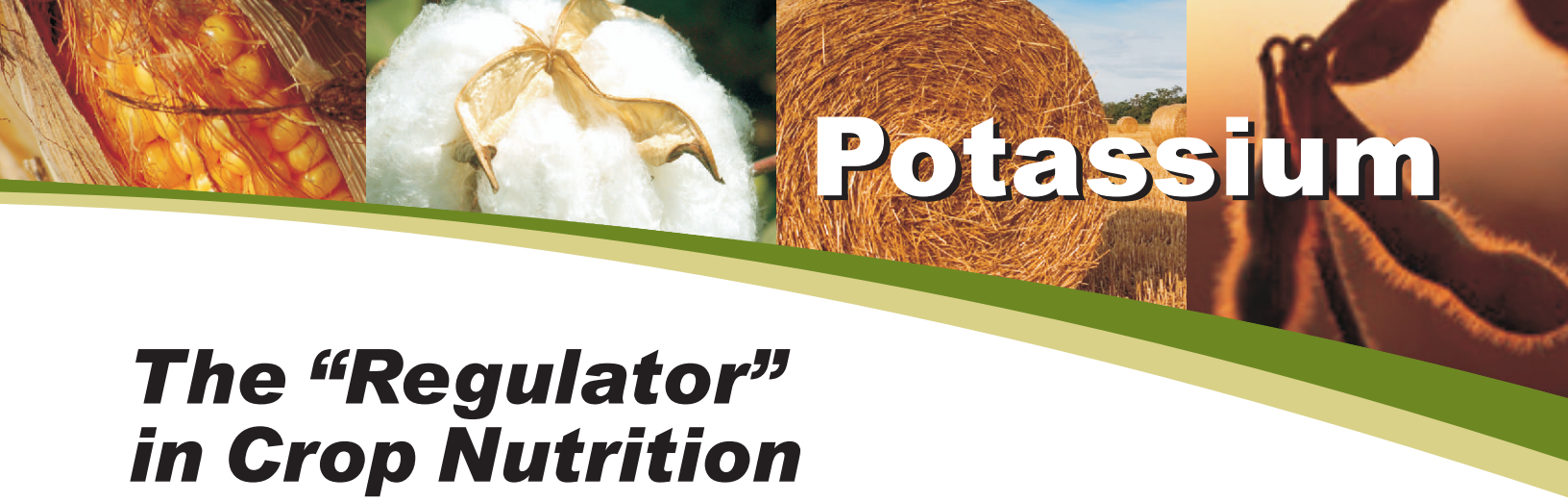

Potassium

The "Regulator" in Crop Nutrition

Plants require more potassium than any nutrient other than nitrogen. Potassium interacts with almost all the essential plant food nutrients. Unlike other nutrients, potassium does not form compounds in plants, but remains free to "regulate" many essential processes, including enzyme activation, photosynthesis, water use efficiency, starch formation and protein synthesis.

Why is potassium important?

Some of the benefits that potassium provides in growing plants are:

- Formation of a larger, deeper root system
- Reduction of water loss and wilting
- Regulation of nitrogen uptake
- Increased protein content
- Reduction of lodging from weak stalks

What nutrients do crops need?

Nutrient uptake varies greatly among major agricultural crops. Corn and wheat are considered a high phosphorus use crops while soybeans, rice and cotton are viewed more as heavy potassium users. The goal is to soil sample to understand what the soil should provide to the crop and apply the difference between crop uptake needs and the amount the soil will provide.

Nutrient uptake by major crops

Crop	# N	# P_2O_5	# K_2O	#S
Corn (180 bu.)	240	100	240	28
Soybeans (60 bu)	325	65	140	25
Wheat (55 bu)	120	45	85	13
Rice (1500 lbs)	120	60	170	12
Cotton (1500 lbs)	180	65	155	40

Source: IPNI

When does the corn plant need potassium?

A 180-bushel corn crop requires 240 pounds of K_2O. Over 50% of the total potassium is taken up by the plants in the first 50 days. Unlike phosphorus, potassium is required in larger quantities early in the season. Shortly before pollination, corn plants remove over 15 pounds of K_2O per acre per day.

