A Seed of Doubt: Assessing AQ-based Avian Repellent Residue, Coverage, and Efficacy

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Introduction

Blackbirds cause significant damage to sunflower crops in the Prairie Pothole Region. Annual damage amounts to \$3.5 million in North Dakota alone and places a burden on local producers. Chemical repellents are a candidate strategy for producers to combat bird depredation. Anthraquinone (AQ), a chemical of interest, has reduced blackbird feeding in lab studies but field results are inconclusive. Foliar application is limited by vegetative components (e.g., disk flowers) of the sunflowers. Efficacy is a result of achieving high enough AQ residues on the sunflower face to allow ingestion by the birds. We aim to evaluate the efficacy of AQ to reduce bird damage on mature sunflowers in lab-based feeding studies and field application using ground-based drop nozzles.

Methods

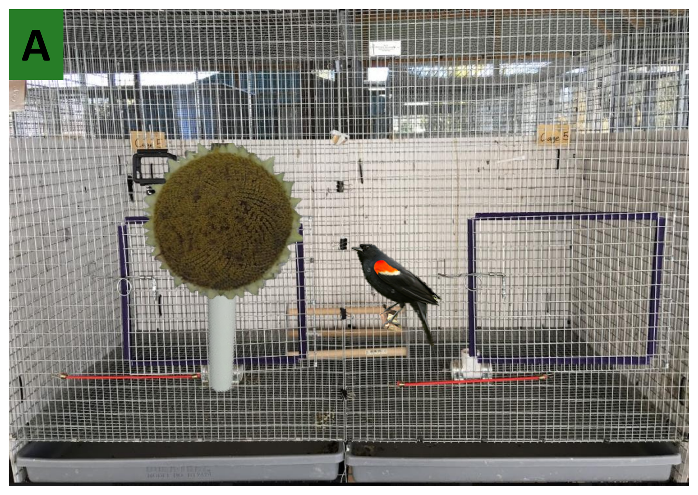


Figure 1a.
Concentration-response experiment consists of acclimation (Day 1), pretest (Days 2, 3), and test (Day 4) days where each bird is offered a single sunflower. Repellent efficacy is based on individual blackbird consumption on test day compared to pretest (control).

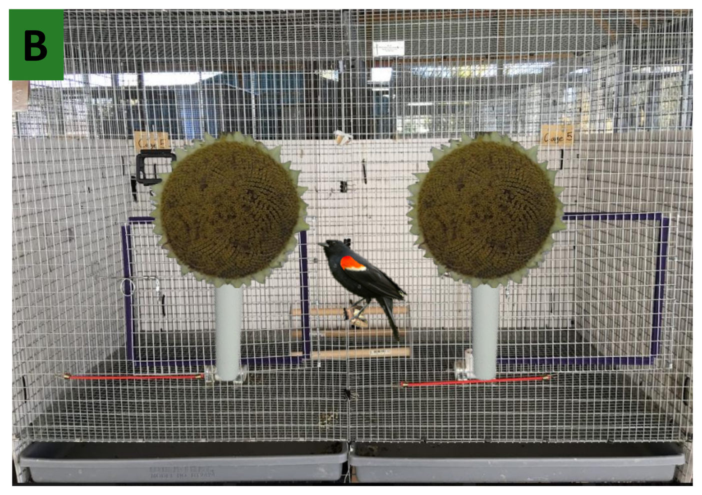


Figure 1b.
Preference experiment consists of acclimation (Day 1), pretest (Days 2, 3), and test (Days 4 - 7) days where each bird is offered two sunflowers. We compare consumption between untreated and treated sunflowers during test days.

Figure 2a.
Sunflower achenes embedded in the sunflower head and protected by disk flowers which may act as a barrier for repellent.
Photo credit: USDA-APHIS-WS NWRC

Figure 2b.
Ground rig equipped with 360° Undercover™ drop nozzle for beneath canopy application to sunflower face.
Photo credit: USDA-APHIS-WS NWRC

Field Application Treatments				
Speed (mph)	PSI	Application Rate (gal/ac)	Formulation Rate (gal/ac)	Spray Action
2.4	50	20	1	Continuous
2.4	50	20	2	Continuous
1.2	50	20	1	50% Pulse
2.4	70	23.6	1	Continuous
4.8	50	20	1	Air Induction

Table 1.
Five test applications of AQ-based repellent applied in plots near at the NDSU Carrington REC. Repellent was applied when sunflower plots were at R6. Damage estimates were collected before application and prior to harvest.

