Information

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Fertigation/Liquid feeding

The application for fertilizers through irrigation systems is not new. Dr Ludwig Blaas applied liquid fertilizers through his 'trickle' irrigation in 1947. He formulated the Liquinure range of fertilizers specifically for that method of application.

Advantages

The application of fertilizers through an irrigation system provides many advantages over conventional spray irrigation methods.

1) Low labour requirements
2) Low energy requirements
3) Ensures a continual availability of nutrients at the right levels
4) Allows the adjustment of nutrients to suit crop stage
5) Safer environmental application method
6) Greater efficient use of applied nutrients by crop
7) Higher yields can be obtained on marginal land
8) Lower production costs

Application methods

1) Main water pump suction injection
2) Venturi suction system
3) Direct injection pump
4) Water actuated injector pump
5) By-pass tank system
6) Conductivity controlled

NUTRIENTS

Nitrogen

Two forms of nitrogen are used by the plant – nitrate and ammoniacal. Nitrate nitrogen in anion form NO_3, is very soluble and moves easily through the soil and is readily absorbed by plants. It is used by the plant for leaf colour and extension growth.

Phosphate

It very slowly moves in the soil and is easily locked up in the soil. It is of most use in the early stage of a plants life and for root development.

Potassium

Potash ions react with the clay colloid by displacing Calcium and other ions. They do not move very quickly in water once attached to the soil. Plants can, however, readily obtain the absorbed nutrients. This nutrient influences both internal and external crop quality. It intensifies flower and fruit colour and will increase resistance to low temperature and disease.

PRACTICAL ASPECTS

Calculation of liquid feed formulae

The nutrient content of the base materials used to make up a feed is used to calculate the formula used. The ppm of each nutrient, kgs/ha or plant food ratio, are the standards to which the formula is made.

	% of Nutrient			
	N	P	K	Mg
Ammonium nitrate	34			
Monoammonium phosphate	11	48		
Potassium nitrate	13		42	
Calcium nitrate	15			
Phosphoric acid		52		
Magnesium sulphate				20

Colour dyes

Use these to aid detection of fertilizer in the water and as a guide to dilution rate.
Disulphine Blue
Fluorescein
Naphthalene Orange

Dissolving nutrients

Solubility table grm/100ml	Cold	Hot
Ammonium nitrate	118	871
Calcium nitrate	102	376
Urea	78	
Monoammonium phosphate	22	173
Potassium nitrate	13	247
Magnesium sulphate	26	73
Sodium borate	1	14
Ferrous sulphate	15	48
Sodium molybdate	56	115

Control of feed strength

Keep a check on strength of nutrients in water to avoid root damage and to keep a check on both water and soil pH. Use a conductivity and pH meter to check this.

Corrosive properties of stock solution

The stock solution is very corrosive and should be kept in plastic tanks with plastic pipe fittings used for its transfer. The use of 1.0% sodium dichromate will reduce corrosion.

Liquid feeds are usually made up into a stock solution, which is injected into the water flow at a recognised dilution rate. The formula for calculating the amount of product is as follows:

$$\text{grm/lt} = \frac{\text{ppm of nutrient} \times \text{dilution rate}}{1{,}000} \times \frac{100}{\%\ \text{nutrient}}$$

or

$$\text{ppm} = \frac{\text{fertilizer weight} \times 1{,}000}{\text{dilution}} \times \frac{\%\ \text{nutrient}}{100}$$

Read the label before you buy – use pesticides safely

WATER QUALITY

Water hardness

The hardness of water is determined by two aspects – temporary and permanent hardness. Temporary hardness can cause lime scaling of the inside of pipes and outlet blocking, whereas permanent hardness tends to create soil pH changes rather than blockages. The use of either continuous or regular acid injections is necessary. The injection rate needs determining by a titration. The lowering of the pH to 6.0 is usually sufficient to control internal lime scale. Nitric Acid is most suitable giving you Calcium nitrate as a product of injection. As much as 17ppm nitrogen can be added by the water treatment process.

Algae

Water taken from surface abstractions may contain algae spores, which can multiply and accumulate inside the pipes causing blockages. The injection of chlorine to oxidise the organic matter is necessary. A continuous free chlorine content of around 5ppm is sufficient to keep the pipe work clean. Sodium hypochlorite is normally used for this treatment process, which is injected as a 14% liquid. Chlorine gas and Calcium hypochlorite tablets are alternative methods.

Iron

Some underground waters have a dissolved iron content within them. This may be in the form of filamentous iron bacteria, sulphate reducing iron, or ferrous carbonate. Iron removal is important in ensuring a freedom from long-term blockages of drip systems. This can be carried out in a variety of ways depending on the form of iron present. The usual way is to pass all the water through a filter containing suitable media such as BIRM or Manganese Dioxide. Aerating the water by spraying it in the air and collecting it or running it over corrugated sheets can in many cases cause the iron to precipitate out. By allowing the water to settle over 24 hours the iron drops to the bottom of the tank, allowing surface abstraction to avoid it.

Consider:

Time to reach furthest part of system.
- Velocity of water in the pipe.
- Pipe size and distance.
- Time for feeding to finish for pipe flushing.

Amount of water needed to dissolve the solids.
- Check water temperature.
- Check water volume.

The root zone area in relation to total soil area.
- Crop root area may be 75% of field area, nutrient values can be reduced accordingly in wide spaced plants.
- Consider feeding rates in kgs/plant count rather than kgs/ha.

Crop life period
- High potash at fruit ripening.
- High phosphate at fruit initiation time and root establishment.
- High nitrogen for extension growth.
- High potash for an increase in winter hardiness.

Pre-mixed feeding products.