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The Effectiveness Application of Tricho Zia 1.0 WS Biological Agent for Controlling Fusarium Disease (Fusarium Oxysporium F. Sp. Cepae) On Red Onion Plant (Allium Ascalonicum L.)

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Abstract: *The research aimed to find out the proper application of Trichodermasp biodiversity to control Fusarium wilt disease on shallot plants. The study was conducted from July to September 2016, housed in the screen house of the Faculty of Agriculture, University of Medan Area and the laboratory of the Faculty of Agriculture, University of North Sumatra. The design used was Randomized Complete (RAL) non factorial with treatment factor that is Tricho Zia 1.0 WS application which consist of 5 treatment levels, namely: 1) T0 (+) = (No Tricho Zia 1.0 WS and Fusarium oxysporum) ; 2) T0 treatment (-) = (Without the application of Tricho Zia 1.0 WS and Fusarium oxysporum); 3) T1 treatment ((immersed tuber with concentration of Tricho Zia 1.0 WS 5 gr / liter of water / m ^ 2 of land); 4) treatment T2 = (Watering to planting ground with concentration Tricho Zia 1.0 WS 5 gr / liter water / m ^ 2 land); and 5) T3 = (Plant Spraying with Tricho Zia concentration 1.0 WS 5 gr / liter of water / m ^ 2 land). The parameters observed were antagonistic test in laboratory, percentage of disease attack, number of leaves, plant height, wet bulb weight and as supporting data ie temperature around the screen house. The results showed that the best application treatment was T2 which was not significantly different with T0 (+) treatment and was significantly different from other treatments on each observation parameter.*

Keywords: *percentage of attack; concentration; Tricho Zia; antagonist*

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I. Introduction

Red onion *(Allium ascalonicum.)* Is one of the leading vegetable commodities that farmers have long been cultivated intensively. This vegetable commodity belongs to a group of unsubstituted spices that serve as food seasonings and traditional medicinal ingredients.According to the Central Bureau of Statistics of North Sumatra (2014), North Sumatra's onion producing areas are *Karo, Simalungun,* South *Tapanuli,* North *Tapanuli, Dairi, HumbangHasundutan, Toba Samosir, Samosir and Mandailing* Natal. Onion production in 2014 amounted to 7,810 tons, while in 2013 its production was 8,305. The data shows that onion production in 2014 decreased by 495 tons (5.96%). The decrease was caused by decreased productivity by 0.14 tons per hectare (1.74%) and harvested area decreased by 45 hectares (4.29%) compared to the year 2013. The need for onion of North Sumatra in 2014 reached 22,854 tons, in the produce is still far to regularly meet those needs. To meet this need, North Sumatra imported 15,684 tons of shallots from three countries: Thailand, India and Vietnam.However, the cultivation of shallots among farmers in general has constraints that can cause the production of shallot crops low in quantity and quality. These constraints include pathogenic infections caused by diseases that are commonly encountered in onion plants, among them wilt disease caused *by Fusariumoxysporum* sp, purple / trotol spots caused by *Alternaria porii* and anthracnose caused by *Colletotrichum gloeosporiorides.Fusarium* oxysporum sp fungus is a soil pathogen that attacks the roots. *Fusarium* disease is a major disease affecting plants, such as wither. The striking symptom of *fusarium* wilt disease initially is the occurrence of older leaf edge edging *(Saragih, et al., 2006).* The part that is attacked is generally *plumula* and radical which result in decay in that part. The fungus in its growth and development require cellulose as a source of carbon and energy *(Winarsih and Syafrudin, 2001).* Agricultural technology, especially in controlling plant diseases caused by the fungus of *F.oxysporum* pathogens in Indonesia at this time still rely heavily on the use of synthetic fungicides. The use of fungicides are not wise can cause environmental pollution problems, disturbance of ecological balance and residuals left behind can be toxic and *carcinogenic.Sesis F.oxysporum* sp fungus disadvantage the farmers due to fungal attack causes the plant to wither pathologist (Juanda, 2009).

