



THE EFFECT OF COMMERCIAL BIOCONTROL AGENT ON THE INCIDENCE OF SHALLOT VIRUSES AND PLANT GROWTH

MOH. MUMTAZUL HAQ ASB



**DEPARTMENT OF PLANT PROTECTION
FACULTY OF AGRICULTURE
BOGOR AGRICULTURAL UNIVERSITY
BOGOR
2026**



Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :
 - a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah
 - b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.
2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.

@Hak cipta milik IPB University

Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :
 - a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah
 - b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.
2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.



AUTHOR'S STATEMENT ON UNDERGRADUATE THESIS AND ITS SOURCE OF INFORMATION AND DELEGATION OF COPYRIGHT

I declare that this undergraduate thesis entitled "The Effect of Commercial Biocontrol Agent on the Incidence of Shallot Viruses and Plant Growth" is my own and authentic work under the supervision of my supervisors and it has not yet been submitted to any universities or institutions for any degree fulfillment. The source of information, both published or unpublished by the authors used for quotations in this thesis is already cited appropriately and presented in the undergraduate thesis's Literature Cited chapter.

I hereby delegate my undergraduate thesis copyright to Bogor Agricultural University

Bogor, January 2026

Moh. Mumtazul Haq Asb
SIN A3401211081

Hak Cipta Dilindungi Undang-undang
1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :
a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah
b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.
2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.



ABSTRAK

MOH. MUMTAZUL HAQ ASB. Pengaruh Agens Biokontrol Komersial terhadap Insidensi Virus Bawang Merah dan Pertumbuhan Tanaman. Dibimbing oleh SRI HENDRASTUTI HIDAYAT dan SARI NURULITA.

Infeksi virus pada tanaman bawang merah bersifat tular umbi dan berpotensi menurunkan produktivitas tanaman. Penelitian dilakukan untuk mengevaluasi potensi aplikasi agens biokontrol komersial terhadap penekanan infeksi virus serta pengaruhnya terhadap pertumbuhan dan produktivitas tanaman bawang merah. Bahan tanam yang digunakan berupa benih umbi (var. Bima Brebes dan var. Tajuk) dan *true shallot seed* (TSS) (var. Sanren F1 dan var. Lokananta). Aplikasi agens biokontrol dilakukan melalui perendaman benih dan kombinasi perendaman benih dengan penyemprotan daun di lapangan. Rancangan acak kelompok faktorial digunakan dengan dua taraf perlakuan yaitu, varietas bahan tanam dan metode aplikasi agens biokontrol. Pengamatan dilakukan pada insidensi penyakit, karakter pertumbuhan dan produktivitas tanaman. Deteksi virus dilakukan menggunakan metode RT-PCR dengan target *Onion yellow dwarf virus* (OYDV), *Leek yellow stripe virus* (LYSV), *Shallot latent virus* (SLV), dan *Garlic common latent virus* (GCLV). Gejala infeksi virus pada tanaman asal benih umbi sudah terlihat sejak minggu pertama, sedangkan pada tanaman asal benih TSS baru mulai terlihat pada minggu keempat setelah tanam. Deteksi virus dari sampel lapangan mengonfirmasi infeksi OYDV dan SLV pada sampel tanaman asal benih umbi. Namun, hanya beberapa sampel dari tanaman asal TSS yang positif OYDV dan SLV. Perlakuan agens biokontrol tidak berpengaruh terhadap insidensi penyakit, karakter pertumbuhan, dan produktivitas tanaman bawang merah. Perlu dilakukan optimasi aplikasi agens biokontrol untuk meningkatkan efisiensinya dalam menekan infeksi virus.

Kata kunci: infeksi virus, insidensi penyakit, RT-PCR, *true shallot seed*, tular umbi



ABSTRACT

MOH. MUMTAZUL HAQ ASB. The Effect of Commercial Biocontrol Agent on the Incidence of Shallot Viruses and Plant Growth. Supervised by SRI HENDRASTUTI HIDAYAT and SARI NURULITA

