



Fluid Fertilizers

Fertilizers are the most important input in the intensive farming systems to achieve higher yields. The liquid or fluid fertilisers have totally revolutionised the farm output in most of the developed world. Fluid fertilisers offer many advantages over the traditionally used solid fertilisers. First and foremost is their ease of use, dust free application, and simultaneous application with seeding. The liquid fertiliser can be conveniently applied through a pump, usually requires less labour to handle and can be custom blended to specifications.

The major types of fluid fertilisers are suspension fertilisers and clear liquids. Clear liquids are dissolved completely in water. Suspensions are partially dissolved in water, and the nutrients are suspended in the medium with the help of suspending agents. Suspensions require completely different farm machinery as constant agitation is required to keep the nutrients in suspension and prevent their sedimentation. The true fertiliser solutions can be stored for an indefinite period so long the temperature stays above freezing. On the other hand the suspension fertilisers must be applied immediately after the dealer delivers them to the farmer. Liquid fertilisers are chiefly applied by broadcast spray, dribble, knife-in, or starter placement. Each method has advantages and disadvantages. Broadcast sprays are commonly recommended for suspension. Avoid broadcast sprays of urea-ammonium nitrate solutions whenever possible on hot, dry days unless the material will be cultivated in, irrigated in, or rain is imminent. A great deal of nitrogen can be lost to the crop when the air temperature is above 30-35 degree C. This loss can be lessened by rain occurring within 2-3 days. Urea ammonium nitrate solutions (UAN 42%N) are popular for grasses, wheat and small grains. Leaf burn may occur on small grains when UAN is combined with broadleaf herbicides and wetting agents/surfactants.

Dribbling is applying liquid fertilisers in narrow bands in either large drops or small streams. Distance between bands depends on the individual situation. Concentrating the material in very small areas generally lessens potential nitrogen loss from urea in UAN solutions. The material touches less of the crop, so there is less potential for crop burn. Because the drops are larger in size than broadcast sprays, they do not settle on the plants and cause leaf burn.

Using knife equipment allows precise placement of fertiliser material with respect to the plants. This is an excellent method of side dressing crops because volatilisation losses are eliminated by placement within the soil, and there is no danger of crop burn from overhead sprays. Specialised equipment are now available to apply fertilisers through this method, however, pesticide application must be avoided with the fertiliser because of limited coverage area and compatibility issues.

The most prevalent form of liquid fertiliser application is the use of starters. Ammonium polyphosphate (APP), 14-21-0 or 16-23-0, are the direct replacements of DAP/MAP solids as the starting materials. These fertilisers are called starters because they are applied in a band near the row at planting. Applying APP in localised zones to promote root proliferation due to even diffusion from the place of application compared to their dry counterparts-DAP and MAP. However, APP must not be applied directly over the seed surface as ammonia can be detrimental to seed survival and germination. The other advantage of APP is its low salt index compared to the other dry starters. Salt index is the degree of osmotic effect a fertiliser can produce. High salt indices can damage the root system, remove water from the seed surface, and cause delayed emergence and reduced stands. A long dry period after planting will increase the chances of salt damage. In severe instances, replanting is required.

Apart from soil application, liquid soluble fertilisers can be directly sprayed on to the plants to:

- boost their growth
- eliminate deficiencies
- supply nutrients under adverse soil conditions, and
- correct internal balance of nutrients chiefly K/N and Ca/Mg ratios.

Foliar feeding has been practiced since long to accelerate crop growth. Liquid fertilisers must be carefully chosen for foliar feeding as they may burn the foliage if used undiluted. The fertiliser material must be in its readily soluble form for immediate uptake by the leaves. Fluids such as APP are generally not recommended as a spray fertiliser. Incorporation of a spray adjuvant or wetting agent accelerates the uptake process and at the same time helps spray to spread uniformly over the leaf surface. This is especially important to avoid sudden nutrient overloads and localised concentration of elements/charge in the leaf interiors. This localisation of elements is the primary cause of leaf burns. Environmental conditions also determine the efficacy of the fertiliser spray. Rapid drying under high light and temperature conditions can cause damage to the foliage, high wind velocity can cause spray droplets to drift from the target. The most suitable time to spray anything on the crop is early morning or late evenings, the uptake is maximum when stomata (leaf pores) are partially opened. Stomata are present on both surfaces of leaves, being relatively higher on the lower surface. These are sites of gas exchange through the leaves. Carbon dioxide, a substrate for photosynthesis and sulphur dioxide enters the leaves while oxygen, water vapours and ammonia are released into the environment. In an actively transpiring plant the gas diffusion pressure is high enough to discourage spray penetration through the stomata, hence the spray uptake is high under conditions of low transpiration.