

RINGKASAN

Indonesia merupakan Negara yang kaya akan sumber daya alam karena letak geografis yang cukup strategis. Tanah Inceptisol perlu mendapatkan perhatian khusus karena mempunyai potensi yang cukup besar untuk dikembangkan dalam budidaya pertanian. Bawang merah (*Allium ascalonicum* L.) merupakan salah satu komoditas hortikultura yang mempunyai potensi serta peluang untuk dikembangkan menjadi produk unggulan. Namun, pertumbuhan produksi bawang merah dalam beberapa tahun terakhir cenderung menurun. Pemanasan global menyebabkan perubahan iklim yang berdampak terhadap kegagalan produksi pertanian. Perubahan lingkungan yang terjadi saat ini salah satunya kekeringan, merupakan faktor pembatas yang menyebabkan penurunan produktivitas dan kualitas bahan pangan termasuk bawang merah. Pemupukan silika (SiO_2) dalam pertanian diduga dapat meningkatkan ketersediaan hara (N, P, K), meningkatkan kinerja pertumbuhan dan efisiensi hasil, serta meningkatkan toleransi terhadap tekanan biotik dan abiotik. Penelitian ini bertujuan untuk mengetahui tanggap fisiologis tanaman bawang merah terhadap pemberian pupuk silika alami dan kondisi cekaman kadar air.

Penelitian ini dilaksanakan di *screen house experimental farm*, Laboratorium Agronomi dan Hortikultura, dan Laboratorium Ilmu Tanah Fakultas Pertanian Universitas Jenderal Soedirman, Purwokerto pada September 2020 sampai Januari 2021. Penelitian ini menggunakan Rancangan Acak Kelompok (RAK) faktorial yang terdiri atas dua faktor perlakuan, yaitu dosis pupuk silika alami dan cekaman kadar air yang diulang masing-masing sebanyak 3 kali. Faktor pertama adalah perlakuan dosis pupuk silika yang terdiri atas 4 taraf, dan faktor kedua adalah perlakuan cekaman kadar air yang terdiri atas 3 taraf, sehingga terdapat 12 (4×3) kombinasi perlakuan. Perlakuan diulang 3 kali sehingga terdapat 36 (12×3) unit percobaan dan dalam satu unit percobaan terdapat 2 sampel tanaman sehingga terdapat 72 (36×2) sampel tanaman. Variabel fisiologis yang diamati meliputi ketebalan daun, kerapatan stomata, kadar klorofil daun total, kadar prolin daun, kadar air relatif, kadar air umbi, dan bobot segar akar.

Hasil penelitian menunjukkan bahwa pemupukan silika alami meningkatkan kadar prolin daun secara nyata. Pemupukan silika alami tidak meningkatkan ketebalan daun, kerapatan stomata, kadar klorofil daun total, kadar air relatif, kadar air umbi, dan bobot segar akar secara nyata, namun ada kecenderungan peningkatan pada beberapa variabel tersebut karena pemberian pupuk silika alami. Cekaman kadar air dapat meningkatkan kadar prolin daun serta menurunkan kadar air umbi dan bobot segar akar secara nyata. Tidak terdapat interaksi antara pemupukan silika alami dan cekaman kadar air.

SUMMARY

Indonesia is a country that is rich in natural resources because of its strategic geographical location. Inceptisol soils need special attention because it has considerable potential for development in agriculture. Shallots (*Allium ascalonicum* L.) are one of the horticultural commodities that have the potential and opportunities to be developed into superior products. However, the growth of shallot production in recent years has tended to decline. Global warming causes climate change which has an impact on the failure of agricultural production. Environmental changes that occur at this time, one of which is drought, is a limiting factor that causes a decrease in the productivity and quality of foodstuffs including shallots. Silica fertilization (SiO_2) in agriculture could be expected to increase the availability of nutrients (N, P, K), improve growth performance and efficiency results, and increase tolerance to biotic and abiotic stresses. The objective of this research was to determine the physiological response of shallot plants to the application of natural silica fertilizer and water stress condition.

This research was conducted at the experimental farm screen house, Laboratory of Agronomy and Horticulture, and Soil Science Laboratory, Faculty of Agriculture, Jenderal Soedirman University, Purwokerto on September 2020 to January 2021. This study used a factorial randomized block design (RBD) which consisted of two treatment factors, namely the dose of natural silica fertilizer and water stress which was repeated 3 times each. The first factor is the dosage treatment of silica fertilizer which consists of 4 levels, and the second factor is the water stress treatment which consists of 3 levels, so that there are 12 (4×3) treatment combinations. The treatment was repeated 3 times so that there were 36 (12×3) experimental units and in one experimental unit there were 2 plant samples so that there were 72 (36×2) plant samples. Physiological variables observed included leaf thickness, stomata density, total leaf chlorophyll content, leaf proline content, relative moisture content, tuber moisture content, and root fresh weight.

The results showed that fertilization of natural silica increases levels of proline in leaves significantly. Fertilization of natural silica did not significantly increase the thickness of the leaves, stomatal density, total leaf chlorophyll content, relative water content, water content tuber, and root fresh weight, but there is an increasing trend on several variables due to the application of natural silica fertilizers. The water stress increased leaf proline levels and decreased the tuber moisture content and root fresh weight significantly. There is no interaction between natural silica fertilization and moisture content stress.