Feeding Behavior of Red-winged Blackbirds on Sunflower with Varying Levels of Repellent Coverage

Brandon A. Kaiser[1] and Page E. Klug[2]

[1]North Dakota State University, Biological Sciences Department, Fargo, ND USA; [2]USDA-APHIS-WS, National Wildlife Research Center, Fargo, ND USA

Introduction

A majority of the 1.65 million acres of sunflower planted in the United States is grown within the Prairie Pothole Region of North Dakota (Figure 1). Annual bird damage can equate to over $3.5 million in North Dakota alone (Figure 2). In localized areas damage can exceed 20% causing economic hardship for producers emphasizing the need for effective management tools to reduce bird depredation. Anthraquinone (AQ), a nonlethal secondary repellent, has been found to effectively reduce bird feeding in the laboratory, but results in the field are inconclusive. Field application is challenging because blackbirds must ingest the repellent to be effective and sunflower achenes are protected from aerial spraying by downward facing heads and disk flowers (Figures 3,4). Therefore, sunflowers require an application method (i.e. drop nozzles) that allows repellent to reach the sunflower face. No application strategy will provide 100% percent coverage, thus understanding how varying coverage impacts repellency as a function of avian foraging behavior is necessary.

Objectives

Repellent Coverage Study:
We will test efficacy of an AQ-based repellent, AV-4044, on sunflower to determine repellency that can be achieved when applied to the face of sunflower at varying percent coverages.

Foraging Behavior Study:
We will compare foraging behavior and time allocation between untreated and treated sunflower with different percent coverages of repellent.

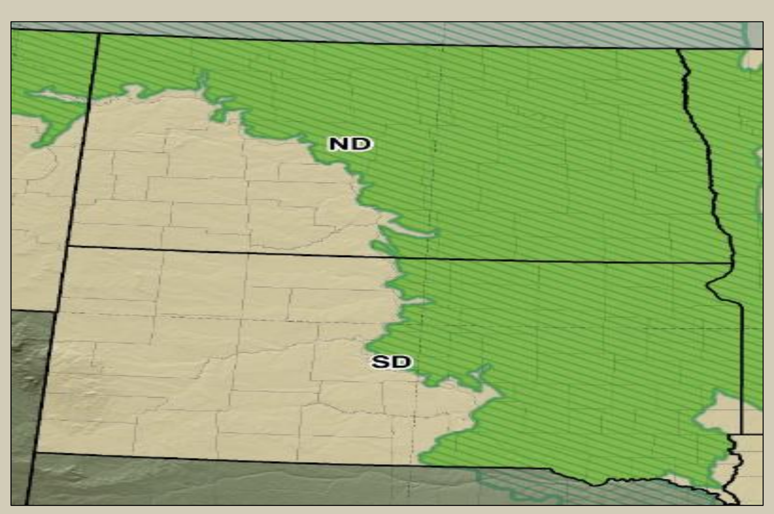

Figure 1. Prairie Pothole Region (green) of the Dakotas where a majority of sunflower is grown in the USA.
Photo credit: www.nrcs.usda.gov.

Figure 2. Blackbird flock consisting of thousands of birds foraging in a mature sunflower field.
Photo credit: USDA-APHIS-WS NWRC.

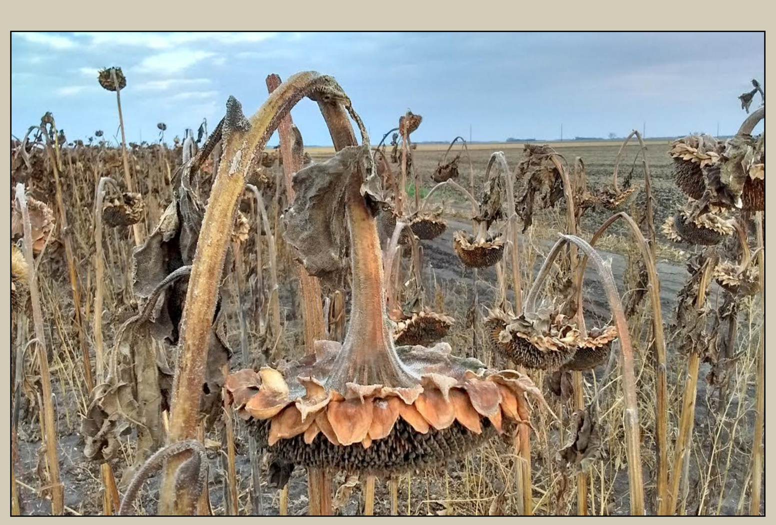

Figure 3. As sunflowers mature they begin to face downward, leaving aerially-applied chemicals to land on the back of the head.
Photo credit: USDA-APHIS-WS NWRC.

