



## FIRST REPORT OF HORNED LARK DAMAGE TO CANOLA SEEDLINGS

Washington Oilseed Cropping Systems Series

By William F. Schillinger, Crop and Soil Sciences, Washington State University. Scott J. Werner, National Wildlife Research Center, USDA-APHIS Wildlife Services.



### First Report of Horned Lark Damage to Canola Seedlings

#### Abstract

The Washington State Oilseed Cropping Systems Research and Extension Project (WOCS) is funded by the Washington State Legislature to meet expanding biofuel, food, and feed demands with diversified rotations in wheat based cropping systems. The WOCS fact sheet series provides practical oilseed production information based on research findings in eastern Washington. More information can be found at: http://css.wsu.edu/biofuels/.

#### Acknowledgments

Funding and support for the WOCS provided by:

Washington State Legislature, Washington State Department of Agriculture, Washington Department of Commerce, and the Washington State University Energy Program.



### Abstract

Winter canola is considered the most promising domestically produced oilseed feedstock for the biodiesel industry and for diversifying wheat-based cropping systems in the Inland Pacific Northwest. Winter canola field experiments conducted in east-central Washington were completely destroyed and commercial fields were damaged over several years by large flocks of horned larks that ate the cotyledon leaves of preemerged and newly emerged seedlings. Numerous control strategies were attempted in field experiments, including laying bird netting over the entire experiment, placing a lifesize predator decoy in a field experiment, blasting a loud propane-powered cannon, and mixing garlic with canola seed before planting followed by spraying garlic water on the soil surface. None of the attempted control methods were successful. This is the first report of horned lark damage to preemerged and newly emerged canola seedlings. We discuss questions relevant to our unique encounter and non-lethal chemical repellents for the protection of canola crops associated with horned lark depredation.

## Importance of Canola as a Biodiesel Feedstock

The Washington State Legislature (2006) passed a law that requires at least two percent of diesel sold within the state must be biodiesel. This law further mandates that at least five percent must be biodiesel when the state's Department of Agriculture determines that in-state production of oilseed feedstock can satisfy this requirement. Since 2007, the legislature has provided annual funding averaging \$300,000 to Washington State University (WSU) for research on production of oilseed feedstocks.

Biodiesel feedstock production research at WSU has largely centered on winter canola (Figure 1) due to high seed yields compared to spring canola, camelina, and safflower. Inclusion of canola in wheat-based rotations affords an excellent opportunity for control of grass weeds and soilborne diseases and enhances nitrogen mineralization that boosts grain yield of the subsequent wheat crop (Kirkegaard et al. 1994; Seymour et al. 2012).

An oilseed crushing plant with a capacity of 1,100 tons of canola seed per day was opened in Warden, WA in 2013. This crushing facility provides a local market and reduces transportation costs for canola farmers in eastern Washington. The majority of canola feedstock for the Warden crushing facility is currently imported from Canada and North Dakota.



Figure 1. Winter canola in an on-farm field experiment near Davenport, WA in 2011. Horned larks did not infest this site. Long-term experiments at this site (18-inch annual average precipitation) have documented rainfed winter canola seed yields as high as 3,800 lb/acre. Winter canola is considered the most important feedstock for biodiesel production in Washington State. Photo by W.F. Schillinger.

### **Horned Larks**

Horned larks (Figure 2) are native to North America and they occupy the Arctic south to central Asia and Mexico, with outlying populations in Morocco and Columbia. The horned lark is a common bird that prefers short, sparsely vegetated prairies, deserts, and agricultural lands (Beason 1995). Horned larks are permanent residents throughout most of their breeding range (i.e., Canada, US, and Mexico), migrating only from northern regions during winter.



Figure 2. The horned lark is a ground-dwelling bird commonly found in open areas and in fallow fields throughout North America. Photo by Karen Sowers, WSU.

In agricultural areas, horned larks inhabit open areas and fallow fields. Horned larks eat mostly seeds during winter. During the breeding season, adults eat mostly seeds but feed insects to their young. Adults consume more insects during the spring and fall, perhaps to compensate for the energy demands of breeding and molting (i.e., annual feather replacement; Beason 1995). North American flocks of migrating horned larks often intermix with resident horned larks to form localized flocks of great density.

With regard to agricultural depredation, horned larks uniquely damage lettuce seeds and seedlings. Horned lark damage to lettuce crops has motivated the use of several bird damage management techniques, including chemical repellents. Although methiocarb effectively reduced horned lark damage to lettuce seedlings in aviary tests (Cummings et al. 1998) and a field enclosure study (York et al. 2000), methiocarb is no longer registered in the US as a bird repellent. Werner et al. (2015) observed 38–100% feeding repellency among horned larks offered wheat seeds treated with anthraquinone.

