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# Response Of Giving Antagonist Fungi Trichodema Spp On Vegetative Growth Of Soybean Plants (*Glycine max* (L) Merr.) Infected By Fusarium Sp.

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## ABSTRACT
*Biological control is the use of antagonistic agents to control plant pathogens. One of the biological agents currently being developed is Trichoderma spp. Trichoderma spp fungi are often used to control Fusarium sp (root wilt disease). Trichoderma spp fungi have the ability to increase the growth rate and development of plants, especially their ability to cause healthy root production and increase root depth (deeper in the soil surface). Therefore, the author aims to examine the response of Trichoderma spp antagonistic fungi to the vegetative growth of soybean plants (Glycine max (L) Merr.) Infected with Fusarium sp. This study was conducted using an experimental method using a single factor Completely Randomized Design (CRD) consisting of T0F0, T0F10, T10F10, T15F10. Each consists of 4 replications. The results of the study showed that Trichoderma spp played a significant role in the process of inhibiting the growth of Fusarium sp in root development, plant height, development of the number of leaves and functioned to provide nutrients for plants causing plant cell metabolism to run better so that plant growth during the vegetative phase did not experience obstacles.*

*Keywords: soybean plants (Glycine max (L) merr.), Fusarium sp (root wilt disease), Trichoderma spp*

## INTRODUCTION

Biological control is the use of antagonistic agents to control plant pathogens. One of the biological agents currently being developed is Trichoderma spp. Trichoderma spp fungi are often used to control Fusarium sp (root wilt disease). Trichoderma spp fungi have the ability to increase the growth rate and development of plants, especially their ability to cause healthy root production and increase root depth (deeper in the soil surface). Therefore, the author aims to examine the response of Trichoderma spp antagonistic fungi to the vegetative growth of soybean plants (Glycine max (L) Merr.) Infected with Fusarium sp. This study was conducted using an experimental method using a single factor Completely Randomized Design (CRD) consisting of T0F0, T0F10, T10F10, T15F10. Each consists of 4 replications. The results of the study showed that Trichoderma spp played a significant role in the process of inhibiting the growth of Fusarium sp in root development, plant height, development of the number of leaves and functioned to provide nutrients for plants causing plant cell metabolism to run better so that plant growth during the vegetative phase did not experience obstacles.

## METHOD
This study was conducted using an experimental method using a single factor Completely Randomized Design (CRD) consisting of T0F0, T0F10, T10F10, T15F10. Each consists of 4 replications. The variables observed include plant height, number of leaves, and number of healthy roots. The variables observed were the number of leaves when the leaves of each plant were counted to open perfectly, Plant height (cm) measured from the ground surface to the growing point of the plant, and the number of healthy roots starting from the taproot to the fibrous roots.

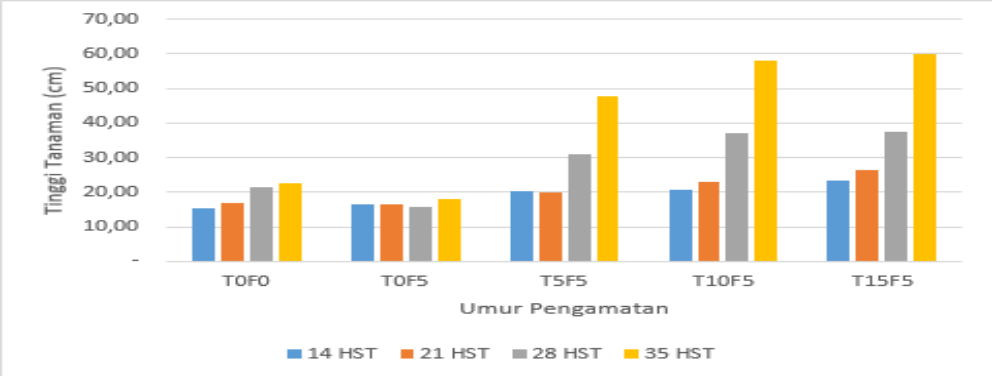
## RESULT AND DISCUSSION (font size 12pt)
Plant Height

Table 2. Average Soybean Plant Height at Various Observation Ages

| Treatments | Plant Height (cm) | | | |
|---|---|---|---|---|
| | 14 HST | 21 HST | 28 HST | 35 HST |
| T0F0 | 15,22 a | 16,95 a | 21,35 b | 22,72 a |
| T0F10 | 16,54 a | 16,45 a | 15,90 a | 17,97 a |
| T5F10 | 20,20 b | 19,90 b | 30,87 c | 47,64 b |
| T10F10 | 20,79 b | 22,54 c | 36,92 d | 58,00 c |
| T15F10 | 23,20 c | 26,54 d | 37,45 d | 60,02 c |
| BNT 5% | 2,25 | 1,73 | 3,07 | 5,74 |

Description: the numbers in the same column followed by the same letter show no significant difference in the 5% BNT test

Based on Table 2. shows that in general the T15F10 treatment is the best treatment. The T0F0 and T0F10 treatments are the treatments that give the lowest results.




