COMMENTS AND LETTERS TO THE EDITOR

5) Estimates of the contributions of fixed \(\text{N}_2\) to field grown soybeans based on variations in \(^{15}\text{N}\) abundance were not significantly different from estimates based on N yield differences between isolines (6). This result required that the variation in \(^{15}\text{N}\) abundance of available soil N be small compared with the approximately \(7^\circ/\text{o}\) difference between the \(^{15}\text{N}\) abundance of air \(\text{N}_2\) vs. the average \(^{15}\text{N}\) abundance of plant tissue of the nonnodulating isolate. Moreover, added corn cobs, which would be expected to increase the relative contribution of \(\text{N}_2\) fixation by immobilizing \(\text{NO}_3^-\), resulted in a clearly discernable decrease in the \(^{15}\text{N}\) content of leaf tissue.

6) A large survey of the \(^{15}\text{N}\) abundance of California plants showed that the mean \(^{15}\text{N}\) content of known \(\text{N}_2\) fixing species was significantly lower than the mean of presumed non-\(\text{N}_2\) fixing plants. Thus, when the \(^{15}\text{N}\) value of a sample of Chaemaebatia foliolosa was found to be \(-1.1^\circ/\text{o}\) (13), experiments were immediately undertaken that established by more conventional procedures that \(\text{C. foliolosa}\) does indeed fix \(\text{N}_2\).

The above examples from field experiments provide evidence that the natural \(^{15}\text{N}\) abundance approach is, indeed, not only feasible but fruitful in many settings.

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Response to Kohl et al. Letter “Concerning the Heterogeneity of the Natural Abundance in Soil Nitrogen”

There seems to us to be little point in discussing the range in \(^{15}\text{N}\) values, which are not presented in the paper, with respect to variability among samples is adequately described by the confidence limits presented in Tables 3 and 4 of our paper. Although, to our knowledge, no other reports on determinations of spatial variability of \(^{15}\text{N}\) in soils have been published, we note that the 95% confidence interval for the average \(^{15}\text{N}\) of the same well-sieved, well-mixed soil by Edwards was calculated to be the mean \(\pm 2.1^\circ/\text{o}\) \(^{15}\text{N}\) units. This is comparable with those reported for many other results in our investigation where we are looking at the variation in nature in addition to the variation in sample replication as used by Edwards.

We recognize that some of the variance reported may be due to the use of three different instruments and several different operators over a period of time. In this context, we note that identical soil samples analyzed in the laboratory of the authors of the letter and the Department of Agriculture laboratory gave significantly different values. For example, a point read from the graph of Shearer and Legg (1975) and corrected for the standard of reference was found to have a value of 1.8 in one laboratory and 8.6 in the other. Another value of \(-1.8\) in one laboratory and \(+7.2\) in the other had the correlation coefficient for values in these laboratories as being only 0.63, and the regression equation was 0.33 instead of the expected 1.00. If this kind of discrepancy, for which these authors offered no explanation, can occur with identical samples, it is not at all surprising that the variances in nature of three or four times this magnitude can be found. It is impossible to say how much of the variation is apparent and how much realistic, since instrumental sampling error, and natural variation are all involved, but in our work it is part of the problem under discussion. All error should be eliminated. We note that Shearer et al. (1978) reported a range of only 12 \(^{15}\text{N}\) units in 139 soils from 10 states.

Relative to single-focusing vs. double-focusing instruments in the Hanford soil in which the greatest variance was found, this soil in our study was analyzed with the same double-focusing instrument as was utilized by Virginia for the data presented.

A further observation is that most of the data shown by Kohl et al. to illustrate ranges of \(^{15}\text{N}\) variability of soils are based on plant samples. These are not representative of the range of variability of natural abundance of \(^{15}\text{N}\) of wheat plants prior to fertilizer nitrogen applications. Soil Sci. Soc. Am. J. 48:359–365.


Literature Cited