Viral infections in shallots are bulb-borne and have the potential to reduce plant productivity. This study was conducted to evaluate the potential application of commercial biocontrol agent in suppressing viral infections and improving shallot growth and productivity. The planting materials used consisted of seed bulbs (var. Bima Brebes and var. Tajuk), and true shallot seed (TSS) (var. Sanren F1 and var. Lokananta). Commercial biocontrol agent was applied by seed soaking and by a combination of seed soaking and foliar spraying in the field. A randomized factorial design was used with two treatment factors, i.e., shallot variety and the biocontrol agent application method. Observations were conducted on disease incidence, growth characteristics, and plant productivity. Virus detection was performed using the RT-PCR method targeting *Onion yellow dwarf virus* (OYDV), *Leek yellow stripe virus* (LYSV), *Shallot latent virus* (SLV), and *Garlic common latent virus* (GCLV). Symptoms of viral infection in plants originating from seed bulbs were visible as early as the first week, whereas symptoms in plants from TSS appeared in the fourth week after planting. Virus detection from field samples confirmed OYDV and SLV infections in all samples from bulb-derived plants. However, only a few samples from TSS plants tested positive for OYDV and SLV. Biocontrol agent treatments did not affect disease incidence, growth characteristics, and productivity of shallot plants. Optimization of biocontrol agent application is needed to improve its effectiveness in suppressing viral infections.

Keywords: bulb-borne, disease incidence, RT-PCR, true shallot seed, viral infection

Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :
 - a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah
 - b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.
2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.



Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :

a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah

b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.

2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.

©Copyright owned by Bogor Agricultural University, 2026
All rights reserved

It is prohibited to quote part or all of this undergraduate thesis without citing or acknowledging the source. Quotation is allowed as long as for education, research, scientific writing, scientific report, research proposal or scientific review purposes only; those quotations should not produce any adverse effects to Bogor Agricultural University

It is prohibited to republish and reproduce a part or whole of this paper in any forms without written permission from Bogor Agricultural University.

Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :

a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah

b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.

2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.



THE EFFECT OF COMMERCIAL BIOCONTROL AGENT ON THE INCIDENCE OF SHALLOT VIRUSES AND PLANT GROWTH

MOH. MUMTAZUL HAQ ASB

Undergraduate thesis
In partial fulfillment of the requirements for the degree of
Bachelor of Agriculture
At the
Department of Plant Protection

**DEPARTMENT OF PLANT PROTECTION
FACULTY OF AGRICULTURE
BOGOR AGRICULTURAL UNIVERSITY
BOGOR
2026**



@Hak cipta milik IPB University

Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :
 - a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah
 - b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.
2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.

Examiner of the thesis:

1. Prof. Dr. Ir. Purnama Hidayat, M.Sc.



Approved by

Sri Hendrastuti Hidayat

Co-Supervisor:

Dr. Sari Nurulita, S.P., M.Si.

S. Nurulita

Acknowledged by



Head of the Department of Plant Protection

Dr. Ir. Ali Nurmansyah, M.Si.
 NIP. 196302121990021001

Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :

a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah

b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.

2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.



Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :

a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah

b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.

2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.

PREFACE

All praise and gratitude to Allah *subhanaahu wa ta'ala* for all His blessings enabling the author to complete this undergraduate thesis entitled, "The Effect of Commercial Biocontrol Agent on Suppressing the Incidence of Shallot Viruses and Plant Growth" as one of the requirements for obtaining a Bachelor of Agriculture degree.

The completion of this thesis would not have been possible without the assistance and support of various parties. Therefore, with deep gratitude, the author would like to express special thanks to:

1. Prof. Dr. Ir. Sri Hendrastuti Hidayat, M.Sc., and Dr. Sari Nurulita, S.P., M.Si., as my supervisors, for their guidance, suggestions, and mentorship throughout the research and thesis writing process;
2. Prof. Dr. Ir. Purnama Hidayat, M.Sc., as my academic advisor and examiner, for consistently providing support throughout my studies;
3. Prof. Dr. Ir. Hermanu Triwidodo, M.Sc., as the academic advisor who has assisted and guided the author's study plan during the study period.
4. All lecturers, staff, and the academic community of the Plant Protection Department for the knowledge imparted during my study at the Bogor Agricultural University.
5. My beloved family, umi, abah, late father, mother, older sister, cousins, uncles, aunts, pakde, and bude, who have always supported me with prayers, motivation, and financial assistance during this challenging phase.
6. The author's friends, Niah, Kak Balqis, Salma, Fikri, Aul, and Dewi, who always provided support, prayers, and encouragement during the study and thesis writing.
7. Research fellows Candrasa, Aji, Farel, Fadil, Amanda, Hazrina, April, and Ishaq for their support and assistance while the author was completing the thesis.
8. Friends from the Virology Laboratory, Plant Mycology Laboratory, and the staff at PKHT Tajur (Mr. Ahmad Kurniawan and his team), for their support and motivation during the completion of the thesis.
9. My friends from Plant Protection 58, who accompanied me throughout my education at the Bogor Agricultural University.
10. All parties who have helped in the form of discussions, support, advice, encouragement, and prayers, which cannot be mentioned one by one.

