

## JOHN'S CORNER:

### MINERALS - The Elements and What They Do (Part 11)

*by John Ferguson*

**18) Argon (Ar)** - The name argon comes from the Greek meaning "inactive" as argon is the cheapest totally inert gas. It is a colorless, odorless gas that is soluble in water. One percent of our atmosphere is argon, it is found in igneous rocks at 3-5 ppm, fresh and seawater at 0.06 ppm, and in mammalian blood at 0.75 ppm.

Argon is used to date ancient rocks and artifacts by various dating methods and it is used in scientific instruments. It is used as a filler in the old incandescent light bulbs, used to fill partially empty wine bottles to keep them from oxidizing and going bad, sometimes used as the gas in double pane windows. It is also used to make the blue lasers used in eye surgery. Argon is produced by the decay of radioactive potassium atoms and has built up in the atmosphere over billions of years.

Argon has no known biological role. However, bacteria in the nodules of certain plants like beans can absorb argon but cannot process further.

Gardening and Landscaping Problems Associated with Argon (Ar)

None known, good or bad.

**19) Potassium (K)** - Essential element for all living things on Earth and is the eighth most abundant element on Earth. Potassium gets its symbol "K" from the Latin word Kalium. It is a soft silvery white metal in pure form and is a member of the alkali metal group on the periodic table. It oxidizes rapidly when exposed to air hence is usually stored in kerosene or oil. It will float on water and react violently with water (burst into purple-violet flames) releasing hydrogen in the process.



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If you notice that potassium is in the far left column on the periodic table this means it has similar chemical properties with lithium (Li), sodium (Na) and Cesium (Cs).

Potassium has several radioactive isotopes that are very common. As these radioactive isotopes decay, it has been suggested, that this decay is associated with the natural genetic modification that occurs in plants and animals. For example, over 4,000 potassium atoms undergo radioactive decay every second in the human body!

Red blood cells have the most potassium, with brain and muscle tissue next. Potassium is critical for nerve electrical signal transmission and if we do not get enough potassium, our heart will stop. The human body does not store potassium hence we must have a daily supply to be healthy. The toxin of the poisonous snake the Black Mamba kills its victims by blocking the potassium channel in mammal's bodies, which causes the heart to quit beating. Scorpions also use potassium in their venom. The compound potassium chloride (KCl), is often used as a poison and is used in some legal executions.

When we add potassium to glass, it makes it stronger and more scratch resistant. Potassium occurs in the Earth's crust mainly as silicate minerals such as feldspars, micas, and clays.

#### Gardening and Landscaping Problems Associated with Potassium (K)

Potassium is strongly bound to clay particles and retained until plants need it. Tilling upsets this natural storage mechanism and allows potassium to be lost from the soil and leached into our streams. This is why it has to be replaced by some form of fertilizer every year.

The poison potassium chloride is the main source of potassium in artificial fertilizers. When the potassium is released it leaves behind chlorine (Cl) which will then react with sodium in the soil to form salt (NaCl).

Potassium affects all areas of plant growth and nutrition from disease resistance, fruit quality, water use efficiency, insect herbivory, and carbohydrate content (e.g. sugars).



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A potassium deficiency usually noticed on lower leaves since potassium is highly mobile in the plant and will be transported to new growth. On older leaves, it may be seen as a yellowing on the leaf margin or outside edge of the leaf, which will eventually die and drop off. Depending on the plant species, other symptoms may be that young plants have dark green leaves with small stems and short internodes, older leaves scorched on margins, weak stems, fruit shriveled, uneven ripening, young leaves wrinkle, and curl. A deficiency of potassium may lead to the absorption of cesium (Cs) which is chemically similar but is a much larger atom that may then lead to the breakdown of many metabolic processes. Other effects of deficiencies include easier winter kill, poor survival of perennials, and increased susceptibility to diseases.

Potassium in the form of potassium chloride (KCl) and potassium sulfate (K<sub>2</sub>SO<sub>4</sub>) also called potash are very soluble and easily available forms of potassium. Potash comes from soaking wood ashes from the fireplace in water to obtain potassium. The potassium rich water historically was used as a liquid fertilizer for plants.

A much more common problem in gardening, is that too much potassium is applied which then creates a magnesium deficiencies in plants.

Potassium is involved with pH management, maintenance of balanced hormone and enzyme systems, and used in the plants immune systems from insect resistance, bacterial or fungal attack to weed control.

In a plant, 3-6% of the compounds contain potassium. Potassium is involved with many plant functions:

- regulates water movement within plants
- regulates the balance between root and leaf growth
- involved with translocation of vital sugars in plant structures
- strengthens plant stalks
- helps undue stress caused by too much nitrogen being supplied in the wrong chemical form
- serves as a catalyst for many processes
- required in the building of chlorophyll



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- required for plants to absorb elements out of the air such as carbon, hydrogen, and oxygen
- required for the production of starches, sugars, proteins, vitamins, enzymes and cellulose
- aids plants in surviving drought conditions
- aids plants in increasing both winter (cold) and summer hardiness (heat)
- governs resistance to certain diseases
- aids in root growth
- involved with balancing nitrogen and phosphorous

Potassium generally occurs in sufficient quantities in most soils but is often unavailable to mineral imbalances or lack of sufficient microbes.

A few foods high in potassium are raisins and almonds (860 mg/g), dates and currants (750 mg/g), peanuts (680 mg/g), rhubarb (430 mg/g), bananas (350 mg/g).

Sources: compost, native mulches, granite sand, greensand, potassium sulfate, molasses, potash, many types of clay rich soil.