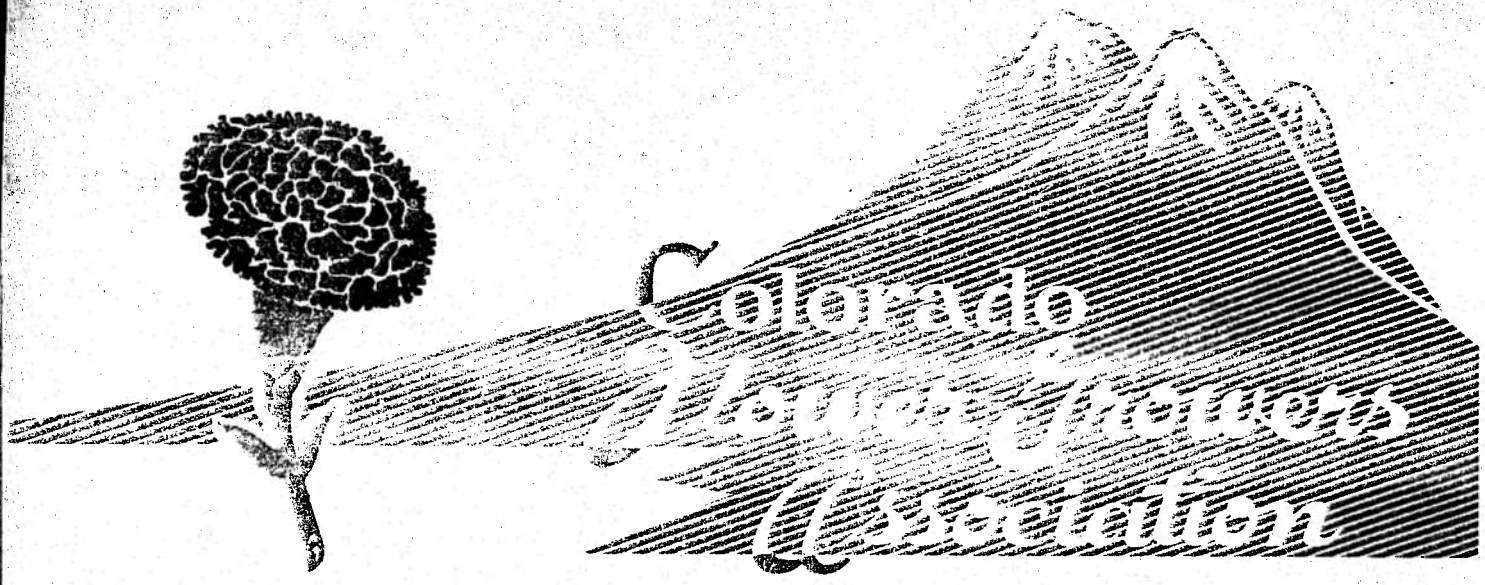

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Potassium, Sodium and Calcium Nutrition of Carnations - Part 2

by W. D. Holley

Potash or calcium hunger reduces the keeping quality of cut carnations. Flowers kept equally well from plants fed with either four or eight pounds of muriate of potash per hundred square feet per year.

Sodium nutrition apparently does not affect the keeping quality of carnations.

Medium and high potash levels increased the yield of carnations over low potash. The quality of flowers cut was greatest from medium potash, second from high potash and least from low potash.

Three applications of sodium increased production from all potash levels. Sodium improved quality, especially when carnations were receiving subnormal potassium.

There were no differences in yield or quality from plants growing at low and high calcium levels.

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Results of the first year's study on potassium, sodium and calcium nutrition of carnations was published in Colorado Flower Growers Bulletin 47. The plots were replanted with rooted cuttings of Red Sim on June 11, 1953. Identical plot arrangement was continued through the 1953-54 season. Briefly, this plot arrangement consisted of a randomized block design involving all combinations of 3 levels of potassium, 2 levels of sodium and 2 levels of calcium, a total of 12 treatments. These 12 treatments were repeated four times for a total of 48 plots. Individual plots contained 7 plants of Red Sim.

The potassium, sodium and calcium levels had been established for one year previously. To continue these same levels potassium was applied at the rates of 1, 4 and 8 lbs. per 100 square feet. Sodium was applied as sodium chloride, 1 lb. per 100 sq. ft. three times to one set of plots while another set received no sodium. Calcium was applied to one set of plots as gypsum at 5 lbs. per 100 square feet three times during the season, while the other set received no calcium. The soil used was a sandy loam low in all these elements (See Bul. 47).

Steady production began mid-October and continued until May 8, 1954, when the plants were taken out.

