

# Phosphorus Stress on Rice Decreases Yields

By Fred Turner and James Engbrock

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*New studies in Texas demonstrate the rice plant's need for phosphorus (P) and provide examples of P deficiency symptoms.*

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**RICE** is an important food crop in many parts of the world. Large acreages of rice are also grown in the southern U.S. and California. Rice is responsive to fertilization, especially nitrogen (N). But as with other crops, balanced fertility is also important.

## Phosphorus Deficiency

Phosphorus deficiency on rice can significantly reduce yields. Phosphorus deficiency is often noticed on highly weathered, low pH soils. These soils may contain iron (Fe) and aluminum (Al) that bind P and make it unavailable to rice plants. Liming these soils is generally not recommended because when they are flooded, soil pH may rise one unit (i.e., from pH 5.0 up to pH 6.0).

When flooded conditions exist and pH increases, some P not normally available to upland crops (soybeans, etc.) will be released. This is due to the reduction of Fe compounds (ferric phosphates) to a more available form of P (ferrous phosphate) and to improved P diffusion to rice roots in flooded soils. At pH values above 7.0, P may be tied up as dicalcium and tricalcium phosphates, which, again, limits availability to rice.

This poses a soil testing problem because it is difficult to predict the response of flooded rice to applications of P. This Texas A&M University project is in the preliminary stages and involves soil test calibrations at a number of locations across the Upper Gulf Coast of Texas to improve soil test recommendations.

## Deficiency Symptoms

With the exception of development of purple pigments in the leaves, rice P deficiency symptoms are similar to other crops:

- stunted plants
- reduced tillering
- smaller leaves
- smaller stem diameter
- poor root growth
- delayed maturity
- reduced yields

Plots reported in **Table 1** were located south of Bay City, TX on an Edna silty clay loam, pH 6.5 and very low extractable P soil test. The data show a significant increase in rice yields due to P fertilization. Even though the 120 lb/A  $P_2O_5$  rate maximized yields in this study, higher rates of application might have increased yields beyond this point.

These studies will be continued in 1993. ■

**Table 1. Effect of P fertilization on rice yields near Bay City, TX.**

Fertilizer treatments, lb/A N	P <sub>2</sub> O <sub>5</sub>	Yield lb/A
180	0	4,842
180	40	5,552
180	80	5,743
180	120	5,849

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**EFFECTS of various rates of  $P_2O_5$  on rice growth are illustrated in this photo from June 1992, on the Mike Ottis farm. From left, the plants received  $P_2O_5$  rates of 0, 40, 80, and 120 lb/A.**

## ***Journal of Production Agriculture* Announces New Format for 1993**

**THE** *Journal of Production Agriculture*, published by the American Society of Agronomy, will unveil a new format with the January 1993 issue. The key to the new format is the inclusion of a "Research Application Summary," which must be written in addition to the usual scientific manuscript. In order to meet this January 1993 deadline all manuscripts submitted for review *after 1 May 1992* will have to include a research application summary. The purpose of the research application summary is to facilitate communication of the information in the scientific article to the "practicing professional" in the field.

Guidelines for preparation of the research application summary are now available. The format for the scientific paper will not change, except that the interpretive summary will be omitted. The research application summary will stand alone and will be printed at the front of each issue of the journal. The scientific papers will follow in a separate section.

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