TESIS

MUSUH ALAMI *Pentalonia nigronervosa* DAN PENGARUH UMUR KEMATIAN TANAMAN SUMBER INOKULUM *BANANA BUNCHY TOP VIRUS* TERHADAP EFISIENSI PENULARANNYA

NATURAL ENEMIES OF Pentalonia nigronervosa AND THE EFFECT OF DEATH LONGEVITY OF THE PLANT SOURCE OF BANANA BUNCHY TOP VIRUS INOCULUM ON THE EFFICIENCY OF THE VIRUS TRANSMISSION

Titi Tricahyati

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SUMMARY

TITI TRICAHYATI. Natural Enemy of *Pentalonia nigronervosa* and The Effect of Death longevity of the Plant Source of Banana Bunchy Top Virus Inoculum on The Efficiency of the Virus Transmission (Supervised by **SUPARMAN SHK, CHANDRA IRSAN**).

Pentalonia nigronervosa (Coquerel) is an important pest of banana. Instead of sucking liquid from banana phloem, *P. nigronervosa* also play an important role in transmitting *Banana Bunchy Top Virus* (BBTV) from infected banana to the healthy ones. In some banana plantations infected plants are usually cut down because they are considered unable to produce optimal production. The felled plants will then be placed around healthy plantations, this situation is thought to have the potential as a place for *P. nigronervosa* to temporarily live and spread the virus to other healthy plants.
This study aims to: The existence of *P. nigronervosa* in the banana field will increase if there is no effort to control the aphid, the objective of this research was to find out the natural enemies of *P. nigronervosa* which may play role in controlling the aphid naturally. And to determine the ability of dead plants that host *P. nigronervosa* to re-transmit the virus to healthy plants.

The research was conducted at the Laboratory and research area of the Department of Plant Protection, Faculty of Agriculture, Sriwijaya University, Indonesia, from October 2021 to April 2022. In the natural enemy study, all natural enemies identified were collected from banana cultivation in Ogan Ilir and Muara Enim Regencies, South Sumatra, Indonesia. Research on the effect of the age of death of the banana bunchy top virus inoculum on the efficiency of transmission was carried out using a Randomized Block Design (RBD) with six treatments on the day of death of infected plants, namely, 0, 5, 10, 15, 20, and 25 days, with five times test.

The results showed that there were natural enemies in the forms of predator, parasitoid and pathogenic fungi. We found 22 species of predator, belonged to 5 families of insect i.e. Coccinellidae, Forficulidae, Chelisochidae, Reduviidae and Syrphidae, and 4 families of Arachnida i.e. Oxyopidae, Araneidae, Salticidae, and Philodromidae. We also found one species of parasitoid belonged to Family Brachonidae, and one species of hyper-parasitoid belonged to Family Encrytidae. Furthermore, we also found 3 species of entomopathogenic fungi infecting the aphid. The fungi belonged to genera Aspergillus and Beauveria. Each predator had different predation capacity, the highest was that of *Forficula auricularia* (23.67 ± 3.05) and *Scymnus* spp. (23.67 ± 1.52). Parasitoid *Lipolexis bengalensis* could parasitize *P. nigronervosa* at relatively high parasitic ability. The finding of various natural enemies of *P. nigronervosa* in South Sumatra could be considered as an alternative way to control the aphid and reduce the transmission rate of BBTV in the province. The use of natural enemies has no residual effects on the environment and relatively saver and cheaper compared to other control measurements. From the results of the study, it was found that plants infected by BBTV still had potential to transmit the

virus to healthy plants through the *P. nigronervosa*. Transmission of BBTV from dead plants on the fifth day resulted in the highest average of BBTV infection. The incubation period of virus in plants ranged from 30-53 days after inoculation. From this research, it is hoped that farmers will pay more attention to thoroughly eradicate banana plants infected by BBTV, removed all plant and suckers thoroughly together with their corms.

Key words: BBTV, Entomopathogenic fungi, hyper-parasitoid, natural enemy, parasitoid, *Pentalonia nigronervosa*, predator, dead banana plant.

RINGKASAN

TITI TRICAHYATI. Musuh Alami *Pentalonia nigronervosa* dan Pengaruh Umur Kematian Tanaman Sumber Inokulum *Banana Bunchy Top Virus* Terhadap Efisiensi Penularannya (Dibimbing oleh **SUPARMAN SHK, CHANDRA IRSAN**).

