by Dr. Jeff J. Schoenau

Fluid Fertilizers In Direct Seeding Systems

Ease of handling and simplocity in single-pass systems provide rapidly growing market for fluids in Western Canada.

Summary: *Fluid fertilizers have a good fit in direct seeding systems in Western Canada. Their flexibility in use offers a wide variety of placement options that can be used to accomplish seed/ fertilizer separation and positioning in the soil for maximum root access and crop nutrient uptake in a single-pass system. The ability to make pre-seeding and postemergence fertilizer applications through low disturbance spoke injection, coulter systems, and dribble banding is also compatible with the concept of minimum soil disturbance. Ease of handling, application, and simplicity have made solutions attractive to producers looking for versatile, low-cost direct seeding and fertilizer equipment setups that they can easily modify to fit their own specific needs and conditions. With expected acreage increases, one can expect to see increased interest in fluid fertilizer technology.*

Improved water conservation, reductions in wind and water erosion, and increases in soil quality associated with direct seeding conservation management systems have been well documented in Western Canada. In Saskatchewan, it has been estimated that as much as 25 percent of the cropland is now direct seeded. Direct seeding refers to seeding of a crop directly into the previous year's crop stubble without any pre-seeding tillage operation. Direct seeding has become a popular management practice on the Canadian prairies. Low disturbance direct seeding of common annual crops such as cereals, canola, peas, lentil, and flax is successfully carried out using knife or disk-type openers that leave much of the residue standing after the seeding operation. This type of low disturbance direct seeding is akin to "zero-till."

Typically, lower fertilizer-use efficiency from broadcasting, along with development of new application technology, has tended toward more producers placing all of their requirement directly into the soil rather than broadcasting. This includes traditional seed-row placement as well as bands separated from the seed row to avoid injury. Other common options include preplanting and postemergent applications of fertilizer in bands or nests using low (knife, coulter, spoke wheel) or zero (dribble band) disturbance.

Effective application of fertilizer in direct seeding systems requires:

- Effective separation of fertilizer and seed to avoid germination problems and seedling injury
- Placing fertilizer below the surface residue to reduce losses and position nutrients for best root access
- Recognizing limitations on amount of fertilizer and seed that can be efficiently handled at once.

Fluid fertilizers have played a key role in meeting these requirements. Use of fluid fertilizers such as UAN has increased greatly in Western Canada over the past few years. For example, of the nitrogen fertilizer materials sold in Saskatchewan from 1993 to 1997, reported UAN sales increased tenfold from '93-'94 to '97-'98. I believe that part of the consumption increase in fluid fertilizers can be attributed to their unique application in direct seeding.

Separation from seed

Guidelines for maximum fertilizer nutrient rates that can be safely placed in the seed row have been developed for the prairie provinces. Maximum rates vary depending on opener spread and row spacing, soil texture, crop sensitivity, and fertilizer nutrient. In a continuous cropping system where a cereal or oilseed is grown, the situation commonly encountered is that only a portion of the nitrogen fertilizer recommended can be safely placed in the seed row.

A potential advantage in solution systems is that flow of the solution can be directed away from the seed row, thereby accomplishing separation. One grower, L. Schick, applied an NS solution as a semi-incorporated dribble band at 20-25 psi about an inch beside the seed row. Soil kicked up by openers provided some coverage of the band.

The ability to direct flow and placement of a solution in the soil is viewed as an advantage in achieving separation between seed and fertilizer in a fluid system.

Positioning

In fields direct-seeded for a number of years, especially zero-till, a thatch or duff layer builds up on the soil surface. On the prairies, thatch can be as thick as one to two inches after 20 years. To minimize losses and assure good crop-use efficiency, fertilizers should be placed *below* the thatch into the mineral soil. Otherwise, nitrogen forms will volatilize when thatch is moist and urease enzyme activity is high. Immobile nutrients like P and K may be "hung up" in the surface and not accessible to roots, especially in dry years. Or, nutrients may be tied up by microorganisms as they decompose residue.

It is not surprising, then, that placement of fertilizer in bands or nests at seeding depth or below has particularly benefited direct seeding systems in Western Canada. New opener designs and configurations have greatly expanded the number of precision placement options. A common approach is placement of the fertilizer about one inch to the side and one inch below the seed row. Such banding encourages root proliferation deeper in the soil.

More recently, another fertilizer placement option for direct seeding termed "mid-row" has become available. In mid-row banding, fluids are applied in a band between the seed rows using a separate knife or coulter opener.

Another approach unique for fluids is the use of point or spoke injectors that nest liquid nutrients with a minimum of soil disturbance.

Delivery

Transport of solution fertilizer to the field by the dealer reduces additional labor requirements or time lost off equipment by operators. With some grain farms in Western Canada approaching 5,000 acres or more and a narrow window for timely completion of seeding, maximum efficiency in seeding and fertilizing is a high priority.

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