

Design, Manufacture and Test of a Solar Powered Audible Bird Scarer and Study of Sound Ranges Used in it

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Abstract: *All around the world, domestic birds are a major threat in the field of agriculture causing damage to economic field crops, storage houses and also dirtying human life areas. Such most common pest birds in India are House crows (Corvus), Common myna, Jungle myna, Brahminy starling, White cheeked bulbul, Acridotterestris etc. In order to distract these birds away, many traditional methods such as Scarecrow models, Hawk kites, Coloured lights, Lasers, Flashes, Chemicals etc are used which nowadays do not seem very effective. An effective bird deterrent technique i.e. Solar Powered Audible Bird Scarer has been developed. Different sounds due to which different species of birds get deterred were also noticed and studied. The testing of the scarer was performed for about one month in August 2015. All major species of birds were tested but the main focus was on Crows as they are the major damage causing bird species in India. 22 common known predator sounds from Eagle (Aquila chrysaetos), Owl (Glaucidium passerinum), Falcon (Falco eleonorae) etc were tested and it was observed that the sound from Falcon was the most effective to scare away Crows as well as other species. One most important observation was that the success of the scarer mainly depends on the predator sound type, its volume, quality and its repetitive nature.*

Keywords: Audible scarer, Solar powered scarer, Predator sound, Pest birds.

1. Introduction

Bird scaring is the dispersal of birds using stimuli that makes them uncomfortable. The most common domestic birds are crows (Corvus corone), pigeons (Columba livia), sparrows (Passer domesticus), starlings (Sturnus vulgaris) and blackbirds (Turdus merula) in India as in many countries in the world (1, 2, 4, 5). 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, 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 (4, 5, 6, 7, 8). 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 quite expensive. Besides, there is also not enough studies are reported in the literatures for protecting the city streets against bird's dirtiness. When social birds are dispersed using other bird scaring methods such as loud noises they generally do not fly far away. They would normally just settle on the nearest safe perch, which might be quite close to the area where they are causing a problem. With the use of distress call bird scarers, they generally tend to move further away from the call source and the entire uncomfortable area. Natural bird distress calls played back at a natural sound level are normally not intrusive to people. Broadcasting distress calls elicits different reactions in different species of pest birds. Social and aggressive birds that communicate verbally within colonies, such as gulls and corvids will usually fly towards the source initially to see if they could mob the predator and help their kind. When the call ceases and they do not find a predator they are then unnerved or „scared“ by the possible danger and disperse. Birds that do not communicate much

verbally or do not have bills or claws to threaten predators such as pigeons or starlings will tend to stop and assess the situation, then disperse directly. The best results are likely to come from the distress call of the actual pest bird species causing the problem, though closely related species distress calls can also evoke a response. Hence it is seen that broadcasting distress calls is one of the most effective and efficient way to deter birds. Therefore, a solar powered audible bird scarer was designed, manufactured and tested in this experimental investigation.

2. Materials and Construction

The design of the scarer is as shown in its circuit diagram drawn below. The major components of the designed and manufactured scarer are 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). 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 75x75 m) where covered with full of poplar trees located in Campus of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra. This area is intensively used by domestic birds for their roosts. The test of the scarer was performed on crows, pigeons, sparrows, starlings and blackbirds etc but the major focus was on crows as they are the most damage causing bird species in India. The bird scarer was tested about 1 month during July - August 2015. Tests were arranged into 4 experiments. 22 different sounds from Falcon (Falco eleonorae), Falcon (Buteo lagopus), Eagle (Aquila chrysaetos), Montagu's

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harrier (*Circus pygargus*), Owl (*Glaucidium passerinum*) etc. of domestic birds were selected for the audible scarer. The approximate percentage of the bird number to 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.

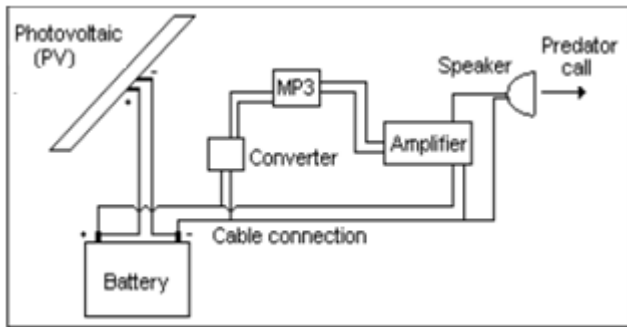


Figure 1: Schematic representation of the components of the bird scarer (5).

