SuPerfect Factsheet

November 2005

- **A dried granulated Single Superphosphate fertiliser, containing 8.8% phosphorus (P) and 11 % sulfur (S) as sulfate;**

- **Ideal for top-dressing grass-legume pastures.**

MANUFACTURE

The invention of superphosphate is said to mark the birth of the modern fertiliser industry. Prior to this, naturally occurring ores and plant and animal wastes were the primary ways of adding nutrients to the soil. Bones and phosphate rock were commonly used as a source of phosphorus.

The manufacture of superphosphate involves treating phosphate rock with sulfuric acid to increase the solubility of the phosphorus it contains, making it more available for plant uptake.

Naturally occurring phosphate rock contains a high proportion of calcium phosphate $Ca(PO_4)_2$ which is normally not sufficiently water-soluble to be used as a fertiliser. The treatment of phosphate rock with sulfuric acid converts it to calcium dihydrogen phosphate $Ca(H_2PO_4)_2$, a water-soluble form that plants are able to utilise.

John Lawes took out a patent for the manufacture of superphosphate in the United Kingdom in the 1840s. The royalties he received were used to establish the Rothamsted Research Station, the oldest agricultural research station in the world and the site of many internationally recognised long-term experiments.

Superphosphate, more correctly called single superphosphate (SSP), was first manufactured in Australia in Victoria in 1876. James Cuming (Victoria) and George Shirley (NSW) were among the early pioneers of the Australian superphosphate industry. Incitec Pivot Limited can trace its origins to these times, with antecedent companies having been involved in the fertiliser industry for over 100 years.

Superphosphate became and remained Australia's most important phosphorus fertiliser on crops and pastures until the 1970s. Since then, its cost competitiveness compared to other phosphorus fertilisers has declined. Superphosphate remains popular in legume-based pastures where both phosphorus and sulfur are important, but higher analysis fertilisers have largely replaced it in cropping, eg. DAP (Diammonium phosphate), MAP (Monoammonium phosphate) and TSP (Triple superphosphate).

Incitec Pivot Limited manufactures superphosphate at Geelong and Portland in Victoria and Newcastle in NSW. During the 1990s, all three plants were modified to improve the physical quality of the superphosphate. The dried and fully granulated product produced at Geelong and Portland is known as **SuPerfect**.

The phosphate rock used in the production of SSP in Australia is imported. Phosphate rock was once obtained from nearby ocean deposits, eg. Nauru, Christmas Island and Banaba (Ocean Island). North Africa (Bucraa) is the primary source at present.

Sulfuric acid is manufactured by recovering sulfur dioxide from smelters and oxidising it to sulfuric acid (H_2SO_4). This reduces atmospheric emissions of sulfur and the impact of acid rain; while the use of the acid to manufacture superphosphate not only improves the availability of the phosphorus in the phosphate rock, it also adds sulfur to the finished fertiliser.

USE OF SUPERPHOSPHATE AS A FERTILISER

Superphosphate contains approximately equal amount of phosphorus and sulfur. As plants also contain approximately equal amount of phosphorus and sulfur, this make superphosphate an ideal fertiliser where both phosphorus and sulfur are required, eg. for top-dressing grass-legume pasture.

As a source of phosphorus, superphosphate costs more per kg of phosphorus (P) than higher analysis alternatives. This is one of the reasons why superphosphate has declined in popularity as a cropping fertiliser.

However, when value is placed on its sulfur (S) and/or calcium (Ca) content, it becomes more attractive to use.

In high rainfall areas, the main reserve of sulfur in the soil is the soil organic matter. When the soil is cultivated, the breakdown (mineralisation) of soil organic matter is increased and sulfur is released. Smaller amounts of sulfur become available where the soil is not disturbed. Consequently, sulfur is more likely to be required in fertiliser programs in perennial pastures than in crops.

Consequently, sulfur usually needs to be applied in pasture fertiliser programs, and is less likely to be required in cropping.

Sulfur-fortified superphosphates are available for use on pasture where more sulfur and less phosphorus is required, eg some basalt and alluvial soils with high native levels of phosphorus.

Molybdenum fortified grades of superphosphate are also available for use on legume-based pasture. Other trace elements may also be required.

Where soil phosphorus levels are low in clover-based pastures, superphosphate is best applied in the autumn, ie. at the start of the main growing season.

Where phosphorus soil test values are higher, ie. non-responsive situations, and a maintenance dressing of phosphorus is being made, timing is less critical, and phosphorus is often applied in the spring.

Spring top-dressings are often advocated on soils with a high phosphorus fixing capacity which become water-logged during the winter. Iron and manganese become more available in the soil in these circumstances, and react with phosphate ions in solution to produce less soluble phosphorus compounds.

WARNING

This information is for use as a guide only. The use of fertilisers is not the only factor involved in producing a top yielding crop or pasture. Local soil, climatic and other conditions should also be taken into account, as these could affect crop or pasture responses to applied fertiliser.

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