

Ultra-early spring wheat planting can increase grain yield and cropping system stability in western Canada.

Brian L. Beres^{1,2}, Graham R.S. Collier², Robert J. Graf¹, and Dean M. Spaner²

¹ Agriculture and Agri-Food Canada, Lethbridge Research and Development Centre, 5403 1st Avenue South, Lethbridge, Alberta, Canada T1J 4B1; ²410 Agriculture/Forestry Centre, University of Alberta, Edmonton, Alberta, Canada T6G 2P5

Early seeding has been suggested as a method of increasing the grain yield and grain yield stability of wheat (*Triticum aestivum* L.) in the northern Great Plains. The point at which early seeding results in a decrease in grain yield has not been clearly identified. Changes in climatic conditions are leading to increased frost-free periods and increased temperatures during grain filling, which can either be taken advantage of or avoided by seeding earlier. Field studies were first conducted at four locations in Alberta and Saskatchewan, from 2015-2018, to determine the benefits and risks of ultra-early seeding. This study negates the ambiguity of 'seeding date' by instead using soil temperature to determine seeding time. Multiple seeding times between soil temperatures of 0°C and 10°C were completed (6) regardless of calendar date, investigating the effects of manipulations to the agronomic system including the use of cold tolerant (2 cultivars) and conventional spring wheat genetics (cv. Stettler), seeding rates (200 vs. 400 seeds m⁻²), and seeding depths (2cm vs. 5cm). Results indicate that grain yield was never compromised and often maximized when seeding occurred at around 2°C soil temperature. A greater reduction in grain yield was observed from delayed planting until soils reached 10°C than from seeding into 0°C soils, despite extreme environmental conditions after initial seeding, including air temperatures as low as -10.2°C and as many as 37 nights with air temperatures below 0°C. Cold tolerant genetics and conventional spring wheat genetics did not exhibit differential grain yield stability. Manipulations to agronomic management further influenced grain yield – higher seeding rates increased grain yield across seeding times and provided greater system stability over lower seeding rates. The results of all studies to date indicate that growers in western Canada can successfully begin seeding wheat earlier, with few changes to their current management practices, and endure less risk than delaying seeding until soil temperatures reach 8-10°C or greater.