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Polyhalite: A New Multi-Nutrient Fertilizer for Indian Farmers

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Polyhalite is a naturally occurring mineral that offers a promising alternative option as a multi-nutrient fertilizer. It supplies four important nutrients—potassium, calcium, magnesium and sulphur—in a single application. It is reported that, polyhalite results in healthier plants, better quality crops and higher yields. Polyhalite can be applied alone or mixing with other fertilizers and is suitable for cereals, pulses, vegetables, sugarcane, cotton and horticultural crops. With its balanced nutrition, easy application and effectiveness, polyhalite is proved to be a valuable mineral input for sustainable and profitable farming in India.

Key words: Crop yield improvement; Multi-nutrient fertilizer; Polyhalite; Potassium–Calcium–Magnesium–Sulphur; Sustainable farming.

Introduction

Today's agriculture faces the challenge of producing more from limited land-resources while maintaining soil health and environmental sustainability. Nitrogen, phosphorus and potassium are mostly applied in the soil, but the Indian soils show deficiency in secondary nutrients such as calcium, magnesium and sulphur. These deficiencies can limit growth, quality and quantity of the produce. Thus, farmers are looking for practical solution to provide balanced nutrition to crop. Polyhalite is a naturally occurring multi-nutrient mineral that is gaining importance as a sustainable fertilizer option. It supplies four essential nutrients—potassium (K), calcium (Ca), magnesium (Mg), and sulphur (S)—simultaneously, which makes it different from most conventional fertilizers. The use of polyhalite helps improve soil health, supports better crop growth, and enhances yield. As it releases nutrients slowly and contains very little chloride, it is suitable for crops such as potato, tobacco, onion, pulses, and many vegetables that are sensitive to chloride. Thus, polyhalite promotes more sustainable farming practices.

What is Polyhalite?

Polyhalite is a naturally occurring evaporite mineral that formed millions of years ago and is mined directly without any chemical processing, making it a highly sustainable fertilizer with a low environmental footprint (according to ICL). Its nutrients are released gradually, providing consistent nourishment to crops and reducing the chances of nutrient loss. The composition of polyhalite includes 11.6% potassium (K), 12.2% calcium (Ca), 3.6% magnesium (Mg), and 19.2% sulphur (S), along with small amounts of boron (B) and iron (Fe), approximately 300 mg kg⁻¹ and 100 mg kg⁻¹, respectively (Yermiyahu et al., 2017). Polyhalite is available in crushed rock granular and powdered forms (Lewis et al., 2020). It restores the potassium that crops take from the soil during harvest, particularly in cereal crops with large amounts of straw, and serves as an important addition to regular fertilization practices.

Nutrient	Content	Reference
Potassium (K)	11.6%	Yermiyahu et al., 2017
Calcium (Ca)	12.2%	
Magnesium (Mg)	3.6%	
Sulphur (S)	19.2%	
Boron (B)	~300 mg/kg	
Iron (Fe)	~100 mg/kg	



Polyhalite granules: a natural source of K, Ca, Mg and S

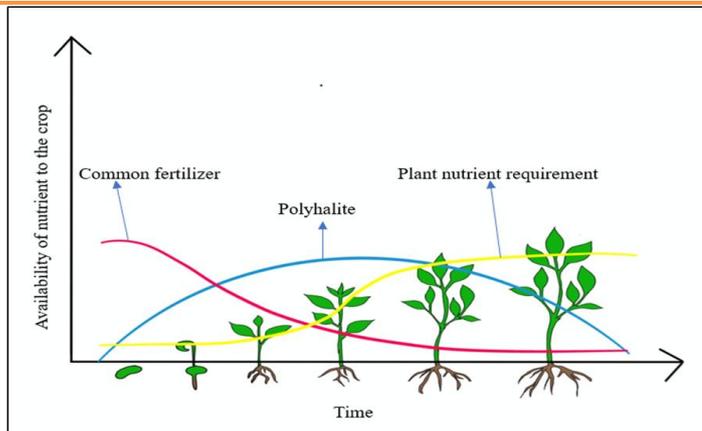


Illustration of nutrient release pattern of common fertilizer and polyhalite

Nutrients in polyhalite and their key benefits

Nutrient	Key benefits
Potassium (K)	Facilitates greater yield and stress mitigative features, improves overall water usage efficiency.
Calcium (Ca)	Increases resistance of cell walls, improves disorders, enhances shelf life.
Magnesium (Mg)	Enhances photosynthesis, improves coloration of leaves, increases size of fruit/grain.
Sulphur (S)	Increase in protein profile, enhances smell, contributes to oil content and facilitates nodulation.
Boron (B)	Flower and fruit set assistance, prevents flower drop.
Iron (Fe)	Prevents yellowing, assists with chlorophyll and overall growth.

Polyhalite vs other common fertilizers

Fertilizer	Nutrients supplied	Chloride level	Release pattern	Special features
Polyhalite $K_2Ca_2Mg(SO_4)_4 \cdot 2H_2O$	K, Ca, Mg, S	Very low	Slow, steady	Natural mineral, multi-nutrient, safe for sensitive crops
MOP KCl	K, Cl	High	Fast	Cheapest K source but unsuitable for chloride-sensitive crops
SOP K_2SO_4	K, S	Low	Moderate	Good for high-value crops but more expensive
Gypsum $CaSO_4 \cdot 2H_2O$	Ca, S	No Cl	Moderate	Improves soil structure but no K or Mg
Dolomite $CaMg(CO_3)_2$	Ca, Mg	No Cl	Slow	Raises soil pH; no K or S
SSP $Ca(H_2PO_4)_2 + CaSO_4$	P, Ca, S	No Cl	Moderate	Provides P and S but no K or Mg

Why choose polyhalite?

