

RINGKASAN

Cemaran kadmium merupakan salah satu jenis pencemaran lingkungan bersifat karsinogenik dan toksik terhadap tanaman, hewan, dan manusia. Kadmium dapat masuk ke dalam tanaman dan terakumulasi di dalam jaringan tanaman. Kontaminasi cemaran pada bahan pangan berpotensi menimbulkan isu kesehatan seperti gangguan ginjal, jantung, hati, paru-paru, kanker, dan mutagenesis yang menyebabkan kematian. Upaya yang dapat dilakukan untuk menekan cemaran kadmium sekaligus meningkatkan produksi tanaman adalah dengan menggunakan pupuk *slow-release* yang mengandung bahan adsorben. Pupuk N-ZEO-SR PLUS sebagai inovasi pupuk N yang di-*coating* dengan teknologi nano berbahan zeolit, mineral silikat montmorilonit, dan asam humat berpotensi menekan cemaran logam berat melalui mekanisme penjerapannya. Tujuan penelitian adalah mengetahui respon pertumbuhan tanaman bawang merah, hasil tanaman bawang merah, dan kandungan Cd di dalam tanah maupun di dalam tanaman terhadap dosis pemupukan N-ZEO-SR PLUS 0kg/ha, 150kg/ha, 300kg/ha, dan 450kg/ha; konsentrasi kadmium 0 ppm, 2 ppm, & 4 ppm; serta interaksi keduanya.

Penelitian dilakukan pada Januari 2024 hingga Juni 2024 di *screenhouse* Fakultas Pertanian dan Laboratorium Ilmu Tanah dan Sumber Daya Lahan Universitas Jenderal Soedirman. Penelitian dimulai dengan mempersiapkan *screenhouse* dan media tanam, dilanjutkan inkubasi kadmium pada media tanam selama 14 hari dan penanaman benih bawang merah. Pemupukan N-ZEO-SR PLUS dilakukan pada hari ke-10 dan ke-30. Pengamatan variabel pertumbuhan, hasil, dan kandungan kadmium dilakukan sesuai dengan waktu yang telah ditentukan. Penelitian dilakukan dengan menggunakan rancangan acak kelompok (RAK) dengan dua faktor, dua belas kombinasi perlakuan, dan tiga ulangan. Data dianalisis menggunakan sidik ragam (ANOVA) dengan taraf kesalahan 5%, apabila berbeda nyata dilakukan uji lanjut menggunakan DMRT dengan taraf kesalahan 5%.

Hasil penelitian menunjukkan bahwa pupuk N-ZEO-SR PLUS 450kg/ha dapat meningkatkan tinggi tanaman 2MST - 4MST sebesar 16,65% dibandingkan tanpa pupuk; jumlah daun 2MST - 7MST sebesar 48,41% dibandingkan tanpa pupuk; dan kandungan klorofil total sebesar 44,18% dibandingkan tanpa pupuk. Perlakuan kadmium 4 ppm dapat menurunkan tinggi tanaman 3MST sebesar 13,42 % dibandingkan dengan 0 ppm; dapat meningkatkan kandungan kadmium di dalam tanah sebesar 16,66% dibandingkan dengan 0 ppm. Terdapat interaksi pupuk N-ZEO-SR PLUS dan aplikasi kadmium terhadap tinggi tanaman umur 6MST dengan hasil terbaik pada dosis pupuk 300kg/ha dengan konsentrasi kadmium 4 ppm, serta terhadap variabel jumlah daun 7MST dengan hasil terbaik dengan hasil terbaik menggunakan dosis pupuk N-ZEO-SR PLUS 150kg/ha pada penambahan konsentrasi kadmium 2 ppm.

SUMMARY

Cadmium pollution is a type of environmental contamination that is carcinogenic and toxic to plants, animals, and humans. Cadmium can enter plants and accumulate within plant tissues. Contamination in foodstuffs poses potential health issues such as kidney, heart, liver, and lung disorders, cancer, and mutagenesis, which can lead to death. Efforts to reduce cadmium contamination while increasing crop production include the use of slow-release fertilizers containing adsorbent materials. N-ZEO-SR PLUS fertilizer, an innovative N fertilizer coated with nano-technology materials such as zeolite, montmorillonite silicate minerals, and humic acid, has the potential to reduce heavy metal contamination through its adsorption mechanism. The purpose of this research is to determine the response of shallot plant growth, shallot crop yield, and cadmium content in the soil and plants at different doses of N-ZEO-SR PLUS fertilizer (0 kg/ha, 150 kg/ha, 300 kg/ha, and 450 kg/ha); cadmium concentrations (0 ppm, 2 ppm, and 4 ppm); and the interaction between them.

The research was conducted from January 2024 to June 2024 in the greenhouse of the Faculty of Agriculture and the Laboratory of Soil Science and Land Resources at Jenderal Soedirman University. The study began with preparing the greenhouse and growing media, followed by cadmium incubation in the growing media for 14 days and planting shallot seeds. N-ZEO-SR PLUS fertilization was carried out on the 10th and 30th days. Observations of growth variables, yield, and cadmium content were made according to the predetermined schedule. The research was conducted using a randomized block design (RBD) with two factors, twelve treatment combinations, and three replications. Data were analyzed using analysis of variance (ANOVA) with a 5% error rate, and significant differences were further tested using DMRT with a 5% error rate.

The research results showed that N-ZEO-SR PLUS fertilizer at 450 kg/ha could increase plant height from 2 to 4 weeks after planting (WAP) by 16.65% compared to no fertilizer; the number of leaves from 2 to 7 WAP by 48.41% compared to no fertilizer; and total chlorophyll content by 44.18% compared to no fertilizer. Cadmium treatment at 4 ppm reduced plant height at 3 WAP by 13.42% compared to 0 ppm and increased cadmium content in the soil by 16.66% compared to 0 ppm. There was an interaction between N-ZEO-SR PLUS fertilizer and cadmium application on plant height at 6 WAP, with the best results at a fertilizer dose of 300 kg/ha with a cadmium concentration of 4 ppm, and on the number of leaves at 7 WAP, with the best results using N-ZEO-SR PLUS fertilizer at 150 kg/ha with a cadmium concentration of 2 ppm.