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Megan Niner

Department of Biological Sciences

George M. Linz

USDA/APHIS/WS National Wildlife Research Center, george_m_linz@yahoo.com

Jeffrey Homan

USDA, Wildlife Services

Mark Clark

Department of Biological Sciences

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Open Field Test with Avipel Bird Repellent: Year I

Megan Niner¹, George Linz², Jeffery Homan², and Mark Clark¹

¹Department of Biological Sciences, NDSU, Fargo, ND 58108

²USDA, Wildlife Services, National Wildlife Research Center, Bismarck, ND 58501

Introduction

Since the mid-1900s, blackbird depredation has become an expensive problem for farmers in the Great Plains region of the United States and Canada (Blackwell et al. 2003). Damage to crops from blackbirds costs the growers of sunflower millions annually (Peer *et al.* 2003). The problem stems from two concurrent events: ripening of sunflowers and fledging of millions of resident blackbirds that must quickly prepare for migration to southern wintering grounds. Multiple methods of protecting crops exist, but none have proved to be cost-effective. For this reason and the safety of the non-target species, a chemical-based repellent might be a good option (Avery and Cummings, 2003).

9, 10 anthraquinone (AQ) was first used as a repellent of blackbirds in the 1940s. Today it is only approved for use in the USA in Flight Control, a chemical formula used to keep geese off lawns (Avery, 2002). Currently, Arkion (Arkion[®] Life Sciences LLC., 551 Mews Drive Suite J., New Castle, Delaware, 19720, USA), the patent holder, is applying for registration with the FDA for use on crops (EPA FIFRA Section 3). AQ is a secondary repellent meaning that it has no immediate effects on the birds that consume it. During digestion the birds will experience mild discomfort with vomiting in rare cases (Avery *et al.* 1997. Avery *et al.* 1998).

Avipel[®], a new repellent containing 50% AQ, has shown promising results in various laboratory studies. Wild caught blackbirds were shown to reliably discriminate between AQ-treated and untreated rice (Werner *et al.* 2009). Seeds treated with 12,220ppm AQ boasted a repellency rate of more than 80% against common grackles. In a field cage study Werner et al. (2009) examined the effectiveness of Avipel[®] after application to oilseed sunflower plots when >50% of the flowers were at the end of the flowering stage (R6). The results showed captive grackles preferred untreated sunflower seeds (Werner *et al.* 2011).

Our goal was to test the effectiveness of Avipel applied foliarly to ripening sunflower using commonly accepted agricultural methods for applying pesticides. This represented an advancement of AQ experimentation on sunflower as field-tests were conducted using free-ranging blackbird populations while avoiding inefficient application techniques such as manual spraying.

Objectives

1. Observe any clear avoidance by blackbirds on plots sprayed with AQ
2. Determine rates of damage to sunflower in treated and reference plots
3. Examine AQ residues remaining on the heads over time

Methods

In early July of 2012, three separate fields of oilseed sunflowers were divided into plots of 200ft x 300ft. Fields 1 and 3 had two pairs of plots whereas field 2 had one pair. All three fields were located on the same grower's property and within a five mile radius of each other in Section 29, Range 81W of Township 146N.

One plot of each pair was sprayed with Avipel[®] while the other was left untreated to serve as reference. The first spray took place on August 17th with a concentration of two quarts

(1.89L) of Avipel® per acre (4047m²). Since one field was not at the R6 stage of flowering, a second spray was applied on August 31st at which time, the dose of Avipel® was increased to one and a half gallons per acre (5.68L). Both sprays were applied using a CaseIH High Boy Patriot Sprayer with an electronic pulsing mechanism.

Prior to the first spray, two biologists began to conduct point counts on a daily basis. From half an hour after sunrise to three hours after, counts were performed on one pair of plots from each field. Stepladders (2m) were set up along the edge of each plot in rows created by knocking down sunflowers with an ATV. Counts were carried out for a five-minute duration following three minutes of waiting for the birds in the area to settle down. Data on all birds landing in or flying out of the field was collected on their species and their general distance within a 25m radius. Birds flushed upon the observers' arrival were recorded separately.

Basic vegetation sampling was recorded weekly. Two randomly selected square meter subplots were observed once a week for max plant height, the number of weeds, weed diversity, number of sunflower plants and canopy cover.

Damage to sunflower heads was sampled on a weekly basis. Six heads per plot were marked and examined one a week. A template with a 5 cm² grid was placed on the head and the percent of damage in each square was estimated and then added together for a total damage value.

Residue analysis was sampled by collected by harvesting randomly selected heads from each plot on the day after each spray and on the day of the harvest, 9 October. The sunflower heads were shipped to Fort Collins, CO for chemical analysis.

Results and Discussion

Point counts did not show a statistically significant difference in the number of birds using treated versus untreated fields. Of the 100 birds seen in the treated plots, 20 were blackbird species and the other 80 were non-targets. In the reference plots, 44 of the 112 birds were blackbird species and the remaining 68 were non-target species. Most of the non-target species using the fields were goldfinches, sparrows, robins, and mourning doves. These numbers do not account for birds outside of 25m of the observers and also do not include birds that flew from the plots upon the observers' arrival. Additionally, the presence of the observers prevented many birds from entering the field during counts despite the efforts taken to blend in and be silent.

Flush counts also revealed similar numbers of blackbirds in treated and untreated plots, averaging 5,672 blackbirds per plot on field two. Fields one and three were completely devoid of blackbirds upon the arrival of biologists.

Vegetation sampling data showed no significant differences between the treated and untreated plots despite some fields not growing as fast as others. Overall, the treatment control plots had similar plant diversity, abundance and canopy cover.

The 2012 season revealed several logistical problems associated with the field experiments. Drought, differential crop growth rates and bird avoidance behaviors were among the problems we experienced. We have used our experience in 2012 to modify the study design for our 2013 fieldwork.

Plans for 2013

In the 2013 field season, field enclosures will be used to directly examine the repellency of Avipel® on redwing blackbirds. Since AQ is a secondary repellent and its effects are not immediate, we understand that a naïve flock of birds will not be deterred from feeding on the plots. As such, we will focus our efforts on protecting the sunflowers from the native population's earlier predation than worry about the flocks that will pass through during migration. Additionally, if AQ can be effective when applied earlier in the season, there is a possibility of applying it with insecticides. A dual application has the added benefits of saving time, money, and water.

Experimental plots will be sprayed only once in 2013, when more than 50% of the flowers between the R5.1 and R5.3 stages, as this is the time that most insecticides are sprayed. No pesticide will be applied at this time since some have been shown to have some repellency when applied alone.

We aim to obtain two fields of similar locale around five acres in total area. These two fields will be divided in half to make two plots of 2.5 acres. One of the halves on both fields will be the treatment and the other will remain unsprayed to act as a reference.

Three cages will be set up in each plot of treated or untreated flowers. We will maintain 5 wild-caught, adult, male red-winged blackbirds in each cage. A maintenance diet of cracked corn will be provided daily in a dish. Water will be provided *ad libitum*. Both maintenance diet and water will be replenished each morning and the amount of cracked corn consumed will be measured. The study will continue until there is about 50% damage to the sunflowers in the untreated cages.

Vegetation sampling, damage assessment, and residue analysis will be carried out within each enclosure on a weekly basis in the same manner as in the 2012 season.

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