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What Source of Nitrogen for Carnations?

by W. D. Holley

Price per pound of nitrogen should be the first consideration when buying nitrogen fertilizers. Plants grew equally well when fed with all the common nitrogen fertilizers except ammonium sulphate.

Questions are often raised as to which nitrogen fertilizer is best for carnations. One grower may claim to get the best growth from calcium nitrate while another believes he is getting a superior response from diammonium phosphate. To obtain reliable information on the effects of different sources of nitrogen on the growth of carnations the following work was completed during the 1955-56 season.

At 2½ to 3 month intervals, beginning in September, rooted cuttings of the carnation variety Red Sim and its sports were planted in glazed 4-gallon crocks of volcanic ash. This material is porous and cinder-like amd is almost inert chemically. No appreciable test for any nutrient element could be obtained, although its porosity makes it an excellent medium for plant roots.

Each planting consisted of 3 crocks with 5 plants per crock for each nitrogen source under test. The tests were repeated 4 times, roughly coinciding with the 4 seasons.

Previous to planting treble superphosphate and gypsum were added and the crocks and medium steam sterilized. The plants were fed by a slop culture method a nutrient solution containing 112 ppm nitrogen, 250 ppm potash, 50 ppm magnesium and minor elements in trace quantities. All treatments received the same amount of nitrogen although from different sources as follows:

diammonium phosphate,
ammonium nitrate,
ammonium sulphate,
calcium nitrate, and
sodium nitrate.

Urea (USP) and urea 45, a commercial fertilizer, were additional sources tested during the summer period only.

After cuttings were established they were pinched to promote branching. They were watered with the nutrient solutions exclusively throughout their life. Plants were harvested 2½ to 3 months after planting, the roots washed free of medium, and fresh weights taken. Plants were then wrapped individually, placed in an oven and dried to constant weight.

The accompanying chart shows the mean fresh weight, mean dry weight and percentage of dry matter from carnation plants grown with the 5 nitrogen sources. The outstandingly different nitrogen source was ammonium

sulphate, which consistently yielded less fresh weight and less dry matter. The other 4 nitrogen sources produced plants of similar fresh weight. Plants grown with calcium nitrate contained slightly more dry matter than all others.

Nitrogen Source	Mean Fresh Weight	Mean Dry Weight	Mean Percentage Dry Matter
Diammonium phosphate	62.0	10.26	16.6
Ammonium nitrate	64.0	10.51	16.4
Ammonium sulphate	56.7	9.72	17.1
Calcium nitrate	62.3	11.16	17.9
Sodium nitrate	62.2	10.58	17.0

Urea (USP) and urea 45 were included in the early summer tests and will be tested further. Plants grown with the former, which is a pure form, equalled or exceeded the best from the other sources of nitrogen in both fresh and dry weight. Yields from Urea 45, on the other hand, were almost as poor as from ammonium sulphate. Commercial fertilizer grades of urea should be used with caution until they are proven good. Some of them contain biuret and other toxic substances which reduce growth.

pH Relations

Although pH relations may offer no explanation of growth responses from the various nitrogen sources, they will be of interest. The pH of the nutrient solution and the pH of the medium following the tests are given below.

Nitrogen source	pH of solution	Final pH of medium
Diammonium phosphate	7.2	5.9
Ammonium nitrate	6.4	6.3
Ammonium sulphate	6.0	5.7
Calcium nitrate	5.3	6.6
Sodium nitrate	6.7	7.0
Urea (USP)	7.8	6.3
Urea 45	8.4	7.0

The influence of the fertilizer on the residual pH of the medium is determined by what part of the fertilizer is used by plants or leached, and what part is left in the medium as residue. Ammonium sulphate and diammonium phosphate are strong acidifiers since they leave acid residues. The other nitrogen fertilizers used in these tests leave less acid residues.

Discussion

Continued and exclusive use of sodium nitrate, ammonium sulphate or diammonium phosphate has been found detrimental to soil structure. The latter two also lower the pH below the optimum range and can lead to many troubles. On the other hand, their acidifying action can be used to advantage, if lowering the pH is desirable. All three of these are expensive in terms of the actual nitrogen they supply.

From these tests it is apparent that nitrogen is nitrogen, regardless of the source. The cheapest fertilizer in price per pound of nitrogen is the best. Acidifying action or the supplying of calcium or phosphorus can be done much more economically in ways other than by attempting to accomplish them with a nitrogen fertilizer.