



Phosphorus rate plots

Phosphorus 101

Take Steps to Prevent Phosphorus Deficiency

In the past few years, I have been seeing more phosphorus (P) deficiency in rice. Most of these situations were calls I received at harvest and consisted of subpar tillering and, in more severe cases, shortened panicles and flag leaves resulting in yield loss. Phosphorus deficiency symptoms largely occur where P fertilizer hasn't been applied; however, there are some cases where P fertilizer has been applied but deficiency symptoms still occur. This newsletter is intended to give a brief synopsis of P management.

Phosphorus is essential for plant growth, especially in respiration and photosynthesis. Phosphorus is the main component of adenosine diphosphate (ADP) and adenosine triphosphate (ATP), which drive most biological processes of the plant, including providing energy for plants to take up other nutrients such as nitrogen (N), potassium and zinc, to name a few. Practically speaking, to make the most of your N fertilizer investment, other nutrients (including phosphorus) have to be at sufficient levels in the soil. If other nutrients are limiting, N efficiency will not be optimum, and yields will suffer.



Signs of phosphorous deficiency in rice

Phosphorus is dynamic in the soil, especially in the drill-seeded, delayed-flood rice production system. Phosphorus availability is determined by pH and oxygen content. In slightly acidic soils, P deficiencies

seldom lead to yield loss because within a week of establishing the permanent flood, P becomes more available and the plant typically recovers from preflood P deficiencies. In alkaline soils, P becomes available after flooding; however, it is much slower, and the plant can lose yield potential.

To minimize the potential for yield loss from P deficiency, soil testing is the first step. The University of Arkansas Soil Testing and Research Laboratory recommendations are listed in the chart below. Application rate and timing are critical. If soils are deficient in P fertilizer, it should be applied nearest the time of plant uptake, which is immediately prior to planting until immediately prior to permanent flood establishment. Fall applications of P fertilizer should only be made in maintenance applications, because availability of fall-applied phosphorus can be negatively impacted.

	Mehlich-3 Soil Test P (ppm)			
	< 9	9 – 16	17 – 25	26 – 50
pH	lbs of P ₂ O ₅ per acre			
≥ 6.5	70	60	50	0
≤ 6.5	50	40	30	0

A practical method to supply P fertilizer is to use an early-season application. Many farmers typically apply ammonium sulfate to 1- to 3-leaf rice with the goal of helping it reach the stage for flooding as soon as possible. Diammonium phosphate can be added as a blend or substituted for ammonium sulfate at this timing and accomplish the same goal. Sulfur can be addressed by blending ammonium sulfate with the urea prior to flooding or even at midseason.

Keep in mind harvested rice grain and soybeans mine phosphorus from the soil. A rice crop that yields 170 bushels per acre will remove about 35 pounds of P₂O₅ per acre. Additionally, a 50 bushel per acre soybean crop will mine approximately 40 pounds of P₂O₅ per acre. In times where margins are extremely thin and nitrogen is a large cost in the total rice production budget, make sure other nutrients, like phosphorus, aren't limiting so that you maximize your profit potential.

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