The author hopes that this scientific work may be beneficial to those in need and contribute to the advancement of knowledge.

Bogor, January 2026

Moh. Mumtazul Haq Asb

Hak Cipta Dilindungi Undang-undang

1. Dilarang mengutip sebagian atau seluruh karya tulis ini tanpa mencantumkan dan menyebutkan sumber :
 - a. Pengutipan hanya untuk kepentingan pendidikan, penelitian, penulisan karya ilmiah, penyusunan laporan, penulisan kritik atau tinjauan suatu masalah
 - b. Pengutipan tidak merugikan kepentingan yang wajar IPB University.
2. Dilarang mengumumkan dan memperbanyak sebagian atau seluruh karya tulis ini dalam bentuk apapun tanpa izin IPB University.



TABLE OF CONTENTS

LIST OF TABLES	x
LIST OF FIGURES	x
LIST OF APPENDICES	x
I INTRODUCTION	1
1.1 Background	1
1.2 Research Question	2
1.3 Hypothesis	2
1.4 Research Objectives	2
1.5 Research Outcomes	3
II LITERATURE REVIEW	4
2.1 Shallot Plant Botany	4
2.2 Growing Conditions for Shallot	4
2.3 Shallot Cultivation	4
2.4 Major Shallot Viruses	5
2.4.1 <i>Onion yellow dwarf virus</i>	5
2.4.2 <i>Leek yellow stripe virus</i>	5
2.4.3 <i>Garlic common latent virus</i>	5
2.4.4 <i>Shallot latent virus</i>	6
2.5 Molecular Detection of Shallot Viruses	6
2.6 Biocontrol Agents for Plant Disease Control	7
III MATERIALS AND METHODS	8
3.1 Location and Research Period	8
3.2 Work Procedures	8
3.2.1 Preparation of planting materials	8
3.2.2 Preparation and application of biocontrol agent	8
3.2.3 Planting shallots in the field	9
3.2.4 Experimental Design and Observation Variables	9
3.2.5 Virus Detection Using RT-PCR	11
IV RESULT AND DISCUSSION	14
4.1 Virus Infection in Bulbs and TSS	14
4.2 Symptoms of Virus Infection on Shallots in The Field	15
4.3 The Effect of Biocontrol Agent on Disease Incidence	16
4.4 Confirmation of Virus Infection in Symptomatic Plants	18
4.5 The Effect of Biocontrol Agent on Plant Height and Number of Tillers of Shallot Plants	19
4.6 The Effect of Biocontrol Agent on the Weight, Number, and Diameter of Bulbs	21
V CONCLUSION AND SUGGESTION	24
5.1 Conclusion	24
5.2 Suggestion	24
REFERENCES	25
APPENDICES	31



LIST OF TABLES

3.1	Application of biocontrol agents in the field experiment	9
3.2	Specific primers used for shallot virus detection	13
4.1	Summary of target virus detected based on the RT-PCR method	19
4.2	Productivity of shallot plants derived from bulbs	22
4.3	Productivity of shallot plants derived from TSS	22

LIST OF FIGURES

3.1	Field layout of the shallot study using a randomized block factorial design	10
3.2	Planting of shallot planting material for screening	11
4.1	Visualization of amplified DNA for OYDV (A), LYSV (B), SLV (C), GCLV (D) in the initial detection of shallot planting material	14
4.2	Symptoms on shallot leaves in the field	15
4.3	Incidence of shallot virus infection in the field	17
4.4	Visualization of amplified DNA for OYDV (A), LYSV (B), SLV (C), GCLV (D) in the field samples of each treatment	18
4.5	Plant height of shallots in the field	20
4.6	Number of tillers of each treatment of shallots in field 6 WAP	20

LIST OF APPENDICES

1	Description of the Bima Brebes variety (Sumarno 2019)	32
2	Description of the Tajuk variety (Kusumasari 2022)	33
3	Description of the variety Sanren F1	34
4	Description of the variety Lokananta	35
5	Shallot Cultivation Procedures (PKHT Tajur)	36
6	Disease Incidence on Shallot Plants Derived from Bulbs	37
7	Disease Incidence on Shallot Plants Derived from TSS	37
8	Average Plant Height of Shallot Plants Derived from Bulbs	38
9	Average Plant Height of Shallot Plants Derived from TSS	38