The Fertilizer in Your Salt Shaker

By R.L. Mikkelsen

Individuals who are advised by their physicians to restrict sodium (Na) intake often use potassium chloride (KCl) to season food rather than common table salt, sodium chloride (NaCl). This is the same potassium chloride used in commercial fertilizer to supply these two nutrients to crops. And, it's the same potassium chloride sometimes added to drinking water through water softeners to reduce hard minerals. So, what's the point? The point is that the "chemicals" in fertilizers are so safe that some are added directly to the food we eat and the water we drink. Let's take a closer look at fertilizer potassium.

Fertilizer potassium is sometimes called "potash", a term that comes from an early production technique where potassium was leached from wood ashes and concentrated by evaporating the leachate in large iron pots. Clearly, this practice is no longer practical and is not environmentally sustainable. This potash collection method depended on the tree roots to deplete the soil of potassium, which was recovered from the wood after it was harvested and burned. Large amounts of wood were burned to collect relatively little potash. Potassium removed from the soil in harvested crops must be replaced in order to maintain a sustainable production system.

The use of finely ground rock minerals has also been attempted as a potassium source for growing plants. However, the agricultural use of ground rock has now been largely discarded, since it frequently takes hundreds or thousands of years for these rocks to geologically weather and release the minerals for the plant—a long period of time even for forestry applications!

Where Does Fertilizer Potassium Come From?

Over 350 million years ago, even before the dinosaurs were on the Earth, the great Devonian Sea was slowly drying up in the area of Central Canada and the northern U.S. As the sun evaporated the water, the ocean salt became increasingly concentrated and minerals were left behind. While the Devonian Sea no longer exists, the process of mineral deposition from drying salt water continues in places such as the Great Salt Lake and the Dead Sea.

Today, these ancient marine salts, especially potassium (the natural potassium rock salt mineral is called sylvite) and common table salt (halite) are recovered and used in a variety of useful ways. The potassium intended for human or for plant use is prepared by washing away the sodium, since neither humans nor plants benefit from excess sodium. After the potassium is separated, it can be used directly as a plant fertilizer or in many other applications (**Figure 1**). Likewise, sodium chloride can be used for various purposes.

While the majority of this separated potassium mineral goes into common fertilizer, its advantages in other uses may be surprising. Potassium chloride is commonly used as a salt substitute for people on a low-sodium diet. It is routinely used to melt ice from roads and walkways, and can be used in water softeners to reduce hard minerals. Whatever the intended use–as a food supplement or a fertilizer, the potassium chloride is exactly the same.

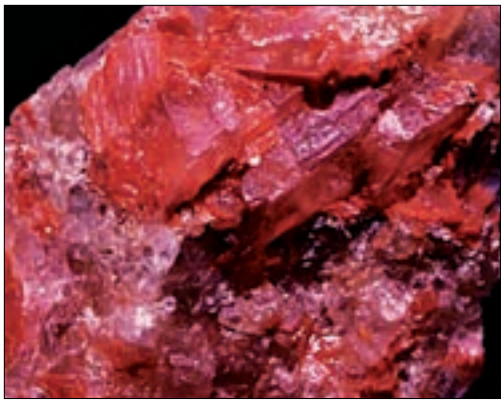

Figure 1. The most common type of potassium ore, called sylvinite, is a mixture of potassium chloride and sodium chloride.

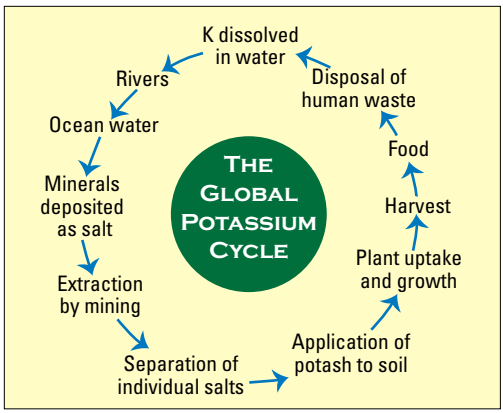

Figure 2. The global potassium (K) cycle.

Natural Material: From the Earth and Back to the Earth

Potassium fertilizer is clearly not an artificial or manufactured chemical—it comes directly from the earth. After potassium is added to the soil as a plant nutrient or directly to our food, it eventually returns to the sea again. Potassium is not consumed or destroyed, but simply recycled through very long-term geologic processes (**Figure 2**).