Results: Captive Feeding Studies

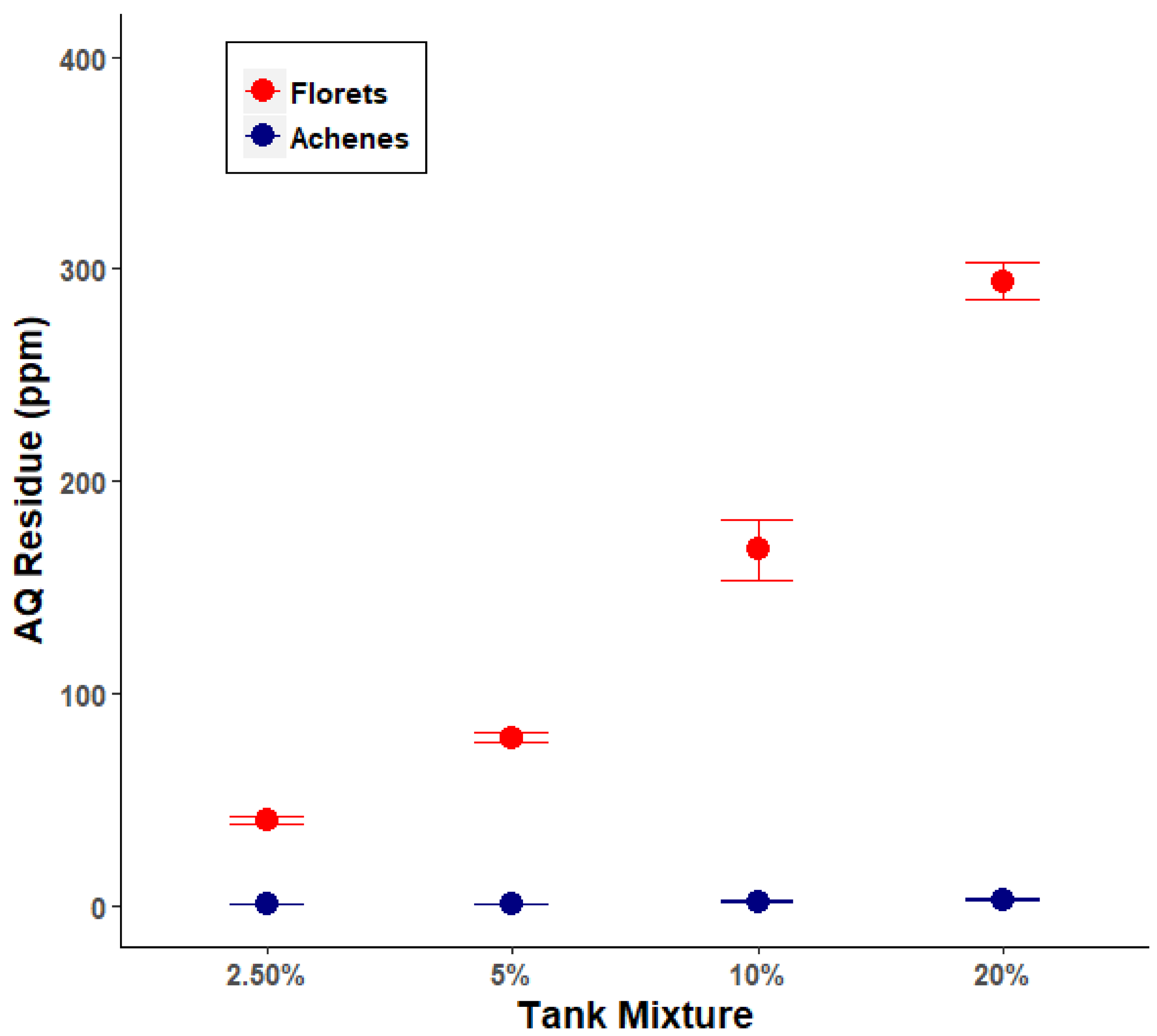


Figure 3.
AQ residues on sunflower florets (red; range = 40 – 294 ppm) and sunflower achenes (blue; range = 0.4 – 2.8 ppm).

