

Control of Basal Stem Rot Disease in Oil Palm by Supplementation of Calcium, Copper, and Salicylic Acid

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Continuous supplementation of mineral nutrients and salicylic acid (SA) as foliar application could improve efficacy in controlling basal stem rot (BSR) disease in oil palm seedling. It is revealed from the results that the highest disease severity index (58.3%) was recorded in T8 treatments at 9 months after inoculation. The best disease control was achieved by T7 treatments (calcium/copper/SA [Ca/Cu/SA] (5.0%) followed by T1 (5.5%), T5 (5.8%), T3 (8.3%), T6 (8.3%), T4 (13.3%), and T2 (15.8%) treatments. Continuous supplementation of Ca/Cu/SA was found to be the most effective in controlling the disease and the high performance liquid chromatography results showed the detection of ergosterol at very low concentration in the treated samples. Moreover, the transmission electron microscopy analysis results clearly indicated that T7 treatment was also enhancing lignification, which was responsible for the thickness of the secondary cell walls and middle lamella compared to untreated samples. It was therefore, concluded that continuous supplementation of minerals nutrients and SA could effectively suppress disease severity by reducing ergosterol activity and also improve the process of lignification in the treated plants. Furthermore, this treatment also managed to delay the onset of BSR symptoms and

promote the growth of the seedlings and eventually suppress the BSR disease.

Keywords : basal stem rot, calcium, copper, *Ganoderma boninense*, induced resistance, salicylic acid

World demand for oil and fat is on yearly increase and as a consequence, the area planted with oil palm in Malaysia tremendously increased from 0.3 million hectares (ha) to 4.49 million ha in 1970 and 2008, respectively (Mohd Basri, 2009). In Southeast Asia, basal stem rot (BSR) disease has remained one of the major obstacles in oil palm cultivation. It is caused by the white-rot fungus, *Ganoderma boninense* which cuts down the oil palm yield in most production areas in Malaysia as well as Indonesia. To date, BSR is controlled by using cultural practices, biological control agents such as *Tricoderma* spp. and selected systemic chemical fungicides. However, till now, no single control proven to effectively control BSR in the field was reported (Susanto et al., 2005). The difficulty managing this disease is due to not exhibiting any external symptoms on mature palms until advanced stage. When it comes to this stage, the infected trees may not be able to respond to any treatment given. Therefore, enhanced nutritional programmes (ENPs) by using mineral nutrients and plant hormone, appropriate dosage application at seedling stage should be done, in order to make them resistant towards BSR disease when they are transplanted in the field.

Nutritional status of a plant has a major impact on disease resistance. In this regards, optimum nutrient uptake is very important to prevent nutrient deficiency in plants.

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