# Horned Lark Damage to Canola Seedlings

Horned larks were first observed as a problem in newly planted winter canola at the WSU Dryland Research Station at Lind, WA in 2006 where they completely destroyed a 0.32acre field experiment before any seedlings could emerge. Birds ate only the cotyledons, not the hypocotyl or seed. This same phenomenon occurred with all rainfed and irrigated winter canola plantings in four subsequent years at Lind. Winter canola was planted in late August. In all cases, horned larks infested plots about three days after planting and exhibited a frantic feeding behavior. Hundreds of horned larks fed in research plots that ranged in size from 0.25–0.5 acres. Horned larks continued to eat cotyledon leaves until about 24 hours following emergence, after which they showed no further interest in the canola and departed the area. During these same years, many thousands of horned larks were present in at least five individual 130-acre, commercial, center-pivot-irrigated winter canola fields located as distant as 50 miles from the WSU Lind Station. Damage to canola stands in commercial fields by horned larks ranged from minor to complete destruction. One farmer relayed that at least 10,000 horned larks destroyed a stand of newly planted winter canola on 65acres, which necessitated replanting (Jeff Schibel, personnel communication). In late April 2016, horned larks destroyed two irrigation circles (260 acres) of newly-planted spring canola and the farmer replanted both fields (J.R. Swinger, personnel communication).

### Attempted Control Measures in Field Experiments

Through the years, several measures were attempted to control horned lark damage in newly planted winter canola fields at the WSU Lind Station. These were:

1. A loud propane-powered noise cannon (such as that used in fruit orchards) was placed inside the plot area and set to explode at random one- to five-minute intervals. Cannon blasts initially caused the birds to take flight, but they soon returned to feeding. Horned larks soon became accustomed to the cannon booms, after which they fluttered briefly a couple feet off the ground before resuming feeding.

2. Bird netting (such as that used to protect cherry trees) was purchased from a supply store and spread on the surface of a 0.5-acre, irrigated winter canola experiment the day after planting. Segments of netting were connected with plastic ties. Horned larks wedged

themselves underneath the netting in small gaps where netting segments were attached and travelled under the netting to eat pre-emerged cotyledon leaves. Several dozen horned larks became trapped in the netting. The sight of trapped horned larks did nothing to deter their companions. Essentially, all canola seedlings in the experiment were destroyed.

3. Concurrent with placing bird netting on the soil surface, a life-size great horned owl replica was mounted on a five-foot-tall perch in the plot area two days after planting. This appeared to have little to no effect on deterring horned larks.

4. A large quantity of garlic was mixed with canola seed (16 ounces of garlic mixed with 3 pounds of seed) in the air drill before planting. Immediately after planting, additional garlic was then mixed with water and applied uniformly on the soil surface with a plot sprayer. A light water irrigation of 0.1 inch was then applied to incorporate garlic into the surface soil. A very strong odor of garlic was emitted from the plot area following these treatments. This had little to no effect as horned larks completely destroyed the plot before seedlings emerged from the ground.

### Discussion

This is the first report of horned lark damage to pre-emerged and newly emerged canola seedlings. We documented the damage to, and destruction of, canola in commercial-size fields and destruction of canola in smaller-sized field experiments. Several attempted control strategies were unsuccessful.

A new potential control method was tried in April 2016 by J.R. Swinger who had just lost 260 acres of irrigated spring canola seedlings to horned larks. After replanting spring canola, Swinger placed five propane-powered boom cannons around the two fields and hired a commercial falconer. The falconer brought six Aplomado falcons to the site (FIgure 3). These falcons were trained to follow a ground-controlled airplane that was modified to resemble the size and appearance of an Aplomado falcon. Operating with three falcons at a time, the falconer systematically flew the airplane, followed by three falcons, over the canola fields at a height of 200 feet or less. Horned larks would take flight when they saw the falcons but would return to feeding in the canola field when the falcons passed over. Nonetheless, the density of horned larks soon declined as evidenced by diminished flock size. After the first day using the falcons, horned larks in the two canola fields were generally feeding in groups of four or less (Andres Sandoval, personal communication). Although some bird damage occurred, the farmer was able to achieve a satisfactory spring canola stand from his second planting.



Figure 3. Aplomado falcons were used by a farmer in Adams County, WA to scare horned larks away from newly-planted irrigated spring canola fields. The tactic appeared to be at least partially successful as the farmer achieved satisfactory stands from his second plantings using falcons whereas his first plantings were totally destroyed by horned larks. Photo by J.R. Swinger.

The cost for replanting canola is substantial. At the standard seeding rate of 5 pounds/acre, the current canola seed cost is \$17/acre. Custom planting of crops in the region (with tractor, drill, fuel, and operator provided) costs about \$20/acre (Jeff Schibel, personal communication). In addition, reduced seed yield with delayed planting of spring canola is common. In a nine-year study near Pullman, WA, Huggins and Painter (2011) showed an average seed yield decline of 50% when planting was delayed from April 11 to May 11. Chen et al. (2005) reported that delaying planting from mid-April to mid-May in a three-year study in central Montana resulted in a 43 to 63% seed yield reduction. Seed yield reductions with late-planted spring canola were associated with flowering and seed development occurring under more heat stress compared to earlier-planted spring canola.

