



## Broadcast phosphorus increased snowmelt runoff losses

CATEGORY [soils and fertility](#) | June 29, 2021

Applying monoammonium phosphate fertilizer using broadcast without incorporation, especially at rates above that normally recommended for a single season, is not recommended due to the increased potential for P export offsite in spring snowmelt runoff.

Phosphorus from non-point sources such as snowmelt runoff is a contributor to eutrophication of surface water. Eutrophication leads to an increase in phytoplankton biomass that can be toxic to fish and reduce water aesthetics.

The objective of this research was to evaluate how commonly used placement methods for granular P fertilizer application influence crop P uptake, soil postharvest water-extractable P, and export potential of soluble reactive P, (dissolved molybdate-reactive P; DMRP) during simulated snowmelt.

Two adjacent farm fields in south-central Saskatchewan in the Brown soil zone that had different management histories were used in the study. One field under conventional tillage (CT) with little or no P or N fertilization since cultivation began approximately 100 years ago was in a wheat-tilled fallow rotation. In 2014, soybean was grown to help overcome very low levels of nitrogen (N) fertility.

A field across the road was used for wheat and canola trials in 2015 and 2016. This field had been maintained in a no-till (NT) pulse-cereal-oilseed rotation for the past 25 years, receiving P fertilizer each crop year at approximately 18 lbs. P<sub>2</sub>O<sub>5</sub>/acre/year (20 kg P<sub>2</sub>O<sub>5</sub>/ha/yr).

An application rate of 18 lbs. P<sub>2</sub>O<sub>5</sub>/acre was seed placed (SP) at time of seeding, deep banded 2.5 cm below the seed row (DB), or broadcast and incorporated with the NKS fertilizers immediately prior to seeding (B/I),

Additional treatments included broadcast without incorporation at 18, 36, or 71 lbs. P<sub>2</sub>O<sub>5</sub>/acre (20, 40, or 80 kg P<sub>2</sub>O<sub>5</sub>/ha; B20, B40, and B80), and a control receiving no P fertilizer.

Simulated snowmelt events were conducted and analyzed for P losses in the snowmelt solution. Since the CT and NT treatments were conducted in separate years, the results from these two fields could not be directly compared.

### **Broadcast treatments had greater losses**

Water-extractable P at the 0 to 2 inch (0- to 5-cm) depth after harvest was variable and not significantly affected by fertilizer placement at either the NT or CT sites. The researchers thought that variability from non-uniform distribution of fertilizer P and plant P uptake across the seedbed likely contributed to the lack of significant treatment.

At the CT site, the in-soil P fertilizer placement treatments had DMRP export amounts and P concentrations in collected surface and subsurface flow that were not significantly different from the unfertilized control. However, the broadcast B20 treatment resulted in significantly more P export than the control and incorporated treatments. The DMRP concentrations in the B20 and B80 treatments were 5 to 10 times those of the control, deep band, and broadcast/incorporated treatments.

At the NT site, the broadcast P treatment applied at the high rate (B80) appeared to have more export than all other treatments

Overall, the results of this study suggest that broadcast fertilizer P application without incorporation, especially under conditions of low crop removal and high application rate, may result in greater DMRP export compared with no fertilizer application or when fertilizer P is applied using in-soil placement at low rates. Methods that put P fertilizer into the soil below the surface is preferred to reduce runoff risk.

---

This study was funded by the Fertilizer Canada–Agriculture and Agri- Food Canada Agricultural Innovation Program, the Foundation for Agronomic Research, the Canadian Fertilizer Institute, the Natural Sciences and Engineering Research Council of Canada, and Agriculture & Agri-Food Canada A-Base Project 1555.

Wiens, J.T., Cade-Menun, B.J., Weiseth, B. and Schoenau, J.J. (2019), Potential Phosphorus Export in Snowmelt as Influenced by Fertilizer Placement Method in the Canadian Prairies. *J. Environ. Qual.*, 48: 586-593.

OPEN ACCESS: <https://doi.org/10.2134/jeq2018.07.0276>