

Introduction: mineral micronutrient biofortification

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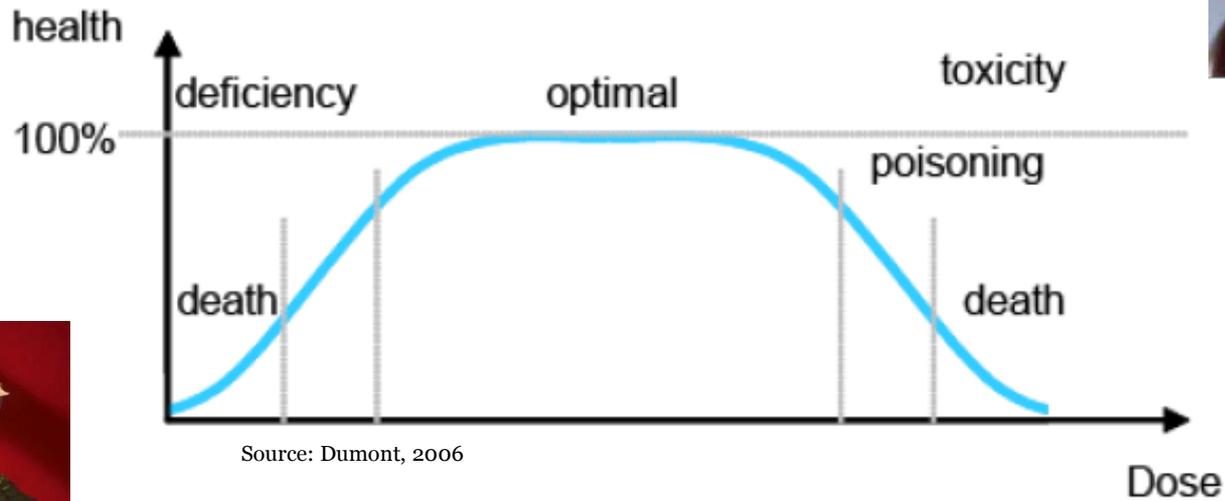
**Faculteit
Bio-ingenieurswetenschappen**

Trace elements



- Elements present in low concentrations
- Low concentrations, but important
 - Essential micronutrients
 - Needed for metabolism of humans, plants and/or animals
 - E.g. Mn, Zn, B, Cu, Mo
 - Toxicity
 - E.g. As, Hg, Pb, Cd

Role of dose



Source: Dumont, 2006



Deficiency

Effect of foliarly-applied zinc on growth of barley plants in Central Anatolia



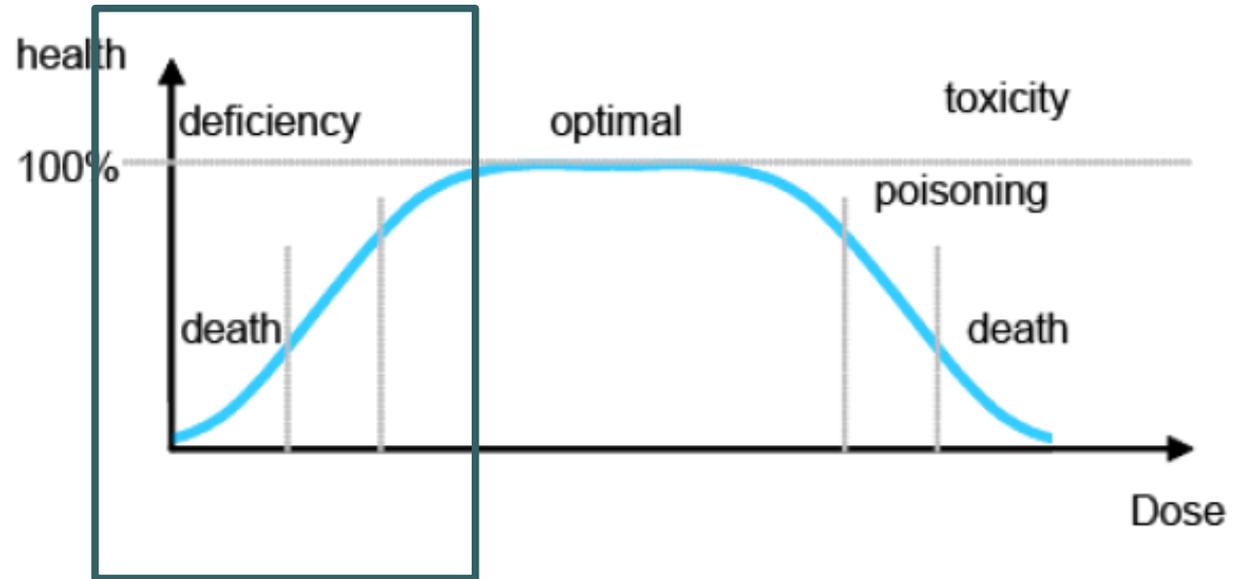
Source: I. Cakmak

Plants

Humans



Animals



Micronutrient deficiencies

- One third of world population considered Zinc deficient
- 800,000 lives lost each year due to Zinc deficiency \approx malaria
- But: micronutrient deficiencies low on the political agenda – why?

How alleviate deficiencies?

- Fortification = practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements) in a food, so as to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health.

Biofortification as a solution?

- Biofortification = process by which the nutritional quality of food crops is improved
 - Conventional selective breeding
 - Genetic engineering / modern biotechnology
 - Agronomic biofortification

“mainly beneficial for those who rarely have access to commercially fortified foods”

Agronomic biofortification: field trial in Kenya



Soil application

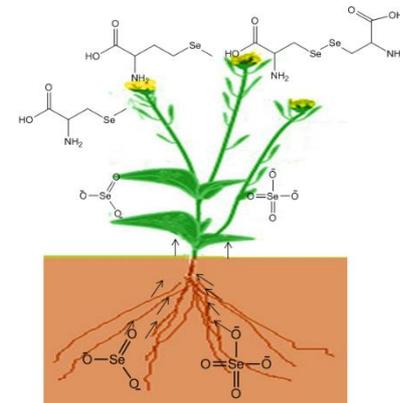


Foliar application



Biofortification: how?

- Increasing environmental abundance – supply through fertilizers (mining - geopolitics!)
- Increasing soil availability of micronutrients
- Increasing plant uptake
- ...



Biofortification: alternatives?

- Addition of micronutrients to animal feed
- Addition of micronutrients during food processing
- Food/feed supplements (tablets)
- Dietary diversification
- ...



Biofortification as a solution for micronutrient deficiencies?

1. Health impact of selenium and iodine and advantages of biofortification
2. Potential of biostimulants as a novel tool for biofortification
3. Potential of nutrient-enriched foods in developing countries
4. Factors affecting effectiveness of micronutrient supplementation in crop and animal production
5. Market potential and consumer perception of biofortified foods

GeoHealth MSCA ITN project proposal

Funding for 15 PhD students focused on Se and I (bio)fortification and associated training

Topics:

- Geochemical modelling of occurrence and relationships with deficiencies
- Bioavailability in soil and crop uptake (fertilizers & biostimulants)
- Losses during crop production (e.g. volatilisation)
- Dietary intake assessment
- Development of diagnostic tools to monitor deficiencies in the field
- Availability and transformations in the intestinal environment
- Interactions with toxic compounds (e.g. As and Hg)
- Impact of toxicants on Se metabolism and transport
- Selenium transport in the body
- Consumers' willingness to pay for biofortified foods
- Cost-benefit analysis of fertiliser use

