

INTISARI

Propagasi setek kakao masih menghadapi permasalahan. Sumber bahan setek yaitu cabang ortotropik dan plagiotropik, serta asal kebun entres (BG) dan kebun produksi (PRG) perlu dikaji karena menghasilkan respons persentase hidup dan pertumbuhan berbeda. Karakter perakaran setek dipertimbangkan sebagai pembatas pertumbuhan dan hasil panen terutama saat cekaman kekeringan. Penelitian terdiri atas tiga topik, yaitu: 1) studi fitokimia bahan produksi dan tipologi setek ortotropik (OC) dan plagiotropik kakao (PC) (penelitian topik I-studi rumah kaca), 2) aktivitas fisiologi OC dan PC pada kondisi cekaman kekeringan dan *rewatering* fase bibit (penelitian topik II-studi rumah kaca), dan 3) komponen hasil dan hasil panen tahunan OC dan PC periode basah dan periode kering (penelitian topik III-studi lapangan). Penelitian topik I bertujuan menganalisis karakter fitokimia bahan produksi dan tipologi OC dan PC. Penelitian topik II bertujuan mendapatkan aktivitas fisiologi OC dan PC pada saat cekaman kekeringan. Penelitian topik III bertujuan mengevaluasi karakter komponen hasil dan hasil panen OC dan PC pada periode musim basah dan kering. Hasil penelitian menunjukkan bahwa bahan entres OC dan PC asal BG memiliki kandungan sukrosa (2,20-2,90 kali) dan auksin (1,09-1,16 kali) signifikan lebih tinggi dan berasosiasi dengan peningkatan persentase hidup setek (1,14-3,34 kali) dibandingkan bahan entres asal PRG. Setek OC menunjukkan karakter luas per daun, diameter empulur, rasio empulur / korteks yang lebih besar, sehingga menghasilkan performa pertumbuhan vegetatif setara dengan tanaman asal biji (HS) dan lebih baik dibandingkan PC. Pada fase bibit, respons fisiologis OC terhadap cekaman kekeringan dan *rewatering* searah dengan sambung plagiotropik (PG), sambung ortotropik (OG), dan HS, terutama pada parameter aktivitas klorofil, konduktansi stomata, laju respirasi, ROS, dan antioksidan. Sebaliknya, respons PC saat cekaman kekeringan melalui peningkatan aktivitas antioksidan. Pada fase tanaman menghasilkan, OC3 menunjukkan komponen hasil dan hasil panen tahunan yang setara dengan PG3, sedangkan PC6 setara dengan PG6, dengan stabilitas hasil yang konsisten pada periode musim basah dan musim kering. Secara keseluruhan, penelitian ini membuktikan propagasi setek kakao, khususnya setek ortotropik yang berasal dari bahan entres juvenil, mampu menghasilkan tanaman dengan performa fisiologis dan produktivitas setara dengan metode propagasi konvensional serta adaptif terhadap cekaman kekeringan. Temuan ini memberikan dasar ilmiah yang kuat bagi pengembangan teknologi propagasi setek kakao sebagai inovasi perbanyakan yang efisien, adaptif, dan berkelanjutan dalam mendukung peningkatan produktivitas kakao nasional.

Kata kunci: Fisiologi, kakao, cekaman kekeringan, setek ortotropik, setek plagiotropik.

ABSTRACT

Cocoa propagation through cuttings face several constraints. Differences in cutting sources, namely orthotropic (OC) and plagiotropic cuttings (PC), as well as the origin of scion material from budwood gardens (BG) and production gardens (PRG), require further investigation due to their contrasting effects on survival rate and plant growth. Root characteristics of cocoa cuttings is considered a potential limitation to growth and yield, particularly under drought stress conditions. This study comprised three main research topics: (1) phytochemical characterization of cutting materials and typology of OC and PC (Topic I, greenhouse study); (2) physiological activities of OC and PC under drought stress and rewatering conditions (Topic II, greenhouse study); and (3) yield components and annual yield performance of OC and PC during wet and dry periods (Topic III, field study). Topic I aimed to characterize the phytochemical properties of cutting materials and the typology of OC and PC. Topic II evaluated the physiological activity of OC and PC when exposed to drought stress. Topic III assessed yield components and annual yield performance of OC and PC under wet and dry conditions. The results demonstrated that OC and PC scion materials originating from BG had significantly higher sucrose (2.20-2.90 times) and auxin (1.09-1.16 times) contents and were associated with a 1.14-3.34-fold increase in cuttings survival percentage compared with PRG derived scions. OC cuttings exhibited significantly greater individual leaf area, pith diameter, and pith-to-cortex ratio resulting in vegetative growth performance comparable to the seed (HS) and superior to PC. At the greenhouse study, physiological responses of OC to drought stress and rewatering were similar to those of plagiotropic grafted plants (PG) and orthotropic grafted plants (OG) and HS, particularly in chlorophyll activity, stomatal conductance, respiration rate, ROS, and antioxidant responses. At the productive stage, OC3 and PC6 showed yields comparable to PG3 and PG6, respectively, with stable performance across wet and dry seasons. Overall, this study provides strong evidence that cocoa propagation through cuttings, particularly OC derived from juvenile scion material, can produce plants with physiological performance and productivity equivalent to those obtained through conventional propagation methods, while also exhibiting adaptive responses to drought stress. These findings establish a scientific basis for the development of cocoa cutting propagation technology as an efficient, adaptive, and sustainable propagation innovation to support national cocoa productivity enhancement.

Keywords : *Cacao, drought, physiological, plagiotropic cuttings, orthotropic cuttings.*