These experiences raise several questions: (i) Why did horned larks become a problem at the WSU Lind Station beginning in 2006 when winter canola had been successfully established many times at this site (with no known horned lark damage) in several preceding years? (ii) Horned larks are native over a wide geographic area, yet damage to canola seedlings by this bird was documented in only a relatively small (i.e., 9,000 square mile) area. What are the implications of horned lark depredation to canola throughout the US and Canada? (iii) Why are new cotyledon leaves of canola so appetizing to horned larks? (iv) Why do horned larks infest some canola fields but not others? (v) How can horned larks detect preemerged canola seedlings through a strong odor of garlic? Repellent seed treatments can be used to protect newly planted crops from bird depredation. In January 2016, an anthraquinone-based seed treatment (AV-1011) was registered in a few southern states for the protection of newly planted rice from blackbird depredation, but it is not registered in Washington, Oregon, or Idaho. At the Lind Station, we plan to test the field efficacy of pre-plant anthraquinone seed treatments for the protection of pre-emerged and newly emerged canola seedlings from horned lark depredation.

### Disclaimer

Some of the pesticides (i.e., garlic) discussed in this publication were tested under an experimental use permit granted by the WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by the WSDA, the US Food and Drug Administration, or both. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.

### Acknowledgements

Support was provided by the WSU Agricultural Research Center through Hatch Project 0250 and by the WSU Oilseed Cropping Systems Project through direct funding from the Washington State Legislature. The authors thank WSU research technicians John Jacobsen, Bruce Sauer, Steve Schofstoll, and Brian Fode for their excellent assistance with field experiments.

### **Additional Resources**

WSU Department of Crop and Soil Sciences. <u>Washington</u> Oilseed Cropping System Project.

### References

Beason, R.C. 1995. Horned Lark (*Eremophila alpestris*). *In* The Birds of North America, No. 195. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, and The American Ornithologist's Union, Washington, D.C.

Chen, C.C., C. Jackson, K. Neill, D. Wichman, G. Johnson, and D. Johnson. 2005. Determining the Feasibility of Early Seeding Canola in the Northern Great Plains. *Agronomy Journal* 97: 1252–1262. Cummings, J.L., P.A. Pochop, C.A. Yoder, and J.E. Davis, Jr. 1998. Potential Bird Repellents to Reduce Bird Damage to Lettuce Seed and Seedlings. *Vertebrate Pest Conference* 18: 350–353.

Huggins, D.R., and K. Painter. 2011. <u>Biofuels Cropping</u> <u>Systems Annual Report.</u> Spring and Winter Canola Research at Cook Agronomy Farm.

Kirkegaard, J.A., P.A. Gardner, J.F. Angus, and E. Koetz. 1994. Effect of Brassica Break Crops on the Growth and Yield of Wheat. *Australian Journal of Agricultural Research* 45: 529–545.

Sandoval, A. 2016. Personal communication. Falconry Bird Abatement, Burbank, WA.

Schibel, J. 2016. Personal communication.

Seymour, M., J.A. Kirkegaard, M.B. Peoples, P.F. White, and R.J. French. 2012. Break-Crop Benefits to Wheat in Western Australia – Insights from over Three Decades of Research. *Crop & Pasture Science* 63: 1–16.

Swinger, J.R. 2016. Personal communication.

Werner, S.J., S.T. DeLiberto, A.M. Mangan, S.E. Pettit, J.W. Ellis, and J.C. Carlson. 2015. Anthraquinone-Based Repellent for Horned Larks, Great-Tailed Grackles, American Crows and the Protection of California's Specialty Crops. *Crop Protection* 72: 158–162.

Washington State Legislature. 2006. <u>RCW 19.112</u>. Motor Fuel <u>Quality Act.</u> Washington State Legislature.

York, D.L., J.L. Cummings, R.M. Engeman, and J.E. Davis, Jr. 2000. Evaluation of Flight Control and Mesurol as Repellents to Reduce Horned Lark (*Eremophila alpestris*) Damage to Lettuce Seedlings. *Crop Protection* 19: 201–203.



Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

Copyright 2016 Washington State University

WSU Extension bulletins contain material written and produced for public distribution. Alternate formats of our educational materials are available upon request for persons with disabilities. Please contact Washington State University Extension for more information.

Issued by Washington State University Extension and the U.S. Department of Agriculture in furtherance of the Acts of May 8 and June 30, 1914. Extension programs and policies are consistent with federal and state laws and regulations on nondiscrimination regarding race, sex, religion, age, color, creed, and national or ethnic origin; physical, mental, or sensory disability; marital status or sexual orientation; and status as a Vietnam-era or disabled veteran. Evidence of noncompliance may be reported through your local WSU Extension office. Trade names have been used to simplify information; no endorsement is intended. Published August 2016.