DECREASED FUSARIUM WILT AND ABUNDANCE OF INSECTS IN SHALLOT AFFECTED BY PLANT GROWTH PROMOTING MICROORGANISM

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Welcome in Lampung

Background

Shallots (*Allium ascalonicum* L.) is one of the horticultural crop that have increase market demand becuse it is plant provides many benefits.

According to Badan Pusat Statistik (2017),
The shallot production can decrease over 39%.

Decrease shallot production caused by pest and disease.

The agricultural sector is required to be able to produce safe products, one of which is the use of plant growth promoting microorganism to strengthn plant vigour

Research purpose

1. To know the effect of plant growth promoting microorganisms on the diversity and abundance of insects on shallots.

2. To know the effect of plant growth promoting microorganism to fusarium wilt intensity.

Framework

The negative impacts caused by chemical pesticides such as resistance, resurgence and the killing of natural enemies are not the target

Plant growth promoting microorgnism efective to strengthen plants

If the plant grows strengthen and healthier, will be more resistance to pest and disease.
The research objective was to determine the decreased Fusarium wilt and abundance of insects due to the influence of the application of *Pseudomonas fluorescens*, *Paenibacillus polymyxa* and *Trichoderma* sp. which are Plant Growth Promoting Microorganism.

Hypothesis

1. The application of plant growth promoting microorganisms is able to affect the diversity and abundance of insects on shallots.

2. The application of plant growth promoting microorganisms is able to inhibit the intensity of fusarium wilt disease in shallots

Materials and Methods

- Laboratory of Pest and Plant Disease Sciences and in the Integrated Field Laboratory of the Faculty of Agriculture, University of Lampung, Bandar Lampung.

- The research was done in October 2020 until December 2020 (off season shallot plants)

Tools and materials

The materials used in this research included Bima variety shallot, goat manure, anorganic compound fertilizer, isolates of *F. acutatum*, Potato Dextrose Agar (PDA) media, alcohol, aquades, plastic, yellow trap paper, insect glue, plastic cups, detergent.

The tools used are petridish, autoclave, orbital shaker, compound microscope, haemocytometer, erlenmeyer, Laminar Air Flow (LAF), knife, brush, label paper, scissors, plastic, meter, scale, documentation tool, measuring pipette, hand sprayer, magnetic stirrer, funnel, and stationery.

Research Method

Research Block Design (5 treatments and 4 replications)
P0 = control is sick plant with fusarium wilt
P1 = application *P.fluorescens* 10^6 *cfu/ml*
P2 = application *P. Polymixa* 10^6 *cfu/ml*
P3 = application *Trichoderma* sp 10^6 spore/ml
P4 = Consortium of 3 microorgnism

- Lay out research

P1U1	P3U2	P0U3	P4U4
P2U1	P4U2	P1U3	P0U4
P4U1	P0U2	P2U3	P3U4
P3U1	P2U2	P4U3	P1U4
P0U1	P1U2	P3U3	P2U4

Research Implementation

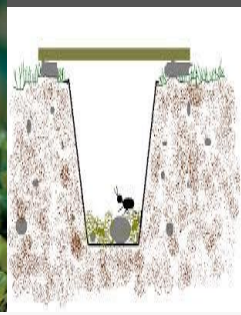
A. Implementation in the Laboratory

1. Preparation of *Fusarium acutatum* isolates
2. Inoculation of the pathogen *Fusarium acutatum*
3. Preparation of plant growth promoting microorganisms

B. Implementation in the Field

1. tillage
2. trial plot
3. planting
4. plant growth promoting microorganisms
5. fertilization

Observation



6. Sprinkling

7. Weeding

1. Insect identification

2. Insect diversity index

$$H' = -\Sigma\, p_i \ln p_i$$

3. Disease Incidence

$$DI = \frac{n}{N} \times 100\%$$

4. Disease severity

$$DS = \frac{\sum(n_i \times v_i)}{Z \times N} \times 100\%$$

Insect Diversity Index

$H' = -\Sigma Pi \ln Pi$

$Pi = ni/N$

H': diversity index Shanon-Weiner

Pi : comparison of the number of individuals of species with the whole species(ni/N)

ni : number of individual of type 1

N : total individuals all types

Criteria diversity index (H')