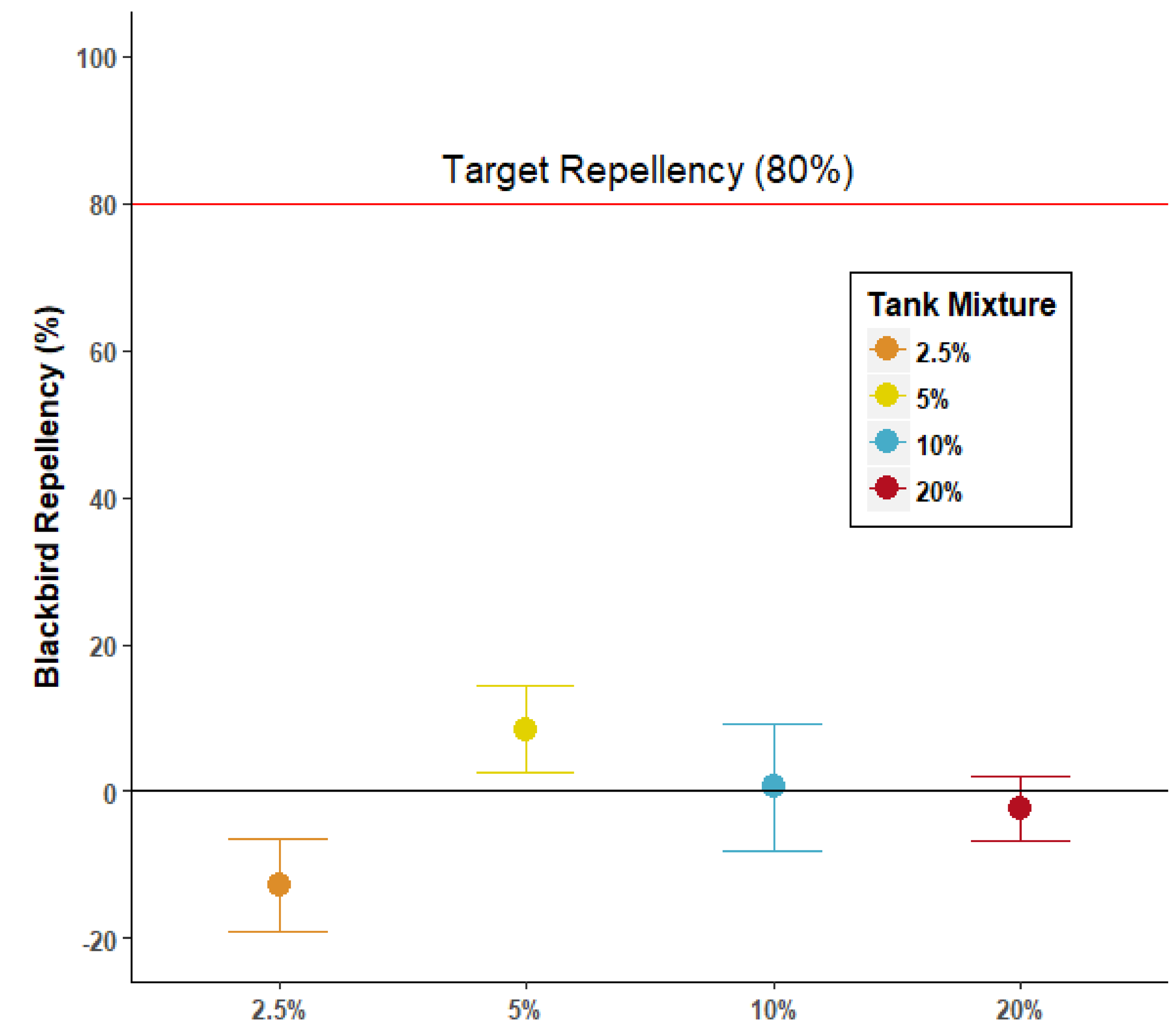


Figure 4.
Mean (± SE) feeding repellency associated with four tank mixtures of AQ-based repellent offered to red-winged blackbirds. Repellency represents test consumption relative to average pretest consumption of mature sunflower. There were no significant differences in repellency between the four tested tank mixtures (range = -12.7 to 8.4%).

