

Sodium Nitrate

Sodium nitrate was one of the first commercially available inorganic nitrogen (N) fertilizers. It was very important in plant nutrition before the discovery of ammonia synthesis by the Haber-Bosch process in the early 1900's. Sodium nitrate is a naturally occurring mined product, and as such is used to provide a portion of N nutrition in some organic cropping systems.

Production

Sodium nitrate ore is mined from surface deposits in the Atacama Desert of northern Chile. The ore body occurs within the top two meters in a zone nearly 500 miles (800 km) long and 10 miles (16 km) wide. Sodium nitrate accumulates in this remote region due to very low rainfall and unique geologic conditions.

The nitrate ore, called caliche, is crushed and washed with hot water to dissolve the sodium nitrate. The solution is then filtered and chilled to recover the final product. It is ultimately sold as crystalline or prilled products.

Small deposits of sodium nitrate are reported in other countries, but the Republic of Chile is the only commercial source of this product, so it is frequently referred to as Chilean nitrate.

Chemical Properties

Chemical formula:	NaNO_3
Nitrogen content:	16% (present as nitrate)
Sodium (Na) content:	26%
Water Solubility:	880 g/L (20° C)



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Sodium nitrate prills

Caliche Ore

Agricultural Use

Sodium nitrate provides an immediately available source of N nutrition to plants since it is highly soluble. It has been used as a source of N nutrition since the mid 19th century and has a distinguished history as a valuable fertilizer material. It has been a preferred source of plant nutrition for many crops, notably for tobacco, which is typically fertilized with a nitrate form of fertilizer.

Sodium nitrate is approved by the U.S. National Organic Program for use as a supplemental source of N nutrition. The permitted use recognizes that mineralization of carbon-based organic N sources is not always rapid enough to meet the N demand of the growing crop. This deficit between N release and plant demand can be overcome with appropriate applications of sodium nitrate. Organic farmers are urged to check with their local certifying agency to determine the appropriate use of sodium nitrate.

Management Practices

Appropriate management is needed to achieve maximum advantage of any fertilizer, including sodium nitrate. Since nitrate is highly mobile in soils, careful consideration of placement, timing, and rate will minimize undesirable losses. Sodium nitrate can be broadcast onto the soil surface or applied in a concentrated band on top, or beneath the soil surface. This source of N is not susceptible to volatile losses, so it can provide added flexibility compared to ammonium and urea-containing N fertilizers.

Concern is sometimes expressed over sodium (Na) in the fertilizer. Excessive Na in soils can have damaging effects on soil structure, but this risk is minimal at typical application rates of sodium nitrate. When used in organic production, Na inputs are quite low. For example, application of 30 lb N would supply only 50 lb Na to the soil. Sodium is held less strongly on soil cation exchange sites than other common cations, so it can be leached during typical rainfall or irrigation events.

Sodium nitrate ore is a naturally occurring product. Therefore, it may contain traces of various elements and compounds such as iodate, borate, perchlorate, magnesium, chloride, and sulfate.

Non Agricultural Uses

Sodium nitrate is a strong oxidizer and is used in a variety of industrial and food processes. For example, it is commonly added to charcoal briquettes to make them easier to light, and is used for making glass and in wastewater treatment. It is used as a food additive in meats and poultry (not to be confused with sodium nitrite which is used as a preservative in deli meats).

Sodium nitrate is combined with other nitrate materials to store heat from solar thermal projects. Solar thermal plants store energy in molten nitrate salts instead of storage in electrical batteries.



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