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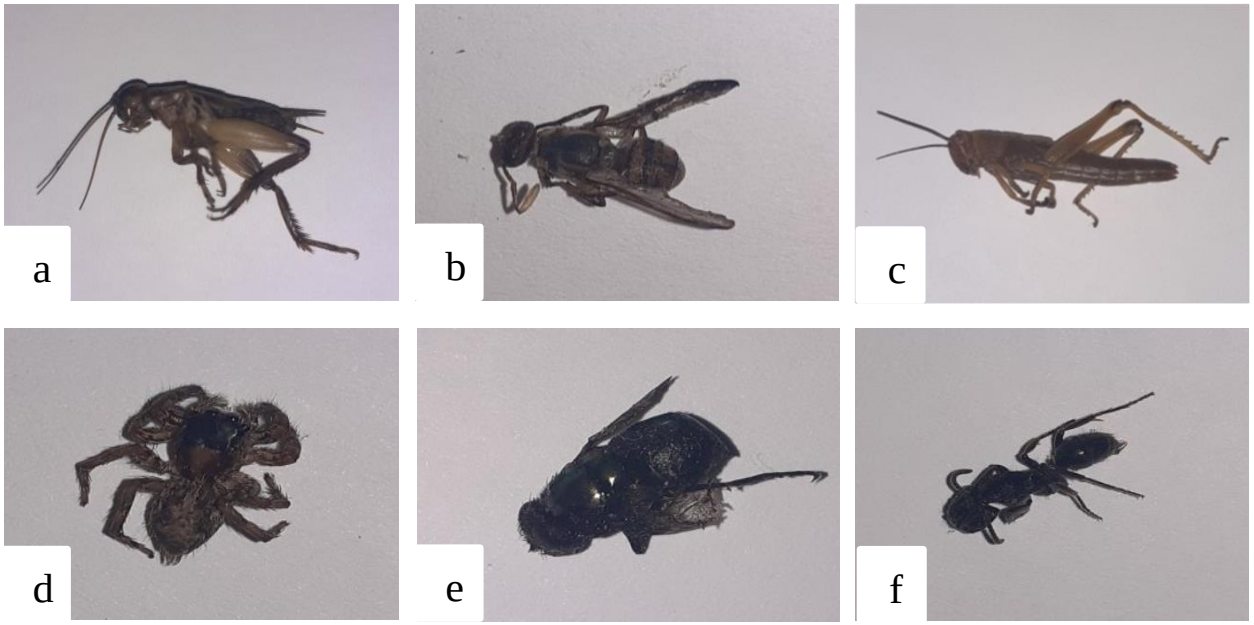
Value Index Shanon	Criteria
<1	Low diversity, distribution of the number of individuals per species is low and community stability is low
1 -3	Moderate diversity, moderate distribution of the number of individuals per species, and moderate community stability
>3	High diversity, distribution of the number of individuals per species is high and community stability is high

Insect Identification



jangkrik (Famili: Gryllidae) (a), lalat buah (Famili: Tephritidae) (b), belalang (Famili: Acrididae) (c), laba-laba (Famili: Araneidae) (d), lalat hijau (Famili: Calliphoridae) (e), semut (Famili: Formicidae) (f)

Table score of disease severity

Score	description	Information
0	No infection	Healthy plant
1	Light attack, when damage <10% per plant	Light
2	Moderate attack, when damage is 10-25% per plant	Moderate
3	The attack is a bit heavy, if the damage is 26-50% per plant	Critical
4	Heavy attack, if damage > 50% per plant	Dead

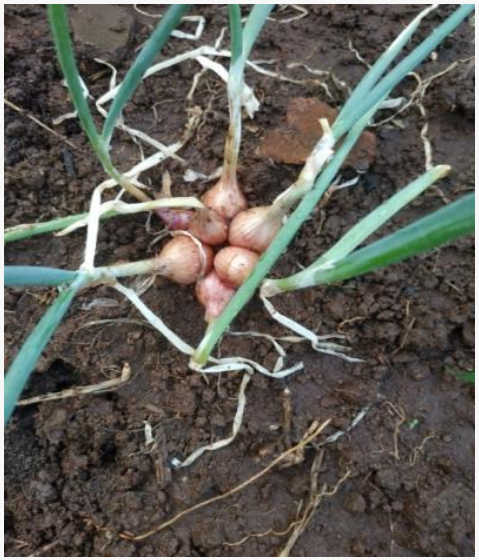
Skor 1

Skor 2

Skor 3

Skor 4

Score of severity Fusarium wilt



DATA ANALYSIS

The data analyzed using variance and then the LSD test was carried out with a 5% significance level.

