Nitrogen Fertilizer Management for No-TillL Cereal Production in the Canadian Great Plains

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Summary

Nitrogen (N) is the nutrient most limiting crop production in all areas of the world and is generally applied to soil in the largest quantity. Its effective and efficient use is essential to optimize crop yield and quality, while minimizing potential for environmental damage. The widespread adoption of reduced tillage systems in the Northern Great Plains has led to a requirement for improved understanding of the impact of tillage on N dynamics and fertilizer use efficiency. The objective of this poster is to summarize research information from various experiments conducted in the Prairie Provinces of Canada related to N fertilization management for no-till cereal production to illustrate the management practices which can be used to optimize the N use efficiency so as to optimize crop yield, improve soil quality, and minimize the N loss from root zone and environmental damage. Reduced tillage may change the balance between crop demand and N supply from the soil, increasing the requirement for N input into the system. Fertilizer use efficiency may also change with changes in tillage management, due to changes in microclimate, microbial activity, and distribution of fertilizer relative to crop residue. Broadcast applications of N become less efficient under a reduced tillage system, increasing the benefits to be obtained from in-soil placement through banding, nesting, use of large granules or seedrow-placement. Improved synchronization of crop demand with N supply can be obtained by developing a combination of N rate, source, placement and timing that is suited to the environment and the management system in use in the farming operation. Placing the fertilizer in a band reduces contact with soil microorganisms, reducing immobilization of both ammonium (NH_4) and nitrate (NO_3). Banding also slows the conversion of urea to NH_3 and NH_4 to NO_3, which can reduce losses by denitrification and leaching. The use of the urease inhibitor n-(n-butyl) thiophosphoric triamide (NBPT) shows promise in improving the efficiency of surface-applied urea-containing fertilizers in no-till systems and reducing seedling damage from seed-placed fertilizers. Ultimately, any N fertilization package has advantages and disadvantages. In selecting the optimum fertilizer management system for a farming operation, the balance between rate of application, cost and availability of equipment, soil disturbance, seedbed quality, moisture conservation, time and labor constraints and fertilizer use efficiency must be considered. The "best" management system is not fixed, but depends on the major limiting factors on each individual farm.