Pentalonia nigronervosa (Coquerel) merupakan hama penting tanaman pisang, selain menghisap cairan pisang *P. nigronervosa* juga berpotensi menyebarkan penyakit *Banana Bunchy Top Virus* (BBTV). Pada beberapa perkebunan pisang tanaman terinfeksi biasanya ditebang karena dianggap tidak mampu menghasilkan produksi secara optimal. Tanaman yang ditebang kemudian akan diletakan disekitaran pertanaman sehat, keadaan tersebut diduga berpotensi sebagai tempat *P. nigronervosa* menumpang hidup sementara dan kembali menyebarkan virus ke tanaman sehat lainnya.

Penelitian ini bertujuan untuk: Keberadaan *P. nigronervosa* akan meluas apabila tidak dilakukan pengelolaan, penelitian ini bertujuan mecari tahu macam-macam musuh alami *P. nigronervosa*. Dan untuk melihat kemampuan tanaman mati yang menjadi inang keberadaan *P. nigronervosa* apakah mampu kembali menularkan virus ke tanaman sehat.

Penelitian dilakukan di Laboratorium dan lahan penelitian Departemen Proteksi Tumbuhan, Fakultas Pertanian, Universitas Sriwijaya, Indonesia, dari Oktober 2021 sampai April 2022. Pada penelitian musuh alami, semua musuh alami diidentifikasi dikumpulkan dari budidaya pisang di Kabupaten Ogan Ilir dan Muara Enim, Sumatera Selatan, Indonesia. Penelitian pengaruh umur kematian tanaman sumber inokulum *banana bunchy top virus* terhadap efisiensi penularannya, dilakukan dengan menggunakan Rancangan Acak Kelompok (RAK) dengan enam perlakuan hari kematian tanaman terinfeksi yaitu, 0, 5, 10, 15, 20, dan 25 hari, dengan lima kali ulangan.

Dari hasil penelitian didapatkan musuh alami berupa predator, parasitoid, dan jamur entomopatogen. Ditemukan 22 spesies predator, yang terdiri dari kelas Insecta sebanyak 5 famili, yaitu Coccinellidae, Forficulidae, Chelisochidae, Reduviidae dan Syrphidae, dan dari kelas Arachnida yang terdiri dari 4 famili yaitu, Oxyopidae, Araneidae, Salticidae, dan Philodromidae. Ditemukan juga 1 spesies parasitoid dari famili Brachonidae, dan 1 spesies hyperparasitoid dari famili Encrytidae, dan juga didapatkan 3 jamur entomopatogen dari genus Aspergillus dan Beauveria. Masing-masing predator memiliki daya mangsa yang berbeda, dan paling tinggi di miliki oleh *Forficula auricularia* (23.67 ± 3.05 a) dan *Scymnus* spp. (23.67 ± 1.52 a). Parasitoid *Lipolexis bengalensis* memiliki daya parasitasi yang cukup tinggi terhadap *P. nigronervosa*. Ditemukan musuh alami *P. nigronervosa* yang cukup beragam, hal tersebut dapat dijadikan acuan pemanfaatan musuh alami tersebut dalam pengelolaan *P. nigronervosa* yang secara tidak langsung juga dapat mengurangi penyebaran penyakit BBTV. Pemanfaatan musuh alami juga tidak meninggalkan residu, aman untuk lingkungan, dan lebih ekonomis. Dari hasil penelitian didapati tanaman yang terserang BBTV masih memiliki potensi menularkan virus ke tanaman sehat melalui vektor *P. nigronervosa.* Penularan BBTV dari tanaman mati

lima hari menghasilkan rerata serangan penyakit *Banana Bunchy Top Virus* tertinggi. Masa inkubasi virus pada tanaman berkisar antara 30-53 hari setelah inokulasi. Dari penelitian ini diharapkan petani lebih memperhatikan eradikasi tanaman pisang yang terserang BBTV, memusnahkan semua tanaman pisang di rumpun yang terserang termasuk semua anakannya sampai ke bagian umbinya.

Kata kunci: BBTV, Entomopathogenic fungi, hyper-parasitoid, natural enemy, parasitoid, *Pentalonia nigronervosa*, predator, dead banana plant.