II. Methods Of The Research

The research was conducted from July to September at *Rumah Kasa* Faculty of Agriculture, University of Medan Area and Laboratory of Faculty of Agriculture, University of North Sumatra. The materials used in this research are onion seeds of *Bima Brebes* varieties, soil, compost, sand, *Tricho Zia* 1.0 WS, *Fusarium oxysporum* and polybag, water, Potato Dextrose Agar (PDA), Sodium hypochlorite 1.5%, and *Aquadest* sterile.The tools used in this research are hoes, machetes, *gembor, handsprayer*, meters, scales, sample boards, calculators, stationery, petri dish, needle inoculation, measuring cups, tweezers, microscopes, *bunsen* lamps, drums, knives, and Thermometer.In this study, the experiments were conducted in 2 stages: laboratory experiments and field experiments. Research in laboratory of antagonistic test was designed with Non Factorial Completely Randomized Design that is treatment of *Trichoderma* sp application consist of 2 levels, namely A0 = *Fusarium oxysporum and A1 = Fusarium oxysporum* and *Tricho Zia* 1.0 WS. The research on the field was designed by Non-Factorial Completely Random Design of *Trichoderma* sp treatment consisting of 5 levels, namely: T0 (+) = Without application *Tricho Zia 1.0* WS and Fusarium oxysporum, T0 (-) = Without application *Tricho* Zia 1.0 WS and administration of *Fusarium oxysporum,* T1 = Immersion of tubers with concentration of *Tricho Zia 1.0* WS 5 gr / liter of water / m ^ 2 land, T2 = Watering to soil cultivation with concentration *Tricho Zia 1.0* WS 5 gr / liter water / m ^ 2 land, and T3 = Spraying Plant with a concentration of *Tricho Zia* 1.0 WS 5 gr / liter of water / m ^ 2 land.

III. Discussion

Test antagonists Tricho Zia 0.1 WS and *Fusarium oxysporum* in vitro.The observational data of *Tricho Zia* 0.1 WS antagonist test with *Fusarium oxysporum* in vitro and its fingerprint results are presented in appendix 5 to appendix 12. Based on the results of the variance the *Tricho Zia* showed no significant effect on the colony growth area 2 days after inoculation (HSI) , and differ significantly affecting the area of growth ranging from 4-8 HSI.

Table 1. Mean Tricho Zia 1.0 WS Antagonist Test In PDA Media On The Growth Of Colony Area In Fusarium Oxysporumf. Sp. Cepae.

Treatment	Fusarium Oxysporum F. sp. cepae At Age (cm)							
	2 HSI		4 HSI		6 HSI		8 HSI	
A0	4,85	tn	20,29	aA	38,13	aA	62,65	aA
A1	4,35	tn	14,33	bB	19,70	bB	23,55	bB

Description: The numbers followed by the same letter in the same column show different unreal at 95% (lower case) and 99% (upper case).

From the data table one shows that the growth area of colony of *F.oxysporum* inoculated with *Tricho Zia* showed no significant difference in 2 observation while in observation of 4.6, and 8 hsi seen a very real difference for the wide growth of colonies *F.oxysporum* applied itself and that was applied with *Tricho Zia.* Consecutive values of colonies of FO (20.29 cm2, 38.13 cm ^ 2, 62.65 cm ^ 2) and for the growth of *F.oxysporum* colonies were applied with *Tricho Zia* (14.33 cm ^ 2, 19 , 70 cm ^ 2, 23.55 cm ^ 2).This is because *Tricho Zia* 1.0 WS with *Trichoderma harzianum* active ingredients can affect the growth of *Fusarium oxysporum* colony and the length of observation time, the higher the inhibition of *Fusarium oxysporum* colony. This is supported by the statement of Chet (1987) *Trichoderma* spp. is able to produce *gliotoksin* and *viridin* metabolites as antibiotics and some species are also known to secrete the β-1,3-glucanase and *chitinase* enzymes that cause *exolisis* in the host *hyphae*, but the most important is the ability of the *microbalasite* and its strong competition with pathogens (Cook and Baker, 1983).This is in accordance with the research of *Purnomo (2006)* that Trichoderma sp. able to master the space and nutrients that exist maximum so that *Fusarium oxysporum* mushrooms cannot compete to get the space and nutrients in its growth. *Trichoderma* sp. also produces an enzyme that inhibits the growth of the pathogen. For example, *chitinase* enzymes produced by *Serratia plymuthica* are reported to inhibit the growth of spores and tissue elongation (germ-tube) in Botrytis *cinerea.* While the enzyme ß-1,3-glucanase synthesized from *Paenibacillus sp. and Streptomyces sp*. May cause *lysis* of the fungus cell wall of *F. oxysporum* and other enzymes produced by the bacteria include *hydrolase, laminarinase* and protease Schulz.

