

Plant Nutrients—Potassium

Information compiled by the Western Plant Health Association

Plant Utilization – Potassium, one of the 17 chemical elements required for plant growth and reproduction, is often referred to as the “the regulator” since it is involved with more than 60 different enzyme systems in plants. Potassium helps plants to resist drought and effects from excessive temperatures. It also increases crop resistance to disease. Potassium aids plants in the production of starches, controls root growth, and regulates the opening and closing of pores in plant cells (called stomata), which is important for efficient water use.

All plants require potassium, especially crops high in carbohydrates, like potatoes. Studies have shown that adequate amounts of potassium may promote the growth of long, strong cotton fibers; increase the shelf life of fruits; increase the stem length and quantity of roses; enhance the green color and growth of turf grass; and increase the size and quality of fruits, grains, and vegetables.

Production – Potassium is the seventh most abundant element in the Earth’s crust, yet only one to two percent is available to plants. The rest is incorporated in the structure of the rocks and unavailable to plants. Farmers often apply potassium fertilizer for optimum plant growth.

Most potassium is mined from underground deposits and is shaft mined, like coal. Some shafts are drilled as deep as 3,000 feet. In some cases, solution mining is also used in which case water is pumped into the shaft to dissolve the ore. The solution is extracted and allowed to evaporate, leaving behind potassium salts. Some potassium comes from the evaporation of water from natural salt lakes, such as the Great Salt Lake in Utah, and the Dead Sea in Israel and Jordan. Tobacco stems, wood ash, wool waste, sugar beet factory waste, and flue dust also contain potassium, but their use as a fertilizer is limited.

Forms – Potassium is symbolized as K_2O on fertilizer labels and is the third number on the label. Plants absorb potassium in the form of the ion K^+ which dissolves readily in water.

Ninety-five percent of all potassium fertilizers come in the form of muriate of potash, also known as potassium chloride. For crops unable to tolerate chloride, other chloride-free salts such as potassium sulfate and potassium nitrate are used. Potassium comes in both liquid and granular form and is usually mixed in the soil or placed directly near the root zones of plants.

Application of chloride-free foliar sprays are sometimes used on certain crops.

History – The letter K, used to symbolize potassium, comes from the German word kalium. Before the industrial era, people burned wood and other organic matter in pots to manufacture soap. The ashes were rinsed and the water was allowed to evaporate, leaving a residue of potassium salts. People called the residue “pot ashes” or potash. These salts were boiled with animal fat to produce soap.

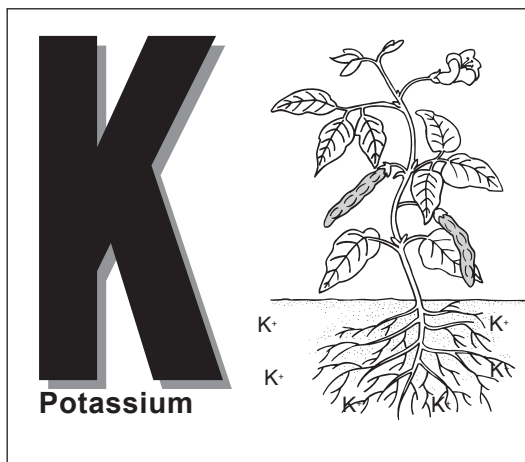
In 1868, Samuel William Jackson, a botanist in Connecticut, burned plants and analyzed the ash. Jackson found plants consisted of large amounts of potassium and other minerals. His work led to the use of fertilizers to promote an increase in crop yields. The very first U.S. patent issued by the United States government was for an improved method of potash production.

Top Producing Regions – Canada is the world’s largest potash producer. Russia, Belarus, and China are also top producers of potash. U.S. production has been stable with most domestic production occurring in New Mexico. Lesser amounts are produced in Utah and Michigan. The price of potash fertilizer has increased significantly in the past few years, causing mining companies to seek new sources of the raw material throughout the world.

China is the world’s leading potash consumer. Brazil and the U.S. are the next leading consumers of potash. Approximately 20% of the 6.5 million tons of potash used in the U.S. is domestically produced.

