FERTFACTS

SULPHUR
FACT SHEET

SULPHUR IN SOILS

70 - 90% of the soil Sulphur is present in the organic matter. This sulphur is not available for plant uptake until it has been converted to sulphate (SO_4^{2-}) by soil bacteria, a process known as mineralization.

Mineralization occurs more rapidly when the soil is warm and moist, and has been cultivated. Consequently, sulphur fertiliser is more likely to be needed in pasture than in crops.

Some sulphur is also received in rain (near industrialised areas and the sea). In Australia, this can exceed 10 kg/ha/annum S; but in inland areas, e.g. the New England Tableland, is often no more than 1-2 kg/ha S per year. The use of low sulphur fuels and added emphasis on air pollution control has reduced the amount of atmospheric sulphur reaching agricultural land through rainfall in many parts of the world.

Compared to phosphate and ammonium ions, sulphate is not as strongly adsorbed onto clay and organic colloids. Consequently leaching losses can be appreciable on light textured soils in areas of high rainfall. In drier areas and in soils of a heavier texture, leaching is less significant. In these situations, crystalline calcium sulphate (gypsum) may accumulate in the sub-soil. Where this occurs, sulphur is seldom limiting as a plant nutrient, provided it is accessible by plant roots.

SULPHUR IN PLANTS

Sulphur (S) is taken up by plants in slightly smaller amounts than phosphorus. It is absorbed by plant roots almost exclusively as the sulphate ion (SO_4^{2-}). Sulphur is a constituent of protein, and is necessary for the development of chloroplasts and in photosynthesis.

DEFICIENCY

The incidence of sulphur deficiency in plants has increased with greater use being made of high analysis fertilisers with a low sulphur content, e.g. urea in place of sulphate of ammonia, and the ammonium phosphates (DAP and MAP) in place of single superphosphate (SSP); and the adoption of reduced tillage practices (resulting in less sulphur being mineralized in the soil).
Responses to sulphur are most likely to occur on lighter textured (sandy) soils with a low organic matter content. In Australia, deficiency most commonly occurs in legume-based pastures, and in canola, which has a high requirement for sulphur.

Because nitrogen and sulphur are important in the formation of chlorophyll (the green pigment in plant leaves) and the synthesis of protein, deficiency symptoms of both are similar, i.e. poor growth, reduced tillering in cereals, and pale green to yellow foliage. Nitrogen, however, is more readily relocated from old to young leaves within the plant, so that in nitrogen deficiency, symptoms first appear in the old leaves, whereas in sulphur deficiency it is usually evident in the young leaves. Sulphur deficient plants are often rigid and brittle, and the stems remain thin. As is the case with nitrogen deficiency in grain crops, a shortage of sulphur will at first be reflected by a decline in protein, before yield is affected. In legumes, the nitrogen-fixing root nodules are often reduced in both size and number in sulphur deficient plants.

SULPHUR FERTILISERS

Sulphur can be applied as sulphate compounds (in combination with other nutrients, e.g. as ammonium, potassium or calcium sulphate), or in the elemental form. The analyses of some Incitec Pivot products commonly used to supply sulphur are given in the following table.

Incitec Pivot Product	Analysis				
	% N	% P	% K	% S	%Ca
Gran-am	20.2			24	
Granulock 15	14.7	11.8		11.8	
SuPerfect		8.8		11	20
Sulphate of Potash			41	18	
Sulphur Bentonite Granules				90	
Phosphogypsum				14.5	18.5
Easy ATS (w/v)	16			34	

Gran-am (granulated ammonium sulphate) is commonly used in combination with other nitrogen fertilisers in fertiliser programs, rather than be applied on its own as the sole source of nitrogen. It contains approximately equal parts of nitrogen and sulphur, whereas most plants take up ten or more times as much nitrogen as sulphur. Gran-am is manufactured in Brisbane.

Granulock 15 is a compound ammonium phosphate sulphate (APS) fertiliser that is manufactured at Newcastle. It is primarily used at planting in oilseed, grain and forage crops, to meet the crop's phosphorus and sulphur requirements, and supply some starter nitrogen.

SuPerfect (Single Superphosphate or SSP) is ideally suited for top-dressing perennial pastures, where both phosphorus and sulphur are usually required. High analysis phosphorus fertilisers such as DAP and MAP contain very little sulphur. SSP is manufactured at Portland, Geelong and Newcastle. Sulphur-fortified grades are also available for soils with a moderate to high phosphorus status.

Sulphate of Potash (potassium sulphate) supplies sulphur as well as potassium. However, it is more expensive than potassium chloride (Muriate of Potash), and unless there are reasons to avoid using Muriate of Potash (on account of its chloride content), the use of alternative sulphur containing fertilisers is likely to be more economical.

Sulphur Bentonite Granules is a dispersible elemental sulphur fertiliser. The granules disperse on wetting after application to release fine sulphur particles. Elemental Sulphur is not immediately available for plant uptake. It must first be oxidized to the sulphate form, a bacterial process that occurs in the soil. The finer the particle size, the more quickly oxidation occurs.

Gypsum (Calcium Sulphate) - Naturally occurring gypsum is used as a sulphur fertiliser in pastures in some districts with soils high in phosphorus, e.g. at 100 - 200 kg/ha per annum. Gypsum is also used at higher rates as a soil ameliorant (to improve soil structure) in cropping soils. Where this is done, it will not be necessary to apply additional sulphur. Incitec Phosphogypsum, a by-product of the manufacture of phosphoric acid, is available ex Brisbane. It is no longer available ex Newcastle.

Easy ATS - is a liquid ammonium thiosulphate solution for application to the soil or use in fertigation programs. Foliar applications are limited due to potential leaf burn.

Sulphur component is half sulphate and elemental sulphur.

FURTHER READING

For further information, a copy of the Incitec Pivot Agritopic on "Sulphur" is available if more detailed information is required. These can be obtained on request from Incitec Pivot Fertilisers.

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