Performance Story Report – *max 2 pages, to be used for publication on funders' websites. Contents will also be used in extension publications, for consumers and/or industry. Information needs to be clear, concise and in 'farmer-friendly' language. Include an Executive Summary, brief experimental description and results, relevance to farmers and future research.*

Stimulating Germination and Emergence of Wild Oat (*Avena fatua*), Volunteer Oat (*Avena sativa*), Barley (*Hordeum vulgare*), and Wheat (*Triticum aestivum*) with Pyroligneous Acid and Potassium Nitrate

Shaun M. Sharpe[1], Taylor Kaye[1], and Breanne D. Tidemann[2]

[1]Saskatoon Research and Development Centre, Agriculture and Agri-Food Canada; [2]Lacombe Research and Development Centre, Agriculture and Agri-Food Canada

Wild oat is a troublesome weed on the Canadian Prairies. It occurs across a wide area and seeds accumulate in the soil over time. These seeds do not all emerge at once or even in one season. This results in flushes of wild oat emerging through the growing season instead of consistently at the start of the season once winter is over. Herbicide resistance in wild oat is present to Groups 1, 2, and 15 (formerly 8) and metabolic resistance has been noted, which may compromise additional herbicides. This complicates control strategies leaving farmers with fewer options to control wild oat. The objectives of this research were to evaluate the potential of applying products to the seeds and soil to encourage wild oat and volunteer cereals to germinate and emerge from the ground.

This research was conducted in an incubator in Saskatoon, SK, in 2021. The stimulants of interest were pyroligneous acid, also known as wood vinegar or smoke water, as well as potassium nitrate, a form of nitrogen fertilizer. Potassium nitrate was chosen due to widespread use of nitrogen fertilizers and familiarity for farmers since equipment and knowledge is already present. Smoke water was chosen due to previous research and that wild oat may be sensitive to smoke due to fires frequenting the prairie and forest before widespread agricultural adoption.

When working in petri dishes with just the stimulants, the smoke water induced dormancy in all the species using 5 to 100% solutions. Smoke water did increase the speed of emergence for wild oat by spraying 50 to 100% solutions at 200 L ha^{-1} (21 GPA) on freshly produced seed deposited either on top or in 1 cm of field soil. Burial of seed in the soil did not impact smoke water's influence on wild oat emergence, indicating a spray will get shallow buried seed. Barley was also sensitive to smoke water, but this was with a 1% solution. The wild oat used in this study was insensitive to nitrogen, limiting how effective using nitrogen as a stimulant could be on a broad scale. While these findings are experimental, the identified spray pattern (50 to 100% solutions of smoke water at 200 L ha^{-1}) give a good starting point for additional research in the field which could be adopted by farmers with conventional spray equipment in the future. Applying stronger solutions of smoke water may have herbicidal activity on emerged vegetation but additional study is required.