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Advanced sulfur fertilisers for self-reliance in oilseed production

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Sulfur is an essential secondary macronutrient, especially for oilseed crops. While it affects the pungency and quality of oil, its deficiency has been observed over the past years (50–80%) in the Indian soils. This has occurred because sulfur is not applied in the crops as in case of other nutrients (NPK). It leads to poor quality and lower reduction, resulting in dependence on imports to meet the domestic demands. This article discusses the role of noble sulfur fertilisers and their efficiency in increasing the oilseed production. Thus, by boosting oilseed production, India can take significant strides towards reducing its heavy reliance on imported edible oils, thereby advancing towards self-sufficiency in oilseed production.

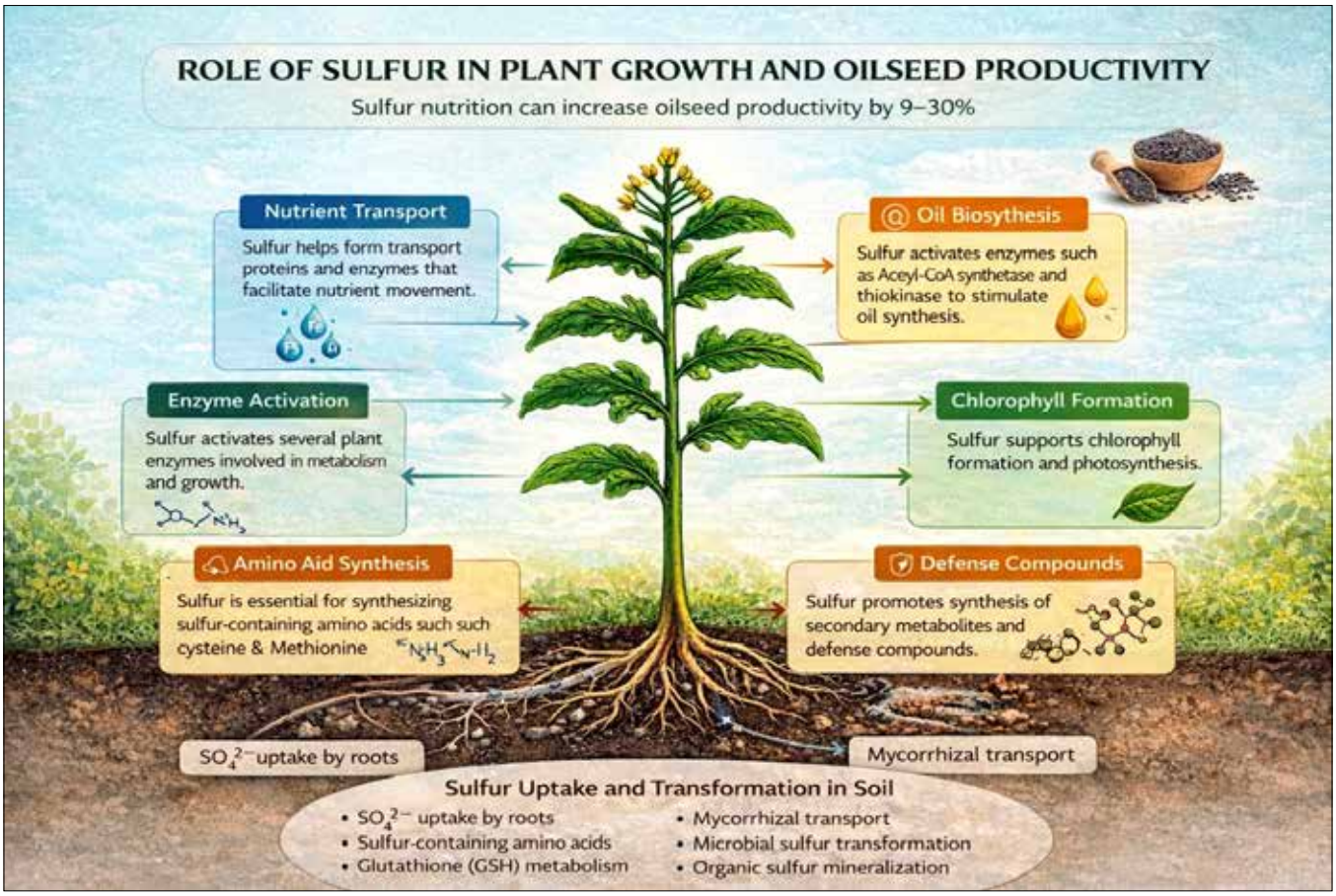
Keywords: Oil quality, Self-sufficiency, Urea, Urea sulfur I and II

