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Evaluation and Development of Blackbird Repellents for Agricultural Applications

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Abstract: We evaluated several registered fungicides and insecticides, and several natural compounds as candidate blackbird repellents for protecting agricultural production. We tested more than 750 red-winged blackbirds at the National Wildlife Research Center's outdoor animal research facility in Fort Collins, CO to evaluate (1) their preference for treated versus untreated rice and sunflower seeds and (2) their consumption of seeds treated with varying concentrations of candidate repellents. Concentrations were varied between 10% and 200% of labeled application rates. With few exceptions, blackbirds discriminated between untreated seeds and seeds treated with one of the candidate repellents. We observed greatest repellency with caffeine + sodium benzoate, GWN-4770, Lorsban, and Tilt. Additional lab efficacy tests are planned for anthraquinone seed treatments, Flock Buster repellent, and Cobalt insecticide. Field residue and efficacy tests are also needed to evaluate and develop promising foliar repellents for protection of ripening crops.

Several blackbird (Icteridae) species are very abundant summer residents and migrants in central and southern regions of North America (Meanley 1971, Dolbeer 1978), including red-winged blackbirds (*Agelaius phoeniceus*), common grackles (*Quiscalus quiscula*), yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), and brown-headed cowbirds (*Molothrus ater*). After breeding, these species aggregate in large flocks that feed on agricultural crops. The flocking behavior continues from late-summer into early spring. Blackbirds can cause economic losses during this period to sunflower and corn in central regions, and seeded and ripening rice in southern regions of North America (Besser 1985, Dolbeer 1990, Linz et al. 1993, Homan et al. 1994, Cummings et al. 2002). Direct economic losses have been estimated per annum at $4-11 million (US) for sunflowers (Hothem et al. 1988, Peer et al. 2003), $25 million for corn (Wywialowski 1996), and $21.5 million for rice (Cummings et al. 2005). These losses have led to use of various bird damage management practices, including chemical repellents (Linz et al. 2006). The present study was designed to evaluate a registered insecticide and a commercial bird repellent as candidate blackbird repellents for protecting agricultural crops.

Tested Compounds

Registered Fungicides:

Apron XL® LS/Maxim® 4FS (Syngenta Crop Protection)

Dividend Extreme® FS (Syngenta Crop Protection)

Endura® (BASF Corporation)

GWN-4770 (Gowan Company)

Tilt® EC (Syngenta Crop Protection)

Quadris® (Syngenta Crop Protection)

Registered Insecticides:

Asana XL® (DuPont Chemical Company)

Baythroid 2® (Bayer Crop Science)

Endosulfan 3EC® (Gowan Company)

Karate® with Zeon Technology™ (Syngenta Crop Protection)

Lorsban-4E® (Dow AgroSciences LLC)

MustangMAX™ (FMC Corporation)

Scout X-TRA® (Adventis CG)

Warrior T® (Syngenta Crop Protection**)**

Natural Compounds:

Aza-Direct™ (neem oil; Gowan Company)

Caffeine (Flavine North America, Incorporated)

Gander Gone (citrus terpenes; Natural Earth Products)

Cage Efficacy Testing

We tested more than 750 red-winged blackbirds in captivity to evaluate (1) their preference for treated versus untreated rice and sunflower seeds and (2) their consumption of seeds treated with varying concentrations of candidate repellents. Concentrations were varied between 10% and 200% of labeled application rates. Our methods were summarized in Linz et al. (2006) and Werner et al. (2008a,b). With few exceptions, blackbirds discriminated between untreated seeds and seeds treated with one of the candidate repellents. We observed greatest repellency with caffeine + sodium benzoate (Werner et al. 2007), GWN-4770 (Werner et al. 2008a), Lorsban (Linz et al. 2006), and Tilt (Werner et al. 2008b).

Field Evaluations

Bird Shield™ for ripening rice and sunflower. We evaluated aerial applications of this methyl anthranilate-based bird repellent in Missouri rice and North Dakota sunflower fields. We observed insufficient, post-application residues of the repellent. Thus, we observed no difference in average bird activity between treated and untreated rice fields and no difference in damage between treated and untreated sunflower fields. Bird Shield was not effective for repelling blackbirds from ripening rice and sunflower fields (Werner et al. 2005).

Caffeine and GWN-4770 for broadcast rice. We broadcast repellent-treated and untreated rice within fallow rice fields in southwestern Louisiana. Our methods for caffeine and GWN-4770 field testing were summarized in Avery et al. (2005) and Werner et al. (2008a), respectively. Birds consumed 13% of treated seeds and 83% of untreated seeds during our test of 10,000 ppm caffeine, and 28% of treated seeds and 68% of untreated seeds during our test of 20,000 ppm GWN-4770. Both seed treatments were effective blackbird repellents under these field conditions.

GWN-4770 for drilled rice. We drill-seeded untreated rice and rice treated with 10,000 ppm GWN-4770 within an experimental rice field in southeastern Missouri (Werner et al. 2008a). We observed 50% fewer unprotected seedlings than those treated with GWN-4770. The manufacturer subsequently obtained a U.S. patent for the active ingredient of GWN-4770 as an avian repellent.

GWN-4140 and Tilt for ripening rice. We used experimental enclosures to evaluate GWN-4140 (same active ingredient as GWN-4770) and Tilt as avian repellents in a ripening rice field (Werner et al. 2008b). We observed insufficient, post-application residues of both repellents. Thus, we observed no difference in consumption of treated and untreated rice.

Repellent Development

We plan to evaluate effective contexts of promising avian repellents (e.g., chlorpyrifos/ sunflower heads) via supplemental lab efficacy testing. In 2009, we plan to evaluate anthraquinone seed treatments to reduce ring-necked pheasant damage to newly seeded sunflower and corn. We also plan to conduct residue and field efficacy studies needed to develop and evaluate foliar applications of anthraquinone for ripening sunflower, rice, and grasses and legumes grown for seed.

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