

Potassium

“the driver in big crop yields”

Dave Curry

Potassium (K) is one of the most important plant nutrients in crop production. As farmers push their target yields higher, the need for increased levels of potassium has become much more evident. To support future yields, the bar for soil levels of potassium will need to be bumped up. Many farmers are doing a great job building their soil tests. However, some soils might need a little work. The old 200lbs/acre of 5.5-26-30 just isn't cutting it anymore.

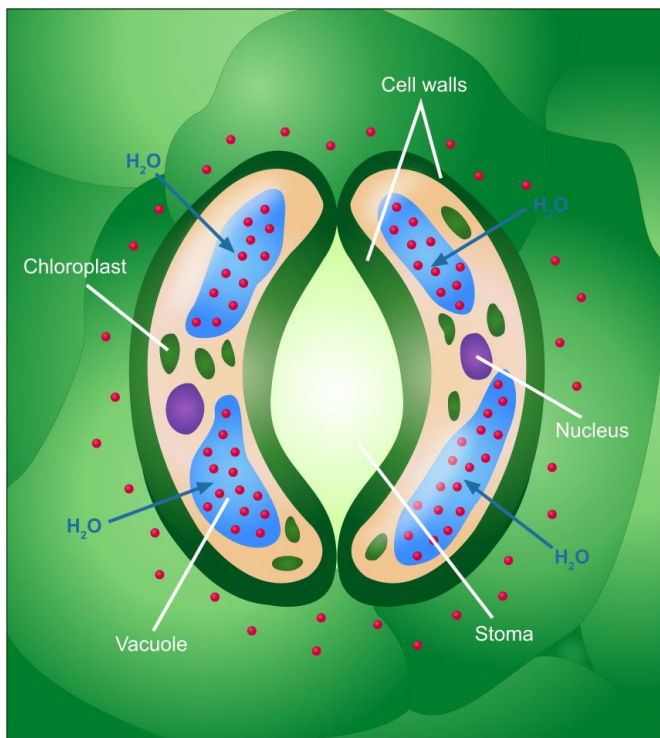
Growing the high yielding corn, beans, and wheat of the future will require a massive amount of in season available potassium.

	Grain (lbs of K2O)	Stover (lbs of K2O)	Total Uptake (lbs of K2O)
Corn (220 bu)	55	242	297
Soybean (65 bu)	78	65	143
Wheat (120 bu)	35	144	179

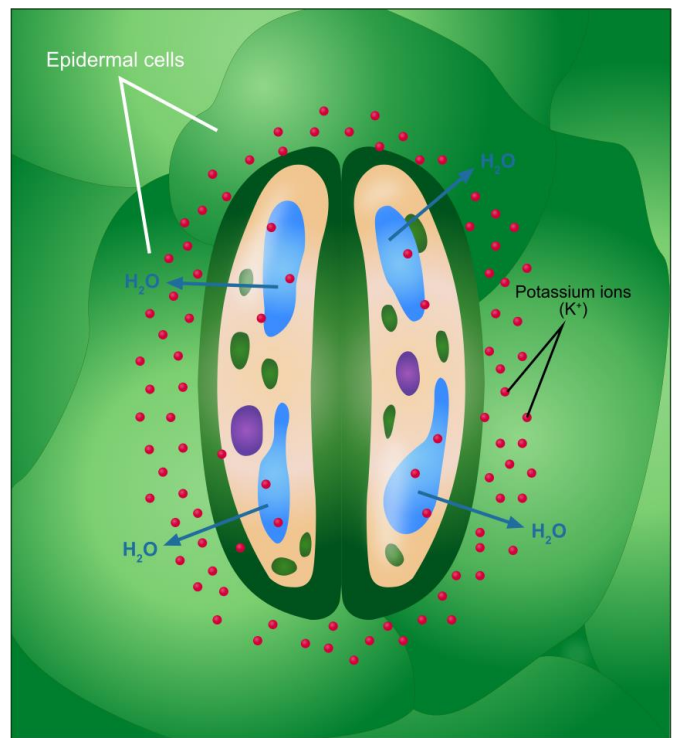
Grain alone in a 3 year rotation removes 168 lbs of K2O or 280 lbs of Potash!!

Potassium in the crop

Potassium is an extremely important nutrient that is required by the plant throughout most of the growth stages. Potassium is needed for tissue and root growth. K is very important in influencing plants water usage and transpiration. This is done by regulation and control of the stomata. K is also involved in the uptake and movement of many other nutrients such as nitrogen. It is also a key component in cell wall formation across the whole plant.



Stoma opening



Stoma closing

The plants stalk and stem strength is strongly related to potassium. Lodged areas in the field likely did not have enough available potassium to support big yields. In large biomass crops, like corn or soybeans, potassium uptake and demand can be enormous.



Plants are lodged on the left side of the picture, where no potash fertilizer was applied to this low testing field. On the right side of the picture, 100 lbs/ac of 0-0-60 was applied. (OMAFRA)

Potassium Deficiency in Crops

Potassium is mobile in the plant tissue and can be reallocated within the plant from the old to the new growth. Deficiency symptoms will show up in the older lower leaves in the plant first. A yellowing, or chlorosis, on the lower leaf margins is one of the main visual symptoms.

Corn

Corn can see a stunting of growth, thinner stalks with less integrity, and poor grain set.



