CRITICAL REMARKS CONCERNING THE VALIDITY OF THE MITSCHERLICH EFFECT LAW *)

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(Mit deutscher Zusammenfassung)

A few years ago Mitscherlich *) and Gericke ¹) published a verification of the validity of the Mitscherlich Effect Law based upon the results of more than 27000 field tests with graded amounts of $P_2O_5$, $K_2O$ and $N$, which have been laid down in the pre-war years on the principal soil types of Germany, using the principal crops as test plants.

The Mitscherlich Law is represented by the following equation:

$$\log (A - y) = \log A - c(x + b),$$

meaning that the increase of the yield of any crop under the influence of increasing amounts of any growth factor $x$ is proportional to the difference between a partial yield $y$ obtained at any stage and a certain maximum possible yield $A$; $c$ is a constant that depends on the nature of the growth factor and determines the slope of the yield curve. The quantity $b$ represents the amount of $x$ originally present in the soil.

The use of average results from large numbers of experimental fields has the advantage that the influence of accidental deviations and errors is to a large degree eliminated.

According to both these investigators the validity of the equation was confirmed. Consequently the relation between yield and the amounts of any fertiliser may be represented by a logarithmic curve which is identical for all crops under investigation. The constant $c$ is approximately equal in all cases with the same nutrient. This result

*) W. Stollenwerk in a recent paper ²) criticizing the work of Mitscherlich and Gericke but employing different methods attained approximately similar results to those of the present paper.
is considered by Gericke to be an average one, from which individual deviations occur. Mitscherlich’s conclusion agrees with that contained in former publications and is very definite: “Das Wirkungsgesetz der Wachstumsfaktoren als solches besteht und ist richtig” *).

From the constancy of \( c \) it is deduced by Mitscherlich that the need for any plant nutrient of all crops is quite similar: “Alle unsere Kulturpflanzen reagieren hinsichtlich der Nährstoffausnutzung zur Ertragsbildung ganz in gleicher Weise! Es gibt so z.B. keine Kulturpflanze, die vielleicht die Bodenphosphorsäure besser aufschließt als eine andere! Diese Ansicht gehört in das Reich der Fabeln”.

It is no wonder that the results obtained by these well-known German investigators has evoked interest elsewhere. Willcox 7) has drawn them to the attention of English readers and emphasizes the outstanding importance of this work. He refrains however from any criticism of the methods applied by Mitscherlich and Gericke.

Since many of the present readers may not be well acquainted with the extensive work of Mitscherlich and the widespread criticisms of it (Rippel 4), Meyer 2), de Vries 6) a.o., it seems worth while to criticize in detail the method of calculation and the interpretation of the results.

**CALCULATION AND INTERPRETATION OF RESULTS**

The procedure of the authors was to take all the series of tests with each of the different crops and to compute the average yields of the treated and the untreated plots. Accepting the values \( c = 0.6 \) for \( \text{P}_2\text{O}_5 \), \( c = 0.4 \) for \( \text{K}_2\text{O} \) and \( c = 0.6 \) for \( \text{N} \) which values were derived from previous investigations, the maximum value \( A \) was calculated from the differences between the average yields of the untreated and those of each of the treated plots.

This method of computation of \( A \) gave 4 different values of \( A \), from which the average was calculated. This is statistically unwarranted. The yield of the untreated plot is used 4 times, viz. in each of the (4) equations with the yields of the other plots. Consequently a

*) There is a law governing the effect of growth factors which is exact.