

RINGKASAN

Kacang tanah (*Arachis hypogaea* L.) merupakan komoditas pangan penting dengan nilai ekonomi tinggi, namun produktivitasnya di Indonesia masih dibatasi oleh kondisi lahan masam dengan pH rendah dan kandungan aluminium tinggi. Cekaman aluminium dapat menghambat pertumbuhan dan menurunkan viabilitas tanaman, sehingga diperlukan upaya pemuliaan untuk memperoleh genotipe yang lebih toleran. Salah satu pendekatan yang dapat dilakukan adalah induksi mutasi menggunakan mutagen kimia ethyl methanesulphonate (EMS) melalui teknik kultur jaringan. Penelitian ini bertujuan untuk mengidentifikasi mutan M0 kacang tanah yang memiliki toleransi lebih baik terhadap cekaman aluminium pada media pH rendah, mengetahui respons mutan terhadap stres pH rendah terkait toleransi aluminium, serta mengevaluasi potensi mutan tersebut sebagai bahan awal program pemuliaan tanaman.

Penelitian dilaksanakan di Laboratorium Pemuliaan Tanaman, Fakultas Pertanian, Universitas Jenderal Soedirman. Bahan tanaman yang digunakan adalah embrio zigotik kacang tanah varietas Gajah dan Domba yang dikulturkan secara *in vitro*. Embrio direndam selama 30 menit dalam larutan EMS dengan konsentrasi 0,3%, 0,4%, dan 0,5%, serta akuades sebagai kontrol, kemudian ditanam pada media MS tanpa penambahan Al dan media MS dengan penambahan $AlCl_3 \cdot 6H_2O$ dosis 500 ppm. Pengamatan dilakukan setiap tiga minggu selama sembilan minggu terhadap persentase tanaman hidup, persentase hidup normal, tinggi tanaman, jumlah akar, panjang akar, serta karakter kualitatif berupa warna dan bentuk daun. Data dianalisis secara deskriptif kuantitatif dan kualitatif.

Hasil penelitian menunjukkan adanya variasi respons mutan M0 kacang tanah hasil perlakuan EMS terhadap kondisi media pH rendah dengan cekaman aluminium. Variasi respons tersebut tercermin dari perbedaan kemampuan mutan dalam mempertahankan persentase hidup, persentase tanaman hidup normal, serta pertumbuhan tanaman, baik antar mutan maupun antar varietas. Pada kondisi cekaman aluminium, varietas Domba secara umum memperlihatkan kecenderungan respons yang lebih baik dibandingkan varietas Gajah. Beberapa mutan terseleksi menunjukkan kemampuan bertahan dan tumbuh pada kondisi cekaman aluminium. Berdasarkan hasil tersebut, dapat disimpulkan bahwa perlakuan EMS menghasilkan mutan M0 kacang tanah dengan respons yang beragam terhadap cekaman aluminium. Selain itu, sejumlah mutan mengindikasikan toleran terhadap cekaman aluminium yaitu GM1-H3, GM2-G3, GM3-D1, DM1-J3, DM2-H2, dan DM3-I3 dengan mutan DM3-I3 menunjukkan performa terbaik pada media dengan cekaman aluminium dibanding kontrol tanpa cekaman aluminium.

SUMMARY

Peanut (Arachis hypogaea L.) is an important food crop with high economic value. However, its productivity in Indonesia is still constrained by acidic soils with low pH and high aluminum (Al) content. Aluminum stress can inhibit plant growth and reduce plant viability, thereby necessitating breeding efforts to obtain more tolerant genotypes. One approach that can be applied is mutation induction using the chemical mutagen ethyl methanesulphonate (EMS) through tissue culture techniques. This study aimed to identify M0 peanut mutants with improved tolerance to aluminum stress under low pH conditions, to evaluate mutant responses to low pH stress related to aluminum tolerance, and to assess their potential as initial materials for peanut breeding programs.

The research was conducted at the Plant Breeding Laboratory, Faculty of Agriculture, Jenderal Soedirman University. The plant material used consisted of zygotic embryos of peanut varieties Gajah and Domba cultured in vitro. The embryos were soaked for 30 minutes in EMS solutions at concentrations of 0.3%, 0.4%, and 0.5%, with distilled water as the control, and then cultured on MS medium without aluminum and MS medium supplemented with 500 ppm $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$. Observations were carried out every three weeks for nine weeks on survival percentage, percentage of normal plants, plant height, number and length of roots, and qualitative characters including leaf color and shape. Data were analyzed using descriptive quantitative and qualitative methods.

The results of this study indicate variation in the responses of M0 peanut mutants obtained through EMS treatment under low pH media with aluminum stress. This variation was reflected in differences in the mutants' ability to maintain survival percentage, percentage of normal surviving plants, and plant growth, both among mutants and between varieties. Under aluminum stress conditions, the Domba variety generally exhibited a better response compared to the Gajah variety. Several selected mutants demonstrated the ability to survive and grow under aluminum stress conditions. Based on these results, it can be concluded that EMS treatment produced M0 peanut mutants with diverse responses to aluminum stress. In addition, several mutants were indicated to be tolerant to aluminum stress, namely GM1-H3, GM2-G3, GM3-D1, DM1-J3, DM2-H2, and DM3-I3, with mutant DM3-I3 showing the best performance under aluminum stress conditions compared to the control without aluminum stress.