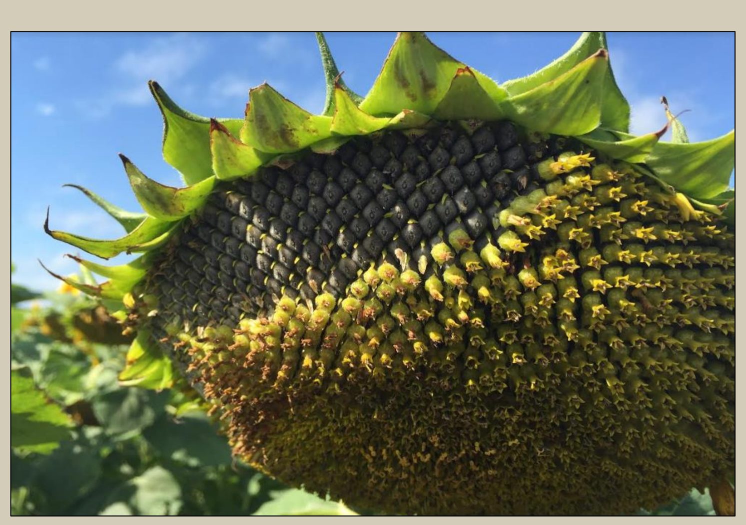

Figure 4. Sunflower achenes are protected by disk flowers which may act as a barrier for repellent application.
Photo credit: USDA-APHIS-WS NWRC.

Methods – Repellent Coverage Study

We will conduct feeding experiments at the Red River Zoo Aviary in Fargo, ND. Birds will be assigned to a treatment group of either 25%, 50%, 75% or 100% coverage of AV-4044 to the sunflower face. We will use templates to generate various repellent coverages, which will simulate potential ground application coverage (Figure 5). We will use a two-choice experimental design to test efficacy of AV-4044 on the sunflower plant. Change in mass of sunflowers will be used to determine repellency. Individual blackbirds will receive one treated and one untreated sunflower daily for three days. We will measure visual percent damage and change in mass of sunflowers to determine repellency.

Expected Results – Repellent Coverage Study

Conducting a repellency experiment on the actual sunflower will inform percent coverage needed to maintain repellency considering growth form and protective disk flowers. We expect at least 80% repellency with 100% coverage of an AQ-based repellent applied to the sunflower face and will evaluate coverage needed to maintain that level of repellency.

