are the most resistant against to the audible bird scarer when compared with pigeons, sparrows, starlings and blackbirds. Therefore the solar powered audible bird scarer was tested on crows. The scarer was tested about one month during April-May, 2007. 18 different common known predators' sounds (voices or calls) of domestic birds from Falcon (*Falco eleonora*), Falcon (*Buteo lagopus*), Eagle (*Aquila chrysaetos*), Montagu's harrier (*Circus pygargus*) and Owl (*Glaucidium passerinum*) were selected for test of the scarer. It was seen from the results that the reaction of the birds was changed depending on the predators' sound type, camouflage of the scarer, sound quality and volume, loudspeaker play and pause periods in one application. In addition, it was also seen that the sound from Falcon (*Buteo lagopus*) was most effective on crows and the scarer was enough efficient.

Keywords—Bird damage; Audible scarer; Solar powered scarer; Predator sound.

I. INTRODUCTION

THIS most common domestic birds are crows (*Corvus corone*), pigeons (*Columba livia*), sparrows (*Passer domesticus*), starlings (*Sturnus vulgaris*) and blackbirds (*Turdus merula*) in Turkey as in many countries in the world [1, 2, 3, 4]. These birds not only give damage to the agricultural area but also make dirty the human life area. In order to protect these areas against bird damage, some studies about mechanical and chemical fighting methods have been made up to now. For instance, it was reported in the literatures

that the effect of 50% anthraquinone and 75% methiocarb, methiocarb, caffeine, garlic extract, physical barriers such as net or acrylic fibres, distress calls of birds, human bird scarer and colored lights on birds were studied [1, 2, 5, 6, 7, 8, 9]. From the results of these works, it can be said that the most effective method is the physical barriers such as nets and fibres for agricultural areas. However, the use of properly mounted and maintained nets is expensive, costing from US \$1000 to over US \$3000 per ha. [5]. Besides, there is also not enough studies are reported in the literatures for protecting the city streets against birds' dirtiness. Usually, municipalities prune the city trees (street trees) where birds roosting as in Samsun city in Turkey against domestic birds' dirtiness. Normally, this method is not preferred because of the environmental reasons. However, we could not see another alternative method or study about the effect of common predators' sounds (voices or calls) of these harmful birds in the literatures during our search. Therefore, a solar powered audible bird scarer was designed, manufactured and tested in this experimental investigation.

II. MATERIALS AND METHODS

The designed and manufactured bird scarer mainly consist of a photovoltaic (PV) panel (BP Solar SX20M and dimensions: 41.5x50 cm), dry-cell battery, converter, MP3 player, amplifier and a loudspeaker (8Ω, 30 W) (Figure 1). Photovoltaic panel converts solar beam radiation into DC electricity during the day. Battery is charged by PV panel and the electricity stored in this device. The domestic bird's predators' calls was loaded to MP3 by using a PC. The amplifier increase the signal level (predators' calls level) for loudspeaker. The working voltage of battery, amplifier and speaker is 12V, but the MP3 needs 1.5V. In order to reduce the voltage from 12 to 1.5V for MP3, a converter was used. The study was conducted in an area (about 50x50 m) where covered with full of poplar trees located in Campus of Education Faculty of Ondokuz Mayıs University, Samsun, Turkey. This area is intensively used by domestic birds for their roosts. Firstly, to understand the resistant or sensitive level of domestic birds against scarer, many series preliminary studies were made during one week. It was seen from these preliminary studies that crows are the least sensitive against bird scarer when compared with pigeons, sparrows, starlings and blackbirds. Therefore, the test of the scarer was focused on crows. The bird scarer was tested about 1 month during April-May, 2007. Tests were arranged into 4 groups. Common

T. K. Author is with the University of Ondokuz Mayıs, Faculty of Agriculture, Department of Agricultural Machinery, Samsun, Turkey (corresponding author to provide phone: +90 362 3121919; fax: +90 362 4576034; e-mail: tkoyuncu@omu.edu.tr).