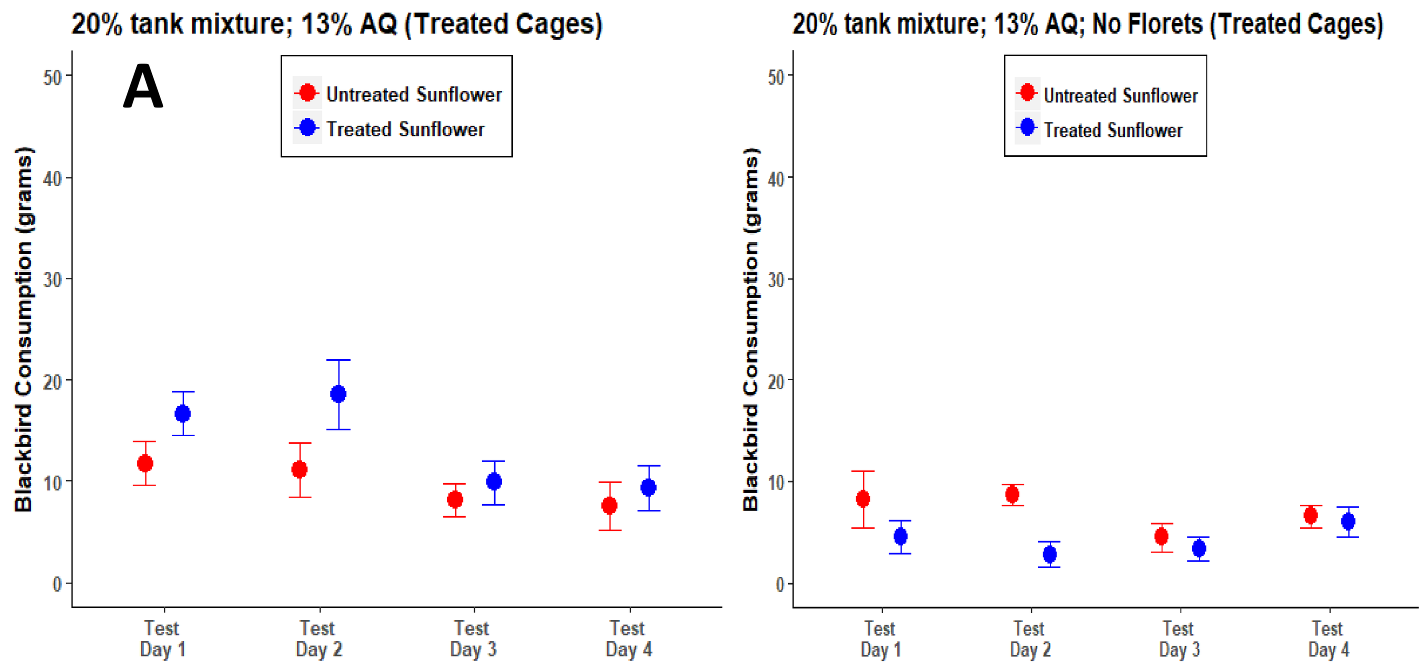
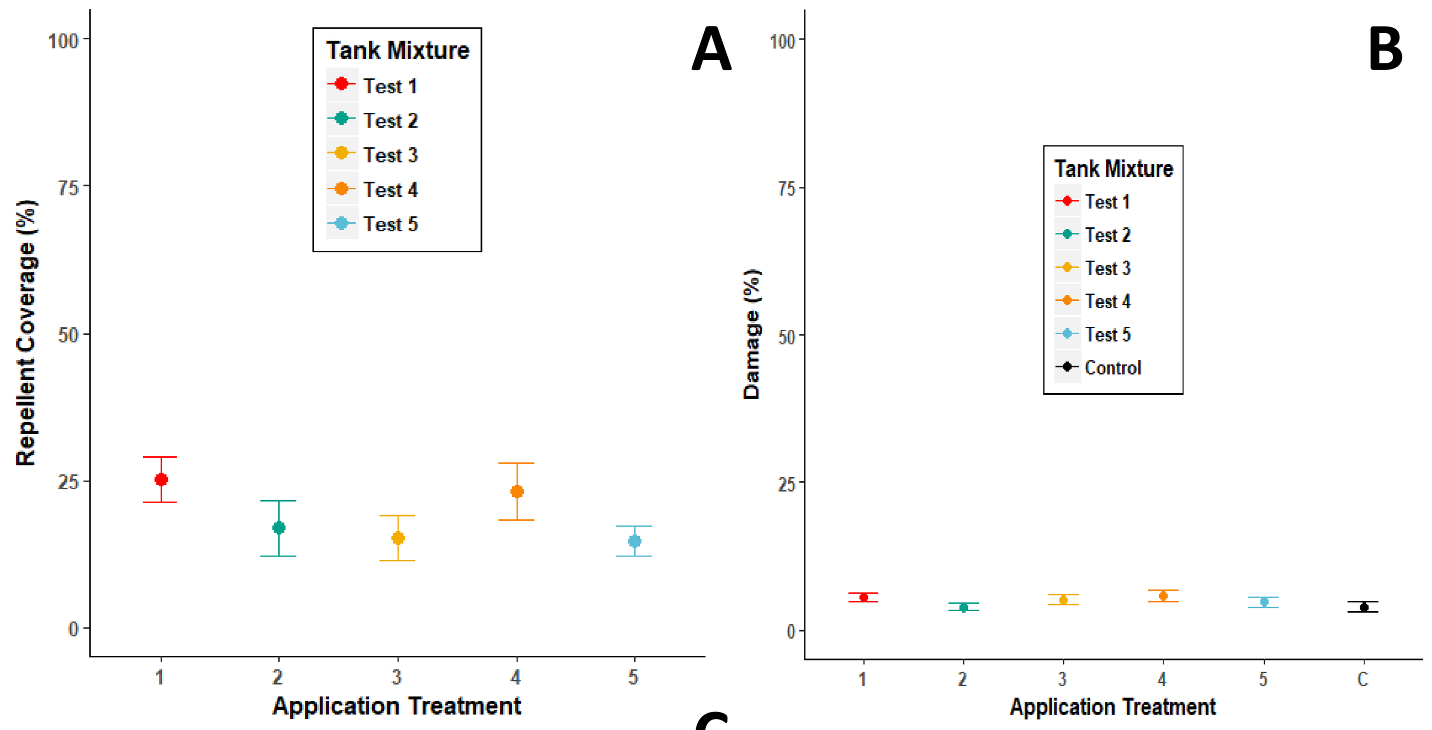


