

Inhibition of Nanoparticle Encapsulated Citronella Essential Oil Against Anthracnose Disease on Bird's Eye Chilli Caused by *Colletotrichum* spp.

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ABSTRACT

Anthracnose disease caused by *Colletotrichum* spp. leads to significant losses in bird's eye chilli production, including reduced fruit quality, lower yield, and increased production costs. Although synthetic pesticides are widely used for disease management, their prolonged application raises concerns regarding environmental sustainability and food safety. This study aimed to evaluate the antifungal potential of citronella essential oil, in both free and nano-encapsulated forms, against *Colletotrichum* spp. The experiment was arranged in a Completely Randomised Design (CRD) with treatments consisting of citronella essential oil at concentrations of 0.125% and 0.063%, either encapsulated or non-encapsulated, tested under in vivo and in vitro conditions. Parameters observed were incubation period, disease intensity, inhibition percentage, colony appearance, and hyphal morphology. Data were analysed using ANOVA at a 5% significance level, followed by Duncan's Multiple Range Test (DMRT) when significant differences were detected. Application of 0.125% citronella essential oil effectively delayed incubation (6.05 DAI), resulted in a disease intensity of 45%, and achieved the highest *in vitro* inhibition (92,21%) until 10 DAI, outperforming Propineb 70 WP and other treatments. Colony morphology remained generally similar, but notable differences in hyphal fate were observed, including lysis, shrinkage, curling, and unbranched growth. These findings indicate that citronella essential oil is a potential alternative for chilli anthracnose management.

Keywords: Antifungal activity, *Cymbopogon nardus*, disease intensity, incubation period.

Daya Hambat Kapsul Nanopartikel Minyak Atsiri Sereh Wangi terhadap Penyakit Antraknosa pada Cabai Rawit yang Disebabkan oleh *Colletotrichum* spp.

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ABSTRAK

Penyakit antraknosa yang disebabkan oleh *Colletotrichum* spp. menyebabkan kerugian signifikan dalam produksi cabai rawit, termasuk penurunan kualitas buah, penurunan hasil panen, dan peningkatan biaya produksi. Meskipun pestisida sintetis banyak digunakan untuk pengendalian penyakit, penggunaan jangka panjangnya menimbulkan kekhawatiran terkait keberlanjutan lingkungan dan keamanan pangan. Penelitian ini bertujuan untuk mengevaluasi potensi antifungal minyak esensial citronella, baik dalam bentuk bebas maupun nano-enkapsulasi, terhadap *Colletotrichum* spp. Eksperimen disusun dalam Rancangan Acak Lengkap (RAL) dengan perlakuan berupa minyak atsiri citronella pada konsentrasi 0,125% dan 0,063%, baik yang dienkapsulasi maupun tidak, diuji dalam kondisi in vivo dan in vitro. Parameter yang diamati meliputi masa inkubasi, intensitas penyakit, persentase penghambatan, penampakan koloni, dan morfologi hifa. Data dianalisis menggunakan ANOVA pada tingkat signifikansi 5%, diikuti dengan Uji Rentang Ganda Duncan (DMRT) jika terdapat perbedaan yang signifikan. Penerapan minyak atsiri citronella 0,125% secara efektif menunda masa inkubasi (6,05 DAI), menghasilkan intensitas penyakit 45%, dan mencapai penghambatan in vitro tertinggi (92,21%) hingga 10 DAI, melebihi Propineb 70 WP dan perlakuan lainnya. Morfologi koloni secara umum tetap serupa, tetapi perbedaan yang mencolok dalam nasib hifa diamati, termasuk lisis, penyusutan, pelengkungan, dan pertumbuhan tanpa cabang. Hasil ini menunjukkan bahwa minyak esensial citronella merupakan alternatif potensial untuk pengelolaan antraknosa cabai.

Kata kunci: Aktivitas antijamur, *Cymbopogon nardus*, intensitas penyakit, masa inkubasi.