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Fertigation Schedule for Commercially Important Flower plants

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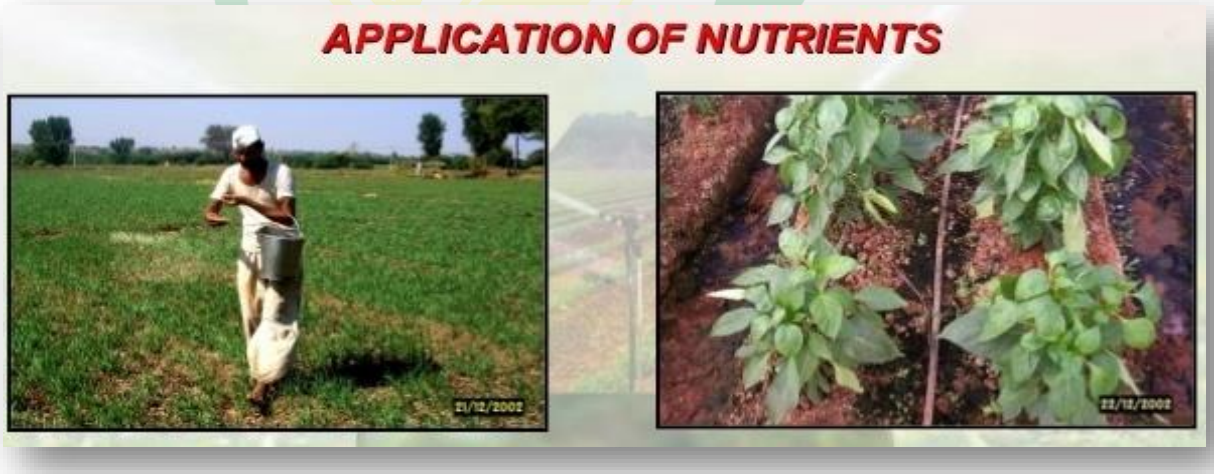
The visual quality of ornamental plants is necessarily linked to an adequate balance of nutrients. Plant height, shape and colouration are qualitative aspects of ornamental species, directly influenced by mineral nutrition, among other environmental aspects. For flower crop, to get maximum yield with good quality flower, scheduled fertilizer application is highly inevitable. Fertigation is the process in which fertilizers can be applied through the system with irrigation water directly to the region where most of the plant roots develop. Fertigation scheduling refers to timely application of water and nutrients as per crop stages through drip fertigation.

Fertigation v/s Fertilizer application

Conventional method- Plants get a large dose of fertilizer than they require at the time it is applied.
Fertigation- Fertilizer applied according to the need of plant following the uptake rate of crop.



Fertigation for open field and protected cultivation technology

- ✓ Fertigation is done with the aid of special fertiliser apparatus (injectors) installed at the head control unit of the system, before the filter.
- ✓ The element most commonly applied is nitrogen. However, application of phosphorus, potassium and other micro-nutrients are common for different flower crops. Fertigation is a necessity in drip irrigation.

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Objectives of fertigation

- ✓ Uniform and timely application of fertilizers
- ✓ Water and nutrient saving
- ✓ Optimizing yield
- ✓ Quality improvement
- ✓ Minimizing pollution

Rational for fertigation

(a.) The rational for fertigation are as under

- ✓ Irrigation and fertilizers are the most important management factors through which farmers control plant development and yield.
- ✓ Water and fertilizers have important synergism which is very well used in fertigation.
- ✓ Timely application of water and fertilizers can be controlled through fertigation.

(b.) Fertilizer used in fertigation

- ✓ Urea and potash are highly water soluble fertilizers are available for applying through fertigation.
- ✓ Application of phosphoric acid in place of super phosphorus through fertigation.
- ✓ Special fertilizers like mono ammonium phosphate (Nitrogen and Phosphorus), poly feed (Nitrogen, Phosphorus and Potassium), Multi K (Nitrogen and Potassium), Potassium sulphate (Potassium and Sulphur) should be used.

Chemicals and biological consideration in selecting fertilizers for fertigation

- ✓ Fertilizer solubility and compatibility.
- ✓ Solution pH and NH3/NO3 ratio.
- ✓ Nutrients mobility and chemistry in soil.
- ✓ Salinity of the irrigation water.

