

# PLANT NUTRITION TODAY

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## POP-UP FERTILIZER... BENEFITS, RISKS, AND OTHER CONSIDERATIONS

Placing fertilizer in-furrow with the seed is a common practice in small grain and row crop production. Often called “pop-up”, fertilizer placed with the seed can under certain conditions have several benefits including promotion of early root growth and plant vigor, which in turn can result in a crop with greater resistance to pests, improved ability to compete with weeds, hastened maturity (associated with P fertilizer), and increased yield.

But, caution is warranted with pop-up fertilizer use since over application can result in seedling damage, and ultimately stand and yield loss. The type of crop, fertilizer source, row spacing, and soil environment all affect how much fertilizer can be safely applied with seed.

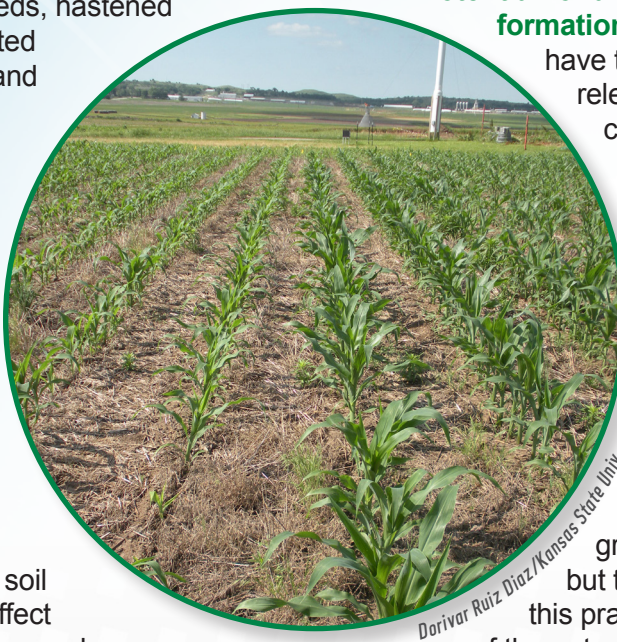
**Type of crop:** Some crops are more susceptible to injury from pop-up fertilizer than others. Oil seed crops are particularly sensitive. The general order of sensitivity (most to least) among major crops is soybeans > sorghum > corn > small grains.

**Type of fertilizer:** Fertilizers are salts... too much fertilizer (salt) in seed contact and desiccation or “burn” can occur. Some fertilizer materials have higher salt index or burn potential than others. As a general rule, most N and K fertilizers have higher salt index than P fertilizers;

therefore, a common predictor for the potential for salt damage is the sum of  $N+K_2O$  per acre applied with the seed. For example, most guidelines for corn in 30-inch rows will allow for no more than 10 lb/A of  $N+K_2O$  in medium to fine textured soils (no urea-containing products).

### Potential for ammonia

**formation:** Fertilizers that have the potential to release free ammonia can cause ammonia toxicity to seed. Thus, in-furrow placement of urea-containing fertilizers is usually ill-advised. In some cases, UAN is applied successfully in-furrow in small grain production, but there is risk in this practice because of the potential for ammonia



*Example of the impact of in-furrow (pop-up) phosphorus application on early corn growth and development. Corn rows on the right received pop-up P while rows on the left did not.*

damage. As a general rule, the use of urea or UAN in-furrow in row crop production should be avoided.

**Row spacing:** For a specific set of circumstances (crop, soil conditions, etc.) safe rate of in-furrow fertilizer increases as row space narrows. This is because the narrowing of row space has the effect of diluting fertilizer over more linear feet of row (per acre).



**Dr. Mike Stewart**

Director, North American Program  
[mstewart@ipni.net](mailto:mstewart@ipni.net)



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**Soil environment:** Soil conditions that tend to concentrate salts or stress the germinating seed increase damage potential. So, the safe limit for in-furrow fertilization is reduced in sandier soils and in drier soil conditions. Also, environmental conditions that induce stress and/or slow germination (e.g., cold temperature) can prolong fertilizer-seed contact and thus increase the likelihood of damage.

**Seed bed utilization:** The type of planting equipment and seed opener used influences the intimacy of seed-fertilizer contact. The more scatter there is between seed and fertilizer in the seed row the more fertilizer can be safely applied. The concept of “seed bed utilization” has been used to address this factor. SBU is simply the seed row width divided by the row width, or the proportion of row width occupied by the seed row. The wider the seed row for a specific row width the

greater the SBU. As SBU increases so does the safe rate of in-furrow fertilization.

A detailed rendering of the topic is beyond the scope of this newsletter, so the information here is mostly general and conceptual. For more specific information regarding in-furrow fertilization refer to university extension resources, and/or consult a knowledgeable and experienced crop adviser or industry professional. Also, IPNI has some helpful electronic tools available online.

**Seed-Placed Fertilizer Decision Aid:** <http://www.ipni.net/article/IPNI-3268> (Excel format)

**Seed Damage Calculator:** <http://seed-damage-calculator.herokuapp.com> (Web-based)