



Laser Scarecrows in Agriculture: An Innovative Solution for Bird Pests

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Abstract

Avian pests threaten global agricultural productivity by damaging crops. Traditional deterrents like scare balloons and auditory methods are ineffective due to habituation, while exclusion netting is labor-intensive and costly. Inhumane practices like avicides also pose ethical concerns. Laser bird deterrents offer a cutting-edge solution, utilizing software-powered cameras to detect bird presence and emitting a 532 nm green light to startle them away without habituation. These devices, equipped with batteries and solar panels, are portable and sustainable, suitable for multifaceted bird control strategies and potentially as standalone tools by increasing device density. Ongoing research is vital to optimize this technology, exploring daytime applications, expanding coverage and adapting devices for diverse crops and pests. Laser bird deterrents represent a promising advancement in agricultural pest management, providing an effective, humane and environmentally sustainable approach to mitigate avian damage to crops.

Keywords: Avicides, Bird pests, Laser scarecrow, Pest management

Introduction

Birds are a constant menace for farmers all around the world. Since, the beginning of crop production, agricultural crops are often susceptible to damage caused by a range of bird pests, resulting in significant economic losses. Many birds like starlings, robins, blackbirds, rose-ringed parakeets, crows, Canada geese, orioles, *etc.* inflict serious damage to the tune of around 25 to 75% in several economically important crops including maize, grapes, cherries, berries, *etc.* They can cause extensive damage by eating away the recently sown seeds, pulling out the germinating seedlings, pecking away the grains, eating the developing fruits and vegetables and even contaminate produce.

Bird pest management in farms is a tedious and expensive task. The conventional methods employed for bird control in agricultural settings like scare balloons, man-like effigies, flash tapes *etc.* are frequently inadequate in terms of effectiveness, sustainability and ethical considerations. The birds get used to them over long term usage too and

these stationary visual deterrents quickly lose effectiveness. The labour required to deploy and move the balloons or effigies on a daily basis in a large field makes these control tactics impractical for many farmers. Exclusion netting provides good control but is labor intensive and costly. Auditory deterrents are associated with social problems like noise pollution. Besides, chemical control measures like avicides are inefficient over large scale, harmful to the environment and unethical too. The advent of laser scarecrow technology has brought a promising solution to address these challenges. By utilizing laser beams of varying colours and patterns, laser scarecrow systems create an illusion of danger or physical barriers for birds, effectively deterring them from agricultural fields.

Understanding Laser Scarecrows

Vision is the primary sense for birds which is used for navigation, food finding and threat detection. The potential use of deploying laser beams to scare away birds was conceived in the 1970s, but the then concomitant safety

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risks of laser technology to human and other biota limited their adoption. Later in the 1990s, the commercialization of semi-conductor laser diodes and increasing cases of human-bird conflicts paced the research in the field of laser-mediated bird management. Laser bird deterrents; originally developed for scaring away birds from airports and industrial sites; are the latest high-tech solution which have been experimentally proved to manage bird populations in a variety of field crops, vineyards and orchards. A software powered camera continuously scans the area, detects the entry of any bird and consequentially aims a diode laser (usually 532 nm green) in a characteristics pattern to startle away the birds (Clausen *et al.*, 2019).



Figure 1: A commercial laser bird deterrent unit specifically designed for agricultural use (Source: Anonymous, 2014)

Continuous improvements in a range of technologies including LED lasers, solar panels, microprocessors and batteries have led to the development of fully automated, portable, battery-powered lasers a commercially realistic option for bird control.

Advantages

1. Humane and Ecofriendly

Laser scarecrow technology is non-toxic and non-lethal, ensuring the well-being of both birds and the ecosystem. Unlike chemical-based deterrents, laser scarecrows do not harm birds or contaminate the environment. They provide a humane approach to bird pest management, minimizing suffering while effectively deterring birds.

2. Versatile and Customizable

Laser systems can be tailored to specific bird species and targeted areas. The adaptability of laser scarecrows allows for precise control and effective deterrence, even in dynamic agricultural environments. The lasers can be adjusted to emit different patterns, intensities and colours, optimizing their effectiveness against specific bird species.

3. Cost-Effective and Efficient

Although laser scare systems may require an initial investment, they offer long-term cost savings. These systems require minimal maintenance, have no ongoing chemical costs and can cover large areas with a single device, making them highly efficient in bird pest management. Additionally, laser scarecrows can be programmed to operate automatically, reducing the need for manual intervention.

Success Stories

- In a trial conducted by the University of Rhode Island,

the installation of the laser scarecrow device reduced the damage caused by starlings and blackbirds in sweet corn field (Brown, 2017).

- The utilization of a 532 nm laser has shown promising potential in mitigating the presence of geese in agricultural areas. The study observed that geese displayed avoidance behaviors, particularly during the early and late hours of the day, with heightened responsiveness observed in overcast conditions (Clausen *et al.*, 2019).
- Laser systems have proven effective in deterring birds from vineyards by significantly interfering with bird foraging behaviour and reducing crop losses due to bird feeding and pecking. Research has shown that laser technology outperformed conventional methods like distress calls or physical barriers and has helped vineyard owners protect their grape harvest and maintain profitability (Klodd *et al.*, 2021).

Conclusion

Laser bird deterrent technology represents an innovative and highly effective solution for bird pest management in agriculture. Supported by scientific research and real-world applications, laser scarecrow systems have demonstrated their efficacy in reducing bird damage to crops, improving yields and minimizing economic losses for farmers. With its humane, environmentally friendly and cost-effective approach, laser scare technology holds tremendous potential for transforming bird pest management practices in agriculture, ensuring sustainable and productive farming operations. The major advantage of this silent technique is that the birds perceive the approaching laser as a physical danger and do not become accustomed to the laser lights instead, become afraid of them with repeated exposure. Presently, laser scarecrow devices come equipped with battery and solar panel, easily moveable and can be deployed as a sustainable and effective component of multi-tool approach of bird control. It can also be effective as a standalone tool by increasing the density of the devices. However, there is room for continuous research and improvement in this cutting-edge technology like examining daytime application, increasing coverage of the devices and evolving devices suited for a greater number of crops and other vertebrate pests.

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