INDIA has emerged as one of the world's largest consumers of edible oils. Currently, the country produces ~11.5 million tonnes (mt) of edible oils, while domestic consumption is estimated 25.6 mt, resulting in a substantial deficit of nearly 14.1 mt that is largely met through imports (Directorate of Economics and Statistics, GOI, 2024). Consequently, India spent ~US $18.70 billion on edible oil imports every year, highlighting the urgent need to strengthen domestic oilseed production. In addition to this production gap, several agronomic constraints limit oilseed productivity in India. Oilseed crops are predominantly cultivated on marginal to sub-marginal lands, where soil fertility and water availability are often limited. Furthermore, only about 30% of the oilseed-growing area is irrigated, making crop yields highly dependent on rainfall. These factors collectively result in significantly lower productivity compared with many major oilseed-producing countries. At the same time, changing dietary patterns, urbanisation and increasing consumption of processed and fast foods have further accelerated the demand for edible oils in the country. Therefore, improving oilseed productivity through scientifically balanced nutrient management and better agronomic practices has become essential to reduce import dependence and enhance national self-reliance in edible oil production. Balanced nutrient management is a key factor in improving oilseed productivity, particularly in sulfur-deficient soils.

Importance of sulfur in agriculture

Sulfur is an essential secondary nutrient that plays a vital role in plant growth, particularly in oilseed crops such as mustard. It is involved in the synthesis of amino acids, proteins, enzymes and oils, thereby directly influencing crop productivity and quality. Oilseed crops generally require higher S than cereals because sulfur is closely associated with oil formation and seed development.

However, continuous cropping, declining organic matter and the widespread use of sulfur-free fertilisers have led to sulfur deficiency in many Indian soils. Currently, about ~58% of Indian soils are deficient in sulfur, which limits oilseed productivity. Its deficiency reduces plant growth, chlorophyll formation, nutrient uptake and ultimately yield and oil quality. Therefore, balanced fertilisation with sulfur along with NPK nutrients is essential for sustainable crop production. Recognising this issue, the Union Budget 2026-27 announced the nationwide introduction of sulfur-coated urea (SCU) priced at ₹254/40 kg bag. This initiative aims to restore soil sulfur balance, improve nitrogen use efficiency and reduce farmers fertiliser costs. By supplying nitrogen and sulfur together, SCU supports better crop growth, improved yields and sustainable nutrient management, contributing to India goal of achieving self-reliance in oilseed production.



Role of sulfur in plant metabolism and oilseed productivity
(Figure created with AI-assisted visualisation)

Noble sulfur fertilisers

To address sulfur deficiency and improve nutrient efficiency, two advanced sulfur fertilisers have been developed: Urea Sulfur I (40-0-0-13) and Urea Sulfur II (10-0-0-75). These fertilisers are produced using micronised sulfur technology, which converts elemental sulfur into extremely fine particles with an average size of less than 10 microns. In this process, micronised sulfur often derived as a by-product from oil and gas industries is blended with urea in appropriate proportions to achieve the desired nitrogen-to-sulfur ratio. The mixture is then processed into granules, resulting in fertilisers that provide both nitrogen and S in a single application. This technology enhances nutrient availability and improves fertiliser efficiency.

