

Potassium Sulfate

Potassium fertilizer is commonly added to improve the yield and quality of plants growing in soils that are lacking an adequate supply of this essential nutrient. Most fertilizer K comes from ancient salt deposits located throughout the world. The word "potash" is a general term that most frequently refers to potassium chloride (KCl), but it also applies to all other K-containing fertilizers, such as potassium sulfate (K_2SO_4 , commonly referred to as sulfate of potash or SOP).

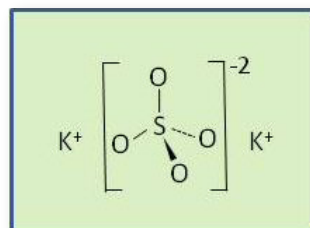
Production

Potassium is a relatively abundant element in the Earth's crust and production of potash fertilizer occurs in every inhabited continent. However, K_2SO_4 is rarely found in a pure form in nature. Instead it is naturally mixed with salts containing Mg, Na, and Cl. These minerals require additional processing to separate their components. Historically, K_2SO_4 was made by reacting KCl with sulfuric acid. However, it was later discovered that a number of earth minerals could be manipulated to produce K_2SO_4 and this is now the most common method of production. For example, natural K-containing minerals (such as kainite and schoenite) are mined and carefully rinsed with water and salt solutions to remove byproducts and produce K_2SO_4 . A similar process is used to harvest K_2SO_4 from the Great Salt Lake in Utah, and from underground mineral deposits.

In New Mexico (USA), K_2SO_4 is separated from langbeinite minerals by reacting it with a solution of KCl, which removes the byproducts (such as Mg) and leaves K_2SO_4 . Similar processing techniques are used in many parts of the world, depending on the raw materials accessible.

Chemical Properties

Chemical Formula:	K_2SO_4
K content:	40 to 44% (48 to 53% K_2O)
S content:	17 to 18%
Solubility (25 °C)	120 g/L
Solution pH	approx. 7



Agricultural Use

Concentrations of K in soil are often too low to support healthy plant growth. Potassium is needed to complete many essential functions in plants, such as activating enzyme reactions, synthesizing proteins, forming starch and sugars, and regulating water flow in cells and leaves.

Potassium sulfate is an excellent source of nutrition for plants. The K portion of the K_2SO_4 is no different than other common potash fertilizers. However, it also supplies a valuable source of S, which is sometimes deficient for plant growth. Sulfur is required for protein synthesis and enzyme function. There are certain soils and crops where the addition of Cl⁻ should be avoided. In these cases, K_2SO_4 makes a very suitable K source. Potassium sulfate is only one-third as soluble as KCl, so it is not as commonly dissolved for addition through irrigation water unless there is a need for additional S.

Several particle sizes are commonly available. Fine particles (<0.015 mm) are used for making solutions for irrigation or foliar sprays since it is more rapid to dissolve. Foliar sprays of K_2SO_4 are a convenient way to apply additional K and S to plants, supplementing the nutrients taken up from the soil. Leaf damage can occur if the concentration is too high.

Management Practices

K_2SO_4 is frequently used for crops where additional Cl⁻ from more common KCl fertilizer is undesirable. The partial salt index of K_2SO_4 is lower than some other common K fertilizers, so less total salinity is added per unit of K. The salt measurement (EC) from a K_2SO_4 solution is less than a third of a similar concentration of a KCl solution (10 mmol/L). Where high rates of K_2SO_4 are needed, it is generally recommended to divide the application into multiple doses. This helps avoid surplus K accumulation by the plant and also minimizes any potential salt damage. ■

Abbreviations and notes: K = potassium; Mg = magnesium; S = sulfur, Cl⁻ = chloride; Na = sodium.