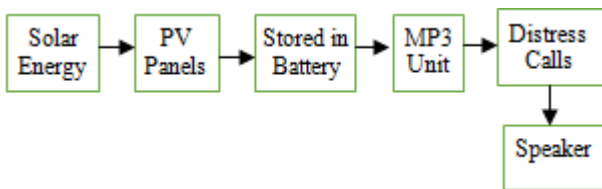


Figure 2: Simple block diagram / flow chart of the process

3. Results and Discussions

All tests were arranged into 4 groups to determine the most effective predator's call. Observations regarding these tests are given in Table 1. In the first experiment 22 different sounds were experimented for 12 days and out of those 7 sounds were found more effective than the others. In the second experiment those 7 sounds were experimented for 10 days out of which 3 were found more effective. In the third experiment, out of 3 sounds 1 sound from Falcon (*Buteolagopus*) was found the most effective when compared with other predators. Besides, in order to define the effectiveness of the selected call, the scarer was tested 05 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 and the average percentage was calculated. 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 85%. It can be said that this is coming from choosing the ideal predator's call, loudspeaker play, 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 1: Test Arrangements

Experiment Number	Experiment Time (Days)	Experimented Sound Number	Success of Scorer (%)
1	12	22	40
2	10	07	55
3	06	03	65
4	05	01	85

Table 2: Observations

Experiment Number	Observations
1	22 sounds were experimented. 7 sounds were found more effective than others.
2	7 sounds were experimented and 3 were found more effective than others.
3	3 sounds were experimented. The sound from Falcon was found most effective.
4	Sound from the Falcon (<i>Buteolagopus</i>) was tested for estimating effectiveness.

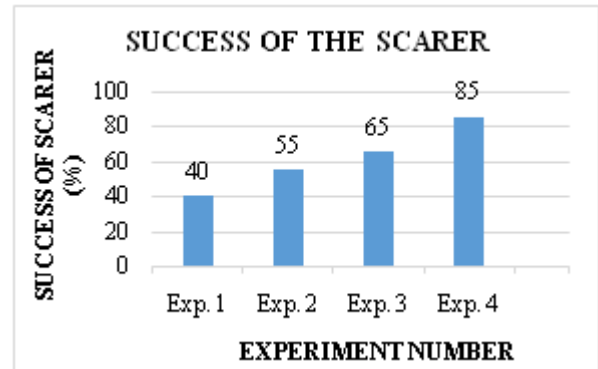


Figure 3 : Success of the scarer in different experiments

4. Major Drawback

The Solar Powered Bird Scarer seems to be very effective as observed but it has a major drawback of climatic change i.e. it performs less efficiently on a dull day. As shown in the fig. 4 below are the observations of the performance of different scarers during sunny and dull days.

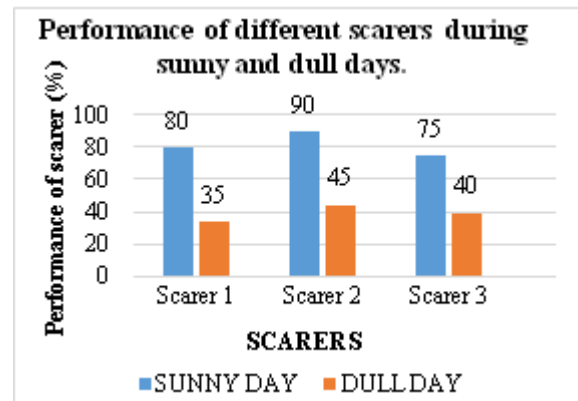


Figure 4: Performance of scarers on sunny and dull days

5. Future Scope

A combined unit operating on both solar as well as wind energy can be designed to overcome the major climatic disadvantage of the solar operated scarer. This unit will store the energy obtained through the wind turbine into the storage battery along with the solar power which can further be used in a dull climate. This type of scarer will work on both Solar as well as Wind power and hence the fluctuations in the climate make a minimal impact on the scarer's efficiency and can be called a "SOLAR CUM WIND POWERED BIRD SCARER".

6. Conclusion

- 1) Out of the 22 sounds, the sound from Falcon (Buteolagopus) was seen most effective.
- 2) Camouflage of bird scarer, sound quality and volume was seen important on crows.
- 3) All crows changed their roosted places when bird scarer was playing during 1 month of experiment.
- 4) If it is possible for the birds to clearly see the speaker, they prefer not to move (fly) away.
- 5) The performance of the scarer depends on the climatic characteristics of the day (dull or sunny).
- 6) It is concluded that the audible bird scarer designed, manufactured and tested in this study was seen enough efficient.

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