

**PENGARUH ABU SEKAM PADI TERHADAP KETAHANAN OKSIDATIF
NON-ENZIMATIK DAN PRODUKTIVITAS PADI (*Oryza sativa* L. 'Segreng'
dan 'Cempo merah') PADA CEKAMAN KEKERINGAN**

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ABSTRAK

Kekeringan menginduksi cekaman oksidatif akibat peningkatan produksi ROS pada organel fotosintetik. Unsur silika (Si) dapat meningkatkan toleransi padi (*Oryza sativa* L.) terhadap cekaman. Pada lahan pertanian intensif terjadi penurunan kadar Si hingga 11-20% sehingga diperlukan pemupukan Si. Abu sekam padi (ASP) merupakan sumber Si potensial. Penelitian bertujuan mengetahui pengaruh ASP sebagai sumber Si terhadap: (1) kadar, serapan, dan densitas badan silika daun; (2) keseimbangan air internal; (3) status cekaman oksidatif dan kadar antioksidan; serta (4) produktivitas padi kultivar toleran 'Segreng' dan sensitif 'Cempo merah' selama kekeringan. Ketersediaan air tanah dipertahankan hingga 50% kapasitas lapangan (kekeringan moderat) dan 25% kapasitas lapangan (kekeringan parah) dengan variasi dosis ASP sebesar 0, 4, dan 8 ton/ha. Data dianalisis dengan analisis sidik ragam, dilanjutkan uji DMRT ($\alpha=0,05$). Perbedaan respons antar kultivar diuji dengan *independent T-test*, korelasi antar parameter diukur dengan uji *Pearson correlation*. Pemberian ASP sebesar 8 ton/ha meningkatkan kadar, serapan, dan densitas badan silika yang berpengaruh terhadap peningkatan kadar air relatif (KAR) dan jumlah daun, serta penurunan rasio akar-tajuk. Terdapat korelasi signifikan antara densitas badan silika dengan KAR dan rasio akar-tajuk padi 'Segreng', namun tidak signifikan pada 'Cempo merah'. Cekaman oksidatif yang dialami padi 'Segreng' lebih rendah daripada 'Cempo merah' ditunjukkan oleh indeks stabilitas membran (ISM) dan kadar antioksidan (AAred dan α -tokoferol) yang lebih tinggi selama kekeringan moderat dan parah. Pemberian ASP sebesar 8 ton/ha paling efektif meningkatkan ISM dan aktivitas pertahanan oksidatif non-enzimatik yang berkorelasi positif terhadap produktivitas (jumlah anakan produktif, waktu pembungaan, persentase biji bernas, bobot seratus biji dan gabah total per tanaman) padi 'Segreng' dan 'Cempo merah' pada kondisi kekeringan hingga akhir fase reproduktif.

Kata kunci : ASP, ISM, AAred, α -tokoferol, kekeringan.

EFFECT OF RICE HUSK ASH AS SILICATE FERTILIZER ON NON-ENZYMATIC ANTIOXIDANT SYSTEM AND YIELD OF RED RICE (*Oryza sativa* L. 'Segreng' and 'Cempo merah') UNDER DROUGHT

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ABSTRACT

Drought induces oxidative stress due to the enhanced production of ROS mainly in photosynthetic apparatus. Silicon (Si) mediates stress tolerance in rice (*Oryza sativa* L.). However, long period of intensive crop cultivation depleted the available soil Si by approximately 11-20%. Rice husk ash (RHA) is potential source for silicate fertilizer. The positive effect of RHA was examined through pot experiment to observe: 1) Si uptake and content in leaf, density of silica bodies; 2) internal water balanced; 3) integrity of cell membrane, antioxidant content; and 4) yield of tolerant cultivar 'Segreng' and sensitive one 'Cempo merah'. Drought was imposed by withholding water until soil water content reach 50% of field capacity (moderate stress) and 25% of field capacity (severe stress). Application of RHA was at level 0, 4, and 8 tons/ha. Data was analyzed statistically by analysis of variance ($\alpha=0,05$). Independent T-test was used to compare the response between cultivars, the correlation between parameter is analyzed by Pearson correlative test. The result showed that application of RHA at level 8 tons/ha increased Si content and density of silica bodies, followed by greater relative water content (RWC), leaves number, and lower root-shoot ratio. Density of silica bodies correlated significantly with RWC and root-shoot ratio of 'Segreng', neither in 'Cempo merah'. Cultivar 'Segreng' had lower oxidative damage shown by greater index of membrane stability (ISM) and antioxidant content (AAred and α -tocopherol) than 'Cempo merah' under moderate dan severe stress. RHA application at level 8 tons/ha significantly increased ISM and enhanced non-enzymatic antioxidative activity which determine yield (number of productive tiller, heading date, percentage of fertile spikelet, grain and total panicle mass) of both rice 'Segreng' and 'Cempo merah' under prolonged drought.

Keywords: RHA, ISM, AAred, α -tocopherol, drought.