frequently been found by this writer to have very limited value for biological interpretation of plant analysis results. Most such results from central composite designs merely confuse the issue. Regression analyses of results from these designs have greater utility in economic interpretations.

Hasn't the time come to avoid publishing plant analysis data which have not been properly related to crop growth or yields?

**LITERATURE CITED**


G. L. Terman
Tennessee Valley Authority
National Fertilizer Development Center
Muscle Shoals, Alabama 35660

Dear Editor:

Response to comments by G. L. Terman.

Concerning Dr. Terman's remarks, presenting data in graphs does not alter the statistical information given in tables. It should be stressed that the statistical implications are based on significance at the 5% level, and I do not endorse lowering the level of significance as implied by the critique. Phosphorus content expressed as percentage dry matter in Table 4 is clear terminology. Webster's Dictionary refers to "content" as "cast iron has a high carbon content".

Dr. Terman's figures assume linear relationship between grain yield and leaf yield, which may or may not have occurred.

It is possible that P uptake (percentage P × leaf yield) may be significant. However, this cannot be ascertained since data on yield of leaves was not obtained.

The presentation of data is similar in many aspects to that in the paper by Mays and Terman (Agron. J. 61:489-492).

J. A. Lutz
Associate Professor of Agronomy
Virginia Polytechnic Institute and State University
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Dear Editor:

Response to comments by G. L. Terman.

We have given Dr. Terman's paper careful consideration. We feel that our paper comes to the same conclusions as Dr. Terman's. We were puzzled by the upper portions of the graphs in Fig. 1 where the yields for cuttings 1 and 2 have been combined and the percentage figure shown for only the second cutting. However, Dr. Terman feels nutrient concentrations and uptake in later cuttings are more closely related to the total yield than to that of the second cutting. Plots for individual cuttings are similar.

We have primarily restricted the use of yield-nutrient plots to studies in which minimum or critical levels of a particular nutrient are desired.

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Dear Editor:

Response to comments by G. L. Terman.

I certainly agree that an examination of the relation between yield and nutrient concentration of plant tissue is potentially useful, essentially for the reasons enumerated by Dr. Terman. In response to the suggestion that yield levels received inadequate consideration in our recent paper (Grimes et al. 1973, Agron. J. 65:37-41), the information contained in a report is determined principally by the objectives. Because the relations between lint yield and nitrate-N status of cotton petals have received considerable attention previously, our work was more concerned with other factors. Of primary concern were: 1) possible effect of water management on nitrate-N status of plants (in addition to dilution from increased growth), 2) presenting a technique whereby economic considerations form a basis for establishing desired levels of nutrient concentration in plants, and 3) examination of a simple regression model which included time as an independent parameter to characterize declining nitrate-N concentrations. A yield equation was presented and formed an integral part of establishing desired nitrate-N levels from economic considerations.

The use of continuous functional relations of regressions greatly facilitated the presentation of our results. However, with these techniques, care must be exercised to insure that no more is inferred from an analysis than is dictated by the actual data. With proper care, there appears to be no reason to restrict regression analyses to economic solutions involving yields.

Donald W. Grimes
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Dear Editor:

Rebuttal.

Dr. Lutz seems to have missed the point in regard to statistical analysis of nutrient concentrations. The point is whether such analysis is really meaningful if the concentrations are strongly influenced by a second attribute, namely yield. Regression analysis is then the appropriate statistical procedure. The same applies to the paper of Laughlin, Martin, and Smith (1975, Agron. J. 67:85-87).

It would probably have been preferable in Fig. 2 to relate nutrient concentrations to total yields of grain + stover, because both grain and leaf yields and concentrations tend to be influenced by the total cumulative yield, as used in Fig. 1. However, total yields were not available.

In spite of Webster, or perhaps because of him, we have continuing confusion in the literature between concentrations of nutrients in plants and their total content or uptake. (Definition by a Terminology Committee needed?)

Papers in which nutrient concentrations in plants have not been properly related to yields are too numerous to mention and may even include some by this writer. Many problems of proper interpretation of nutrient concentrations in plants remain unsolved. The purpose of this letter is to call attention to some of these problems, not to solve all of them.

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