1. It is natural and eco-friendly: Polyhalite is a naturally occurring mineral, unlike all the conventional fertilizers made in factories. There is no case of destructive processing, needing to mine, chemically separated, or any lack of safeness to the environment. That is important nowadays. Especially with the world targeting more sustainable ways in farming and agriculture.
2. Source of multi-nutrient: Polyhalite, unlike any other product, delivers all four primary macro-nutrients in one bundle, that is potassium, magnesium, calcium, and sulphur. All these nutrients are available for single application. Each of the four nutrients is delivered in a way that is easily available to the plants at their time of peak need. In addition, the crystals are a slow-release formulation so the nutrients are available for all of the plant's growth stages. Polyhalite is also extremely user friendly. Easy to store, simple to spread, and it blends well with all other fertilizers.
3. Safe for chloride-sensitive crops: Polyhalite is one of the best choices for decidedly chloride sensitive crops. Its neutral pH (Singh et al., 2023) and low chloride content (Arunachalam et al., 2025) makes it a fertilizer of choice for all of these sensitive crops.
4. Improves yield and quality: Polyhalite shows positive results. The crops that are treated with polyhalite are more nutritious, healthier, more resilient, and able to recover from diseases faster. There is an increase in yield and the crops produced are of a higher quality due to polyhalite creating more robust stems, deeper roots, and an overall hardier plant. The sulphur in polyhalite contributes to the formation of proteins and enhances the ability of the crops to withstand heat and stress condition.
5. Soil health and environmental benefits: Polyhalite supports sustainable agriculture. It helps to improve water holding capacity and the content in it helps soil aggregation, microbial growth and soil health. Its slow nutrient release nature (Gopinath et al., 2024) helps to reduce nutrient leaching. It has low carbon footprint; so that it is a more climate friendly option for modern day agriculture

Why Farmers Like Polyhalite

- Easy to apply in the field
- Comfortable to handle, mix, and apply as there are no smell and no dust
- Compatible with most traditional fertilizers
- Crop safety is ensured, even when high application rates are used
- Polyhalite is a naturally occurring mineral. It suits farmers with more organic-oriented practices.

How to use polyhalite in the field: A simple guideline

Polyhalite works best when it is used as basal fertilizer. It should be applied during land preparation, just before sowing or planting. As it releases nutrients gradually, early application helps the crop by supplying nutrients throughout its growing period. Long-duration crops like sugarcane, banana, potato and tomato can also benefit when polyhalite is placed in furrows at planting or during earthing-up. To get the best results, polyhalite should be applied correct and recommended dose. Based on soil conditions and regions. The dose is decided. It can be adjusted based on potassium status in soil and the amount of MOP uses. Polyhalite can be applied through broadcasting, furrow placement or blending with other fertilizers. Broadcasting is the easiest method among them. Farmer can spread it uniformly across the field and mix it lightly with soil using a cultivator or harrow. This practice ensures the granules reach the root zone. For crops like potato, maize, sugarcane and vegetables, polyhalite can be placed directly in the furrow before planting. Polyhalite can be easily mixed with urea, SSP, DAP, MOP and other NPK fertilizers. It does not cake and blends easily, without any harmful reaction. This makes it convenient to apply balanced nutrition in one go.

Things to keep in mind in case of polyhalite

- Always mix polyhalite with soil; do not leave it on the surface.

- Use it as a basal fertilizer because it releases nutrients slowly.
- Combine it with nitrogen and phosphorus fertilizers for balanced crop growth.
- Follow soil test results whenever possible to avoid overuse.
- Not a replacement for all fertilizers—best used as a supplementary nutrient source.

Crops that respond well to polyhalite

Farmers from various regions have noticed that many crops respond well when polyhalite is added to their fertilizer schedule. Potato and tomato often show clearer skin and better-sized produce. Onion and garlic benefit because these crops naturally need more sulphur. Sugarcane and banana, being long-duration crops, make good use of the slow and steady nutrient release. Field crops like maize and groundnut usually show stronger growth and better-filled grains or pods. Moong, urad and lentil also perform well, especially in soils that are low in sulphur. Plantation crops like tea, coffee and several spice crops also show healthier plants and improved quality when polyhalite is used.

Conclusion

Polyhalite is steadily gaining attention because it fits well with the practical needs of Indian farming. It offers a reliable way to improve crop nutrition by adding nutrients that many soils are now lacking. Farmers can use it easily along with their regular fertilizers, and its slow, gentle release suits a wide range of crops and field conditions. More than anything, it helps build a healthier soil base, which is essential for long-term productivity. As farming systems continue to face pressure from climate, soil degradation and rising input costs, polyhalite provides a simple and dependable option that can support better yields and more resilient crops. With proper guidance and field-based recommendations, it can become a useful part of everyday nutrient management for farmers across the country.

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