

# Is grain phytate/zinc ratio in rice dependent on soil phosphorus and zinc availability?

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## Why research the relationships between grain phytate/Zn ratios and soil P and Zn availability?

- Zn deficiency is a constraint to human health of > 2 billion people, mainly in developing countries where diets are cereal-based.
- A large part of Zn taken in is unavailable because the major Zn source (cereal grains) contains antinutritional factors such as phytate.
- The phytate/Zn molar ratios is an important index of grain Zn availability to human consumers.
- Soil P and Zn availability may effects phytate/Zn molar ratios.
- The relationships between the phytate/Zn and soil P and Zn are not clear.

## A survey conducted in China

In 2004, a survey was conducted in 41 fields in the Chinese provinces of Beijing, Anhui, Zhejiang, Sichuan and Yunnan.

At harvest, aerobic rice grains and shoots were collected and analysed for total P, total Zn and phytate (brown rice only). The topsoil of 20 cm was sampled for P-Olsen and DTPA-Zn. Plant samples were digested by a HNO<sub>3</sub>/HClO<sub>4</sub> mixture. Zn was determined using AAS, and P was determined by the vanadate-molybdate colorimetric method. Brown rice was grinded to pass 1 mm sieve. Phytate was determined according to the sensitive method for the rapid determination of phytate in cereals and products which is a colorimetry method.

## Results

- Brown rice phytate/Zn molar ratios ranged from 29-100.
- Grain phytate/Zn was positively but not significantly related to soil P-Olsen/DTPA-Zn (Figure 1;  $P=0.17$ ; adj.R2 =0.02).
- Straw P/Zn ratios were positively related to soil P/Zn, but the explained variation was low (Figure 2;  $P=0.002$ , adj.R2=0.22).
- The regression between straw P/Zn and grain Phytate/Zn was nonsignificant ( $P=0.9$ ).

Figure 1. Relationship between soil P-Olsen/DTPA-Zn molar ratios and brown rice phytate/Zn molar ratios.

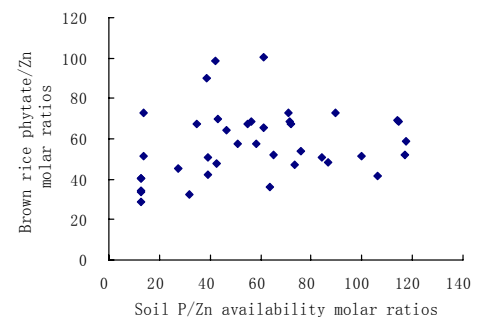
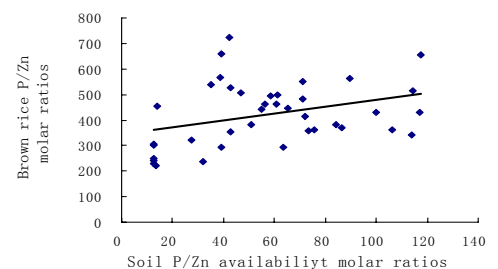


Figure 2. Effects of soil P/Zn availability ratio on straw P/Zn molar ratio ( $P=0.002$ , adj.R2=0.22).



## Conclusion

- Grain phytate/Zn molar ratios were all higher than 20, and Zn availability of aerobic rice to the human consumer is low
- Soil P/Zn bioavailability was a very poor predictor for grain the phytate/Zn ratio

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