TESIS

MUSUH ALAMI *Pentalonia nigronervosa* DAN PENGARUH UMUR KEMATIAN TANAMAN SUMBER INOKULUM BBTV TERHADAP EFISIENSI PENULARANNYA

Sebagai Salah Satu Syarat Untuk Memperoleh Gelar
Magister Sains (M.Si)

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PROGRAM STUDI MAGISTER ILMU TANAMAN
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2022

LEMBAR PENGESAHAN

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TESIS

Sebagai Salah Satu Syarat untuk Memperoleh Gelar Magister dalam Bidang Kajian Utama Hama Penyakit Tumbuhan

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PERNYATAAN INTEGRITAS

Judul Penelitian	: Musuh Alami *Pentalonia nigronervosa* dan Pengaruh Umur Kematian Tanaman Sumber Inokulum *Banana Bunchy Top Virus* Terhadap Efisiensi Penularannya
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RIWAYAT HIDUP

Titi Tricahyati, lahir pada tanggal 07 Februari 1998 bertempat di Gelumbang, Muara Enim, Sumatera Selatan dari pasangan Bapak Ramli dan Ibu Rosilawati. Penulis merupakan anak ke tiga dari tiga bersaudara, kakak perempuan pertama bernama Indah Pratiwi dan kakak perempuan kedua bernama Euis Safitri. Penulis menganut agama Islam.

Penulis lulus dari pendidikian TK Aisyah Gelumbang pada tahun 2004, SD Negeri Talang Taling pada tahun 2010, SMP Negeri 1 Gelumbang pada tahun 2013, dan SMA Negeri 1 Gelumbang pada tahun 2016. Setelah lulus SMA melanjutkan ke Perguruan Tinggi Negeri (PTN) Universitas Sriwijaya, Fakultas Pertanian, Program Studi Proteksi Tanaman, melalui jalur SBMPTN. Lulus Strata 1 di tahun 2020, kemudian pada tahun yang sama melanjutkan pendidikan Pasca Sarjana di Program Studi Ilmu Tanaman Fakultas Pertanian Universitas Sriwijaya.

Penulis aktif di organisasi HIMAPRO (Himpunan Mahasiswa Proteksi Tanaman) selaku staf AKPRES (Akademik dan Prestasi) pada tahun 2017-2018, penulis juga aktif menjadi asisten praktikum mata kuliah Dasar-Dasar Perlindung Tanaman, Mikrobiologi Pertanian, Mikologi, Bakteriologi, Ilmu Penyakit Tanaman, dan Penyakit Benih Pasca Panen.

KATA PENGANTAR

Assalamu'alaikum warrohmatullahi wabarakatuh

Puji dan syukur disampaikan kehadirat Allah SWT yang telah melimpahkan nikmat dan rahmat-Nya sehingga penyusun dapat menyelesaikan proposal penelitian tesis yang berjudul: Musuh Alami *Pentalonia nigronervosa* dan Pengaruh Umur Kematian Tanaman Sumber Inokulum BBTV Terhadap Efisiensi Penularannya. Tak lupa pula salawat dan salam penulis sampaikan kepada junjungan kita Nabi Muhammad SAW berserta keluarga, sahabat dan para pengikutnya.

Penulis menyampaikan terima kasih atas segala bantuan, bimbingan, dan arahan yang diberikan. Penulis mengucapkan terima kasih kepada**:**

1) Bapak Dr. Ir. Suparman SHK dan Bapak Dr. Ir. Chandra Irsan, M.Si. selaku dosen pembimbing tesis yang telah memberikan arahan, bimbingan, nasehat, motivasi, serta kepercayaan kepada penulis sehingga dapat menyelesaikan skripsi ini.
2) Seluruh dosen dan staf administrasi Program Studi Ilmu Tanaman, Fakultas Pertanian, Universitas Sriwijaya yang telah mendidik dan mengajarkan ilmu pengetahuan dibidang pertanian.

Penulis berharap semoga proposal penelitian ini bisa bermanfaat sebaik-baiknya dan dapat berguna sebagai pengalaman serta ilmu yang dapat digunakan sesuai dengan fungsinya. Aamiin

Palembang, 24 Juli 2022

Titi Tricahyati

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BAB 1
PENDAHULUAN

1.1 Latar Belakang

Budidaya pisang (*Musa* spp) tersebar hampir diseluruh dunia, terutama di negara dengan iklim tropis seperti Indonesia (Lestari dan Hidayat, 2020). Produksi pisang di Indonesia mencapai 7 280 658,00 ton/ ha, sementara di Sumatera Selatan produksi dapat mencapai 143 110,00 (Badan Pusat Statistik, 2019). Dalam budidayanya permasalahan dapat dipicu dari serangan virus, bakteri, jamur, hama, serta cekaman abiotik (Elayabalan *et al*., 2015). Salah satu penyebab rendahnya produksi pisang disebabkan oleh penyakit *Banana bunchy top virus* (BBTV), kasus ini pertama kali dilaporkan pada 1889 di Fiji, Oceania (Jones, 2021). *Pentalonia nigronervosa* merupakan vektor penyebab BBTV (Rahayuniati *et al*., 2021).

