

Comparison of Agronomic Performance of N Placement and Formulation on Wheat, Canola and Flax at Four Sites in Saskatchewan

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A 3-year field study was conducted from 2000-2002 in four soil-climatic zones in Saskatchewan to compare the efficiency of placement methods (broadcast, side band and mid-row band) and application times (autumn and spring) of urea and anhydrous ammonia for production of wheat, canola and flax, and the impact on the emission of greenhouse gases (N₂O). Experimental sites included Swift Current (Brown), Scott (Dark Brown), Indian Head (Black) and Melfort (Gray). The crops were direct seeded into standing stubble at 25 cm spacing. In side banded treatments, seed was placed with Flexicoil Stealth openers, and in mid-row banded treatments, seed was placed with Bourgault 2 cm knives. In mid-row banded treatments, urea or anhydrous ammonia was mid-row banded (attached between every second seed row) and P fertilizer was seed-placed. In side banded urea treatments, P fertilizer was side banded with the Stealth openers, and in side banded anhydrous ammonia treatments, P fertilizer was seed placed. All plots received a blanket application of potassium sulphate. Fertilizer N rates were 0, 40, 80 and 120 kg N ha⁻¹ at Melfort and Indian Head and 0, 30, 60 and 90 kg N ha⁻¹ at Scott and Swift Current. In addition to crop yield, N₂O emissions were also measured but seed yields only are reported in this poster. Seed yield response to N fertilizers was observed at all four sites for the three crops, but the increase in seed yield from N application varied with method of placement, time of application and source of N depending on the soil-climatic zone. Of the total 12 site-years for each crop, significant seed yield response to N fertilizer was observed in 5 site-years for wheat, 6 site-years for canola and 4 site-years for flax. The N rate for maximum seed yield varied with crop, year, site and soil-climate conditions. Anhydrous ammonia (NH₃) gave similar seed yields compared to urea with both mid-row and side band fertilizer application systems. This research confirms other research results that NH₃ can be safely side banded. On average, there was no significant difference in seed yield (or seed protein content) between mid-row and side band systems 75% of the time. Whenever there was a significant difference in seed yield, the mid-row band system had higher seed yield 12.5% of the time, and the side band system had higher seed yield 12.5% of the time. Seed yields were lower with broadcast compared to banded urea in 3 site-years for wheat; 2 site-years for canola; and 2 site-years for flax. Autumn-banded N produced lower seed yield than spring banded N in 1 site-year for wheat; 2 site-years for canola; and 3 site-years for flax. For canola, seed yield was greater with autumn than spring banded N in 2 site-years. Seed-placed P fertilizer produced more seed yield in canola in 3 site-years compared to side banded P fertilizer. Other observations: Side band openers were found more difficult to adjust for optimum seed depth compared to knife openers due to soil disturbance with the side band openers. Overall, there was no difference in seed yield between the two N sources (urea and NH₃). There was no seed yield difference between the two fertilizer application systems (mid-row and side band) in

75% of the site/crop years, and seed yield differences were exactly equally split between the two systems for the remaining 25% of the site/crop years. Autumn band N and broadcast urea were less effective in increasing seed yields than their spring banded counterparts. Other observations suggest that side band systems increase the potential for problems with seed-bed quality under both dry and wetter soil conditions in heavy clay soils. If soil conditions are dry, there is a possibility of limited availability of N to crop plants in the early growing season from mid-row banded N fertilizer.