

# Phosphorus loss in runoff and leaching from freezing and thawing of cover crops

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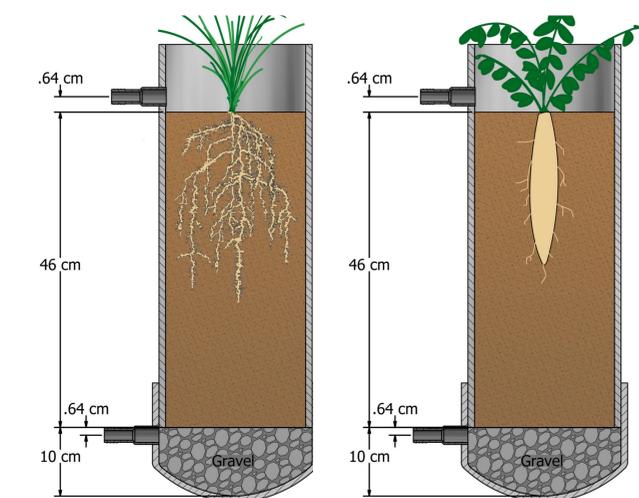
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## INTRODUCTION

Cover crops have gained momentum over the past decade due to their multiple environmental and agronomic benefits. Freezing and thawing of these crops may increase the potential of phosphorus leaching due to plant cell lysis. **The objective was to evaluate phosphorus loss in cereal rye (*Secale cereale*) and Daikon Eco-Till radish (*Raphanus sativus* L. var. *longipinnatus*) after freeze/thaw events.**

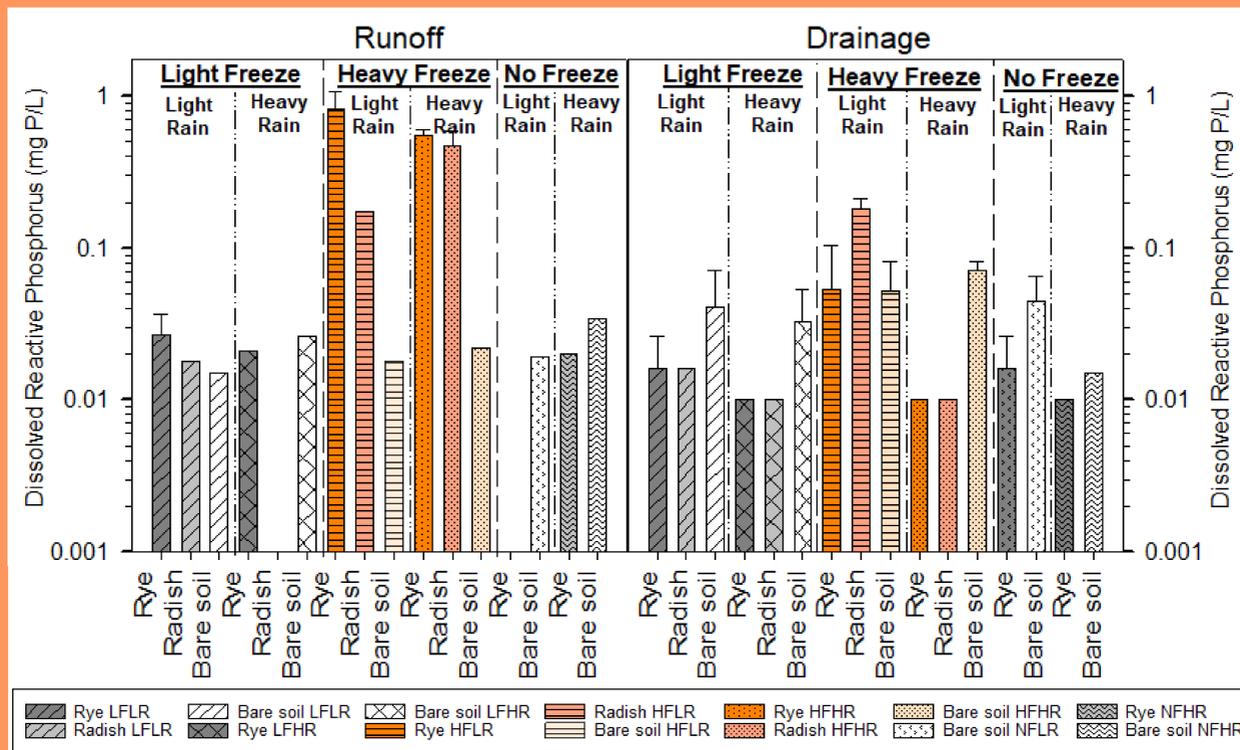
## METHODS

Polyvinyl chloride (PVC) columns (20 cm diameter; 56 cm length) were filled with a sandy loam mix and planted with either cereal rye ( $n=3$ ) or Daikon Eco-Till radish ( $n=3$ ). After the plants grew for a month in a greenhouse, they were exposed to heavy (eight nights,  $-12$ – $12^{\circ}\text{C}$ ) and light (two nights,  $-1$ – $12^{\circ}\text{C}$ ) freeze conditions. Simulated rainfall intensities of either 10.2 cm/h or 6.4 cm/h were performed on the columns and both runoff and drainage samples were collected. Bare soil and columns not exposed to freezing were the two controls.



**Figure 1.** PVC columns with cereal rye and radish cover crops.

# Cover crops exposed to heavy freezing and thawing conditions release phosphorus in surface runoff.



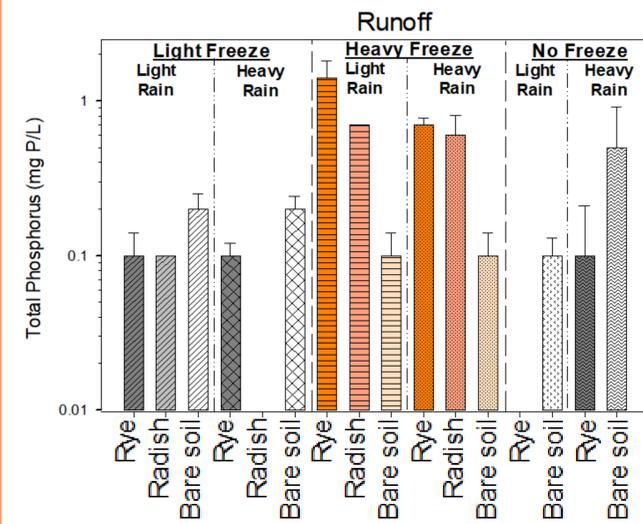
**Figure 2.** Dissolved reactive phosphorus (mg P/L) in runoff and drainage water samples.



**Figure 3.** Radish (left) and cereal rye (right) cover crops after exposure to 6 nights of freezing conditions.

## RESULTS

Both the cereal rye and radish subjected to heavy freeze conditions presented high dissolved reactive phosphorus (DRP,  $>0.40$  mg P/L) and total phosphorus (TP,  $>0.65$  mg P/L) concentrations in runoff samples. There was no significant difference between cereal rye and radish TP and DRP concentrations in drainage samples.



**Figure 4.** Total phosphorus (mg P/L) in runoff water samples.

## CONCLUSIONS

Cereal rye and radish cover crops can release phosphorus to surface runoff after being exposed to freezing and thawing conditions. The heavy freeze conditions, in particular, may have exacerbated plant cell lysis leading to elevated phosphorus loss.

## ACKNOWLEDGMENTS

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