Results of Additions of Krilium or Organic Matter to Three Soil Types

To investigate the possible beneficial effects of Krilium on some greenhouse soils, a combination of soil plots were set up during the summer of 1951. Three basic soil types with widely varying mechanical analyses were used.

One of these, which is used almost entirely in the Colorado A&M Research Greenhouses, comes from along the main irrigation canals and was in sod as recently as three years ago. It is high in silt content.

The subsoil used is of reddish color and underlies the Fort Collins loam. Bentonite clay was taken from relatively pure deposits in the foothills west of Fort Collins. This Bentonite is white in color, calcium saturated and low in other nutrients.

The mechanical analyses of these soils were: Greenhouse soil; 44.6% sand, 41.6% silt, and 13.8% clay. Subsoil: 53.6% sand, 19.6% silt, and 26.8% clay. Bentonite: extremely difficult to analyze mechanically - relatively pure clay with a very granular structure.

To each soil Krilium (CRD-186) was added at the rate of two pounds per 100 square feet, after sterilization, and thoroughly mixed in. In a second series of treatments approximately one-fourth of the volume of the soil was made up of native peat, a slightly acid material containing approximately 40% organic matter. This gave the soil mixture 10-12% organic matter, which is extremely high for most greenhouse soils. The three soils were also left untreated to serve as checks. There were nine different plots arranged at random and replicated twice, or a total of 18 plots.

Additions of a complete fertilizer were made to the subsoil and bentonite series, the soils were steam pasteurized and planted with the carnation varieties Davis Supreme and Vanguard. Subsequent fertilization was approximately the same for all plots but varied according to soil tests.

Total Production

The production period was from September through February, 1952. Since the records of both varieties for production and quality were similar in each treatment, they are lumped together in the results that follow. The production figures given in Table 1 are an average of the two replications.

Table 1. The Effect of Addition of Krilium or Organic Matter on Total Production of Carnations in Three Soil Types.

Treatment	Total production
Soil	194.5
Soil plus Krilium	202.5
Soil plus native peat	248.5**
Subsoil	187.5
Subsoil plus Krilium	200.5
Subsoil plus native peat	203.5
Bentonite clay	253.0**
Bentonite plus Krilium	239.5*
Bentonite plus native peat	211.0

*Minimum difference to be significant with odds of 19 to 1 - 25 blooms
**Minimum difference to be significant with odds of 99 to 1 - 36 blooms.

The addition of Krilium to soil and subsoil increased total production though the difference is not great enough to be statistically significant.

When native peat was added to soil the increase in production was highly significant; when added to subsoil the increase was about the same as that from Krilium.

Relatively pure Bentonite clay gave a different trend in results. Probably this difference was due in part to the initial granular structure of the clay for plants grow very poorly in powdered or deflocculated bentonite. The production from bentonite was highly significant over that from bentonite plus native peat. The addition of Krilium to this type of bentonite decreased its total production. Bentonite plus Krilium produced significantly more carnations than bentonite with peat added.

Quality of Production

The flowers were graded into splits, shorts, standards and fancies by cleaning the stems of side growth and weighing on a dietary scale as described in previous bulletins. The production of fancy or top grade blooms was used as a measure of quality induced by each treatment. This grade includes over half of the total production but varies considerably with the soil treatments. The figures for production of fancy blooms in table 2 are an average of two replications.

Table 2. The Effect of Addition of Krilium or Organic Matter on Quality of Production of Carnations in Three Soil Types.

Treatment	Production of fancies
Soil	106.5
Soil plus Krilium	105.5
Soil plus native peat	150.0**
Subsoil	70.0
Subsoil plus Krilium	91.0*
Subsoil plus native peat	113.5**
Bentonite clay	129.0**
Bentonite plus Krilium	122.0*
Bentonite plus native peat	106.5

*Minimum difference to be significant at odds of 19:1 - 13.2
**Minimum difference to be significant at odds of 99:1 - 19.0

In the production of fancy or top grade flowers, soil plus native peat was highly significant over soil alone or soil plus Krilium.

Subsoil with Krilium added produced significantly more fancies than subsoil alone yet, when native peat was added to subsoil, the production of quality blooms was highly significant over either treatment.

Bentonite followed a reverse pattern just as it did in total production. We have no doubt that the initial granular structure was responsible for these results to some extent. The quality produced from bentonite was highly significant over that from bentonite and native peat. Bentonite plus Krilium produced fewer fancies than bentonite alone, but significantly more than bentonite and native peat.

Quality-wise Krilium improved the carnations produced on an extremely poor soil which would probably never be used in a greenhouse bench. Krilium did not improve the quality on a good greenhouse soil and the slight increase in total production which it caused was not significant statistically.

A heavy application of organic matter to a good soil gave highly significant increases in both production and quality. When this same amount of organic matter was added to subsoil, the quality was improved but the increase in production was not significant.

Further work is being done on both granular and powdered bentonite. Why these results were obtained is not entirely explainable. We feel sure that had the bentonite been deflocculated, organic matter or Krilium would have improved it.

In the meantime, the place of Krilium in the greenhouse has not been proven. Probably it will be helpful in conditioning problem soils that have lost their permeability. It works best when there is a fairly high clay content.

Your editor,

W. D. Holley