Figure 5.
Preference test results evaluating consumption of untreated sunflowers and sunflower treated with a 20% tank mixture containing AV-5055 (13% AQ). A) Repellent applied when florets were present. B) Repellent applied after removing florets. Neither application with florets present nor florets removed resulted in significant differences in consumption between untreated and treated sunflowers over the four day testing period.

Results: Field Study



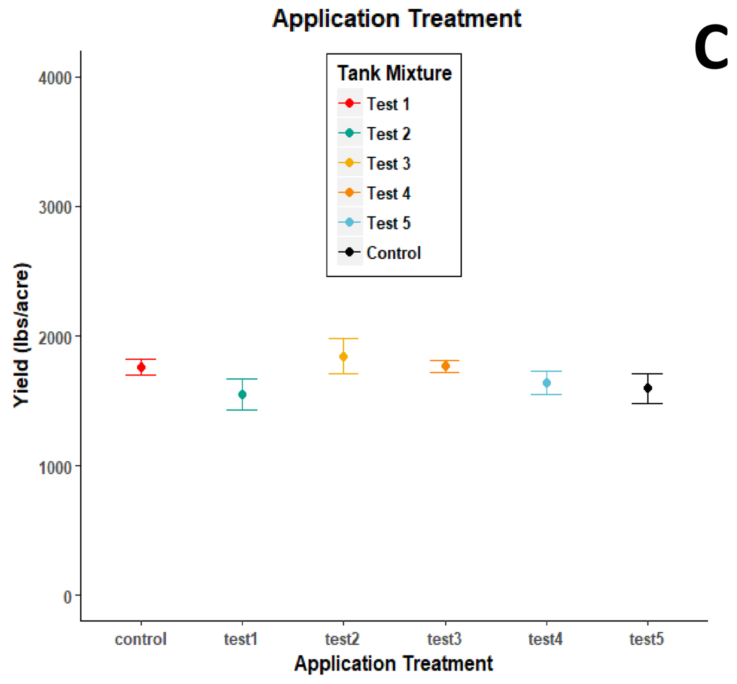


Figure 6.
We tested five applications of an AQ-based repellent (Table 1). A) We saw no statistical difference in coverage between the five tested applications. Although agronomic factors may have an influence, no differences were observed in B) bird damage or C) yields between treatment plots and control plots.

Conclusions

- We were unable to reduce blackbird consumption on sunflower with the tested tank mixtures in a captive setting.
  - Residues on achenes likely were not high enough.
- Drop nozzle application looks promising as a method for delivering repellent to the face of the sunflower.
  - However, our data provides evidence of disk flowers blocking repellent landing on the achenes potentially reducing ingestion of repellent by the birds.

Acknowledgements

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