

Intisari

Penelitian bertujuan untuk mengetahui pengaruh cekaman aluminium (Al) terhadap aktivitas biokemis dalam jaringan kelapa sawit, mengetahui mekanisme pertahanan biokemis tanaman kelapa sawit terhadap cekaman Al, dan mengetahui apakah aplikasi pembenah tanah berbahan aktif silika (Si) dapat menginduksi perubahan aktivitas biokemis dalam jaringan yang mengarah pada stimulasi pertahanan tanaman kelapa sawit terhadap cekaman Al. Percobaan disusun dalam Rancangan Acak Kelompok Lengkap (RAKL) faktorial dengan tiga blok sebagai ulangan. Faktor pertama adalah cekaman Al, terdiri dari dua taraf yaitu tanpa dan dengan cekaman Al. Cekaman Al diaplikasikan menggunakan larutan aluminium sulfat 300 ppm, diberikan secara rutin bersamaan dengan aktivitas penyiraman. Faktor kedua adalah pemberian pembenah tanah berbahan aktif Si, terdiri dari empat taraf yaitu 0, 32, 64 dan 96 g/tanaman. Pengamatan dilakukan terhadap konsentrasi H_2O_2 , malondialdehid, antiradikal, fenolik total, prolin, glisin betain dan aktivitas pertumbuhan tanaman kelapa sawit. Data yang diperoleh selanjutnya dianalisis varian (ANOVA) pada taraf uji 5 %. Apabila hasil analisis varian menunjukkan perbedaan yang nyata antar perlakuan dilanjutkan dengan Uji Jarak Berganda Duncan (DMRT) pada taraf uji 5 %. Hasil penelitian memberikan informasi bahwa cekaman Al meningkatkan laju sintesis dan akumulasi malondialdehid, antiradikal, senyawa fenolik total dan prolin. Disisi lain, cekaman Al menyebabkan penurunan jumlah daun, luas daun, bobot daun khas, nisbah luas daun, laju asimilasi bersih, tinggi tanaman, dan bobot kering. Mekanisme pertahanan yang terjadi pada tanaman kelapa sawit terekspos cekaman Al dalam bentuk pelemahan peroksidasi lipid yang diindikasikan oleh konsentrasi malondialdehid, *radical scavenging* yang diindikasikan oleh kenaikan konsentrasi antiradikal, dan *reducing agent* yang diindikasikan oleh kenaikan konsentrasi prolin dan fenolik total. Aplikasi Si sampai dengan dosis 96 gram tanaman⁻¹ pada tanaman kelapa sawit terekspos cekaman Al secara nyata mampu memperbaiki aktivitas biokemis yang berkaitan dengan sistem pertahanan terhadap radikal bebas, namun demikian perbaikan tersebut belum mampu terekspressi pada karakter agronomis karena kegiatan penelitian dihentikan segera setelah tanaman kontrol menampakkan gejala keracunan Al.

Kata kunci : cekaman, aluminium, silika, biokemis, pertumbuhan

Abstract

The research objectives were to determine the effects of aluminum (Al) stresses to the biochemical activities of oil palms, determine the biochemical defenses mechanism of oil palms to Al stresses, and determine whether the application of silica (Si) was able to induce changes in the biochemical activities that leads on the stimulation of plant defenses against Al stresses. The field experiment was conducted in Randomized Complete Block Design (RCBD) factorial with three blocks as replications. The first factor was Al stress, consists of two levels, namely without and with Al stresses. Stresses of Al were applied using Aluminum Sulfate 300ppm, routinely given along with watering activities. The second factor was application dose of Si, consists of four levels, namely 0, 32, 64, and 96 g/plant. The observations were done on the concentration of H₂O₂, malondyaldehyde, antiradical, total phenolic compounds, proline, glycine betaine, and growth activities of oil palms. Data were analyzed with Analysis of Variance (ANOVA) at 5% levels, and continued with Duncan Multiple Range Test (DMRT). The results showed that Al stresses increase the rate of synthesis and accumulation of malondialdehyde, antiradical, total phenolic compounds, and proline. On the other hand, Al stresses cause decrease in the number of leaves, leaf area, specific leaf weight, leaf area ratio, net assimilation rate, plant height, and dry weight. Defenses mechanism that occur in oil palms that exposed to Al stresses were lipid peroxidation weakening as indicated by the decrease in malondialdehyde concentration, radical scavenging as indicated by the increase in antiradical concentration, and reducing agent as indicated by the increase in proline and total phenolic compounds concentrations. The applications of Si up to 96 g/plant on the oil palms that exposed to Al stresses were significantly able to improve the biochemical activities relating to defenses mechanism against free radicals. However, these improvements have not been able to be expressed in the agronomic characters due to termination of research activities as soon as the control plants showed Al toxicities symptoms.

Keywords: Stress, Aluminum, Silica, Biochemical, Growth