Potassium is a natural plant food because compounds such as potassium chloride, potassium sulfate, and potassium nitrate are widely found in nature. When these compounds are added to water, they rapidly dissolve into the positively charged potassium cation and the negatively charged anion (such as chloride, or sulfate). The potassium atom used by humans or plants is identical, regardless of the form that it is used. Even potassium found in animal manure is very water soluble, with a minor portion bound to the organic matter. Since potassium in animal manure behaves like mineral sources of potassium, there is no reason to distinguish between these two materials as far as potassium supply is concerned. Whether added to soil as fertilizer or manure, potassium salts are quite soluble and rapidly enter the soil solution.

Potassium fertilizers are safe to use since they pose no harmful environmental or health effects when used at normally recommended rates. However, like any substance, when fertilizer potassium is used in excess quantities, unintended side effects can result. In particular, due to the very high solubility of most potassium sources, large amounts of these materials should not be placed in close proximity to seeds and seedlings. Despite its natural solubility, potassium additions at appropriate levels are not rapidly lost from soils as are other nutrients, such as nitrogen.

Some plants prefer fertilization with sulfate forms of potassium, and this can be easily supplied from minerals that come from naturally occurring deposits of potassium sulfate or deposits containing a mixture of potassium sulfate and magnesium sulfate. The chloride that naturally occurs in some potassium fertilizers, manure, table salt, and rainfall is an essential plant nutrient and must not be confused with chlorine gas, hypochlorite used as a sterilant, or other chlorine forms which do not naturally occur in soils, plants, or fertilizers.

The most important role of fertilizer potassium is to replace the soil potassium removed by crop plants. Without it, not only

would the quantity of food produced be markedly reduced, but the quantity of potassium in that food would be reduced as well. Potassium is an important mineral required for human health. Since potassium is not stored in the human body, it is necessary to continually replace this nutrient on a regular basis. The U.S. Food and Drug Administration (FDA) recognizes that "diets containing foods that are good sources of potassium and low in sodium may reduce the risk of high blood pressure and stroke." **Table 1** shows normal potassium levels in major potassium-supplying foods.

TABLE 1. Some examples of food sources of potassium (K).

Food/serving	K content, mg	Food/serving	K content, mg
8 oz. whole milk	371	1 medium potato	610
1 medium banana	467	8 oz. yogurt	531
8 oz. orange juice	473	1 tomato	273
3 oz. sirloin steak	311		

From USDA Nutrient Database:
http://www.nal.usda.gov/fnic/foodcomp/Data/SR15/wtrank/sr15a306.pdf
Note: FDA Daily Reference Values (DRVs) generally indicate 3,500 mg of potassium.

Potassium is a common mineral that has important functions for maintaining the health of both humans and plants. Although several forms of potassium are available, they are all natural, safe, and abundant in nature. These minerals are recycled through natural geological processes to sustain a productive and healthy ecosystem. BC

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Acknowledgment: Photo at top of page 21 courtesy of Salt Lake Convention and Visitors Bureau.

INFOAG 2003 SET FOR JULY 30 TO AUGUST 1

Certified Crop Advisers (CCAs), field agronomists, Extension representatives, innovative farmers, and other precision agriculture enthusiasts are encouraged to mark their calendars for the sixth Information Agriculture Conference, InfoAg 2003. The event is scheduled for July 30 through August 1, at the Adam's Mark Hotel, Indianapolis Airport.

An optional precision agriculture field day is planned for Monday, July 29, preceding the conference, with visits to the Ag One Co-op facility at Wilkinson, Indiana, and the Davis-Purdue Agricultural Center.

Keynote speaker for InfoAg will be Bruce Vincent, agriculture advocate known for developing positive programs and messages directed to community groups. Program content for InfoAg 2003 will be oriented to practical, real-world application of technology and analysis of data essential in site-specific farming. As in the past, an exhibit area will feature the latest in data collection and management, communications technology, and other tools for precision agriculture.

InfoAg 2003 is organized by the Potash & Phosphate Institute (PPI), Foundation for Agronomic Research (FAR), and CropLife Media Group (*CropLife* and *CyberDealer* magazines). The conference is supported in part by a grant from the USDA-CSREES Initiative for Future Agriculture and Food Systems (IFAFS) program.

More details about program plans, registration and exhibitor fees, and related information will be available at the website: www.ppi-far.org/infoag. BC