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**Respons Pertumbuhan Bibit Tua Kopi Robusta (Coffea canephora) terhadap Aplikasi Pupuk NPK Cair dan
Bakteri Bacillus (Bacillus velezensis)**
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Intisari

Permasalahan dalam pembibitan kopi (*Coffea canephora*) salah satunya adalah keberadaan bibit tua atau over-aged seedlings yaitu bibit yang telah melewati umur ideal tanam yang melebihi usia 18 bulan. Bibit tua menunjukkan masalah vigor, akar terikat, dan etiolasi, yang menyebabkan bibit dengan produktvitas rendah di lapangan. Upaya perbaikan pertumbuhan bibit tua dapat dilakukan melalui aplikasi pupuk NPK cair dan *Bacillus velezensis*. Penelitian ini bertujuan untuk mengetahui bagaimana pengaruh aplikasi pupuk NPK cair dan *Bacillus velezensis* serta menentukan dosis optimum. Penelitian dilaksanakan pada Oktober 2025–Februari 2026 di Dusun Gunung Gambar Kabupaten Gunungkidul, Daerah Istimewa Yogyakarta. Penggunaan Pupuk NPK cair dilarutkan dalam air dan diaplikasikan dengan cara disemprotkan pada daun, sedangkan *Bacillus velezensis* dilarutkan dalam air dan diaplikasikan dengan cara disiramkan pada media tanam. Metode pengumpulan data menggunakan Rancangan Acak Kelompok Lengkap faktorial dengan tiga blok sebagai ulangan. Faktor pertama adalah pupuk NPK cair yang terdiri atas 0, 6, dan 12 ml/L, sedangkan faktor kedua adalah *Bacillus velezensis* yang terdiri atas 0, 80, dan 160 ml/L. Hasil penelitian menunjukkan bahwa perlakuan aplikasi pupuk NPK cair dan *Bacillus velezensis* mampu memperbaiki pertumbuhan bibit tua kopi robusta melalui peningkatan ketersediaan hara, serapan P, aktivitas fotosintesis, dan akumulasi biomassa. Pupuk NPK cair berperan sebagai sumber hara makro yang mendukung pertumbuhan tajuk, sedangkan *Bacillus velezensis* berperan sebagai PGPR yang membantu pelarutan fosfat, fiksasi nitrogen, produksi IAA, serta perkembangan akar. Interaksi kedua perlakuan tersebut berpengaruh terhadap serapan P, bobot segar total, bobot kering total, LAB, LPT, dan BDK, sehingga menunjukkan adanya hubungan sinergis antara pemupukan dan aktivitas mikroba rizosfer. Analisis *Response Surface Methodology* (RSM) menunjukkan bahwa pupuk NPK cair dosis 9–10 ml/L yang dikombinasikan dengan *Bacillus velezensis* dosis 140–150 ml/L memiliki potensi untuk diuji lebih lanjut.

Kata kunci : bibit tua, *Bacillus velezensis*, pupuk NPK cair

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Abstract

One of the major constraints in robusta coffee (Coffea canephora) nurseries is the presence of over-aged seedlings, defined as seedlings that have exceeded the ideal transplanting age of more than 18 months. Over-aged seedlings commonly exhibit reduced vigor, root binding, and etiolation, which may result in poor establishment and low productivity in the field. Growth improvement of over-aged coffee seedlings can be pursued through the application of liquid NPK fertilizer and *Bacillus velezensis*. This study aimed to evaluate the effects of liquid NPK fertilizer and *Bacillus velezensis* application on the growth of over-aged robusta coffee seedlings and to estimate the potential dosage range for further optimization. The study was conducted from October 2025 to February 2026 in Gunung Gambar Hamlet, Gunungkidul Regency, Special Region of Yogyakarta. Liquid NPK fertilizer was diluted in water and applied as a foliar spray, whereas *Bacillus velezensis* was diluted in water and applied by drenching the planting medium. The experiment was arranged in a factorial randomized complete block design with three blocks as replications. The first factor was the concentration of liquid NPK fertilizer, consisting of 0, 6, and 12 ml/L, while the second factor was the concentration of *Bacillus velezensis*, consisting of 0, 80, and 160 ml/L. In general, the application of liquid NPK fertilizer and *Bacillus velezensis* improved the growth performance of over-aged Robusta coffee seedlings by enhancing nutrient availability, P uptake, photosynthetic activity, and biomass accumulation. Liquid NPK fertilizer served as a source of macronutrients that supported shoot growth, while B. velezensis acted as a plant growth-promoting rhizobacterium (PGPR) by facilitating phosphate solubilization, nitrogen fixation, IAA production, and root development. The interaction between these two treatments significantly affected P uptake, total fresh weight, total dry weight, net assimilation rate, crop growth rate, and specific leaf weight, indicating a synergistic relationship between fertilization and rhizosphere microbial activity. Response Surface Methodology analysis indicated that liquid NPK fertilizer at 9–10 ml/L combined with *Bacillus velezensis* at 140–150 ml/L has potential for further evaluation.

Keywords: *Bacillus velezensis*, liquid NPK fertilizer, over-aged seedlings