The results of observations on plant height showed that the highest plant height was in the T15F5 treatment (15 gr/plant) Where the average Observation results were carried out for 35 days after planting, and observed 4 times with a time interval of 7 days, which was then tested using the test reached 60 cm, while the lowest plant height was in the T0F5 treatment (10 ml Fusarium sp) reaching an average of 15 cm. The data can be seen in Figure 13. Based on the percentage inhibition data, Trichoderma spp isolates were able to inhibit Fusarium sp. According to (Nohemi et al, 2012) Hyphae intervention by Trichoderma results in changes in chemical elements and particles in the cell wall so that it can affect the permeability of the pathogen cell wall. Therefore, plants given Trichoderma spp have a superior ability to inhibit disease and are able to make plants grow well during the vegetative period. Reviewing the results of the Trichoderma spp antagonism test. against F. oxysporum on bananas in previous studies also provided optimal results (Sulistyorini & Sulistyowati 1995).

**Number of Leaves**

Table 3. Average Number of Soybean Leaves at Various Observation Ages

| Perlakuan | Jumlah Daun (helai) | | | |
|---|---|---|---|---|
| | 14 HST | 21 HST | 28 HST | 35 HST |
| T0F0 | 5,75 b | 5,75 b | 6,00 b | 9,00 a |
| T0F10 | 5,25 a | 5,25 a | 4,75 a | 4,25 a |
| T5F10 | 6,00 b | 6,00 b | 6,50 b | 10,25 a |
| T10F10 | 6,00 b | 6,00 b | 8,25 c | 11,75 b |
| T15F10 | 6,00 b | 6,00 b | 10,50 d | 14,00 c |
| BNT 5% | 0,47 | 0,47 | 1,31 | 1,83 |

Description: the numbers in the same column followed by the same letter show no significant difference in the 5% BNT test

Based on Table 3, it shows that in general the T15F10 treatment is the best treatment. The T0F0 and T0F10 treatments are the treatments that give the lowest results.

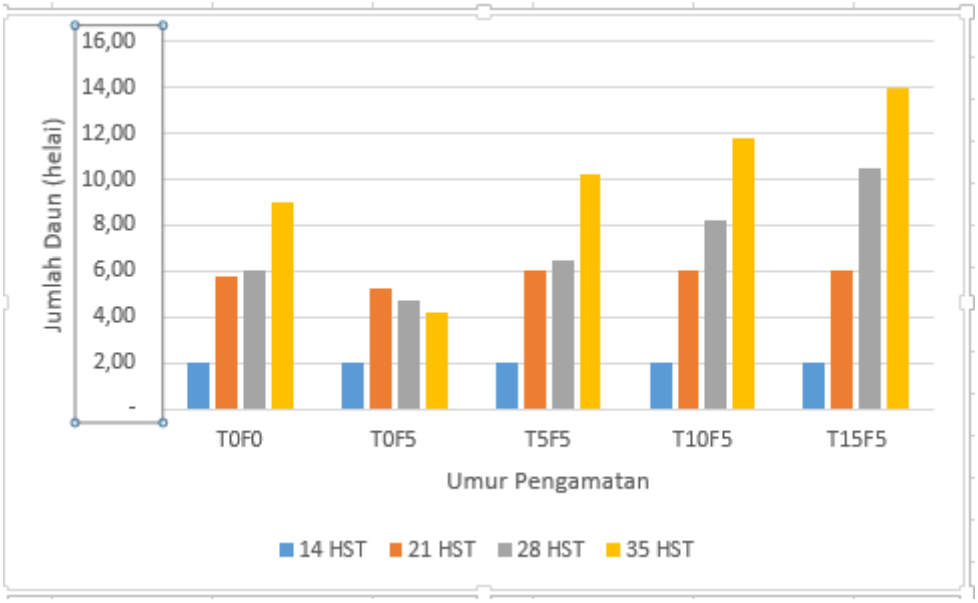



**Figure 2. Number of Plant Leaves in various observations**

Observation of the number of leaves was carried out the same as the observation of the Number of Leaves, which was carried out for 35 days, 4 observations with a period of 7 days. which was then tested using the F test. The results of observations on the number of leaves showed that the largest number of leaves was in the T15F5 treatment (15 gr/plant) Where the average reached 14 strands, the first week's observation showed the same results, namely 2 strands, then the second week's observation 21hst showed an increase then in the third and fourth weeks there was a decrease, while the lowest number of leaves was in the T0F10 treatment (10 ml Fusarium sp). The data can be seen in Figure 14

Seen from Figure 14 in the first observation (14hst) there was no difference in results. Because in soybean plants, leaves that grow at the age of 14hst still grow 2 Primary leaves (muchlish, 2016). Differences began to appear when the 2nd observation (21hst). Seen from Figure 4.2 shows that each dose also affects the growth of the number of leaves. Judging from the number of leaves, in each observation, the highest number of leaves was found in the T15F10 treatment (15 g/plant). And the smallest number of leaves was found in the T0F10 treatment (without Trichoderma spp).

