SPRAYGRO LIQUID FERTILIZERS
ABN 47 007 974 496

MEDIA RELEASE

ZINC NUTRITION AND PLANT GROWTH

Zinc is one of the essential micronutrients required for optimum crop growth. Plants take up zinc in its divalent form. At this time it still remains unclear whether this uptake is facilitated as diffusion through membranes specific for zinc ion or whether it is mediated by specific transporter(s). It has been concluded that both mechanisms operate, and about 90.5% of the total zinc required by plants moves towards the roots by diffusion. This lateral movement of zinc is highly dependent upon the soil moisture, and this may be the reason why, particularly in arid and semi-arid areas, zinc deficiency is more frequently seen.

The vast majority of zinc is present in the lattice structure of the soil and therefore, unavailable to meet the plant's nutritional requirements. Available soil zinc is dissolved in the soil solution in ionic or complex form and may be found on the exchange sites of clay minerals and organic matter. Zinc can also be found as adsorbed divalent cation, zinc hydroxide, or zinc chloride. The solubility of zinc is highly dependent upon soil pH. Presence of calcium carbonate decreases the availability of zinc due to higher soil pH. The poor zinc availability in alkaline calcareous soils is precisely due to the formation of zinc carbonate. High levels of soil phosphorus are also commonly responsible for zinc deficiency. Presence of excess amount of copper can also reduce zinc availability because the absorption of both cations is through the same mechanism, which causes interference in the uptake. On the contrary, application of magnesium can enhance zinc availability and uptake by the roots.

Zinc is transported in the xylem tissues from the roots to the shoots. However, high levels of zinc have been detected in the phloem tissues, which indicates that zinc moves through both transport tissues, and maybe remobilisation of zinc towards the grain during ripening. Substantial translocation of zinc takes place from the older leaves to the younger ones during grain development phase. Plants deficient in nitrogen do not show the retranslocation of zinc from the older leaves, indicating that the deficiency symptoms of zinc are more pronounced in the nitrogen deficient plants.

Using zinc in the fertility program

Both soil and leaf tissue tests are accurate evaluations of zinc requirements. If a crop is "zinc responsive" and a high yield program is being used, some zinc is often inexpensive insurance for the higher yield goals. Zinc is sometimes applied broadcast to correct the zinc level in soils in one treatment. Zinc oxide and oxy-sulphates are slow release forms for build-up purposes. However, for in- row applications or for immediate uptake zinc sulphate or chelated and /or complexed zinc must be sprayed or applied to the soil. As indicated above, zinc must be present in soil solution in soluble form, a form that can only be possible with the application of zinc sulphate or complexed zinc. Zinc oxide, though, a very high analysis source of zinc, is not soluble in water, consequently the zinc is not released in the soil solution for roots to absorb. Moreover, spray application of zinc oxide on a standing crop will not be profitable as only a very minute percentage of applied zinc can penetrate the leaf tissue. Rest of the zinc goes waste during threshing as it still adheres to the foliage. This may limit the zinc requirement of a crop and reduce the yields. Zinc oxide forms a thin film over the leaf surface, which may reduce the canopy light interception and consequently reduce photosynthesis. Zinc oxide should always be applied through the soil for correcting zinc pool for the subsequent crops. However, the amount of zinc released depends upon the subsequent soil moisture conditions, as dry topsoil can still limit the zinc availability for the next crop. For immediate requirements the growers should use a soluble form of zinc such as **Smartrace Zinc** or zinc sulphate. Zinc applied using these fertilisers is rapidly absorbed by the leaves, and is translocated to the grain. The growers must correctly ascertain the amount of zinc required by the crop as excessive amounts of zinc sulphate can cause severe leaf fall.

SPRAYGRO LIQUID FERTILIZERS
ABN 47 007 974 496

MEDIA RELEASE

Zinc deficiency

Deficiency of zinc is widespread among crops grown in calcareous soils and highly weathered acid soils. The deficiencies in the calcareous soils are often associated with iron deficiency as well. Zinc deficiency symptoms in wheat appear between three to five weeks after emergence, and in rice about two to four weeks after transplanting. In severely deficient zinc soils, wheat and corn germination is poor and in these situations, seed treatment with **Smartrace Zinc-Manganese** or **Smartrace Zinc** can substantially improve seed germination and seedling vigour. Spray application of soluble zinc such as Smartrace Zinc during grain filling can improve the zinc level in seeds for better germination in such soils. The deficiency symptoms of zinc are;

1. dusty brown spots of upper leaves of stunted plants
2. uneven plant growth and patches of poorly established plants in the field
3. decreased tillering, spike or spikelet sterility and interveinal chlorosis on l eaves
4. dicots shows drastic decrease in leaf size, loss of lustre and shoots die off.
5. premature leaf fall, chiefly in apples.

Metabolic roles of zinc

Zinc plays an important role in many biochemical reactions within the plants. Plants such as maize and sorghum and sugarcane shows reduced photosynthetic carbon metabolism due to zinc deficiency. Zinc modifies and/or regulates the activity of cabonic anhydrase, an enzyme that regulates the conversion of carbon dioxide to reactive bicarbonate species for fixation to carbohydrates in these plants. Zinc is also a part of several other enzymes such as superoxide dismutase and catalase, which prevents oxidative stress in plant cells. Following are the various other roles of zinc in plants;

1. production of auxin, an essential growth hormone
2. regulates starch formation and proper root development
3. formation of chlorophyll and carbohydrates
4. enable plants to withstand lower air temperatures
5. helps in the biosynthesis of cytochrome; a pigment, and maintains plasma membrane integrity, and synthesis of leaf cuticle.

While zinc is essential for every plant, these crops have been found to be especially responsive: corn, rice, wheat, sweet corn, cotton, citrus, most orchard crops and sorghum.



SPRAYGRO LIQUID FERTILIZERS
52 BEDFORD ST, GILLMAN SA 5013
PO BOX 494, PT ADELAIDE BUSINESS CENTRE, PT ADELAIDE SA 5015
PH (08) 8447 7266 FAX (08) 2840 1844
EMAIL: spraygro@picknowl.com.au
WEBSITE: www.spraygro.com.au