Application strategy

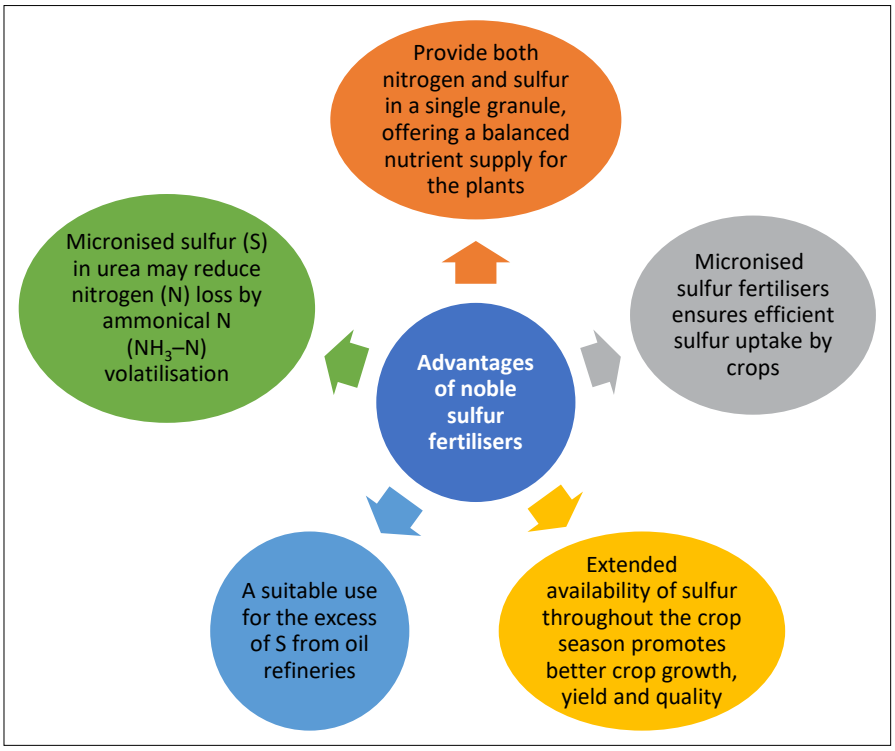
The recommended application rate for noble S fertilisers in oilseed crops is 30 kg/ha. For optimum results, the fertiliser should be applied in two equal splits. The first half is applied at the time of sowing, ensuring that the crop receives S during the early stages of growth. The remaining 50% of the S dose is applied approximately 30 days after sowing as top dressing. This split application ensures a continuous supply of S during critical growth stages such as vegetative growth and flowering. Field experiments conducted at the ICAR-Indian Agricultural Research Institute



Noble sulfur fertilisers



Field visit and crop assessment



(IARI), New Delhi, demonstrated that this management strategy significantly improves mustard productivity. When S was applied through Urea S I or Urea S II in combination with recommended NPK fertilisers at 30 kg/ha (with 50% applied at sowing and 50% as top dressing 30 days after sowing), mustard yield increased by 20–30% when compared with the use of NPK fertilisers alone.

SUMMARY

Oilseed crops respond strongly to S fertilisation, yet S is often underutilised in Indian agriculture. Considering that a large proportion of Indian soils are deficient in S, improving S management is essential for increasing oilseed productivity. The application of Urea S I and Urea S II at 30 kg/ha S, applied in two splits, has demonstrated significant improvements in mustard yield when used alongside recommended NPK fertilisers. Such nutrient management strategies can play an important role in enhancing domestic oilseed production and reducing India's dependence on imported edible oils. However, careful observations and trails are needed to evaluate the long-term effects, nutrient-use efficiency and economic feasibility of these sulfur fertilisers across different soil types and agro-climatic conditions. Wider multi-location and on-farm validation is also recommended to confirm their consistency and suitability for large-scale adoption in mustard production.

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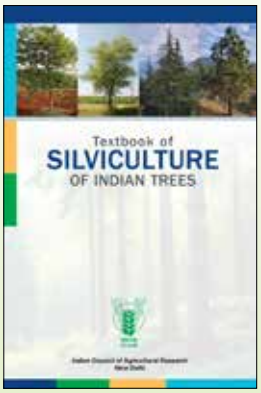
Textbook of Silviculture of Indian Trees



The contents of the book are synthesized to provide information about individual species from classification, taxonomy, origin, distribution, silvicultural characters, forest types, flowering, fruiting, propagation, cultivation practices, agroforestry systems, tree improvement and its multiple-uses. The book covers important tropical and temperate species along with photographs that will act as ready reckoner for species identification and information. Hence, the purpose of the book is to document recent advances and its multiple uses in different species ranging from tropical, arid to temperate parts of India.

TECHNICAL ASPECTS

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