Silicon treatment in oil palms confers resistance to basal stem rot disease caused by Ganoderma boninense

ABSTRACT

Basal stem rot (BSR) disease, which is caused by the fungus Ganoderma boninense, is the major disease of oil palm in Malaysia and causes economic losses in the oil palm industry around the world. Plants that are treated with silicon (Si) show enhanced host resistance, perhaps because the accumulation of silica in host cell walls deters the pathogen from penetrating host tissues. In this study, oil palm seedlings were treated with five Si sources (silicon oxide, potassium silicate, calcium silicate, sodium silicate, and sodium meta-silicate) at four concentrations (0, 800, 1200, and 2000 mg Lī 1) to evaluate the effects of Si treatment on the growth and resistance to G. boninense of oil palm. Treatment played a role in keeping the G. boninense infection below the threshold for BSR initiation by restricting the fungus from entering and traveling through host tissues, as assessed by foliar symptoms and examinations of the root and bole for infection. At eight months after inoculation, palms in the control group, which had received no supplemental Si fertilizer, demonstrated the highest levels of disease severity, with estimated 95% cell damage and high physiological stress caused by G. boninense. Inoculation of seedlings with SiO2 at a concentration of 1200 mg Lī 1 was most effective in suppressing BSR and provided a 53% disease reduction compared with other treatments. Silicon nutrition also reduced the numbers of primary roots infected and of stem tissues that developed lesions.

Keyword: Elaeis guineensis; Ganoderma boninense; Silicon; Photosynthesis; Transpiration; Host defense