

1993 Progress Report for PPIC Project:

Chemical and Physical Changes in Standing Cereal Straw Residues in No-Till Fallow and Its Relationship to Nitrogen and Phosphorus Availability

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Project Objectives:

The objectives of this project are to 1) determine the changes in nutrient form and composition of standing wheat and barley straw during a no-till (herbicide) fallow period and 2) to examine how these changes are related to N and P availability when residue is incorporated into the soil.

Experimental Procedures:

In the spring of 1993, two plots were established in southern Saskatchewan to monitor the changes in chemical composition of wheat and barley straw over a chemical fallow period. The straw, from crops grown in 1992, was sprayed with 2,4,-D and glyphosate in the spring and summer of 1993 to control weed growth. Straw samples from the plots (3 replicates at each sampling period) were taken at 6 week intervals throughout the spring, summer, and fall of 1993. Sampling is continuing this winter and will proceed up until the time of seeding in the spring of 1994. Samples of 1 year old vs 2 year old straw were also obtained from chemical fallow plots at Saskatoon and Central Butte for use in a growth chamber experiment, just started, to examine the relative effects of added straw on N and P availability in soil over time. In the 6 week interval sampling study, straw samples at each sampling time were analyzed for total and water soluble carbon, nitrogen, phosphorus and sulfur. Carbon, nitrogen and phosphorus were further sub-divided into organic and inorganic forms.

Results and Discussion:

Over the summer and fall of 1993, we have observed significant changes in the chemical composition of wheat and barley straw. Over six week measurement intervals during the summer of 1993, large decreases in the amount of water soluble phosphorus and sulfur took place. Figure 1 shows the significant decrease in water soluble P in the straw which took place over a 6 week interval from early June to mid July. Approximately five inches of rainfall were recorded at this site over the time period.

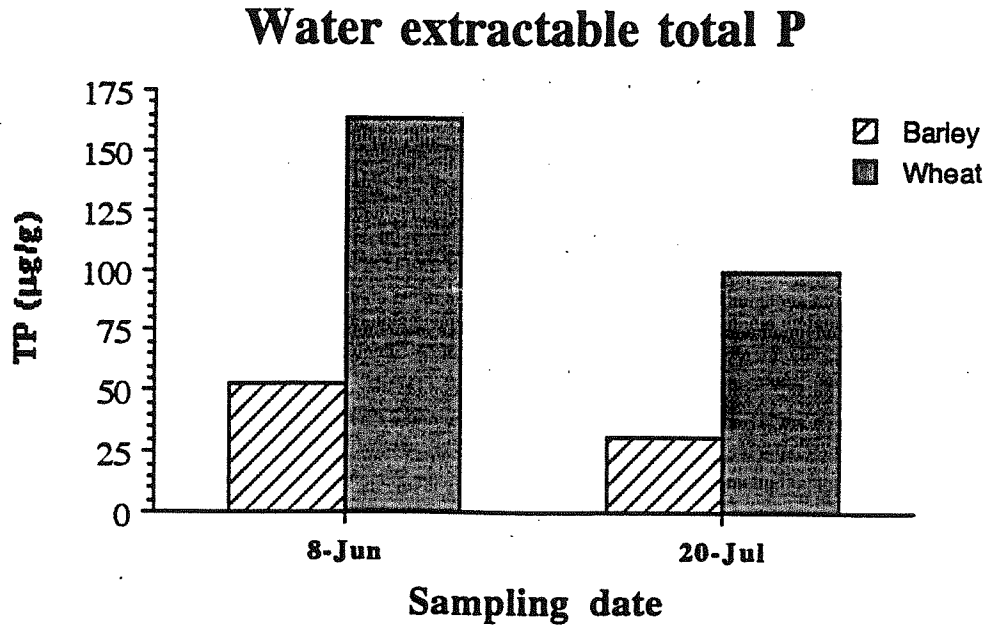


Fig. 1. Changes in water soluble P content of standing cereal straw over a 6 week period.

The decreases in water soluble nutrient content of the straw are believed to be associated with leaching of soluble constituents from the straw into the mineral soil, which likely took place during intense rainfall events during the summer. Preferential loss of labile phosphorus and sulfur - rich constituents from the straw by leaching may affect the decomposition rate of the straw residue when it is incorporated into the soil, as well as affect the net mineralization or immobilization of nutrient that occurs. A complete presentation and interpretation of the results of this component of the study will be presented at the Soils and Crops '94 meetings in Saskatoon in February of 1994.