**Number of Healthy Roots**

The observation of healthy roots aims to determine the effect of Trichoderma spp and Fusarium sp in influencing the development of healthy roots in soybean plants. Observations were carried out for 35 days after planting, and were observed 4 times with a time interval of 7 days, which were then tested using the F test. The results of the F test are presented in Table 4 below.

Table 4. Average Number of Healthy Soybean Roots at Various Observation Ages

| Perlakuan | **Healthy Roots (helai)** | | | |
|---|---|---|---|---|
| | 14 HST | 21 HST | 28 HST | 35 HST |
| T0F0 | 14,75 a | 21,00 a | 24,50 a | 25,75 b |
| T0F10 | 18,00 a | 18,50 a | 15,00 a | 9,75 a |
| T5F10 | 24,50 b | 26,75 b | 33,25 b | 33,50 b |
| T10F10 | 33,75 c | 36,25 c | 30,75 c | 34,00 b |
| T15F10 | 31,00 c | 41,50 c | 45,00 d | 52,25 c |
| BNT 5% | 5,72 | 7,83 | 4,05 | 5,65 |

Description: the numbers in the same column followed by the same letter show no significant difference in the 5% BNT test

Based on Table 4. shows that in general the T15F10 treatment is the best treatment. The T0F0 and T0F10 treatments are the treatments that give the lowest results.

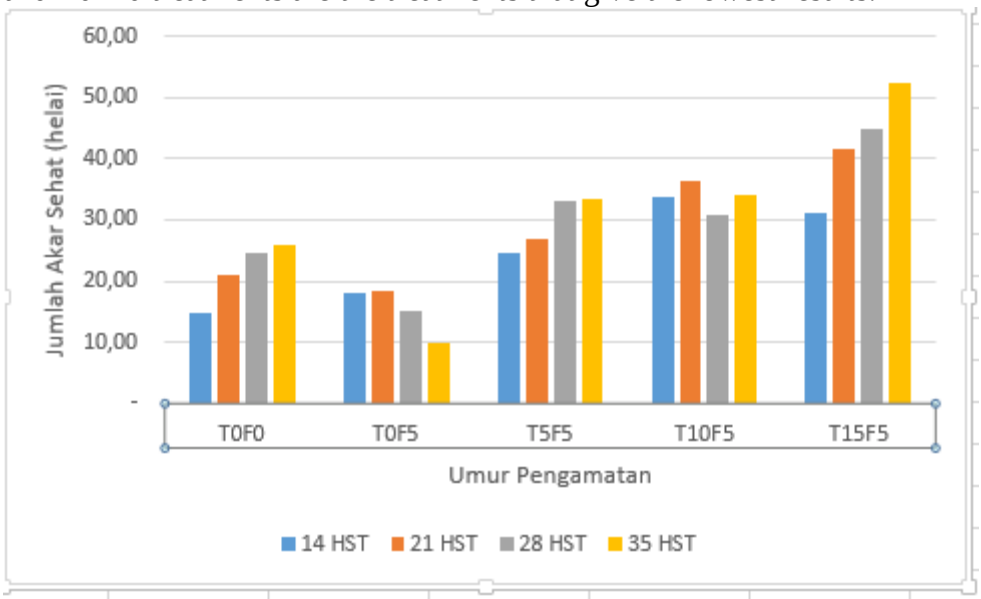



Figure 3. Number of Healthy Roots in Plants

Based on the results of observations from this study, Trichoderma spp is able to inhibit the growth of Fusarium sp, but with varying percentages of inhibition. Trichoderma is a type of microbe that has the ability to inhibit the growth of pathogens by producing biologically active compounds in vitro. These active compounds include alkaloids, paxillin, lolitrems, and tetranone steroids (Sudhanta & Abdul 2011). In the first observation, the role of Trichoderma spp in plants was seen, because Trichoderma spp was able to infect roots and reproduce at the age of 1 week after inoculation (Tandion, 2008), in the second observation and so on, the role of Trichoderma spp increasingly suppressed Fusarium sp. It can be seen from the results of each observation that the number of healthy roots in the T15F5 treatment (15 gr/plant) showed the highest results compared to other treatments. While the plants in the T0F5 treatment showed the lowest results, because this treatment was not given Trichoderma spp.

## CONCLUSIONS

Trichoderma spp plays a significant role in the process of inhibiting the growth of Fusarium sp in the development of healthy soybean roots and in the T15F treatment (15 gr/plant) showed the highest results compared to other treatments, Trichoderma spp plays a significant role in the process of plant height growth. The presence of Trichoderma spp which functions to provide nutrients for plants causes plant cell metabolism to run better so that plant growth during the vegetative phase is not hampered, Trichoderma spp plays a significant role in the process of inhibiting the growth of Fusarium sp in the development of the number of leaves and in the T15F treatment (15 gr/plant) showed the highest results compared to other treatments.

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