

Zinc – The Vital Micronutrient for Healthy, High-Value Crops

Zinc is absolutely essential for the normal healthy growth and reproduction of all higher plants, animals and humans and is therefore called an “essential trace element” or a “micronutrient”. Even where optimum amounts of manures and/or fertilizer nutrients (N, P and K)¹ and water requirements have been satisfied, a crop will not achieve its full potential yield if its supply of zinc is inadequate. A very wide range of crops are affected by zinc deficiency, including: cereals, fodder crops, pulses, bush and tree fruits, nuts, vegetables and non-food crops such as cotton and tobacco.

When crops have a deficient supply of zinc, yield will be reduced and quality of the crop product may also suffer. Losses of up to 30% in the yield of cereal grains in crops such as maize, wheat and rice can occur as a result of “latent” or “hidden” deficiencies without the appearance of any obvious visible symptoms of stress. However, more severe deficiencies (manifested by leaf symptoms) can result in much greater yield losses and even complete crop failure. Zinc treatments have given yield responses of up to 4 tonnes/hectare in wheat and rice and up to 2 t/ha in maize².

Why is Zinc Essential for Crop Growth?

Zinc is required in small but critical concentrations to allow several key plant physiological pathways to function normally. These pathways have important roles in photosynthesis and sugar formation, protein synthesis, fertility and seed production, growth regulation and defence against disease. Where zinc is deficient, these physiological functions will be impaired and the health and productivity of the plants will be adversely affected, resulting in lower yields (or even crop failure) and frequently in poorer quality crop products.

Animals and humans also have critical zinc requirements and in areas where zinc deficiency in crops is widespread there is a high risk that the health of livestock and people will also be affected. However, in addition

to the zinc content of the diet, its availability to humans and some species of farm livestock is also affected by other dietary components such as the relative amounts of calcium and phytate (a phosphorus-containing compound present in many crops, especially cereals).

Several important food crops can be seriously affected by zinc deficiency. Maize and rice are the most sensitive with wheat being moderately sensitive. Nevertheless, where soils are deficient in zinc, whatever the crop species’ relative sensitivity to the problem, if the zinc supply is inadequate, the crops will be affected by deficiency.

Extent of Crop Zinc Deficiency Problems in the World

A study for the Food and Agriculture Organization of the United Nations (FAO) involved 190 field trials in 15 countries around the world by Sillanpää³ showed that zinc deficiency was the most commonly occurring micronutrient deficiency problem. Zinc deficiency was recorded in 49% of the trials and 25% of these were acute forms with visible symptoms and 24% were latent or hidden deficiencies confirmed by yield responses to zinc amendments. In India and Pakistan, between 50 and 70% of crop-growing soils are affected by zinc deficiency.

The figure below shows the general distribution of the problem but localized deficiencies can occur in many other parts of the world where crops are grown and the soil factors mentioned above occur.

The above is an extract from an article by Brian Alloway, an Emeritus Professor of Soil Science at the University of Reading in England and an independent consultant.

¹ Nitrogen(N), phosphorous(P) and potassium(K).

² World average cereal yield is 2.9 t/ha and typical yields of both wheat and rice can range from <1 to 9 t/ha depending on growing conditions and crop management

³ Sillanpää, M. Micronutrient assessment at the country level; an international study, FAO Soils Bulletin No. 63, Food and Agriculture Organization of the United Nations, Rome, 1990.

Source: Zinc Protects, International Zinc Association

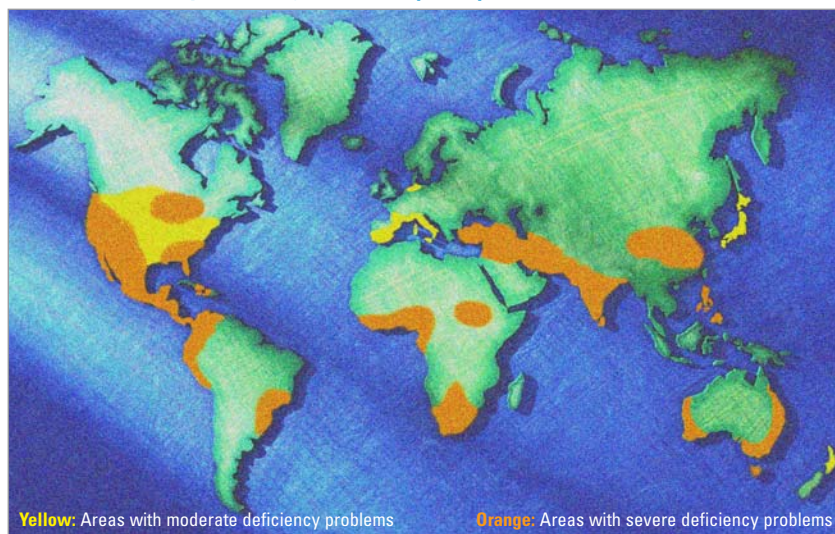
World zinc deficiency in soil: major areas of reported problems



Field with severe deficiency of zinc



Adequate zinc status



Yellow: Areas with moderate deficiency problems

Orange: Areas with severe deficiency problems

Based on data from Robson, A.D. (editor) Zinc in Soils and Plants. Kluwer Academic Publishers, Dordrecht, Boston and London, 1993. Other areas may also be affected to varying extents.



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