[https://www.croptechinc.com/be-on-the-lookout/potassium-def/#lightbox\(postimages\)/0](https://www.croptechinc.com/be-on-the-lookout/potassium-def/#lightbox(postimages)/0)



<https://extension.entm.purdue.edu/newsletters/pestandcrop/article/low-soil-moisture-and-compaction-promote-potassium-deficiency/>

Soybean

Soybean plants exhibiting a K deficiency will see a reduction in bean size, beans per pod, and pods per plant, as well as, standability in high yielding environments.



Wheat

Wheat may show poor resistance to lodging, smaller grain, and lower drought tolerance at flowering.



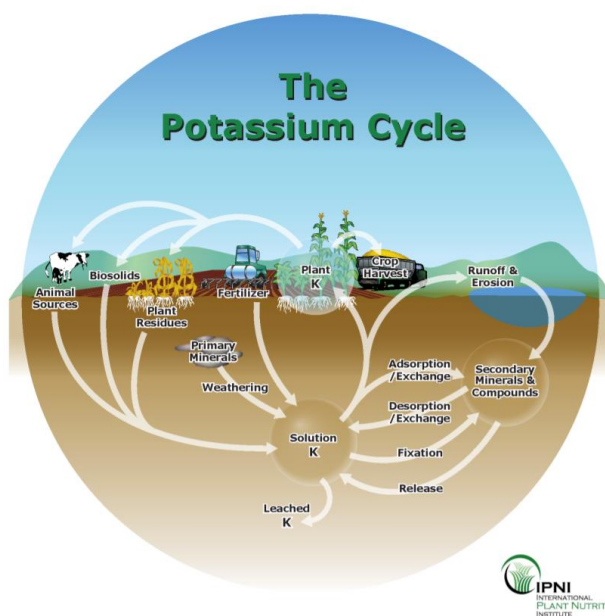
https://www.researchgate.net/figure/figure1-Potassium-effects-on-size-and-yield-of-wheat-grain-Institute-Research_fig1_306323856

Potassium in the Soil

Plants require potassium to be available in the soil solution and will be readily taken up by the roots when required. This soil solution K is fed by a few different channels in the soil. These sources include the soil exchangeable K, crop residue breakdown, and added sources such as commercial fertilizer or manure. Potassium moves into the root mostly by diffusion (moving from a high concentration to a low). Adequate moisture and soil temperature around the root zone are key in the uptake of K.

Keeping the pool of K solution, with enough available K for the crop, is crucial in maximizing crop yield potential. Potassium is slightly mobile in the soil, but in general, tends to stay attached to clay particles because of the positive charge. However, on sandy or mucky soils, potassium can potentially leach down through the soil profile and become unavailable.

Clay in the soil will “fix” a portion of K, leaving it non-exchangeable (available to the crop). Building a soil test to an adequate level will increase the exchangeable and available K for the growing crop. Typically, as you get higher in clay content, more K is fixed or unavailable to the crop.



Soil type and CEC (cation exchange capacity) differences in potassium

Sands are typically much easier to quickly build potassium levels but are at a higher risk of leaching. This might mean that some soils require a feeding of potassium each season vs three years worth in one shot.

CEC plays a large role in potassium availability/exchangeability to the crop. A potassium soil test of 120 ppm is not the same across soil types. A heavier clay soil type with a high CEC (15-20) will potentially have less exchangeable potassium than a sandy loam soil type with a moderate CEC (6-10).

Soil type and clay content play a massive factor in soil test K targets. A 120 ppm soil test isn't the same on a sandy loam compared to a heavy clay. Targets on clay loams and clays need to be much higher (175-200 ppm) to overcome fixation and tie up

Increasing the soil test potassium can happen relatively fast with additional applications of K sources. It takes roughly 25 lbs of actual K₂O to move soil by 1 ppm. That is about 40 lbs of Potash.

On a typical soil type, it will take 250 lbs of K₂O or 400 lbs of Potash to move a 110 ppm to 120 ppm.

Fertilizer sources of Potassium

Muriate of Potash (0-0-60)

-most economic source of potassium is muriate of potash, can sometimes be found in a 62% form.

-higher salt content with chloride ions, may not be suitable to all crop and soil types for a spring application from a crop safety standpoint.

Sulphate of Potash (0-0 50 18S)

-extremely high quality and very crop safe form of potassium.

-highly available the day you broadcast.

-typically suited for vegetable crops and is priced at a premium.

KMAG (0-0-22 22S 11Mg)

-very high-quality available form of potassium.

-excellent choice for those soil types lacking magnesium.

NK 21 (21-0-21)

-the perfect low salt and very crop safe potassium product for a corn starter blend.

-top flowability and compatibility in planter mixes

Applications of Potassium

Farmers need to apply, at minimum, crop removal of potassium to maintain soil tests. However, to achieve those higher targeted yield goals, it may require the soil be built up. We need to keep that soil potassium pool replenished and maintained with readily available potassium. Whether its broadcasted, banded, or strip tilled, potassium needs to be applied in the crop rotation cycle in order to achieve profitable high yields.

Discuss with one of our team to help you work on a Potassium strategy based on your unique equipment, tillage practices, soil tests and yield targets.

References

University of Wisconsin – Soil Potassium, Ag Nutrient Management

<https://www.agronomy.k-state.edu/documents/nutrient-management/nmrg-potassium-management.pdf>

<http://www.ipni.net/topic/potassium-k>

Genetic approaches for improvement of the crop potassium acquisition and utilization efficiency. YiWangWei, HuaWu: Current Opinion in Plant Biology Volume 25, June 2015, Pages 46-52.

<https://extension.oregonstate.edu/potassium-deficiency-listening-your-ears-corn>