Correlation of the Potassium Content of Alfalfa with That Available in Soils

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In the humid region, alfalfa probably suffers more from a lack of available potassium than from a lack of any other element. One reason for this is that the potassium content of alfalfa is so high that several cuttings of this crop often cause a lowering of the available supply of this element in the soil to a level that is inadequate for further satisfactory growth and survival. It would seem that detection of the approach of this critical stage might be ascertained by an analysis of either the plant or the soil for potassium. Accordingly, the present investigation was undertaken for the purpose of studying this possibility, and particularly the correlation that may exist between the potassium content of alfalfa and the level of the available supply of this element in the soils on which the crop was grown.

REVIEW OF LITERATURE

The relationship between the composition of plants and the soils on which they were grown has been studied for more than 300 years, according to Beeson (7). In this comprehensive report, he reviews much of the pertinent literature for 1682 to 1939. Much controversy has arisen as to the relationship exists between composition of crops, especially as concerns the element potassium. Some confusion regarding the relationships of potassium may arise from the practice of air-drying soil samples prior to analysis for exchangeable potassium. Data presented by Attoe (3) suggests that the drying process may increase or decrease the content of exchangeable potassium in soils, depending on the state of equilibrium that exists between the exchangeable and fixed forms.

Vandecaveye and Bond (14) and Lucas et al. (10) found that the application of potassium fertilizers to alfalfa in field experiments increased the potassium content of the crop. Hunter (9) found that increasing amounts of potassium were absorbed by alfalfa from both sand and soil cultures as the rate of application of potassium was increased. Wallace et al. (15) obtained similar results with the soil in a greenhouse experiment. Singleton et al. (11) found that even when the soil was at a high level of fertility with muriate of potash at the rate of 325 pounds of K₂O per acre increased the potassium content of the alfalfa to 2.6-2.8% K₂O. Snider (12) found that the percentage of potassium in alfalfa was proportional to that available in the soil, and that it tended to be higher in wet seasons.