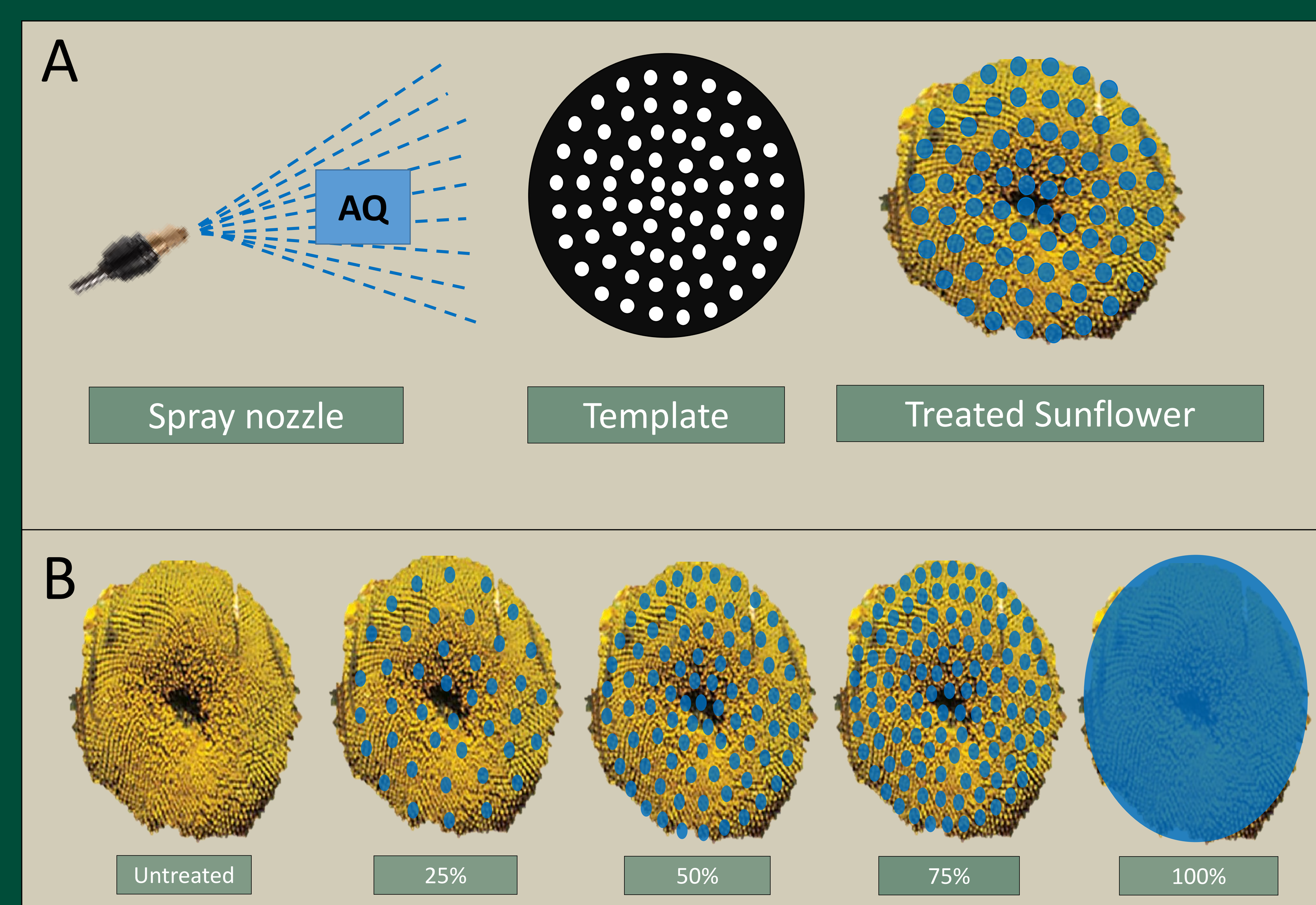

Figure 5. A) AQ will be applied from a backpack sprayer through a template for desired coverage. Templates will be unique for each treatment for precise application.
B) Repellent will be applied with consistent coverage within treatment groups.

Methods - Foraging Behavior Study

We will conduct foraging behavior observations by video-recording birds in the repellent study. Foraging activities will be scored for all four treatments (Table 1). We will use activity scores to calculate key behavior changes with and without repellent (i.e. feeding rate, pecking rate, activity proportions).

Expected Results - Foraging Behavior Study

The presence of repellent may prolong seed acquisition resulting in more search interruptions to conduct vigilance and require more time to acquire seeds. We expect to see increased vigilant scanning and decreased seed handling with increased repellent coverage. We also expect a decrease in feeding rate with increased repellent coverage resulting from more pecking attempts per seed acquisition due to the presence of treated seeds.

Table 1. Red-winged blackbird activities to be scored for behavioral analysis.

Code	Activity	Description
a	Alert behavior	Increased scanning, crouching, neck extension, or feather compression
b	Bract tearing	Pecking, tearing or manipulation of bracts, not directed at seeds
h	Handling	Processing the seed until seed hull is ejected
p	Preening	Cleaning feathers, stretching, wiping beak and head shaking
s	Searching	Time spent looking for seeds until a seed is obtained or searching has ended
v	Vigilance	Scanning the surroundings without a seed being processed

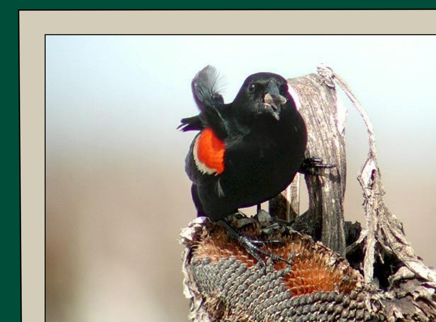

Figure 6. Male red-winged blackbird perched and feeding on a sunflower head. Blackbirds are capable of compatible handling, meaning they can process a seed while scanning for predators. Photo by Ann Cook.

Figure 7. Red-winged blackbirds search for seeds while in a head down position. Searching requires full attention and therefore birds can not simultaneously scan for predators. Photo credits: Darlene Durham.

Management Implications

Results will provide information concerning the efficacy of AV-4044 as a repellent applied to the face of sunflowers. Understanding the efficacy of varying repellent coverage on actual sunflowers informs field application strategies such as ground-based spray equipment with drop nozzles and appropriate application.

Results from the behavioral study will provide an understanding of foraging changes in red-winged blackbirds in the presence of a chemical repellent. Changes in feeding rate or successful seed acquisition rate can impact scanning rates to ultimately influence the rate of sunflower damage. Partial coverages of AV-4044 could be effective as a pest management tool paired with other management methods (i.e. physical hazing, decoy crops) as a way to manage blackbird damage.

Acknowledgements

We acknowledge the efforts of Ken Ballinger of Arkion Life Sciences, LLC for repellent contribution, Burton Johnson of NDSU Plant Sciences Department for sunflower plots, Alison Stone of Nuseed for contributing sunflower hybrid seeds, Sally Jacobson of the Red River Zoo for aviary space, Scott Werner and Shelagh Deliberto of USDA-APHIS-WS NWRC Repellent Project for consultation and capture of red-winged blackbirds for the study, Thomas Seamans of USDA-APHIS-WS NWRC Ohio Field Station and Lucas Wandrie of NDSU Biological Sciences Department for guidance on bird care, and Ned Dochtermann of NDSU Biological Sciences Department and Marion Harris of NDSU Entomology Department for project design assistance, and Jennifer Preuss and Kaitlyn Boteler of NDSU for technician assistance.