

ABSTRAK

PENGARUH PENINGKATAN KONSENTRASI CO₂ DI ATAS KANOPI TANAMAN PADA PERTUMBUHAN, PRODUKSI DAN FENOLOGI TANAMAN KEDELAI (*Glycine max* L.) DI DATARAN RENDAH: STUDI DAMPAK PERUBAHAN IKLIM PADA TANAMAN

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Peningkatan konsentrasi karbon dioksida (CO₂) di atmosfer merupakan salah satu pemicu utama perubahan iklim global yang memengaruhi respons fisiologis dan agronomis tanaman, terutama kedelai (*Glycine max* L.) sebagai tanaman C₃. Penelitian ini bertujuan mengkaji pengaruh penambahan konsentrasi CO₂ (+CO₂ dan Kontrol/-CO₂) dan tiga varietas kedelai (Dena-1, Deja-2, Grobogan) terhadap fenologi, pertumbuhan, dan hasil produksi di dataran rendah. Penelitian dilakukan dengan *Strip plot* dalam RAK. Hasil penelitian menunjukkan bahwa penambahan CO₂ pada penanaman di dataran rendah tidak memberikan efek pemupukan (*CO₂ fertilization effect*), melainkan memberikan dampak negatif akibat adanya interaksi dengan suhu ekstrem (mencapai 41,1 °C). Perlakuan +CO₂ signifikan menurunkan variabel pertumbuhan (jumlah daun) dan produksi (bobot basah brangkasan, bobot basah akar, bobot 100 butir, dan bobot produksi tanaman), serta meningkatkan akumulasi unit panas atau *Growing Degree Days* (GDD) dan memperlambat pencapaian fase fenologi (R1-R8) dibandingkan -CO₂. Terdapat interaksi signifikan antara CO₂ dan varietas. Varietas Deja-2 menunjukkan respon paling adaptif/toleran (penurunan hasil minimal) dibandingkan dua varietas lainnya dibawah kondisi peningkatan konsentrasi CO₂. Disarankan pemilihan varietas toleran dan perbaikan metode aplikasi CO₂ yang seragam sebagai strategi adaptasi iklim.

Kata Kunci: Penambahan CO₂, fenologi, kedelai (*Glycine max* L.), perubahan iklim, suhu ekstrem, varietas

ABSTRACT

THE EFFECT OF ELEVATED CO₂ CONCENTRATION ABOVE THE CANOPY ON THE GROWTH, PRODUCTION, AND PHENOLOGY OF SOYBEAN (*Glycine max* L.) IN LOWLAND: A STUDY OF THE IMPACT OF CLIMATE CHANGE ON PLANTS

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The increase in atmospheric carbon dioxide (CO₂) concentration is a primary driver of global climate change, affecting the physiological and agronomic responses of plants, particularly soybean (*Glycine max* L.) as a C₃ plant. This study aims to examine the effect of elevated CO₂ concentration (+CO₂ and Control/-CO₂) and three soybean varieties (Dena-1, Deja-2, Grobogan) on the phenology, growth, and yield in the lowlands. The research was conducted using a Strip-Plot design within a Randomized Block Design (RBD). The results indicated that elevated CO₂ in lowland planting did not produce a CO₂ fertilization effect; instead, it had a negative impact due to the interaction with extreme temperatures (reaching 41.1 °C). The +CO₂ treatment significantly decreased growth variables (number of leaves) and yield components (fresh stover weight, fresh root weight, 1,00-grain weight, and total grain yield per plant). Furthermore, it increased heat unit accumulation (Growing Degree Days/GDD) and delayed the attainment of phenological phases (R1–R8) compared to the control (-CO₂). A significant interaction was observed between CO₂ and varieties. The Deja-2 variety showed the most adaptive and tolerant response, exhibiting minimal yield reduction compared to the other two varieties under elevated CO₂ conditions. This study suggests the selection of tolerant varieties and the improvement of uniform CO₂ application methods as crucial climate adaptation strategies.

Keywords: Elevated CO₂, phenology, soybean (*Glycine max* L.), climate change, extreme temperature, varieties