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Ketahanan Jeruk Terhadap Patogen dan Perilaku Diaphorina citri yang Diberi Perlakuan Bacillus tropicus, Rhizophagus intraradices dan Pupuk Organik Cair
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ABSTRAK

Jeruk siam (*Citrus nobilis* L.) merupakan salah satu komoditas hortikultura penting yang menghadapi berbagai kendala kesehatan tanaman akibat serangan patogen dan serangga vektor. Salah satu pendekatan yang berpotensi dikembangkan untuk mendukung kesehatan tanaman adalah pemanfaatan agens hayati *Bacillus tropicus* BYL-3, jamur mikoriza arbuskula *Rhizophagus intraradices*, dan pupuk organik cair (POC). Penelitian ini bertujuan mengetahui pengaruh aplikasi *B. tropicus* BYL-3, *R. intraradices*, dan POC terhadap pertumbuhan dan kesehatan tanaman jeruk siam serta mengetahui pengaruh perlakuan tersebut terhadap perilaku makan *Diaphorina citri* menggunakan metode Electrical Penetration Graph (EPG). Penelitian dilaksanakan pada Januari–November 2025 di screenhouse, lapangan Desa Kembanglimus, Kecamatan Borobudur, Kabupaten Magelang, dan laboratorium Fakultas Pertanian Universitas Gadjah Mada. Penelitian screenhouse menggunakan Rancangan Acak Lengkap dengan enam perlakuan dan lima ulangan, sedangkan penelitian lapangan menggunakan enam perlakuan dengan tiga kelompok dan lima ulangan. Perlakuan terdiri atas kontrol, *B. tropicus* BYL-3, *R. intraradices*, POC, *B. tropicus* BYL-3 + POC, dan *R. intraradices* + POC. Parameter yang diamati meliputi pertumbuhan vegetatif, perilaku makan *D. citri*, insidensi dan intensitas penyakit blendok, AUDPC, serta kolonisasi *R. intraradices* pada akar. Hasil penelitian menunjukkan bahwa aplikasi perlakuan berpengaruh nyata terhadap tinggi tanaman dan volume kanopi pada kondisi screenhouse. Pada umur enam bulan, kombinasi *R. intraradices* + POC menghasilkan tinggi tanaman tertinggi sebesar 1,03 ± 0,05 m, sedangkan *B. tropicus* BYL-3 + POC menghasilkan volume kanopi tertinggi sebesar 0,08 ± 0,05 m³. Analisis EPG menunjukkan bahwa kombinasi *B. tropicus* BYL-3 + POC menghasilkan durasi non-probing (Np) tertinggi, yaitu 48,80 ± 89,40 menit, serta memengaruhi beberapa parameter yang berkaitan dengan aktivitas makan pada jaringan floem. Pada pengamatan penyakit blendok, perlakuan *B. tropicus* BYL-3, *R. intraradices*, POC, maupun kombinasinya menunjukkan kecenderungan menurunkan intensitas penyakit dan AUDPC dibandingkan kontrol, tetapi perbedaannya tidak nyata secara statistik. Nilai intensitas penyakit terendah terdapat pada perlakuan *B. tropicus* BYL-3, *B. tropicus* BYL-3 + POC, dan *R. intraradices* + POC, masing-masing sebesar 2,67 ± 1,33%, sedangkan AUDPC terendah terdapat pada *B. tropicus* BYL-3 + POC sebesar 14,67 ± 7,33. Kolonisasi *R. intraradices* pada akar menunjukkan keberhasilan pembentukan asosiasi simbiotik, dengan kolonisasi tertinggi sebesar 74% pada kombinasi *R. intraradices* + POC. Berdasarkan hasil penelitian, aplikasi agens hayati yang dikombinasikan dengan POC berpotensi meningkatkan pertumbuhan vegetatif, mendukung kolonisasi mikoriza, dan memodifikasi perilaku makan *D. citri*, serta menunjukkan kecenderungan menekan perkembangan penyakit blendok pada tanaman jeruk siam.

Kata kunci: *Bacillus tropicus*, *Diaphorina citri*, Electrical Penetration Graph, jeruk siam, *Rhizophagus intraradices*, pupuk organik cair.

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ABSTRACT

Citrus nobilis L. is an important horticultural commodity that faces various plant health constraints caused by pathogen infections and insect vectors. One approach with potential for further development to support plant health is the utilization of the biological control agent *Bacillus tropicus* BYL-3, the arbuscular mycorrhizal fungus *Rhizophagus intraradices*, and liquid organic fertilizer (LOF). This study aimed to determine the effects of *B. tropicus* BYL-3, *R. intraradices*, and LOF applications on the growth and health of Siam orange plants and to determine the effects of these treatments on the feeding behavior of *Diaphorina citri* using the Electrical Penetration Graph (EPG) technique. The study was conducted from January to November 2025 in a screenhouse, a field site in Kembanglimus Village, Borobudur District, Magelang Regency, and laboratories of the Faculty of Agriculture, Universitas Gadjah Mada. The screenhouse experiment was arranged in a Completely Randomized Design with six treatments and five replications, whereas the field experiment consisted of six treatments with three blocks and five replications. The treatments consisted of a control, *B. tropicus* BYL-3, *R. intraradices*, LOF, *B. tropicus* BYL-3 + LOF, and *R. intraradices* + LOF. The observed parameters included vegetative growth, feeding behavior of *D. citri*, incidence and severity of diplodia disease, Area Under the Disease Progress Curve (AUDPC), and colonization of *R. intraradices* in roots. The results showed that the treatments significantly affected plant height and canopy volume under screenhouse conditions. At six months of age, the *R. intraradices* + LOF combination produced the highest plant height of 1.03 ± 0.05 m, whereas *B. tropicus* BYL-3 + LOF produced the highest canopy volume of 0.08 ± 0.05 m^3. EPG analysis showed that the *B. tropicus* BYL-3 + LOF combination resulted in the longest non-probing (Np) duration, namely 48.80 ± 89.40 min, and affected several parameters associated with feeding activity in the phloem tissue. In the observation of diplodia disease, treatments with *B. tropicus* BYL-3, *R. intraradices*, LOF, and their combinations tended to reduce disease severity and AUDPC compared with the control; however, the differences were not statistically significant. The lowest disease severity was observed in the *B. tropicus* BYL-3, *B. tropicus* BYL-3 + LOF, and *R. intraradices* + LOF treatments, each with a value of 2.67 ± 1.33%, whereas the lowest AUDPC was observed in the *B. tropicus* BYL-3 + LOF treatment, with a value of 14.67 ± 7.33. Colonization of *R. intraradices* in the roots demonstrated the successful establishment of a symbiotic association, with the highest colonization rate of 74% recorded in the *R. intraradices* + LOF treatment. Based on the results, the application of biological control agents in combination with LOF has the potential to improve vegetative growth, support mycorrhizal colonization, and modify the feeding behavior of *D. citri*, while also showing a tendency to suppress the development of diplodia disease in Siam orange plants.

Keywords: *Bacillus tropicus*, *Diaphorina citri*, Electrical Penetration Graph, liquid organic fertilizer, *Rhizophagus intraradices*, Siam orange.