TANGGAPAN FISIOLOGIS DAN PERTUMBUHAN BIBIT KELAPA SAWIT (*Elaeis guineensis* Jacq.) TERCEKAMAN ALUMINIUM TERHADAP SILIKA

ABSTRAK

Penelitian bertujuan untuk 1) mempelajari tanggapan fisiologis dan pertumbuhan bibit kelapa sawit terhadap pemberian silika (Si) saat tercekam aluminium (Al), dan 2) menentukan konsentrasi Si yang optimal untuk memaksimalkan aktivitas fisiologis dan pertumbuhan bibit kelapa sawit saat tercekam Al. Percobaan disusun dalam Rancangan Acak Kelompok Lengkap (RAKL) faktor tunggal dengan tiga blok sebagai ulangan. Faktor yang diuji adalah konsentrasi Si, yaitu 0, 300, 600, 900, dan 1200 ppm pada keadaan tanaman tercekam Al. Sumber Al dan Si yang digunakan berturut-turut adalah $Al_2(SO_4)_3$ dan SiO_2. Variabel yang diamati meliputi karakter iklim mikro, karakter kimia media tanam, konsentrasi dan serapan Al dan Si jaringan, karakter fisiologis, dan pertumbuhan bibit kelapa sawit. Data yang diperoleh selanjutnya dianalisis varians (ANOVA) pada taraf kepercayaan 95% dan dilanjutkan dengan uji beda nyata terkecil (BNT) jika terdapat beda nyata antar perlakuan. Konsentrasi Si yang optimal untuk meningkatkan ketahanan bibit kelapa sawit terhadap cekaman Al ditentukan dengan analisis regresi. Sedangkan hubungan antar variabel pengamatan ditentukan dengan analisis korelasi. Hasil penelitian memberikan informasi bahwa pemberian Si pada bibit kelapa sawit tercekam Al saat fase pembibitan utama mampu meningkatkan konsentrasi Si media tanam, menurunkan ketersediaan Al media tanam, meningkatkan konsentrasi dan serapan Si jaringan, penurunan konsentrasi Al jaringan, peningkatan kerapatan stomata, penurunan lebar bukaan stomata, peningkatan luas daun, peningkatan BDK, peningkatan laju fotosintesis, peningkatan LAB dan LPN, peningkatan bobot kering akar dan rasio akar tajuk, peningkatan jumlah daun, diameter batang, dan tinggi tanaman. Aktivitas fisiologis bibit kelapa sawit tercekam Al pada fase pembibitan utama mencapai maksimal pada konsentrasi Si sebesar 609,08ppm, sedangkan pertumbuhan bibit masih terus meningkat sejalan dengan kenaikan konsentrasi Si sampai dengan 1200ppm.

Kata kunci: bibit kelapa sawit, silika, cekaman aluminium, aktivitas fisiologis, dan pertumbuhan.

THE PHYSIOLOGICAL AND GROWTH RESPONSES OF OIL PALM SEEDLINGS (*Elaeis guineensis* Jacq.) UNDER ALUMINIUM STRESS TO SILICA

ABSTRACT

The research objectives were 1) to determine the physiological responses and growth of oil palm seedlings to the application of silica (Si) under aluminum (Al) toxicity, and 2) to determine the optimal Si concentration that able to maximize physiological activities and growth of oil palm seedlings under Al toxicity. The experiment was arranged in a single factor of Randomized Complete Block Design (RCBD) with three blocks as replications. The treatments were Si concentrations, namely 0, 300, 600, 900, and 1200 ppm, and all the oil palm seedlings were under Al toxicity. The sources of Al and Si used were Al2(SO4)3 and SiO2, respectively. Observations were done on several variables of microclimate, soil chemical characteristics, concentrations of Al and Si in the tissues, physiological characteristics, and growth of oil palm seedlings. Data were analyzed using analysis of variance (ANOVA) at 5% levels, and continued with least significant difference (LSD) if the ANOVA results showed significant differences among treatments. The optimum Si concentration that able to increase the resistance of oil palm seedling to Al toxicity was determined using regression analysis. Meanwhile, the relationships among variables ware determined using correlation analysis. The results showed that the Si applications to oil palm seedlings under Al toxicity within the main nursery stage were able to increase in soil Si concentrations, reduce in soil Al availabilities, increase in tissues Si concentration and uptake, decrease in tissues Al concentration, increase in stomatal density, decrease in stomatal width, increase in leaf area, increase in specific leaf weight, increase in photosynthesis rate, increase in net assimilation and relative growth rate, increase in root dry weight and ratio of shoot root, increase in number of leaves, stem diameter, and plant height. The physiological activities of oil palm seedlings under Al toxicity in the main nursery stage were reached maximum at Si concentration of 609.08ppm, while oil palm seedlings growth were continued to increase in line with the increase in Si concentrations up to 1200ppm.

Keywords: oil palm seedlings, silica, aluminium toxicity, physiological activities, and growth.