

Behaviour of applied nutrients in Fertigation

Nitrogen

Efficiency of nitrogenous fertilizer is more in micro irrigation system than conventional method

Both liquid and dry nitrogen fertilizer available for use in drip

In conventional method amonical form is held by soil particles and do not move like urea or nitrate

Nitrogen

- In fertigation, applied urea travels with the water in the soil.
- the fertigated urea on reaching the boundaries of the wet zone becomes susceptible to volatilization.

Nitrogen

- **Evaporation from the soil surface results in increased urea concentration near the soil surface.**
- **This residual urea at the soil surface is also certain to be lost to the atmosphere as ammonia.**
- **Ammonium(NH_4^+) carries a positive electric charge (cation) and is adsorbed to the negatively charged sites on clay and can also replace other adsorbed cations (calcium and magnesium) on the clay surfaces.**

Nitrogen

- Within a few days, the soil ammonium is usually oxidized by soil bacteria to the nitrate form that is dispersed in the soil with further irrigation cycles.
- When either ammonium or urea is used as nitrogen source in fertigation, significant gaseous losses as nitrous and nitric oxide has also been recorded

Nitrogen

- Nitrate (NO_3^-) carries a negative electric charge(anion). It cannot, therefore, bind to the clay particles of basic and neutral soils which carry negative charges.
- However,nitrate binds to positively charged iron and aluminum oxides present in acid soils.

Nitrogen

- Under fertigation high nitrogen content of emitter saturates soil fixing sites and permit ammonium ion to move into root zone and later on converted to nitrate form
- Ammonium sulphate is less suitable for acid soils as continuous use lowers the pH of soil
- Periodical check is necessary to test the soil pH

Water quality

- In fertigation water quality should be considered.
- Injection of anhydrous ammonia in irrigation increases the pH and causes precipitation of calcium, magnesium and phosphorus or forms the complex like magnesium ammonium phosphate (MAP) –which is insoluble
- Injection of ammonium phosphate causes serious clogging with formation of the same complex if calcium and magnesium are present

Water quality

- Urea is most favoured form for use in fertigation
- However presence of urease enzyme in algae containing soils cause hydrolysis of urea to ammonium ion

Phosphorous

- Phosphorus (P) in solution is subject to interactions with inorganic and organic constituents in the soil.
- The rapid reactions of phosphate with Ca (lime rich soils) in basic soils and with Fe and Al in acid soils restrict the distance of movement of applied P in the soil.

Phosphorous

- The higher the clay content or CaCO_3 fraction of the soil, the shorter is the distance of movement of P from the dripper.
- When the P is complexed by organic compounds like in manures, it does not react with soil constituents and therefore, can travel to considerable distances from its point of application in the soil.
- Acidification of stock solution or use of phosphoric acid can solve the problem

Potassium

- **No adverse effect is observed when potash is applied alone**
- **However mixture of different fertilizers like use of calcium nitrate and potassium sulphate produces insoluble calcium sulphate**

Micronutrients

- Chelates or sulphate salts of micronutrients can be predissolved and applied through fertigation
- Growers encounter problems like precipitation and clogging of emitters when zinc is applied in sulphate form
- Chelates are highly water soluble and cause no precipitation
- However chelates are costly