Utilization of Phosphorus From Barley Straw

Succeeding Crops Immediately Use Phosphorus From Crop Residues

By W. H. Fuller

Barley is one of the leading winter crops grown on irrigated land in Arizona. As a consequence, rather large quantities of barley residues, such as straw and roots, are added to the soil each year.

Residues of this nature are valuable in soil building. The return of such crop residues to the soil each year is one of the greatest factors responsible for the maintenance of soil fertility and productivity. Barley straw from one acre, for example, contains 40 to 60 pounds phosphorus as P^2O^5. Plowing under straw residues is like putting money in the bank.

Tracer Elements Help

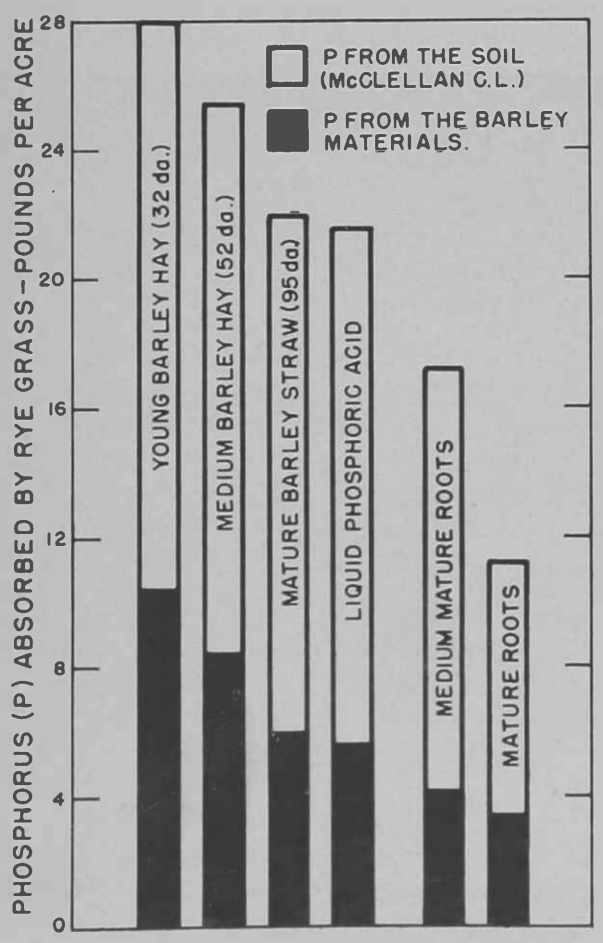
Although it is known that plant food elements ultimately are released from crop residues for use by succeeding crops, the rate at which these elements become available to plants is not known. The production of radioisotopes by the Atomic Energy Commission as tracer elements in recent years has permitted an expansion of research work involving the identification of single plant food elements from two or more sources. An experiment was jointly supported by the University of Arizona Agricultural Experiment Station and the Atomic Energy Commission.

Radioactive barley materials of 3 stages of growth were chopped into small pieces and added to soils. The soils were planted to rye grass which was cut three times at intervals of four weeks for analysis of radiophosphorus.

Uptake Compared

Uptake of phosphorus from barley straw and root residues was compared to that of radioactive liquid phosphoric acid added to a duplicate set of pots.

The rate of utilization or absorption of phosphorus by rye grass from barley was shown to be directly related to the stage of maturity of the added residue. The rye grass absorbed a greater percentage of its phosphorus from the younger barley material than from the mature straw. Barley roots were found to be a poorer source of phosphorus than the hay or straw. Less phosphorus was absorbed from roots of mature barley than from the younger barley.



The absorption of phosphorus from different barley materials (hay, straw and roots) by rye grass in a cultivated McClellan clay loam compared to the absorption of phosphorus from liquid phosphoric acid. (Sum of two cuttings.)

The absorption of phosphorus by rye grass from mature barley straw added to five different soils. (Sum of two cuttings.)

Liquid phosphoric acid, a wholly soluble and inorganic form of phosphorus, was a poorer source of phosphorus than young and medium mature barley hay, though its phosphorus was absorbed by rye grass to about the same extent as that of mature barley straw and to a greater extent than that of barley roots.

Total phosphorus derived from the barley residues, incorporated into cultivated McClellan soil, is shown in the graph at left below to be greater for the young than the mature material.

Soil Type Makes Difference

All soils do not supply phosphorus to plants to the same extent. The graph at right below shows that the total phosphorus absorbed from the mature barley straw differed with the different soils. The amount supplied to the rye grass by the soil is calculated as the difference between the total phosphorus found in the grass and the amount derived from the barley straw.

Perhaps the most important single discovery of this research is that succeeding crops begin to utilize phosphorus from crop residues such as barley straw immediately after they have been added to the soil.

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