3.1 Intensity of Fusarium Oxysporum Attack

Based on the results of variance indicate that the treatment of several ways of application *Tricho Zia* 1.0 WS can suppress *Fusarium oxysporum* wilt attack significantly affect the intensity of onion attacks ranging from 1 to 6 MST. The results of the average treatment test of several ways of application of *Tricho Zia* 1.0 WS to the intensity of attacks ranging from 1 MST to 6 MST are presented in table 2.

Table 2: Mean intensity of F. oxysporum attack f. sp. cepae on shallot plant after application of Tricho Zia 1.0 WS.

Treatment n	Intensity of F. oxysporum attack f. sp. cepae At Age (%)					
	1 MST	2 MST	3 MST	4 MST	5 MST	6 MST
T0(+)	0,00 Bb	0,00 dD	0,00 cC	0,00 dC	0,00 dC	0,00 dC
T0(-)	35,00 Aa	50,00 aA	50,00 aA	55,00 aA	55,00 aA	55,00 aA
T1	0,00 bB	15,00 cB	15,00 bB	20,00 bB	20,00 bB	20,00 bB
T2	0,00 Bb	0,00 dC	0,00 cC	10,00 cB	10,00 cB	10,00 cB
T3	35,00 aA	35,00 bA	40,00 aA	45,00 aA	45,00 aA	45,00 aA

Description: The numbers followed by the same letter in the same column show different unreal at 95% (lower case) and 99% (upper case).Table 2 shows that the intensity of onion attack caused by *Fusarium oxysporum*disease on 1 to 6 MST has a significant effect on each treatment of Tricho Zia 1.0 WS application. At T0 (-) treatment with percentage of attack reaching 55% is not significant with treatment, T3 with 45% attack percentage and very different with T1 treatment with 20% attack percentage, T2 with 10% attack percentage and no FO attack on treatment T0 (+). This is because the treatment T0 (+) did not get treatment of *Fusariumoxysporum and Tricho Zia* disease. In addition to the planting media already in sterilized so that no pathogens that interfere during the growth period. This is in accordance with *Fardiaz (1992)* that sterilization is a process for killing all existing microorganisms, so that if grown in a medium no more microorganisms can breed and sterilization can kill most heat-resistant microorganisms such as bacterial spores .

Table 3: Effectiveness of F.oxysporum Attack Intelligence Attack on red onion crop after application of Tricho Zia 1.0 WS.

Treatment	Effectiveness of Fight Pressure Intensity Fusarium oxysporum f. Sp. Cepae on the Red Onion Plant Age (%)					
	1 MST	2 MST	3 MST	4 MST	5 MST	6 MST
T0(+)	-	-	-	-	-	-
T0(-)	-	-	-	-	-	-
T1	70,00	70,00	63,64	63,64	63,64	63,64
T2	100,00	100,00	81,82	81,82	81,82	81,82
T3	30,00	20,00	18,18	18,18	18,18	18,18

On the table of effectiveness of the intensity of attack attacks *Fusarium oxysporum* f. Sp. *Cepaepada* onion plant after the application *Tricho Zia* 1.0 WS showed good results. The highest antagonistic effectiveness in the T2 treatment was 81.18% and the lowest effectiveness in the T3 treatment was 18.18%. Seen on data from the treatment of various ways of application of the lowest percentage of attack is in T2 treatment that is watering *Tricho Zia* solution to planting medium this is suspected because inoculated antagonistic microbe is able to grow and spread in planting medium. This is in accordance with the opinion of Davies and Whitbread (1989), which states that microbial antagonists can grow and grow in planting medium This is because the giving of Trico Zia through watering is very effective because Trico Zia can be in direct contact with the roots.

3.2 Plant Height (cm)

Based on the result of variance, it showed that the treatment of several ways of application of *Tricho Zia* 1.0 WS had significant effect on the height of onion plants ranging from 3 MST to 6 MST. The results of the average treatment test of several ways of application of *Tricho Zia* 1.0 WS ranging from 1 MST to 6 MST are presented in Table 4.

Table 4: Average high onion plants with various TrichoZia 1.0 WS applications to suppress F. oxysporum f. sp. cepae.