Result

Table 1. The number of insect families and individuals in the yellow trap

Treatment	Arthropods in week													
	Number of family							Number of individu						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
P0	7	8	7	7	5	6	5	175	227	372	370	175	134	90
P1	4	4	5	7	8	5	4	149	110	371	381	187	139	99
P2	5	7	7	6	7	5	6	192	229	263	313	208	151	130
P3	4	7	8	9	7	8	5	128	105	288	270	234	105	91
P4	5	7	7	6	5	5	6	139	137	162	214	153	133	110

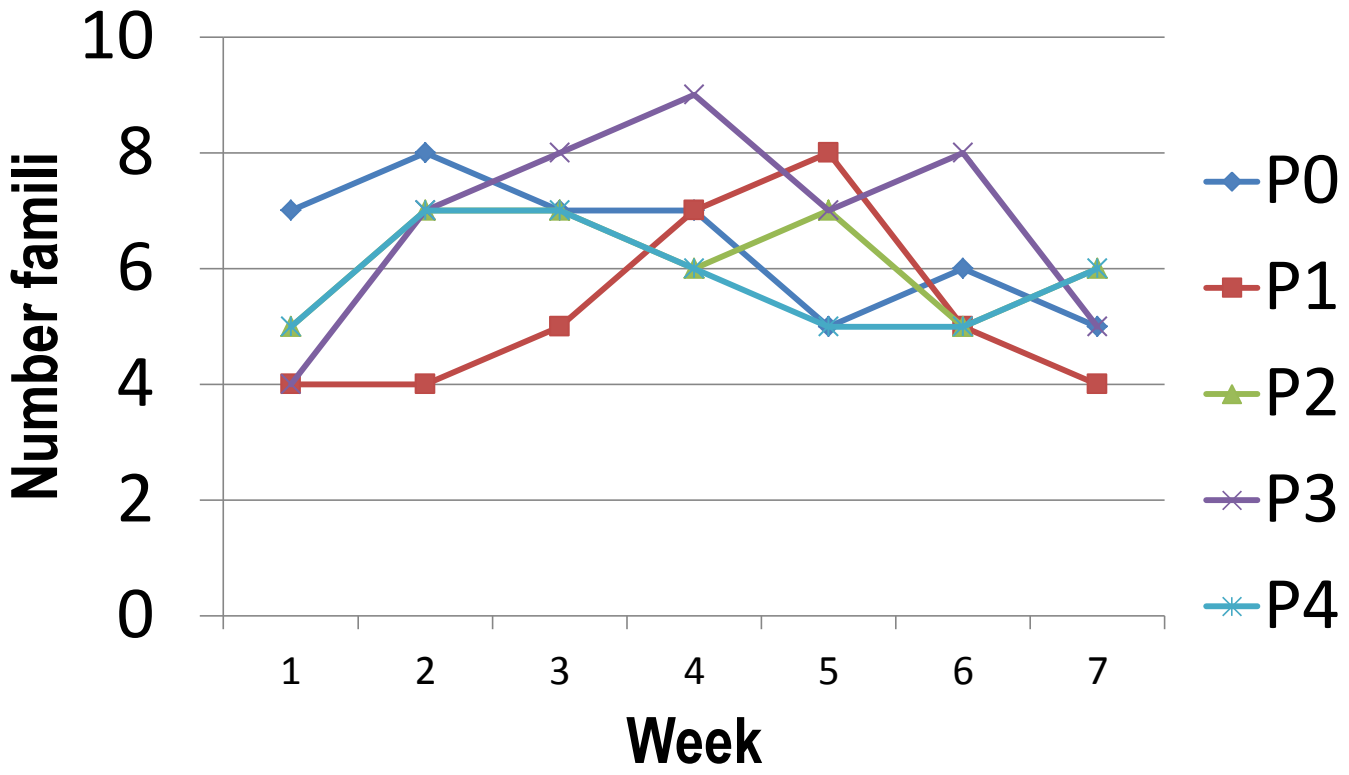


Figure 1. Graph of insect diversity in yellow trap

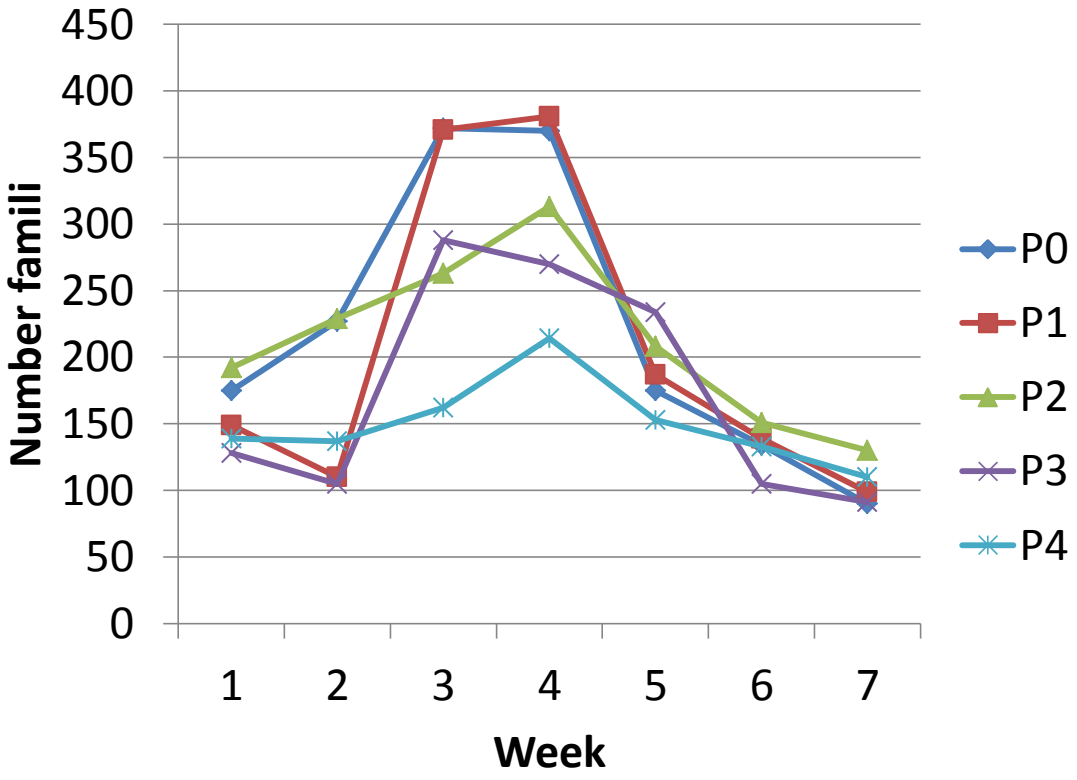


Figure 2. Graph of the abundance of insects in the yellow trap

Table 2. Insect diversity index in yellow traps

Treatment	Week						
	1	2	3	4	5	6	7
P0	0,95	0,89	0,86	0,94	0,52	0,47	0,69
P1	0,34	0,51	0,87	0,70	0,13	0,73	0,35
P2	0,56	1,06	0,65	1,09	0,39	0,63	0,49
P3	1,15	1,33	0,89	0,65	0,15	0,80	0,78
P4	1,03	0,80	0,42	0,51	0,33	0,70	0,51

Table 3. Disease Incidence at 5-7 wai

Treatment	Disease Incidence (%)					
	5 wai		6 wai		7 wai	
P0	9,00	b	16,00	c	17,00	c
P1	3,00	a	9,00	b	14,00	bc
P2	3,00	a	7,00	b	9,00	abc
P3	0,00	a	1,00	a	7,00	ab
P4	0,00	a	1,00	a	4,00	a
F table =	3,25		3,25		3,25	
F count =	3,71	*	10,88	*	3,59	*

Values followed by the same letter are not significantly different at the 5% level.

Table 4. Disease severity at 5-6 wai

