Liquid Feeding for Greenhouses

The application of most of the plant nutrients in a liquid form holds many advantages to the greenhouse operator. The most readily apparent advantages are: 1. A saving of labor, 2. the maintainance of a more even nutrient content in the soil, and 3. more even distribution of fertilizer. A temporary disadvantage may be the cost of installation of a liquid feeding device. Several methods of liquid feeding are in operation in greenhouses throughout the country.

Probably the most used is the tank and pump method. The fertilizer chemicals are dissolved in the tank of water then pumped into the existing water lines or into auxillary lines that have been installed especially for the purpose. Centrifugal or turbine pumps should be used with this sort of installation as there is always a certain amount of grit present in any fertilizer solution. Rotary or gear pumps would be subjected to excessive wear. The tank should be equipped with an agitator to insure uniformity of the solution.

Most liquid fertilizer recommendations are based on a light watering of approximately one quart per square foot of bench area. Uniformity of watering is essential to accurate feeding. One can safely apply up to the amount of fertilizer that would be used as a dry feed for a given area. However, it is more economical and safer to apply less fertilizer and apply it more often. The frequency of liquid feeding should be determined by soil tests.

Another method of liquid feeding that has even greater possibilities is in conjunction with a proportioner. Concentrated fertilizer solution is introduced into the water line at a rate determined by the rate of flow of water past the orifice. Such a machine is in operation at Colorado A & M and is a common device for chlorinating city water supplies. When operating properly this machine can be set to deliver water with a definite fertilizer content, regardless of the rate of flow. The machine is geared to a water meter which determines its rate of injection into the water line. A less expensive machine may be adapted to a pump-pressure tank system of watering. In this case the flow is constant when the pump is running so the machine is less intricate.

Ordinary suction pump proportioners may be used but the error of dilution is great. At a flow of eight gallons per minute the proportion may be 1 to 12, while with a flow of ten gallons per minute, the proportion may almost double. Any small amount of back pressure or even the length of hose will affect the dilution materially.

When using a proportioner method of liquid feeding the solubility of the fertilizer chemicals becomes the major problem. Many chemicals are not sufficiently soluble even for a proportion of 1 to 400. The most soluble of the chemicals listed in the table are satisfactory, however the potassium compounds may not be sufficiently soluble to maintain the minimum requirements without occasional applications of dry chemical.

Solubility of Fertilizer Chemicals and Safe Application Rates

Dry chemical	Lbs. chemical sol. in 1 gal. water at 70 F.	Ounces chemical per 100 gal. fertilizer solution*
Ammonium nitrate (33% N)	6.6	18
Ammonium sulfate (20% N)	4.8	28
Calcium nitrate (15.5% N)	7.5	36
Tech. urea (46% N)	3.3	12
Commercial urea (44% N)	2.8	13
Potassium nitrate (13% N and 44% K_2O)	2.3	32
Muriate of potash (60% K_2O)	3.1	32
Potassium sulfate (50% K_2O)	1.0	36

*These figures based on half the amount that would be applied as a dry chemical. 100 gallons of fertilizer solution at these strengths would cover approximately 400 square feet of bench area or one quart per square foot.

The residue left by chemicals should be an important consideration in liquid feeding, especially if the feeding is to be done on a constant basis. Chemicals such as ammonium nitrate, calcium nitrate and potassium nitrate leave no objectionable residues, whereas the chloride and sulfate forms of chemicals, when used continuously, may build the soluble salt content of the soil above the tolerable limits for plants.

Your editor,

W D Holley

COLORADO STATE FLOWER GROWERS ASSOCIATION
OFFICE OF EDITOR
W. D. Holley
COLORADO A & M COLLEGE
FORT COLLINS, COLORADO

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30