

Cadmium (Cd) is a toxic, non-essential heavy metal which is found naturally in Saskatchewan soil. Flax can accumulate high levels of cadmium in seeds, thereby introducing cadmium into the food chain. Cadmium accumulation has been an emerging trade concern for Canadian flax farmers after the European Union established a limit of 0.5 ppm of Cd for imported flaxseed in 2021. While Cd is naturally present in SK soils, more is added through the application of Monoammonium Phosphate (MAP) fertilizer contaminated with Cd from its parent rock. This demonstration was intended to evaluate the efficacy of zinc and calcium fertilization in reducing Cd levels in flax. The field trials were conducted at Scott, Yorkton, Indian Head, and Redvers in 2022 and 2023. Seven treatments were evaluated: 1) Untreated control, 2) Zn at 2.5 kg/ha, 3) Zn at 1.25 kg/ha, 4) Zn at 5 kg/ha, 5) Gypsum at 107 kg/ha, 6) Gypsum at 53.5 kg/ha, and 7) Gypsum at 214 kg/ha.

Soil and MAP samples were collected in the beginning of the experiment and sent to the lab for Cd analysis. Soil samples analyzed for Cd content showed low Cd in all 4 sites, ranging from <0.1 ppm to 0.2 ppm. Cadmium levels were more varied in MAP fertilizer samples collected from each site and ranged from 9.1 ppm at Scott to 39 ppm at Indian Head. While a causal relationship could not be established between MAP or soil Cd content and Cd content of harvested flaxseed, the location at Indian Head, with the highest MAP Cd content, produced flaxseed with highest Cd levels (averaging 0.7 ppm, which was 0.2 ppm higher than the 0.5 ppm set by the EU). Average Cd content of seeds harvested at all other sites was within the 0.5 ppm limit (Figure 1).

Individual site analysis showed no significant effect of any of the treatments of zinc or gypsum on plant density,

plant height, yield, or seed Cd content. Treatment of flax with varying rates of zinc and gypsum produced similar results as the untreated control, thus rendering the treatments economically inefficient.

Compared to 2022, flax yield was significantly reduced at all sites in 2023. Cadmium levels in harvested flaxseed were also lower in 2023 at all sites except Indian Head. However, none of the treatments of zinc or calcium in either year at any of the sites led to a significant reduction in seed Cd levels compared to the untreated control. Thus, findings from two years of this project suggest that at the rates and formulations used in this project, the application of neither zinc nor calcium is effective at reducing Cd accumulation in medium-high to high Cd-accumulating flax varieties.

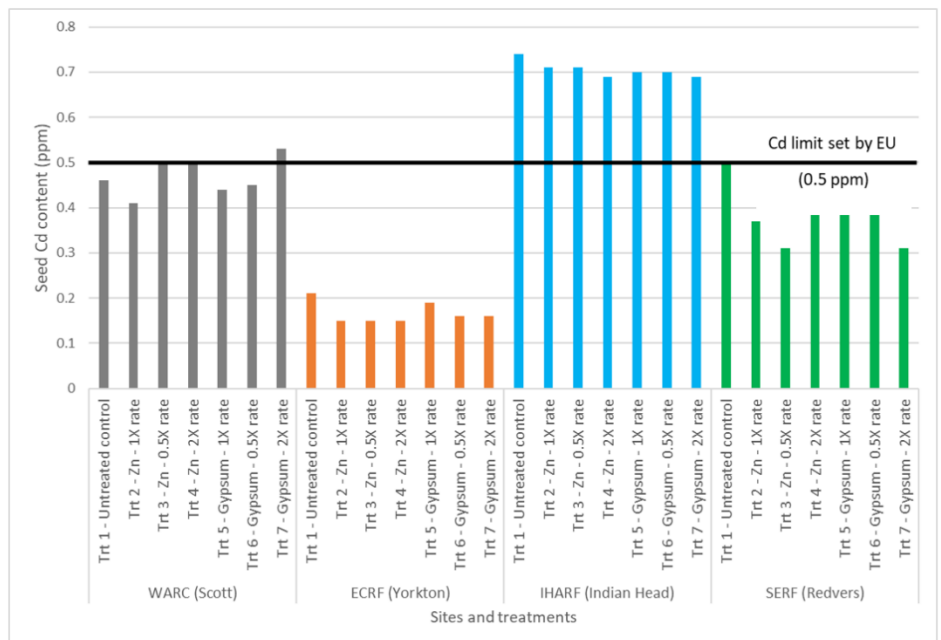


Figure 1. Cadmium accumulation in harvested flaxseed for various treatments at four different sites in 2023.

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