Quality of fertilizers used in fertigation

- ✓ 100% water soluble.
- ✓ Quick dissolution.
- ✓ High nutrient content.
- ✓ Lack of toxic materials.
- ✓ Low price.
- ✓ Easy availability.

Table 2.0 Fertigation scheduling in flower under protected cultivation

Crop	Plants	Fertigation schedule	Dose	Total	Yield

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	No./1000 m^2		N	P	K	N	P	K	
			ppm	ppm	ppm	Kg/1000m^2	Kg/1000m^2	Kg/1000m^2	Stems (No.)
Rose	12000	Vegetative stage Sept-Oct.	80	50	60	28	17	25	270000
		Flowering and harvesting flush Nov-March	100	60	80				
		Flowering and harvesting normal April-August	80	50	80				
Gerbera	16000	Vegetative stage Sept-Oct.	70	50	60	17	12	17	650000
		Flowering and harvesting flush Nov-April	80	60	80				
		Maintenance dose May-August	40	24	24				
Chrysanthemum	65000	Vegetative stage Sept-Oct.	80	50	60	21	13	19	90000
	Flowering and harvesting flush Nov-April	90	60	80					
	Maintenance dose May-August	50	30	50					

Table 2.0 Fertilizer use efficiency in fertigation (%)

Sn.	Nutrient	Soil application	Drip + Soil application	Drip + Fertigation
1	N	30-50	65	95
2	P2O5	20	30	45
3	K2O	60	60	80

Fertigation management in greenhouse crops

a. **Electrical conductivity -** If the difference between the EC values of the leached solution and the incoming solution is more than 0.4-0.5 ds/m, irrigation should be applied in order to wash the excess of salts.

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b. **Chlorides -** If the Chloride concentration in the leached is higher than the Chloride concentration in the incoming solution and if it is more than 50mg/L, chloride accumulation is indicated. Irrigation without fertilizers to leach the chlorides is recommended to apply in such a case.

c. **pH -** The optimal pH value of the irrigation solution must be around 6 and the pH of the leaching solution should not exceed 8.5. A more alkaline pH in the leaching water indicates that pH in the root zone reaches a value that causes phosphorus precipitation and decreases micronutrient availability.

Interaction between fertilizers and irrigation water

The water with high content of carbonates and bicarbonates of calcium and magnesium as usually seen in tube well waters, results in precipitation in fertilizer tanks especially that of phosphates. Clogging in the system due to increase in pH. On the other hand water with low pH and high content of iron and aluminum as in tropical climate can cause toxicity due to these elements in addition to precipitation of phosphorus. Hence it is mandatory to use water with near neutral pH for fertigation.

Precautions for fertigation

- ✓ The fertilizers should be fully dissolved in water before fertigation.
- ✓ The selected fertilizers should be fully compatible with each other.
- ✓ The quality of irrigation water should be properly checked and managed before mixing.
- ✓ Incorrect application may lead to salinity problem, crop damage, leaching of nutrients and pollution of ground water.
- ✓ The time needed to distribute the fertilizer should be less than the time needed to supply enough water to the field; otherwise salinity may arise.
- ✓ Over irrigation should be avoided.
- ✓ The ratio NH_4/NO_3 of nitrogen sources should be such as to have a nitrogen mixture with 80% of nitrates and 20% of ammonium to regulate pH.

Limitations of Fertigation

- ✓ Initial investment is high.
- ✓ Chemical reaction in drip system leading to corrosion and precipitation of fertilizer.
- ✓ Clogging of emitters.
- ✓ Lacking the information
- ✓ The fertigation material is either not available in desired form or available at higher price.
- ✓ Lack of knowledge about chemical technique.
- ✓ Require safety measures.

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Conclusion

Floriculture sector is generating higher income and employment opportunities, promoting domestic market and exports. NPK Application in the form of fertigation enhanced various growth indices and increased flower yield. High frequency of fertigation (500 ml at 2 days interval) increased plant height, number of branches, number of leaves, number of flowers per plant, number of petals flower per plant, leaf nitrogen, phosphorus and potassium percentage. Whereas, number of days for the emergence of first flower was maximum with low frequency of fertigation @ 250 ml at 6 days interval. Therefore, optimum use of compound fertilizer (NPK) at high frequency proved better towards vigorous growth and maximum flower production in flower crops. Under protected conditions fertigation and foliar application methods of fertilizers application are the best method for flower production. The exact dosage optimizes fertilization, reducing the potential for groundwater contamination caused by the leaching of fertilizers.