NRCS	**Michigan Technical Note** **USDA-Natural Resources Conservation Service**

AGRONOMY #46
Subject: Buckwheat a Phosphorus Pump
Date: June 2010

Buckwheat is known as a "phosphorus pump" or phosphorus scavenger as the roots solubilize phosphorus from phosphate precipitates in the soil profile and subsoil. Buckwheat roots produce mild acids that release nutrients from the soil. These acids also activate slow-releasing organic fertilizers, such as rock phosphate unavailable to growing crops; however, these nutrients are release to later crops as the residue breaks down. Buckwheat has outstanding characteristics for its phosphorus efficiency as follows:

1) A finely divided root system produces a high ratio of root surface to root/shoot length;
    a. Buckwheat has a dense, fibrous root cluster in the top 10 inches of soil, which provides a large root surface area for nutrient uptake.
2) A high storage capacity for inorganic phosphorus;
3) An increased release of protons (FePO4- or MnO2) and solubilizing substances by phosphorus deficient plants;
4) A favorable ratio of phosphorus uptake to root mass growth, especially at a low phosphorus supply;
5) A high activity of acid phosphatase in the rhizosphere and the capability to use phosphorus from organic sources (Gardner and Boundy, 1983; Annan and Amberger, 1989).

Buckwheat is termed a deep rooter by Pears et al. (1989); however, this is an apparent error (Bugg, 1995). Although the rooting system is superficial, it does show a high root volume in the upper soil stratum (0.0-0.25 m in depth) (Bugg, 1995).

The ability of buckwheat to acquire phosphorus (P) was characterized by investigating P uptake, morphological features, and chemical changes in the rhizosphere. Root weight and length increased, and frequency of root hairs were higher when plants were grown under P-deficiency. P uptake rates were only moderate, concentrations of P in the shoot were high (1.8% of dry weight). Release of Mn from MnO2- and P from FePO4- and glucose-6-phosphate was not due to a buildup of organic acids in the rhizosphere, but P release was due to high activities of acid phosphatase for plants grown with low P.

References

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