F. L. Author is with the University of Ondokuz Mayıs, Faculty of Agriculture, Department of Agricultural Machinery, Samsun, Turkey (e-mail: flule@omu.edu.tr).

predators' 18 different sounds from Falcon (*Falco eleonora*), Falcon (*Buteo lagopus*), Eagle (*Aquila chrysaetos*), Montagu's harrier (*Circus pygargus*) and Owl (*Glaucidium passerinum*) of domestic birds were selected for the audible scarer. The bird number leave or not to leave from the trees during the predators' calls played throughout loudspeaker was counted to determine the effect of the scarer on the birds.

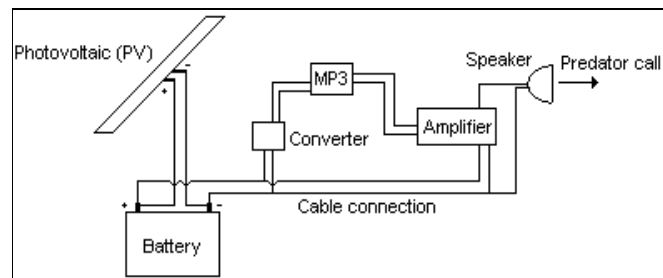


Fig. 1 Schematic presentation and components of the bird scarer.

III. RESULTS AND DISCUSSION

All tests were arranged into 4 groups to determine the most effective predator's call and speaker play and pause periods. Observations regarding these tests are given in Table 1. As

seen from this table that the most effective sound is the call from Falcon (*Buteo lagopus*) when compared with other predators and the best speaker play and pause periods are 60 second (1 minute) and 360 second (6 minute), respectively. Besides, in order to define the effectiveness of the selected call and play and pause periods, the scarer was tested 20 days as given in experiment 4, Table 1. The average number of crows roosted in trees was counted before test starting and after loudspeaker playing period for each experiment (Table 2). To see and understand the results clearly, we also arranged the results of experiments as percentage (Table 2 and Figure 2). As seen from Table 2 and Figure 2, the success of the bird scarer are increasing from experiment 1. to experiment 4. because of the selected appropriate calls and periods. In last experiment, the success reached at 100%. It can be said that this is coming from choosing the ideal predator's call, loudspeaker play and pause periods and scarer camouflage. In addition, it was also seen during tests that birds try to see the speaker when it play to be sure that it is real predator or any other artificial material before moving away. If it is possible for birds to see clearly the speaker, they prefer not to move away.

TABLE I
 TEST ARRANGEMENTS AND OBSERVATIONS

Experiment number	1	OBSERVATIONS : 1. 18 sounds were experimented. In these sounds, 6 sounds of different predators was seen more effective than others. 2. Pause period was seen short.
Experiment time (Days)	4	
Experimented sound number	18	
Speaker play period (Second)	20	
Speaker pause period (Second)	60	
Roosted crow number	50...60	
Experiment number	2	OBSERVATIONS : 1. 6 sounds were experimented. 2 sounds from Falcon (<i>Falco eleonora</i>) and Falcon (<i>Buteo lagopus</i>) was seen more effective than others. 2. Play and pause period was seen short.
Experiment time (Days)	2	
Experimented sound number	6	
Speaker play period (Second)	20	
Speaker pause period (Second)	300	
Roosted crow number	60...70	
Experiment number	3	OBSERVATIONS : 1. 2 sounds were experimented. The sound from Falcon (<i>Buteo lagopus</i>) was seen the most effective. 2. Play period was seen best but pause period was seen long.
Experiment time (Days)	4	
Experimented sound number	2	
Speaker play period (Second)	60	
Speaker pause period (Second)	600	
Roosted crow number	70...80	
Experiment number	4	OBSERVATIONS : 1. The Falcon (<i>Buteo lagopus</i>) sound was experimented. 2. It was seen that the best speaker play and pause periods are 60 second (1 minute) and 360 second (6 minute), respectively.
Experiment time (Days)	20	
Experimented sound number	1	
Speaker play period (Second)	60	
Speaker pause period (Second)	360	
Roosted crow number	60...70	

TABLE II
THE RESULTS OF EXPERIMENTS

Experiment number	1
Roosted crow number before speaker play period	50...60
Number of crows moved away after experiment	40...45
Success of the scarer (%)	77
Experiment number	2
Roosted crow number before speaker play period	60...70
Number of crows moved away after experiment	50...60
Success of the scarer (%)	85
Experiment number	3
Roosted crow number before speaker play period	70...80
Number of crows moved away after experiment	70...75
Success of the scarer (%)	96
Experiment number	4
Roosted crow number before speaker play period	60...70
Number of crows moved away after experiment	60...70
Success of the scarer (%)	100

