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SULFUR'S IMPORTANCE IN SOUTHERN AND EASTERN RUSSIA

Spring rapeseed plot at Tyulyachi District, Republic of Tatarstan, Russia (July 1, 2016) that received 126-22-6-28 kg N-P-K-S/ha preplant and 24-24-24 kg N-P-K/ha at planting. Ammonium sulfate nitrate was used as the S source supplying 121-28 kg N-S/ha.

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The majority of sulfur (S) in soils is present as part of soil organic matter. Organic S is continually being transformed to plant-available sulfate (SO_4^{2-}) through organic matter mineralization by soil microorganisms. In areas of Russia, S mineralization from soil organic matter is often too slow to meet the nutritional demand of high-yielding crops. Any deficit between the soil supply and crop demand must be overcome through S fertilization.

The S requirement for crops grown in Russia is much like other temperate regions and is typically greatest for *brassica* crops like rapeseed (canola), followed by legumes, and then cereals. The harvested portion of these crops removes 10 to 30 kg S/ha. Sulfate taken up by plant roots is ultimately converted to various S-containing organic compounds, including S-containing amino acids. Crops like rapeseed also produce secondary S-containing metabolites called glucosinolates. Onion produces alliin compounds that may contain >80% of the total plant S.

IPNI field experiments initiated in southern and eastern Russia during last two years have revealed a noticeable crop response to S on a wide range of soils with both low (<6 ppm) and high (>12 ppm) test S concentrations and a range of soil organic matter levels. Soil testing may not always be successful in predicting crop response to S fertilizer application as seasonal mineralization rates vary and interpreting the test results can be challenging.

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V. Nosov/IPNI Image

Onion field experiment in Volgograd.

There is now a wide range of S fertilizers available in the region. Most of these products contain sulfate, and some also contain elemental S. The sulfate-S is immediately available to the crop, while elemental S needs to be oxidized to sulfate over the season, giving a prolonged effect on crop growth.

Spring rapeseed grown on both the grey forest and leached Chernozem soils of the middle Volga region responds well to additions of S. Application of ammonium sulfate nitrate on these soils with low initial concentrations of available S improved plant height and number of pods (and seeds) per plant, leading to 7% higher seed yields.

Maize grown on the low-S, ordinary Chernozem soils of southern Russian respond to S fertilizer with a noticeable increase in 1000-kernel weight and final grain yield.

Field vegetable crops, like onion, grown on the high S-testing soils in southern Russia still respond positively to ammonium sulfate nitrate dissolved in irrigation water during the second half of a fertigation program. Marketable yield of onion bulbs increased by 3% which was significant in terms of profitability. Sulfur nutrition hence may be important for onion grown on soils even having a high level of available S. Water use efficiency (volume of water used/ton of bulbs) was improved with S fertigation.

Similarly, S fertigation on bell pepper, which mixed ammonium sulfate nitrate with ammonium nitrate to deliver half the total N from each source, resulted in both increased fruit number and weight per plant. Marketable fruit yield, water use efficiency, and farmer profit were also increased by using additional S fertilizer.

An adequate supply of S is clearly required for sustaining crop yields and quality, both in Russia and in many other areas of the world. The need for S fertilization is occurring in regions where the importance of this nutrient has been over-looked for too long. Don’t let a lack of S keep your crops from reaching their potential yield and quality.

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Bell pepper field experiment in Volgograd.

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