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Boron and Zinc Fertilisation to Compensate Negative Effects of Photooxidative Stress in Lychee (*Litchi chinensis* Sonn.)

Silke Will[1], Christine Tisch[1], Marianne Schütt[1], Wolfram Spreer[2], Winai Wiriya-Alongkorn[3], Torsten Müller[1], Volker Römheld[1]

[1] *University of Hohenheim, Institute of Plant Nutrition, Germany*
[2] *University of Hohenheim, Institute of Agricultural Engineering, Tropics and Subtropics Group, Germany*
[3] *Mae Jo University, Department of Horticulture, Thailand*

Abstract

Lychee is grown in mountainous regions in Southeast Asia. During the winter season with low temperature and high radiation, severe chlorosis are observed on south-southwest exposed branches, inhibiting flowering. This is probably due to a missing compensation of photooxidative stress caused by the widespread extremely low Boron (B) and/or Zinc (Zn) nutritional status of Lychee trees. The aim of this study was to identify the role of both nutrients in remediation of transient chlorosis.

In 2007 field experiments were conducted in Mae Sa Mai, Chiang Mai Province, northern Thailand. B and Zn were applied to field grown Lychee trees, by foliar, soil or combined foliar and soil fertilisation, a control group was not fertilised. Each group consisted of six trees. For foliar fertilisation branches were sprayed within one tree exposed to south-southwest direction. The treatments were: a) 0.5 % B b) 1.0 % Zn c) 0.5 % B and 1.0 % Zn in combination, for all formulations a surfactant was added. Soil treatments were always a combination of 13 g B and 142 g Zn per tree, dissolved in 10 l of water and applied in a ring 1.0 m around the tree trunk. Appearance and intensity of chlorosis were weekly observed and rated with respect to intensity. Green value (SPAD-meter, Minolta 502) and chlorophyll content (Opti-Science CCM200) were measured. To determine the stage of chlorosis a rating scale based on RGB green tones was developed and each stage was defined with SPAD-meter and chlorophyll values.

Foliar treatments showed a reduction of chlorosis. It made no difference whether the nutrients were applied single or in combination. Highest compensation of photooxidative stress was observed when combining foliar and soil fertilisation. Soil fertilisation alone could not increase B and Zn concentrations in the leaves to a sufficient level, resulting in chlorosis on all leaves exposed to South-Southwest direction.

In conclusion, nutrient deficiencies in Lychee trees have an impact on the appearance of photooxidative stress symptoms during winter in the uplands of northern Thailand and can be remedied by foliar application of B and Zn.

Keywords: Boron, lychee, photooxidative stress, zinc

Contact Address: Silke Will, University of Hohenheim, Institute of Plant Nutrition, Fruwirthstr. 20, 70599 Stuttgart, Germany, e-mail: silke.will@uni-hohenheim.de