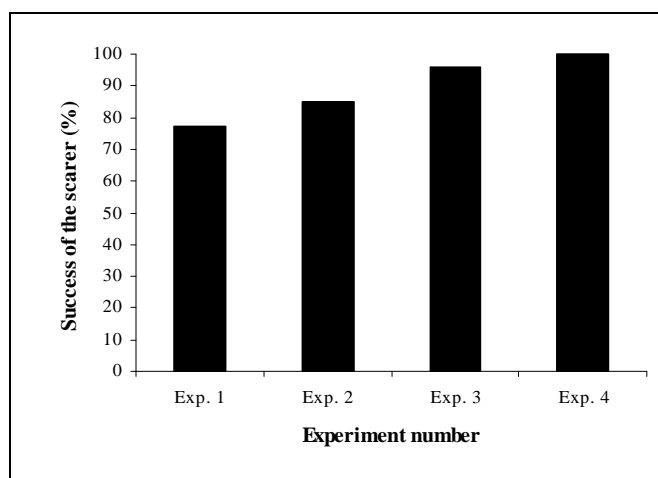


Fig. 2 The success of the scarer depends on experiments.

IV. CONCLUSION

1. In 18 sounds, the sound from Falcon (*Buteo lagopus*) was seen most effective.
2. Best periods of loudspeaker was seen 1 min play 6 min pause.
3. Camouflage of bird scarer, sound quality and volume was seen important on crows.
4. Play and pause periods of MP3 in one application was seen important on birds.
5. All crows changed their roosted places when bird scarer was playing during 20 days of experiment.
6. It is concluded that the audible bird scarer designed, manufactured and tested in this study was seen enough efficient on crows.

ACKNOWLEDGMENT

We would like to thank our students Ahmet Dilmac, Erman Ayyildiz and E. Ani Sancak for their assistance during this study.

REFERENCES

- [1] M. L. Avery, S. J. Werner, J. L. Cummings, J. S. Humphrey, M. P. Milleson, C. J. Carlson, T. M. Primus and M. J. Goodall, "Caffeine for reducing bird damage to newly seeded rice", *Crop Protection*, vol. 24, pp. 651-657, 2005.
- [2] J. R. Mason and G. Linz, "Repellency of garlic extract to European starlings", *Crop Protection*, 16 (2), pp. 107-108, 1997.
- [3] A. C. Saglam and F. Onemli, "The effects of sowing date and sowing density on birds damage in the cultivators of sunflower (*Helianthus annuus L.*)", *Journal of Tekirdag Agricultural Faculty*, 2 (1), pp. 50-57, 2005.
- [4] R. W. Summers, "The effect of scarers on the presence of starlings (*Sturnus vulgaris*) in cherry orchards", *Crop Protection* 4 (4), pp. 520-528, 1985.
- [5] R. L. Bruggers, "Ruelle, P., Efficacy of nets and fibers for protecting crops from grain-eating birds in Africa", *Crop Protection* 1 (1), pp. 55-65, 1982.
- [6] M. E. Tobin, R. A. Dolbeer and C. M. Webster, "Alternate-row treatment with the repellent methiocarb to protect cherry orchards from birds", *Crop Protection* 8 (6), pp. 461-465, 1989.
- [7] J. A. Vickery and R. W. Summers, "Cost-effectiveness of scaring brent geese *Branta b. bernicla* from fields of arable crops by a human bird scarer", *Crop Protection* 11 (5), pp. 480-484, 1992.
- [8] T. Koyuncu and F. Lule, "The Effect of An Audible Bird Scarer on the Presence of Reed Cocks (*Parphyro porphyro*) in Rice Fields", *The Journal of Agricultural Faculty of Ondokuz Mayıs University*, 23 (3), pp. 152-153, 2008.
- [9] D. L. York, J. L. Cummings, R. M. Engeman, and Jr. J. E. Davis, "Evaluation of Flight Control and Mesurol as repellents to reduce horned lark (*Eremophila alpestris*) damage to lettuce seedlings", *Crop Protection* 19, pp. 201-203, 2000.