Gejala BBTV berupa pinggiran daun menguning, klorosis pada daun baru, mozaik hijau, tampilan daun yang sempit dan tegak, serta pisang menjadi kerdil (Lestari dan Hidayat, 2020). Tanaman pisang terinfeksi BBTV menghasilkan pertumbuhan yang terhambat dan buah yang kecil (Elayabalan *et al.,* 2015). Kehilangan hasil lain oleh *P. nigronervosa* dapat dilihat dari buah pisang yang terserang secara langsung, sehingga tidak laku dijual di pasaran (Yele dan Poddar, 2019).

P. nigronervosa sebagai vektor BBTV dapat dikendalikan dengan beberapa cara, salah satunya dengan memanfaatkan musuh alami (Leybourne *et al.,* 2020). Penggunaan musuh alami dianggap lebih baik dibandingkan dengan penggunaan pestisida, karena tidak berbahaya bagi lingkungan maupun organisme selain hama yang ada (Miller dan Rebek, 2018). Beberapa contoh predator *P. nigronervosa* seperti (Syrphidae, Cecidomyiidae: Diptera), (Coccinellidae: Coleoptera), dan memanfaatkan parasitoid (Aphiidae, Aphelinidae: Hymenoptera) (Biale *et al.*, 2017).

Tanaman pisang yang terserang BBTV berpotensi menjadi sumber inokulum bahkan setelah diaplikasikan beberapa perlakuan pengobatan (Hooks *et al.*, 2009). Identifikasi gejala awal sangat penting untuk menekan gejala BBTV sebelum menyebabkan gangguan dalam pertumbuhan pisang (Mahadev *et al.,* 2013). Kurangnya pengetahuan petani terhadap kemampuan *P. nigronervosa* sebagai vektor BBTV menjadi kelemahan penanganan dari

penyakit tersebut (Niyongere *et al.*, 2012). Sehingga pada beberapa perkebunan ditemui tanaman pisang yang terserang yang hanya diletakan disekitaran pertanaman pisang sehat. Hal tersebut dapat memicu perkembangan *P. nigronervosa* sebagai vektor BBTV untuk berpindah pada tanaman pisang sehat (Hooks *et al.*, 2009).

Berdasarkan uraian diatas, penulis tertartarik untuk meneliti lebih lanjut mengenai musuh alami yang dapat menekan keberadaan *P. nigronervosa* dan mengetahui apakah tanaman mati yang diletakan pada wilayah pertanaman sehat dapat menjadi sumber inokulum penyebaran penyakit BBTV.

1.2 Rumusan Masalah

1. Adapun rumusan masalah dalam penelitian ini adalah keberadaan *P. nigronervosa* yang dapat berperan sebagai vektor penyakit BBTV, tanaman terserang BBTV akan sangat mengganggu produksi pisang, dan menyebabkan kehilangan hasil. Dalam upaya pengelolaan *P. nigronervosa* di lapangan maka dilakukan upaya pemanfaatan musuh alami seperti predator dan parasitoid.
2. Dalam budidaya pisang petani melakukan penebangan tanaman yang terserang penyakit BBTV dan meletakannya di sekitaran pertanaman pisang sehat. Hal tersebut menimbulkan pertanyaan, apakah tanaman yang terserang BBTV ini masih dapat menjadi sumber inokulum BBTV dan masih dapat ditularkan oleh *P. nigronervosa* ke tanaman pisang sehat di sekitarnya.

1.3 Tujuan

1. Adapun tujuan dalam penelitian ini adalah untuk mengetahui parasitoid, predator dan entomopatogen yang dapat menjadi musuh alami *P. nigronervosa*.
2. Untuk mengetahui apakah umur kematian pisang dapat berpengaruh terhadap kemampuan *P. nigronervosa* dalam menyebarkan kembali BBTV ke tanaman sehat.

1.4 Hipotesis

Adapun hipotesis dalam penelitian ini adalah:

1. Diduga *P. nigronervosa* juga memiliki musuh alami berupa predator, parasitoid, serta entomopatogen.

2. Diduga tanaman pisang terinfeksi BBTV masih dapat menjadi sumber inokulum virus setelah ditebang.

1.5 Manfaat

1. Penelitian ini diharapkan dapat bermanfaat bagi petani pisang dalam upaya penanganan *P. nigronervosa* dengan mengoptimalkan pemanfaatan musuh alami.
2. Apabila umur kematian tersebut berpengaruh pada kemampuan *P. nigronervos* dalam menularakan BBTV pada tanaman sehat, maka hal tersebut dapat memberi informasi pada petani mengenai pentingnya menjaga perkebunan pisang mereka dari tanaman terserang BBTV agar dapat memutus keberadaan *P. nigronervosa* pada tanaman sehat.

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