Mind your ppms – they are very important

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Fertigation is a method of fertiliser application in which fertiliser is incorporated within irrigation water and distributed evenly by a drip system. It is an immensely useful and flexible approach to feeding plants. There are a significant range of compound fertilisers (feeds) which usually contain 2 or 3 nutrients of Nitrogen (N), Phosphate (P_2O_5), and potash (K_2O) for growers to choose from. The final amount of fertiliser dissolved in the irrigation water is normally between 0.5g to 2g per litre of water. Normally a concentrated stock fertiliser solution is made up, which is then further diluted to give the required level of fertiliser in the water.

The dilutors used to dilute the concentrated stock fertiliser to the final level can be either fixed or variable type. With fixed dilutors, growers can select from a limited range of dilution options, such as 1:100 or 1:50. With variable dilutors, a range of dilution ratios can be set normally between 1:50 to 1:200

Technical advice notes for these compound feeds often set feeding rates in relation to the quantity of nitrogen applied, for instance 150 parts per million (ppm) nitrogen. The basis of the ppm concept is that 1 litre of water = 1 kilogram (kg) = 1000 grams (g) = 1,000,000

milligrams (mg). If 1mg of a substance is then dissolved in 1 litre of water then there is 1mg in 1,000,000 mg of water – or one part per million (ppm).

If a grower is then using an 18-18-18 (i.e. the ratio of $N/P_2O_5/K_2O$) fertiliser, they would have two options to achieve say **150ppm N in the irrigation water**.

Fixed Dilution Diluter

The first method is used when working with a fixed dilution dilutor. Here you will need to work backwards and calculate the strength of the stock solution required **(S)** to achieve the target 150 ppm N.

The formula to calculate (S) is:

$$\text{Grams per litre of water soluble (WS) fertiliser needed in stock solution (S)} = \frac{\text{ppm N required in final feed solution (T)} \times \text{dilution rate of diluter (D)} \times 100}{1000 \times \text{\% Nutrient in fertiliser (F)}}$$

So for example - if a final target dilution of 150 ppm N is required **(T),** and the fixed dilution rate of the diluter is specified at 1:100 **(D),** and the fertiliser being used is 18:18:18 i.e. 18% N **(F)** then the calculation becomes:

$$\frac{150\ \textbf{(A)} \times 100\ \textbf{(D)} \times 100}{1000 \times 18\ \textbf{(F)}} \Rightarrow 83\text{g / litre water to be dissolved in stock}$$

To make this easier for growers to measure it is usually then converted to a rate for 10 litres
So 0.083 Kg x 10 => 0.83kg per 10 litres of water

Variable Diluter Method

The second method is used where the dilution on the diluter is variable. Here by using a standard stock solution of 100g fertiliser/ litre water **(S)** the equation can be rearranged to identify the dilution rate to be set

$$\text{Dilution rate to be set on diluter } \mathbf{(D)} \Rightarrow \frac{\text{Amount of WS fertiliser in stock solution in g/litre } \mathbf{(S)} \times \text{\% Nutrient in fertiliser } \mathbf{(F)} \times 1000}{\text{ppm of element in final feed solution } \mathbf{(T)} \times 100}$$

So if the ppm N required is 150, the WS fertiliser has been dissolved at a rate of 100g/litre, and the % of N in the 18:18:18 fertiliser is 18% then the calculation is as follows:

$$\text{Dilution rate required to achieve 150ppm } \mathbf{(T)} \Rightarrow \frac{100\ \mathbf{(S)} \times 18\ \mathbf{(C)} \times 1000}{150\ (T) \times 100}$$

This calculates out at a setting of 1:120 or one part stock solution to 120 parts diluting water.

Growers should calibrate their dilutors on a regular basis to ensure they are operating properly and not over or overdosing. If you would like further information on fertigation calculations, please contact Mark Huey, Horticulture Development Adviser, CAFRE by e-mail; mark.huey@daera-ni.gov.uk or mobile telephone 07785344244.