Commercially Grown Carnations

studies in soil fertility control made to determine optimum fertilization for production of ornamentals

O. R. Lunt, R. H. Sciaroni, and E. J. Bowles

Soil testing for fertility control in carnation production showed that large quantities of nitrogen and of potassium are removed from the soil—by plant absorption or through leaching—when cultural methods for bench grown carnations are typical of those in use in the San Francisco Bay Area.

The merits of soil testing as a control for maintaining an abundant supply of nutrients for cut-flower production were investigated in greenhouse studies.

White Sim's carnations were transplanted into small plots—with an area of about 10 square feet—on August 8, 1951 in two commercial greenhouses, on the west side of San Francisco Bay.

The plots at greenhouse *A* were replicated four times on a clay adobe soil of the Dublin series into which about 15% peat by volume had been incorporated. The plots at greenhouse *B* were replicated twice on a soil mix consisting of seven parts by volume of loamy sand, three parts of peat moss and two parts of crushed stone.

The soil mix at greenhouse *A* had an exchange capacity of 38 m.e.—milliequivalents—per 100 grams and at greenhouse *B* it was 20 m.e. per 100 grams.

At both locations the phosphorus, as single superphosphate, was incorporated prior to transplanting. Gypsum also was applied to bring the level in all plots equivalent to that of the high phosphorus plots. Potassium and nitrogen were applied as sulphates about three weeks after transplanting.

Differential rates of nitrogen were applied again in November and at monthly intervals beginning in February 1952. The highest level of nitrogen received a total of 2.6 pounds per 100 square feet during a period of nine months.

Yield records were kept from the time blooming started in November 1951 until May 8, 1952 at greenhouse *A* and until May 14, 1952 at greenhouse *B*. The flowers were graded into No. 1 and No. 2 grades. Soil samples were taken at irregular intervals.

The yields of No. 1 carnations obtained at the two locations showed a large response to nitrogen. The yield of blooms of the plots receiving an average of about .3 pound of nitrogen per 100 square feet per month was significantly better than that obtained on the plots treated with .15 pound per 100 square feet per month.

There were no significant differences due to the phosphorus treatments at either location nor was there any response to potassium at greenhouse *A*. However, at greenhouse *B* the responses from the plots receiving .125, .5, and 2.0 pounds of potassium per 100 square feet were significantly better than the plot not treated with potassium. The treatments did not meaningfully affect the percentage of blooms graded No. 2.

The nitrogen determinations showed rapid fluctuations and indicated that when soluble sources of nitrogen are used applications of nitrogen fertilizers should be made at about monthly intervals.

In spite of low phosphate readings in the plots receiving no phosphorus fertilizer, yields were not affected. Soil tests also indicated that if values of pH—the acidity-alkalinity ratio—do not become too acid an application of five pounds of single superphosphate per 100 square feet will maintain adequate amounts of soluble phosphorus for almost a year.

The pH of the soil measured slightly acid, about 5.4—pH 7 is neutral—during most of the growing season at greenhouse *A* but dropped to about 4.6 at the time the last soil samples were taken. This may account for the rapid drop in water soluble phosphorus. The pH of the soil at greenhouse *B* remained between six and seven during the experiment.

The rapid depletion of nitrogen and potassium plus the uncertainty of interpretation of potassium values when appreciable quantities of non-exchangeable potassium are present militate against the use of periodic soil tests for fertility control.

When carnations are grown under conditions similar to those of these studies, it is evident that monthly applications of from .25 to .40 pound nitrogen; quarterly applications of .15 to .25 pound potash—K_2O—and annual applications of one pound of phosphoric acid—P_2O_5—per 100 square feet will meet the needs for these elements and obviate the need for soil testing.

The rates and frequency of application may have to be modified somewhat according to soil texture, sandy soils receiving more frequent and lighter applications of fertilizers than clay soils.

Most varieties of carnations are very tolerant to saline conditions but soil testing to indicate the level of soluble salts is recommended because quality and yields of carnations are often reduced by salinity conditions resulting from overfertilization or improper irrigation practices.

O. R. Lunt is Assistant Professor of Irrigation and Soils, University of California, Los Angeles.

R. H. Sciaroni is Farm Advisor, San Mateo County, University of California.

PLOW-PAN

Continued from preceding page

chards. The root distribution pattern of citrus trees was examined in several groves in San Bernardino County, some of which had been under the non-cultivation system for many years. The soil was well explored below about 2″ in contrast to near-by groves in clean cultivation. These groves were on soil too loose for apparent soil density measurements.

It would appear from the observations obtained in this series of studies that tree root distribution can be modified markedly by the soil management program and that the effects of soil compaction by tillage equipment can be counteracted to a considerable degree. The use of covercrops or non-cultivation may bring rapid improvement. Clean cultivation need not develop plow-pan if care is exercised as to moisture content of the soil when it is worked.

There is some evidence from leaf analyses that the better root distribution has enabled the trees to absorb additional nutrients, which might be a factor of importance for orchards located on shallow soils.

E. L. Proebsting is Professor of Pomology, University of California, Davis.

The above progress report is based on Research Project No. 768.

The apparent soil density determinations at Davis were made by senior student Walter Gamboni, and the root distribution and apparent soil density study at other locations were conducted by graduate student T. C. Tomich, under the direction of Professor Proebsting.