

RINGKASAN

Kopi (*Coffea* sp) merupakan produk pertanian bernilai ekonomi tinggi yang produksinya menurun dalam beberapa tahun terakhir. Salah satu faktor penyebabnya adalah organisme pengganggu tanaman (OPT) yaitu patogen *Hemileia vastatrix* penyebab karat daun kopi yang dapat menurunkan produksi sampai dengan 35%. Pengendalian secara hayati perlu dilakukan agar produktivitas meningkat dan lingkungan terbebas dari cemaran bahan kimia sintetis. Penelitian ini bertujuan untuk mengetahui aktivitas enzim dan kemampuan pertumbuhan *Trichoderma atroviride* pada media padat, mengetahui pengaruh *T. atroviride* terhadap perkecambahan spora *H. vastatrix*, serta mengetahui konsentrasi formula padat dalam mengendalikan karat daun kopi.

Penelitian dilaksanakan pada Agustus 2024 sampai Mei 2025 di Fakultas Pertanian Unsoed. Penelitian diawali pengujian aktivitas enzim pendegradasi dinding sel jamur patogen yang dihasilkan *T. atroviride* meliputi enzim kitinase, protease dan glukonase pada media uji enzim, dilanjutkan dengan uji kesesuaian pertumbuhan *T. atroviride* pada media formula padat meliputi media beras, jagung, dan dedak untuk mengetahui media paling sesuai untuk formulasi *T. atroviride*. Pengujian penghambatan perkecambahan spora *T. atroviride* terhadap uredospora *H. vastatrix* dengan mengamati jumlah spora *H. vastatrix* berkecambah setiap 3 jam sekali sebanyak 3 kali. Penelitian di lapangan dilakukan dengan mengaplikasikan formula padat *T. atroviride* dari media paling baik sebanyak 4 perlakuan konsentrasi formula padat *T. atroviride* diulang sebanyak 6 kali sehingga diperoleh 24 unit percobaan. Perlakuan aplikasi meliputi T0 : Kontrol, T1 : 10 g/L , T2 : 25 g/L, T3: 50 g/L. Pengaruh perlakuan terhadap komponen patosistem yang diamati meliputi intensitas penyakit, laju infeksi, AUDPC, dan kemampuan kolonisasi antagonis terhadap patogen secara mikroskopis pada daerah kontak.

Hasil penelitian menunjukkan *T. atroviride* mampu menghasilkan enzim pendegradasi dinding sel yaitu enzim kitinase, protease, dan glukonase, beras menjadi media paling baik untuk pertumbuhan jamur pada aspek masa inkubasi dan diameter sedangkan dedak memiliki kerapatan spora paling tinggi, *T. atroviride* mampu menghambat perkecambahan uredospora *H. vastatrix* sebesar 42%. Hasil aplikasi formula padat *T. atroviride* mampu menurunkan laju perkembangan penyakit dibandingkan perlakuan kontrol. Penurunan intensitas pada perlakuan konsentrasi T2 dan T3 masing-masing yaitu 46,93% dan 48,93%. *T. atroviride* memarasit *H. vastatrix* dengan melilit spora dan menghasilkan enzim pendegradasi dinding sel. Pengaplikasian *T. atroviride* dapat menurunkan perkembangan penyakit karat daun kopi.

SUMMARY

Coffee (*Coffea* sp) is an agricultural product with high economic value whose production has declined in recent years. One of the causal factors is plant-disturbing organisms (PDO), namely the pathogen *Hemileia vastatrix*, which causes coffee leaf rust, which can reduce production by up to 35%. Biological control must be carried out to increase productivity and ensure the environment is free from synthetic chemical contamination. This study aims to determine the effectiveness of the antagonist *Trichoderma atroviride* in solid formulation against leaf rust disease in coffee plants.

The research was conducted from August 2024 to May 2025 at the Faculty of Agriculture, Unsoed. The research began with testing the activity of the cell wall degrading enzymes of pathogenic fungi produced by *T. atroviride* including chitinase, protease and glucanase enzymes in enzyme test media, followed by a test of the suitability of *T. atroviride* growth on solid formula media including rice, corn, and bran media to determine the most suitable media for the *T. atroviride* formulation. Testing the inhibition of *T. atroviride* spore germination against *H. vastatrix* uredospores by observing the number of *H. vastatrix* spores germinating every 3 hours 3 times. Field research was carried out by applying the *T. atroviride* solid formula from the best media as many as 4 treatments of *T. atroviride* solid formula concentrations repeated 6 times to obtain 24 experimental units. Application treatments include T0: Control, T1: 10 g/L, T2: 25 g/L, T3: 50 g/L. The effect of treatment on the observed pathosystem components includes disease intensity, infection rate, AUDPC, and antagonistic colonization ability against pathogens microscopically in the contact area.

The results of the study showed that *T. atroviride* is able to produce cell wall degrading enzymes, namely chitinase, protease and glucanase enzymes, rice was the best medium for fungal growth in terms of incubation period and diameter, while bran had the highest spore density, *T. atroviride* was able to inhibit the germination of *H. vastatrix* uredospores by 42%. The results of the application of the solid formula of *T. atroviride* were able to reduce the rate of disease development compared to the control treatment. The decrease in intensity in the T2 and T3 concentration treatments was 46.93% and 48.93%, respectively. *T. atroviride* parasitized *H. vastatrix* by wrapping around the spores and producing cell wall degrading enzymes. The application of *T. atroviride* can reduce the development of coffee leaf rust disease.