Tests on the keeping quality of carnations from various nutrient combinations were made throughout the year. For keeping trials, the flowers were placed in warm water and set in a draft free room. Up to February first this was a basement room with a rather constant 66° F temperature day and night. After this time a cooler room was used, hence the differences in keeping time, Table 2.

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Potash

The effect of potassium on production and quality of Red Sim is shown in Table 1. Plants growing with high and medium potassium produced approximately 22% more flowers than those growing with inadequate potash. These differences were highly significant.

Table 1. Potassium on yield and quality of Red Sim

Potassium level	Split short	Standard	Fancy	Total	Q.I.
High	80	707	538	1325*	4.32
Medium	41	627	631*	1299*	4.44*
Low	49	609	405	1063	4.33

Plants receiving the medium amount of potash, 4 lbs. per 100 sq. ft. per year, produced the most fancy flowers and significantly better average quality.

No differences were noted in the keeping of flowers from all potassium levels up through January. Beginning in February, flowers from high and medium potassium levels consistently kept longer than those from the low potassium level. These differences were highly significant.

Table 2. The effect of 3 potassium levels on the keeping quality of Red Sim

	No. Flowers	Mean days of keeping
Trials of Oct. 21, Nov. 12, Jan. 4, Jan. 26		
High	47	7.21
Medium	50	7.26
Low	46	7.35
Trials of Feb. 6, 16, 18, 27; Mar. 9, 30; Apr. 1 and 6		
High	132	13.86
Medium	124	13.82
Low	132	11.33

Sodium

Three applications of sodium increased the yield of Red Sim by approximately 11% (Table 3). Average quality as measured by the Quality Index (Q.I.) was also improved. Sodium increased yield at all potassium levels. The greatest improvement in quality came when plants were deficient in potassium. Statistical treatment of these data shows high significance.

Table 3. The effect of 2 sodium levels on production and quality of Red Sim

	Split & short	Standard	Fancy	Total	Q.I.
Sodium added	76	1001	861	1938	4.40
No sodium	94	942	713	1749	4.33

Sodium showed no apparent influence on the keeping of the flowers cut in these experiments (Table 4). Keeping trials were made on Jan. 9, 16 and 28; March 2, 6 and 18; and April 19, 22 and 24.

Table 4. The effect of sodium on the keeping quality of Red Sim

	No. flowers	Mean days of keeping
Sodium added	165	11.39
No sodium	165	11.50

Calcium

Three applications of gypsum to this soil improved neither yield nor quality, even though the soil contained low calcium initially. Yield and quality data are shown in Table 5.

Table 5. The effect of two calcium levels on production and quality of Red Sim carnations

	Split & Short	Standard	Fancy	Total	Q.I.
High calcium	88	978	782	1848	4.36
Low calcium	82	965	792	1839	4.37

Flowers cut from plots receiving high calcium kept approximately 5% longer (Table 6). Although this is a small difference, it was significant when the data were analyzed statistically. The high calcium plots tested approximately 150 ppm calcium (Spurway), whereas the low calcium plots tested near 40-100 ppm. Keeping trials were set up with flowers from calcium plots on Jan. 14, Feb. 2 and 4, March 11, April 3, 27 and 29.

Table 6. The effect of two calcium levels on the keeping of Red Sim flowers.

	No. flowers	Mean keeping in days
High calcium	113	10.98
Low calcium	113	10.40

Discussion

The data presented on potash should give us little concern. With regular soil testing we can avoid potassium hunger on carnations. However, the fact that a medium potassium level gave equal production and keeping quality with superior growth quality can be used to advantage. Unless the leaching rate is very high, four pounds of muriate of potash or its equivalent should be adequate for carnations yearly. Since these plots had been fed at the same rate for two years, the chances are good that they were able to use little or no potassium except that applied during this season. Soil tests for the three potash levels, using the Bray Test, averaged

High	-	63 ppm,
Medium	-	22 ppm, and
Low	-	10 ppm.

The addition of sodium to our feeding schedule improved both yield and quality. The first year, only quality was increased. Evidence from these data is sufficiently strong to warrant sodium nitrate being used occasionally in the nitrate feeding schedule. Although sodium nitrate leaves an alkaline residue, it is not a strong one. One pound of ammonium sulfate will almost neutralize four pounds of sodium nitrate.

The place of calcium in our feeding program may have been overemphasized. Only three plots in this series of experiments tested as much as 200 ppm calcium. The average was near 150 ppm. Many commercial greenhouse soils have been fed with limestone until tests of over 200 ppm are common. Possibly some savings can be accomplished by withholding calcium when tests climb above 150 ppm.