Economic Value – Fertilizer manufacturers, wholesalers, importers, brokers, retailers, and the businesses that serve them support 487,000 American jobs with a total annual economic impact of \$130 billion. The fertilizer industry creates over 30,000 jobs in California, paying workers more than \$2 billion in wages. Fertilizer, which is responsible for half of the world’s food supply, helps keep U.S. farmers profitable by helping them grow in excess of \$366 billion worth of crops every year.

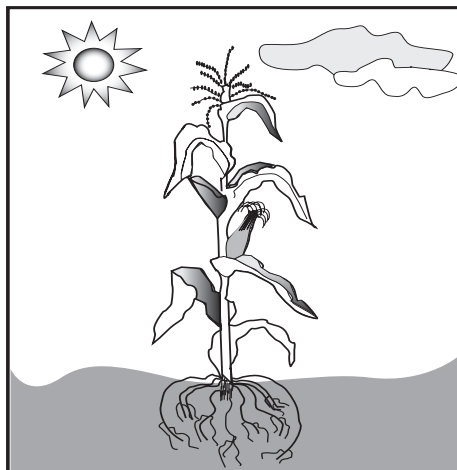
For additional information:
California Fertilizer Foundation
(916) 574-9744
Website: www.calfertilizer.org



Potassium Activity Sheet

How Potassium Functions in Plants

- *Helps slow crop diseases.*
- *Builds cellulose needed for stalk and stem strength.*
- *Aids in photosynthesis and food function.*
- *Increases root growth and improves drought resistance.*



- *Produces grain rich in starch.*
- *Necessary for plant protein formation.*
- *Reduces water loss and wilting.*
- *Assists many enzyme actions.*

Lesson Ideas

- On a world map, color the major potassium exporters blue and the major importers red.
- On a map of North America, locate and color the areas where potassium is mined.
- Research how humans utilize potassium and find out what foods are high in potassium.
- Make a poster illustrating the various roles potassium plays in plant growth and health.
- Locate potassium on the periodic table of elements. Learn about its physical and chemical properties.
- Find two points that are 3,000 feet apart so students can appreciate the depth of some potassium mine shafts.
- Research the Colonial soap-making process and the various uses of potash.
- Find out how agronomists determine the potassium content of soils.

Fantastic Facts

1. Canada is the world's leading exporter of potassium.
2. Potassium is obtained by underground mining.
3. Potassium is sometimes called "the regulator" because it controls many plant enzyme systems.
4. Potassium helps plants by aiding protein and starch formation, stimulating root growth, providing winter hardiness, and opening and closing cell pores called stomata.
5. New Mexico processes the most potassium in the United States.
6. Historically, potassium was called "potash" because it was sourced from the residue found in wood ashes.
7. California is the largest importer of potassium.
8. Some potassium is obtained from The Great Salt Lake in Utah.
9. The very first U.S. patent issued was for an improved method of potash production.

Lesson Plan: The World of Potassium

Introduction: Potassium is an essential nutrient for plants and animals. It also has many other uses, depending on its chemical formulation.

Objective: Students will research potassium and its various uses. They will create a wall-length mural that depicts their findings.

California Standards: CC ELA: W.3-12.7; RI.3.5; RI.4-5.9; RST.6-10.2, 7

Materials: Reference materials, including encyclopedias, human nutrition books, plant nutrient requirement books, butcher paper, paint or markers, glue.

Procedure:

1. Write the following phrases on index cards: plants which produce fibers for clothing; annual crops, such as celery; forage crops, such as alfalfa; tubers, such as potatoes; disinfectant; human nutrition; component in soap; plant guard

cells; potassium forms which are usable by plants; agricultural by-products which contain potassium; roses and other flowers.

2. Divide the students into groups of three or four and distribute one index card to each group.
3. Each group is responsible for researching how potassium relates to the key words on the index card. After they gather the details, the group is to decide how they will depict their knowledge on a wall mural called "The World of Potassium."
4. In a class discussion, determine what the class mural will look like so that all aspects of potassium use will be displayed.
5. Have each group create their graphics and text for the mural and then place it on the mural.
6. Display the mural at a science night or in the library. This may be displayed with other murals made for other elements, such as nitrogen and phosphorus.