

used in stand establishment studies. During this funding period, the Neff Lab has used a combination of molecular, genetic, biochemical, and biotechnological approaches to understand the role of *AHL* genes in plant growth and development. Our primary goal has been to characterize *AHL* genes from *Arabidopsis* and camelina, while also establishing a canola transformation system. The picture is of Pushpa Koirala using tissue culture to generate transgenic canola using *Agrobacterium*-mediated transformation as a part of her Ph.D. training. We have used the camelina draft genome sequence to identify 81 camelina *AHL* genes, eight of which have been cloned. We have transformed camelina and *Arabidopsis* with some of these camelina genes. We have also generated putative transgenic canola, though these still need to be verified. Using *Arabidopsis* *AHL* mutants, we have now demonstrated that the long hypocotyl seedling phenotypes are regulated by plant hormones including the auxins and brassinosteroids. This work is part of David Favero's Ph.D. dissertation. The auxin-related work has been accepted for publication: Favero, D.S., C.N. Jacques, A. Iwase, K.N. Le, J. Zhao, K. Sugimoto, and M.M. Neff. 2016. *SUPPRESSOR OF PHYTOCHROME B4-#3* Represses Genes Associated with Auxin Signaling to Modulate Hypocotyl Growth in *Arabidopsis thaliana*. *Plant Physiology* (accepted).



## First Report of Horned Lark Damage to Pre-emerged Canola Seedlings



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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 (PNW). 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 (*Eremophila alpestris* L.) that ate the cotyledon leaves of pre-emerged and newly-emerged seedlings (Fig. 1). Horned larks are permanent year-round residents of the PNW. Through the years, several measures were attempted to control horned lark damage in newly-planted winter canola fields. These were:

- (i) A loud propane-powered noise cannon (such as that used in fruit orchards) was placed inside the plot area and set to explode at one-to five-minute intervals. Explosions 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 about a meter off the ground before resuming feeding.
- (ii) Bird netting such as used to protect cherry trees was spread on the surface 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 died after becoming trapped in the netting. The sight of dead horned larks did nothing to deter their companions. Essentially all canola seedlings in the experiment were destroyed.
- (iii) Concurrent with placing bird netting on the soil surface, a life-size great horned owl replica was mounted on a 5-ft-tall perch in the plot area two days after planting. This appeared to have little to no effect on deterring horned larks.

- (iv) A large quantity of garlic was mixed with canola seed in the 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.

Repellent seed treatments can be used to protect newly-planted crops from bird depredation. In 2016, we will field test a non-toxic anthraquinone-based seed treatment for the protection of pre-emerged and newly-emerged canola seedlings from horned lark depredation.

Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by 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 WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.



Figure 1. The horned lark is a ground-dwelling bird commonly found in open areas and in fallow fields throughout North America. Photos by Terry Sohl (with permission) and S.J. Werner.

## Evaluation of a Precision Double-Disk Planter for Spring Canola



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Growers typically use a seed drill and a lot of seed to produce an adequate stand of canola. In general, approximately 50 to 60% of the 4.5 to 6 lbs of seed per acre planted actually germinates and emerges. Canola stands for production can be quite variable, but there needs to be a minimum of 4 plants per ft of row, and populations can be as high as or higher than 10 per ft of row. When high variation in seedling establishment is coupled with the wide variability in seed lots (canola seed can vary between 80,000 and 120,000 seeds per pound) and the expense of transgenic canola seed, a significant amount of money is wasted just planting canola. Precision vacuum plate planters offer a potential solution to minimize seed expense in canola production. Unlike seed drills, which are calibrated by flow (using weight of seed per unit time), precision vacuum plate planters are calibrated by seed number – instead of lbs to the acre, growers calibrate by the desired seed number per foot of row. By uniformly distributing seed in the row, greater numbers of seed could potentially establish and seeding rate could be reduced.

A study was conducted in 2015 to evaluate canola stand establishment using a precision vacuum plot planter. Eight seeding rates were selected: 4, 5, 6, 7, 8, 10, or 12 seed per ft. The study design was a randomized complete block with 3 replications. Plots were 8 ft wide by 75 ft long. HyCLASS® 955 Roundup Ready® canola was seeded May 7, 2015 into a smooth seedbed 1.5 inch deep, and into moisture. Stand counts were recorded June 16, 2016. Two 1-meter sections of