

**RESPONS MORFOFISIOLOGIS TANAMAN TEMBAKAU
(*Nicotiana tabacum* L. var. Bligon) DENGAN PEMBERIAN
KALSIUM SILIKAT PADA KONDISI CEKAMAN
KEKERINGAN**

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INTISARI

Tembakau (*Nicotiana tabacum* L. var. Bligon) merupakan komoditas tanaman musiman yang berasal dari Temanggung, Jawa Tengah. Tembakau sangat sensitif terhadap perubahan iklim seperti penurunan ketersediaan air yang dapat membatasi pertumbuhan dan perkembangan tanaman. Tembakau (*Nicotiana tabacum* L. var. Bligon) yang mengalami cekaman kekeringan menunjukkan respons morfologis yang dapat ditinjau langsung dari kondisi fisik tanaman, serta respons fisiologis dapat dilihat dari aktivitas metabolisme tanaman. Penelitian ini bertujuan untuk mengetahui pengaruh pemberian kalsium silikat (CaSiO_3) terhadap respons morfofisiologis tanaman tembakau pada cekaman kekeringan. Penelitian ini menggunakan rancangan percobaan acak lengkap dengan dua jenis perlakuan yaitu dosis kalsium silikat dan cekaman kekeringan. Cekaman kekeringan diberikan dengan perlakuan Kapasitas Lapang (KL) 100%, 75%, dan 50%, serta faktor kedua yaitu tiga variasi konsentrasi pupuk silikat meliputi 0 mg (C0), 300 mg (C1), dan 600 mg (C2) CaSiO_3 per 5 kilogram tanah. Parameter pertumbuhan yang diamati meliputi tinggi tanaman, jumlah daun, diameter batang, luas daun, berat segar dan berat kering akar dan tajuk serta rasio akar dan tajuk. Uji kadar klorofil dan karotenoid, kadar prolin, indeks stabilitas membran, kandungan air nisbi, kadar nikotin serta densitas stomata daun tembakau diukur untuk mengetahui respons fisiologis tembakau terhadap cekaman kekeringan dengan pemberian pupuk silikat (CaSiO_3). Data dianalisis dengan (ANOVA) *two way* pada SPSS dengan uji DMRT (*Duncan's Multiple Range Test*) pada tingkat kepercayaan 95% ($p < 0,05$). Pemberian kalsium silikat (CaSiO_3) pada dosis optimal 600 mg menunjukkan interaksi sinergis dengan cekaman kekeringan dengan meningkatkan ketahanan tanaman tembakau secara morfologis meliputi peningkatan tinggi tanaman, jumlah daun, luas daun, diameter batang, berat akar dan tajuk, serta penurunan rasio akar-tajuk tanaman. Secara fisiologis, terjadi peningkatan kadar klorofil dan karotenoid, indeks stabilitas membran (ISM), dan kandungan air nisbi (KAN), serta penurunan kadar prolin dan nikotin. Sementara itu, secara anatomi densitas stomata meningkat sebagai respons adaptif terhadap cekaman.

Kata kunci: cekaman, fisiologi, morfologi, silikon (Si), tembakau

MORPHOPHYSIOLOGICAL RESPONSES OF TOBACCO PLANT (*Nicotiana tabacum* L. var. Bligon) WITH THE APPLICATION OF CALCIUM SILICATE UNDER DROUGHT STRESS CONDITIONS

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ABSTRACT

Tobacco (*Nicotiana tabacum* L. var. Bligon) is a seasonal crop originating from Temanggung, Central Java. Tobacco is highly sensitive to climate changes, such as decreased water availability, which can limit the growth and development of the plant. Tobacco (*Nicotiana tabacum* L. var. Bligon) subjected to drought stress show morphological responses that can be directly observed from the physical condition of the plant, as well as physiological responses seen from the plant's metabolic activity. This study aims to investigate the effect of calcium silicate (CaSiO_3) application on the morphophysiological responses of tobacco plants under drought stress. The study used a randomized complete block design with two factors: calcium silicate dosage and drought stress. Drought stress was imposed by applying soil moisture levels at 100%, 75%, and 50% field capacity (FC), while the second factor involved three variations of silicate fertilizer concentrations: 0 mg (C0), 300 mg (C1), and 600 mg (C2) CaSiO_3 per 5 kilograms of soil. Growth parameters observed included plant height, number of leaves, stem diameter, leaf area, fresh and dry weight of roots and shoots, as well as root-to-shoot ratios. Measurements of chlorophyll and carotenoid content, proline content, membrane stability index (MSI), relative water content (RWC), nicotine content, and stomatal density on tobacco leaves were conducted to evaluate the physiological responses of tobacco to drought stress combined with CaSiO_3 application. Data were analyzed using two-way ANOVA in SPSS, followed by Duncan's Multiple Range Test (DMRT) at a 95% confidence level ($p < 0.05$). Application of calcium silicate (CaSiO_3) at the optimal dose of 600 mg showed a synergistic interaction with drought stress by enhancing the resistance of tobacco plants morphologically, including increased plant height, number of leaves, leaf area, stem diameter, root and shoot biomass, and a decreased root-to-shoot ratio. Physiologically, there was an increase in chlorophyll and carotenoid content, membrane stability index (MSI), and relative water content (RWC), along with a decrease in proline and nicotine levels. Anatomically, stomatal density increased as an adaptive response to stress.

Keywords: morphology, physiology, silicon (Si), stress, tobacco