Assessing the Relationships Between Soil Test Phosphorus and Soil Phosphorus Release with Spring Snowmelt to inform Agronomic P Management

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Soil test phosphorus (STP) serves as a standard measure for assessing both crop-available P and the likelihood of phosphorus transport to downstream waters. In cold climatic regions such as the Canadian Prairies, snowmelt-induced flooding is a major pathway for P export from agricultural fields. However, the relationship between STP levels and P release during snowmelt remains unclear. This study investigates how STP influences phosphorus release during simulated snowmelt flooding. Intact soil columns with initially low Olsen-P concentrations were collected from four fields and amended with monoammonium phosphate to establish a gradient from below 60 ppm to above 180 ppm, then subjected to simulated snowmelt flooding to quantify phosphorus release into overlying water. Split-line regression analysis revealed a change point of 64 ppm for Olsen-P (R^2 = 0.6475) and 96 ppm for Mehlich-3 P (R^2 = 0.7104), indicating an increased P release above these values. These findings highlight the practical importance of maintaining soil P below critical thresholds to reduce P loss, support more informed nutrient management decisions and help producers balance crop fertility needs with water-quality protection. Ongoing work will evaluate additional P indices including oxalate-extractable P, degree of P saturation and P sorption capacity to further understand the relationship.