Treatment	5 wai	6 wai
P0	3,75 b	8,50 b
P1	2,75 b	8,00 b
P2	3,00 b	5,50 ab
P3	0,00 a	1,00 a
P4	0,00 a	0,75 a
F table =	3,49	3,49
F count =	4,04 *	5,01 *

Values followed by the same letter are not significantly different at the 5% level.

Application of *Pseudomonas fluorescens, Paenibacillus polymyxa* and *Trichoderma* sp. which are Plant Growth Promoting Microorganism. *Pseudomonas fluorescens* is a plant strengthening booster that has the potential to be developed to strengthen plants, be able to colonize plant roots, and impact plant resistance.

P. fluorescens, P. polymyxa bacteria , likewise *Trichoderma* sp are microorganism capable of producing growth regulators (ZPT) such as those produced by plants, namely indole-3-acetic acid (IAA) compounds so that they can trigger plant growth.

The results of this study were decrease Fusarium wilt and low insects diversity index in the shallot biosystem.

Conclusion

1. The application of pgpm in the field did not affect the diversity and abundance of insects in shallot plantations.

2. Application of pgpm in the field can reduce the incidence and severity of moler disease in shallot plantations. The consortium 3 microoganism were the most effective treatment in controlling the occurrence and severity of moler disease in shallot plantations.