

INTISARI

Penelitian bertujuan untuk (1) mengetahui perbedaan aktivitas biokimiawi dan fisiologis empat hibrida kelapa sawit pada berbagai aras lengas tanah, (2) mengetahui mekanisme kerja antioksidan yang terjadi di dalam jaringan tanaman kelapa sawit, (3) mendapatkan hibrida yang tahan terhadap cekaman kekeringan, dan (4) merakit metode cepat yang dapat digunakan untuk menentukan tingkat ketahanan hibrida kelapa sawit terhadap cekaman kekeringan. Percobaan disusun dalam Rancangan Acak Lengkap (RAL) faktorial dua faktor. Faktor pertama adalah hibrida kelapa sawit, terdiri dari empat hibrida yaitu P-1, P-2, P-3, dan P-4. Sedangkan faktor kedua adalah lengas tanah yang ditentukan dengan *fraction of transpirable soil water* (FTSW), terdiri dari tiga aras yaitu FTSW 1,00 (tidak tercekam kekeringan); FTSW 0,35 (cekaman kekeringan moderat); dan FTSW 0,15 (cekaman kekeringan berat). Variabel yang diamati meliputi karakter fisiologis dan biokimiawi hibrida kelapa sawit. Data yang diperoleh dianalisis varian (ANOVA) pada level 5%, dan dilanjutkan dengan Uji Jarak Berganda Duncan (DMRT) apabila terdapat beda nyata antar perlakuan. Hubungan antar variabel pengamatan ditentukan menggunakan analisis korelasi dan regresi. Kedekatan hubungan antar hibrida ditentukan menggunakan analisis kluster dan komponen utama (PCA). Hasil penelitian memberikan informasi bahwa cekaman kekeringan menyebabkan peningkatan kandungan hidrogen peroksida (H_2O_2), malondialdehida (MDA), klorofil b, prolin, glisin-betain (GB), anti radikal, dan CO_2 intrasel serta persentase daun kering; penurunan kandungan klorofil total, klorofil a, karotenoid, serta aktivitas nitrat reduktase (ANR), konduktansi stomata, laju transpirasi, dan laju fotosintesis. Mekanisme kerja antioksidan yang terekspos pada hibrida kelapa sawit terekspos cekaman kekeringan adalah *selecting agent*, penghambatan peroksidasi lipid, dan aktivitas anti radikal. Hibrida P-2 termasuk peka, P-3 dan P-4 moderat toleran, sedangkan P-1 toleran terhadap cekaman kekeringan. Kandungan H_2O_2 dan prolin berkorelasi positif dengan persentase daun kering sehingga merupakan indikator terbaik untuk sidik cepat tingkat ketahanan hibrida kelapa sawit terhadap cekaman kekeringan.

Kata kunci: biokimiawi, fisiologis, hibrida kelapa sawit, cekaman kekeringan

ABSTRACT

The objectives of study were to (1) determine differences in biochemical and physiological activities of four palm oil hybrid at various levels of soil moisture, (2) determine the mechanism of action of antioxidants that occur in the plant tissue of palm oil, (3) obtain the palm oil hybrids that were resistant to drought stress, and (4) assemble the rapid fingerprint that can be used to determine the level of resistance of palm oil hybrids to drought stress. The experiment was arranged in Completely Randomized Design (CRD) factorial of two factors. The first factor was palm oil hybrids, namely P-1, P-2, P-3 and P-4. The second factor was soil moisture, determined by the fraction of transpirable soil water (FTSW), namely FTSW 1.00 (field capacity), FTSW 0.35 (moderate drought stress), and FTSW 0.15 (severe drought stress). The observations were done on biochemical and physiological variables of palm oil hybrids. Data were analyzed with Analysis of Variance (ANOVA) at 5% levels, and continued with the Duncan Multiple Range Test (DMRT) if there were significant differences among treatments. The relationships patterns among variables were determined with correlation and regression analysis. The closeness of the relationships among palm oil hybrids were determined using cluster and principal component analysis. The results showed that drought stress caused increase in the content of hydrogen peroxide (H_2O_2), malondialdehida (MDA), chlorophyll b, proline, glycine-betaine (GB), anti-radical, intracellular CO_2 and percentage of dry leaves; decrease in chlorophyll a and total, carotenoids, nitrate reductase activity (NRA), stomatal conductance, transpiration and photosynthesis rate. Antioxidants action that were expressed in the palm oil hybrids under drought stress were selecting agent, inhibition of lipid peroxidation, and radical scavenging. P-2 was not tolerant to drought stress. P-3 and P-4 were moderate tolerant to drought stress. Meanwhile, P-1 was tolerant to drought stress. There were positive correlations between proline and H_2O_2 with percentage of dry leaves, so that proline and H_2O_2 were able to act as the best rapid fingerprints that indicate the resistance levels of palm oil hybrids to drought stress.

Key words: biochemical, physiological, palm oil hybrid, drought stress