

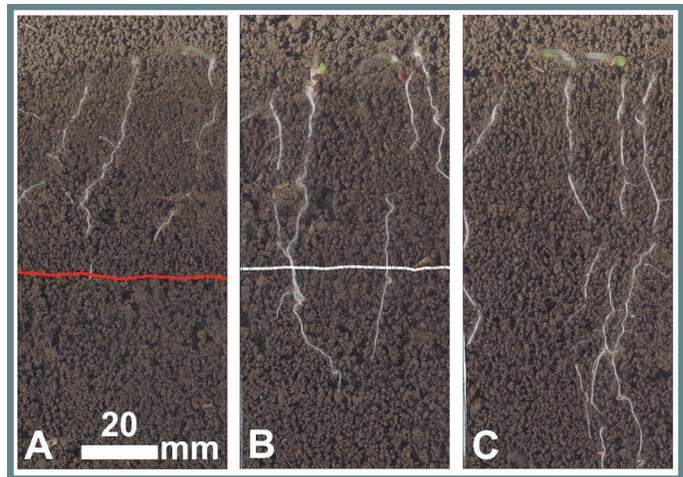
taproot growth and development as observed by Pan. Spring timed application may be ideal to minimize N loss in terms of 4R nutrient management, but placement and source will need to consider ammonia exposure to maximize seedling health and overall productivity. In drier winter locations, fall N fertilization has effectively spread the N fertilization of spring wheat, while achieving better distribution of soil nitrate throughout the 4 ft root zone.

## Selecting Nitrogen Source to Minimize Damage Caused by Free Ammonia



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When planning Nitrogen (N) fertilizer application the source of the fertilizer should be considered in order to optimize nutrient availability as well as to avoid damaging seedling root systems. Canola root systems have been shown to be sensitive to urea banded below the seeds. The two primary considerations when choosing a safe source of N fertilizer are the salt toxicity and ammonia/ammonium toxicity. The conversion of ammonium to free ammonia is primarily controlled by the initial pH of the fertilizer reaction. A high pH will lead to more free ammonia than ammonium. Free ammonia has been shown to be extremely toxic to plant cells. Therefore fertilizers with a high pH would be expected to release more free ammonia and consequently have a higher level of toxicity. Urea, Anhydrous Ammonia, and Aqua Ammonia all have pH greater than 8 in solution. Fertilizers with a pH lower than 8 are Ammonium Sulfate, Mono-Ammonium Phosphate, and Di-Ammonium Phosphate. In this study we compared the application of ammonium sulfate (AS) (pH = 5-6, partial salt index = 3.52) to urea (pH = 8.5-9.5, partial salt index = 1.618). Urea (Fig. 1.A) and AS (Fig. 1.B) were banded at a rate of 0.016 oz N ft<sup>-1</sup> (43 lbs/A at a 6" row spacing) were compared with a control 0 oz N ft<sup>-1</sup> (Fig. 1.C). Both the AS and the Urea were seen to retard tap root growth. However, the urea was seen to completely prevent root passage through the fertilizer band, whereas the roots exposed to AS were seen to pass through the band.



**Take away points:** It was determined that canola roots are more sensitive to urea than ammonium sulfate. This is likely because urea would produce higher levels of free ammonia following dissolution.

## Effects of Mowing Early Planted Winter Canola on Yield, Survival, and Moisture Use



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A major constraint on the adoption of winter canola in the winter wheat/fallow zone of Washington is the ability to establish a uniform stand of the crop in the hot, dry growing conditions associated with the recommended seeding date of mid-to-late August. Seeding canola earlier in the summer (early-to mid-July) increases the chance for uniform stand because temperatures are cooler and soil moisture more readily available. However, large plants are less likely to survive the winter, due to exhaustion of soil moisture reserves or occurrence of stem elongation before the frost.