

# ZINC FACTSHEET

December 2003

## ZINC IN SOILS

Clay soils are high in total zinc (Zn), whereas sandy soils are low. The availability of zinc for plant uptake is reduced at high pH. On acid soils, zinc deficiency is mostly caused by a low total zinc content, whereas on alkaline soils, the total zinc level may be high but a deficiency occurs due to low availability. As much of the plant available zinc is associated with the soil organic matter, deficiency is more likely to occur on soils low in organic matter.

## ZINC IN PLANTS

Zinc is taken up by plant roots as  $Zn^{2+}$ . Factors which affect its uptake include :-

**Restricted Root Growth** - Any factor that affects root development or the rates of diffusion of zinc in the soil may cause zinc deficiency, e.g. soil compaction, high water tables, container grown plants. Cold weather may also restrict root development and reduce microbiological release of zinc from soil organic matter.

**VAM** (vesicular arbuscular mycorrhiza) is a beneficial fungi which infects the roots of most crops plants (canola is an exception). The mycelium (fungal threads) act like fine root hairs, effectively increasing the root surface area, thereby greatly increasing plant uptake of immobile nutrients such as phosphorus and zinc. VAM are dependent on plants for survival. If land is fallowed for a long period, e.g. 12 months, or non-host crops are grown, VAM populations will decline, increasing the likelihood that responses to zinc will be obtained

Zinc has a low mobility within plants. The ease with which zinc is transferred to younger tissue is depressed further in zinc deficient plants.

## DEFICIENCY SYMPTOMS

With the exception of molybdenum deficiency in legume-based pastures, zinc is the most common trace element deficiency in Australian agriculture.

The incidence of zinc deficiency and demand for zinc fertilizers has increased in Australia over the last 10 - 20 years. There are several reasons for this, including :-

- Higher crop yields, increasing the demand on the soil for nutrients.
- Declining soil fertility, as a result of nutrient depletion or expansion onto poorer classes of land.
- Reduced zinc availability in some soils and districts, due to or loss of soil organic matter or increases in soil pH, e.g. as a result of the use of lime; irrigating with alkaline water; or cultivation, land leveling or erosion exposing or bringing more alkaline sub-soil to the surface.
- Changed fallow management practices, with greater use being made of herbicides for weed control. Bare fallows reduce soil VAM populations. Some herbicides may also affect root growth and VAM.
- Finally, zinc has unintentionally been applied as an impurity in phosphorus fertilizers. The phosphate rock used nowadays to manufacture phosphorus fertilizers used in Australia contains appreciably less zinc than that used in the past.

Plants suffering from zinc deficiency often show chlorosis in the interveinal areas of the leaf. These areas are pale green to white in colour. In monocotyledons (cereals and grasses), chlorotic bands develop on either side of the midrib of the leaf. Symptoms are usually most marked in the seedling stages, and tend to



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disappear as the crop matures. In fruit trees, leaf development is affected with unevenly distributed clusters or rosettes of small, stiff leaves being formed at the end of young shoots.

Water-logging tends to increase zinc deficiency, e.g. in paddy rice where zinc deficiency is often accompanied by visible symptoms of iron toxicity.

## ZINC FERTILIZERS

Incitec Pivot Limited manufactures and imports several zinc enriched ammonium phosphate planting fertilizers for grain, cotton and forage crops, e.g. **Granulock ST- Z**, **Granulock 12 Z** and **Granulock 12 Z Lite**. In the granulation process, some zinc oxide is incorporated into each fertilizer granule, providing more even distribution of zinc along the crop row than do blended fertilizers. The use of these zinc enriched Granulock fertilizers at planting ensures young seedlings have early access to phosphorus, zinc and some starter nitrogen.

**Zinc Sulfate Monohydrate** is granulated fertilizer that is applied dry to the soil, either on its own or in blends, e.g. for row crops, tree crops and sugarcane.

**Liquifert Zinc** (Zinc sulfate heptahydrate) is applied in solution (dissolved in water), either sprayed on the soil through a boom-spray, or to plant foliage as a foliar spray.

Zinc chelate can be applied in solution, either to the soil or as a foliar spray. The chelate forms are less subject to fixation in the soil than is sulfate, but are more costly.

## APPLICATION

Soil application rates for zinc are variable, depending on the soil type (texture, pH), the crop or pasture being grown, the district, and the frequency of application :-

- In pastures, zinc is broadcast at intervals of about 5 years.
- Where annual crops are grown, zinc can be applied pre-plant, at rates which remain effective for about 5 years. It should be drilled into the soil, or if spread or sprayed on the soil surface, incorporated afterwards. As zinc is immobile in the soil, surface applications without incorporation are relatively ineffective. Alternatively, zinc can be applied at lower rates in the basal fertilizer each time a crop is planted, e.g. as Granulock ST-Z or Granulock 12 Z.
- In sugarcane, zinc is best applied in the drill with the planting fertilizer. This should last a crop cycle (plant plus ratoons).
- In tree and vine crops, zinc is commonly applied in a broad band along the canopy edge, where the roots are most active.

Zinc can also be applied as foliar sprays. In annual crops, preventative sprays should be applied from soon after emergence. In tree crops, zinc should be sprayed onto a new growth flush, e.g. spring. More than one spray may be required. Late season sprays, i.e. approaching harvest, are usually ineffective.

Where zinc-based fungicides such as zineb and mancozeb are used, there may be no need to apply additional zinc to the soil and/or foliage (depending on the severity of any deficiency).

**FURTHER READING** - An Agritopic on Zinc is available if more detailed information is required.

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Incitec Pivot Limited 70 Southbank Bvd, Melbourne 3006  
ABN 42 004 080 264 Freecall 1800 333 197 [www.incitecpivot.com.au](http://www.incitecpivot.com.au)



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