Nitrate Production as Affected by Sweetclover Residues Left on the Surface of the Soil

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Crop residues left on the surface of the soil protect the land against water and wind erosion (2). Their retention above ground, however, as a practice, raises numerous questions. One of these is their effect on nitrification. That the residues of grain crops left on the surface have some depressing effects on nitrification has been noted frequently, and has been reported by the authors (3) and others. The purpose of this paper is to report the effects of another type of residues, namely, those of biennial sweetclover.

Albrecht (1), as remotely as 1922, conceived the leaving of leguminous residues on the surface of the land as an alternative to plowing them under and conducted investigations on comparative total nitrogen accumulations during 15 continuous years. He reported no nitrate determinations but concluded that there must have been about 3% more nitrogen rendered soluble and available to plants where the red clover material employed (2½ tons per acre per year) was plowed under immediately than where it was left on the surface for a year and incorporated with the soil one year later.

The leaving of leguminous residues on the surface of the soil has been under study in Nebraska since 1940. The data presented here are a portion of a comprehensive investigation on the role of leguminous crops in the practice of subsurface tillage.

EXPERIMENTAL

DESCRIPTION OF SOIL

The studies reported in this paper were conducted at Lincoln, Neb., on Marshall silty clay loam that has been under cultivation for about 60 years. Its texture and fertility are fairly typical of eastern Nebraska conditions. It has ample available potassium but responds occasionally to phosphorus fertilizer. It has a pH of about 5.4 to 5.7. Its nitrogen and organic matter contents are about 0.17% and 3.4%, respectively, in the 0 to 6-inch section. These percentages are about one-third less than those of the original virgin soil. In the management of this soil the problems of primary concern are moisture conservation and erosion control, together with nitrogen maintenance and nitrification. The mean annual precipitation is approximately 27 inches. About 22 inches of this comes during the period of April to September.

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2Bacteriologist and Soil Conservationist, respectively, Soil Conservation Service, Research. The writers are indebted to Dr. F. L. Duley for his suggestions during this investigation and in the preparation of this manuscript, and for his vision and leadership in the broader project of which this study is a part.

3Figures in parenthesis refer to "Literature Cited", p. 421.

4Publications previous to 1935 identify this undulating upland soil at Lincoln as Carrington series.