K_2O usage by 180-bushel corn crop

Days	% of total use	Total %
0-25	9	9
26-50	44	53
51-75	31	84
76-100	14	98
101-125	2	100

Potassium deficiency in corn

Deficiency symptoms:

- Slow growth rate and/or poor response to N
- Leaf edges turn brown but midrib stays green
- Stalk lodging due to weak stalks
- Thin stands and poor vigor

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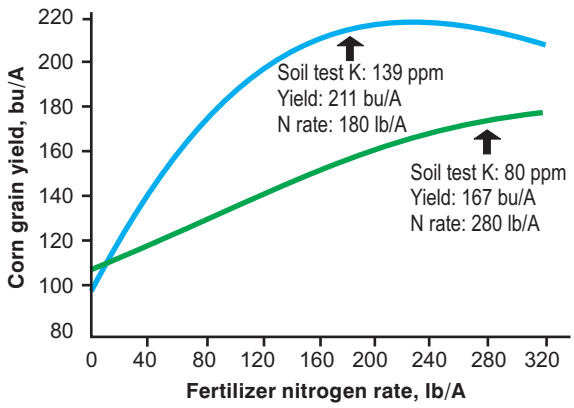
Importance of balanced nutrition

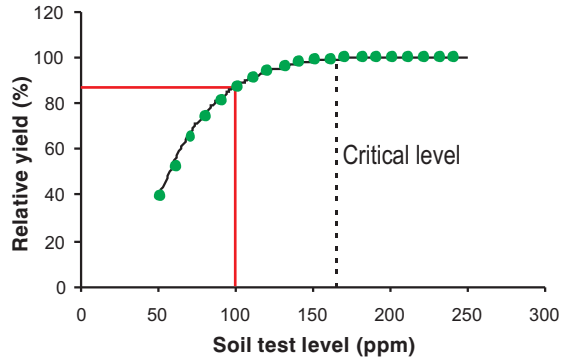
Proper nitrogen management has received the most focus in crop nutrition, but it should be noted that K is important in getting the most out of an investment in N fertilizer. A study by Ohio State University showed that yields were reduced 44 bushels/acre when high levels of nitrogen were used on fields with inadequate K levels. An IPNI survey concluded that 42-81% of the soils in California, Missouri, Arkansas, Louisiana, and states east of the Mississippi River tested low to medium in K. Potassium fertilizer is not environmentally sensitive and is a very good investment.



Source: Ohio State University

Impact of potassium levels on yield

Adequate potassium is necessary for higher yields and improved grain quality. The amount of potassium fertilizer required is dependent on existing soil test levels. The critical level of potassium in the soil is approximately 165 ppm. Yield losses can be severe as the soil K levels drop below 165 ppm. For example, a field testing 100 ppm that did not receive potassium fertilizer would be expected to yield 85% of a field that was above the critical level. It takes approximately 8 pounds of K_2O to raise soil test levels 1 ppm.



Case scenarios for 180-bushel corn yield goal – Crop removal =50 # K_2O/acre

SCENARIO 1	SCENARIO 2	SCENARIO 3
Soil K level = 100 ppm	Soil K level = 165 ppm	Soil K level = 300 ppm
Desired soil K level for no yield reduction = 165 ppm	Desired soil K level for no yield reduction = 165 ppm	Desired soil K level for no yield reduction = 165 ppm
University rec. = 90 # K_2O	University rec. = 50 # K_2O	University rec. = 0 # K_2O
Application = 30 # K_2O	Application = 50 # K_2O	Application = 0 # K_2O
Soil K levels drop 3 ppm/year	Soil K levels unchanged	Soil K levels drop 6 ppm/year
Expected yield loss = 8% (or 15 bu/acre)	**Expected yield loss = 0%**	**Expected yield loss = 0%**
Consequences: Insufficient K may lead to reduced nitrogen uptake, less developed roots, lower protein content and stalk lodging.	**Consequences: None expected**	**Consequences: Deficiencies may occur in cool, wet years before soil K becomes available. K deficiencies in minimum, ridge till, and no-till systems are more common. Better to apply a minimum of 30# K_2O to ensure adequate levels of K to the plant.**

Note in scenario 2 & 3, soil test K is above the critical level and limited yield responses will be received with application of K. When soil test K is above the critical level, farmers often still apply crop removal levels of K to maintain soil test levels, increase their land values, and use fertilizer purchases in their business tax planning decisions. Iowa State University recommendation.

Some of this information is provided by:

IPNI
International Plant Nutrition Institute

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