Potassium (K) is an essential plant macronutrient taken up in large quantities, like nitrogen. In plants, K does not become part of complex organic molecules. It moves as a free ion and performs many functions.

**Potassium in Plants**

In plants, K is involved in many essential functions. It serves to:

- regulate water pressure in plant cells, affecting cell extension, gas exchange, and movement of leaves in response to light;
- activate enzymes that help chemical reactions take place;
- synthesize proteins;
- adjust pH within plant cells;
- increase carbon dioxide fixation during photosynthesis;
- transport chemical compounds; and
- balance electrical charges in various parts of cells.

Harvesting crops removes K from the soil. The quantity removed varies with the quantity of biomass and K content of the plant organs harvested (Table 1).

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield level per A</th>
<th>K₂O uptake</th>
<th>K₂O removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa (DM)</td>
<td>8 ton</td>
<td>400</td>
<td>392</td>
</tr>
<tr>
<td>Corn</td>
<td>160 bu</td>
<td>224</td>
<td>40</td>
</tr>
<tr>
<td>Corn silage (67% water)</td>
<td>25 ton</td>
<td>183</td>
<td>183</td>
</tr>
<tr>
<td>Cotton</td>
<td>1,500 lb lint</td>
<td>186</td>
<td>57</td>
</tr>
<tr>
<td>Grain Sorghum</td>
<td>130 bu</td>
<td>221</td>
<td>35</td>
</tr>
<tr>
<td>Potato</td>
<td>500 cwt</td>
<td>590</td>
<td>325</td>
</tr>
<tr>
<td>Rice</td>
<td>7,000 lb</td>
<td>171</td>
<td>25</td>
</tr>
</tbody>
</table>

**Note:** To convert K₂O to K, multiply by 0.8301. DM = dry matter (0% moisture) basis.

For more crops, visit [http://ipni.info/nutrientremoval](http://ipni.info/nutrientremoval)

Plants that are supplied with adequate K are better able to withstand stress, insect damage, and many plant diseases compared with plants low in K.

As plants age, rainfall leaches K from plant leaves, depositing K at the soil surface. Plants therefore redistribute K from lower depths to the soil surface, a process termed “uplift.” Uplift contributes to nutrient stratification in no-till and reduced tillage systems and affects how soil tests change in response to K additions and crop removal.

**Potassium in Soils**

Plants can only access K when it is dissolved in the soil solution. Contributors to potentially plant-available K are:

- K redistributed from other areas, including: irrigation water, precipitation, commercial fertilizer, manure, biosolids, and sediment deposition;
- weathering of K-containing primary minerals like micas and some feldspars;
- K released from the interlayers of the layer silicate minerals illite, vermiculite, and smectite; and
- K desorption from surfaces and edges of layer silicate minerals, termed “exchangeable K.”

Exchangeable K is measured by soil tests and is considered readily available for plants. Layer silicate minerals that release...
Potassium Deficiency Symptoms

Potassium deficiency slows the growth rate of plants. In corn, for example, K deficiency leads to delayed pollination and maturity. Leaf margins yellow and eventually die, and leaves may not develop fully. The resulting reduction in leaf area reduces crop yields. Stalks are also weakened, increasing the risk of lodging. Plants have a lower resistance to some diseases and to moisture stress. Reduced cell extension shortens internodes, producing stunted plants that may result in greater harvest losses.

Potassium Deficiency Symptoms

Potassium-deficient corn.

Crop Response to Potassium

When soils do not supply adequate K, fertilization has a high chance of providing profitable crop responses. Table 3 shows that larger, less frequent fertilizer K applications can be just as effective as smaller, annual applications.

Harvest removes different amounts of K for various crops. Replacement of this K is necessary to avoid long-term depletion of soil nutrient reserves. There are many excellent fertilizer materials available for maintaining the K supply for healthy crop growth.

References