Treatment	Plant height At Age (cm)					
	1 MST	2 MST	3 MST	4 MST	5 MST	6 MST
T0(+)	16,04 tn	23,73 tn	29,35 a A	33,16 b A	34,11 b B	34,77 b A
T0(-)	14,95 tn	21,00 tn	25,55 c C	26,78 d C	27,23 d D	27,47 d C
T1	13,86 tn	21,78 tn	28,15 b B	30,78 c B	31,60 c C	31,93 c B
T2	15,15 tn	23,44 tn	30,28 a A	34,31 a A	35,80 a A	36,40 a A
T3	14,70 tn	21,05 tn	25,30 c C	27,34 d C	27,76 d D	28,04 d C

Description: The numbers followed by the same letter in the same column show different unreal at 95% (lower case) and 99% (upper case).

Table 4 shows that high growth of onion plants at 1 to 2 MST had no significant effect on each treatment of *Tricho Zia* 1.0 WS application. This indicates that the application of *Tricho Zia* 1.0 WS has not demonstrated its effectiveness for high onion plants. While at 3 to 6 MST showed a significant different effect on each treatment. The best administering treatment was T2 (watering *Tricho Zia* solution to planting medium) with an average plant height of 36.40 cm and not significantly different from T0 (+) treatment (control without *Tricho Zia* 1.0 WS treatment and *Fusarium oxysporum* disease) and different very real with T1 treatment (soaking tubers with *Tricho Zia* 1.0 WS solution), T3 (spraying *Tricho Zia* solution when symptoms occur), and T0 (-) (control treatment without *Tricho Zia* and *Fusarium oxysporum* disease) of 36.40 cm . Because the inoculated antagonist microbe is capable of spreading, primarily because of the moving water flow. This is in accordance with the opinion of Davies and Whitbread (1989), that microbial antagonists can move This is because giving Trico Zia through watering is very effective because *trico* can be in direct contact with the roots.The addition of *Tricho Zia* with *TrichodermaHarzianum* active ingredient in planting medium besides functioning as *Fusarium* disease controlling agent on shallot plant, it also plays a role in the process of decomposition of organic matter in the soil. In this research, *Tricho Zia's* role applied to onion planting media has a positive effect on the improvement of soil environment condition where the plant grows, and *Trichoderma* is able to decompose organic matter in the soil into nutrients that are easily absorbed by plants that affect the increase of plant height and number of leaves. In the opinion expressed by *Affandi et.al (2001)* which states that some fungi are associated with degradation processes, in which *Trichoderma* plays a key role in the decomposition process of organic compounds especially in its ability to degrade degradable compounds such as *lignosellulose*.

3.3 Number of Leaves (strands)

Based on the result of variance indicate that the treatment of several ways of application of *Tricho Zia* 1.0 WS to suppress *Fusarium oxysporum* disease significantly affect on the height of onion crops from 4 MST to 6 MST. The mean test results of several ways of application of *Tricho Zia* 1.0 WS ranging from 1 MST to 6 MST are presented in table 5.

Table 5: Average number of onion plant leaves after Tricho Zia 1.0 WS application to suppress F. oxysporum attack f. sp. cepae.

Treatment	Number Of Leaves At Age (strands)					
	1 MST	2 MST	3 MST	4 MST	5 MST	6 MST
T0(+)	11,85 tn	17,15 tn	22,70 tn	26,73 a A	31,35 a A	34,20 a A
T0(-)	10,65 tn	14,95 tn	18,3 tn	20,90 d C	23,45 c C	24,45 c C
T1	10,75 tn	16,70 tn	22,00 tn	25,35 b A	27,40 b B	29,55 b B
T2	10,85 tn	17,00 tn	22,50 tn	27,70 a A	31,80 a A	34,60 a A
T3	11,60 tn	17.00 tn	21,10 tn	25,00 c B	27,20 b B	27,90 b B

Description: The numbers followed by the same letter in the same column show different unreal at 95% (lower case) and 99% (upper case).

Table 5 shows that the growth of leaf number of onion plants at 1 to 3 MST differed was not significant in each treatment of *Tricho Zia* 1.0 Ws application to suppress *Fusarium oxysporum* disease in onion plants. While at 4 to 6 MST showed a significant different effect on each treatment. The best treatments were T2 (watering *Tricho Zia* solution to planting medium) with average number of plant leaves 34,60 strands and not significantly different with T0 (+) treatment (*Tricho Zia* 1.0 WS control and *Fusarium oxysporum* disease) 34,20 strands and very different from T1 treatment (soaking tuber with *Tricho Zia* 1.0 WS solution) that is 29,55 strands, T3 (spraying *Tricho Zia* solution when attack symptom) that is 27,90 strands, and T0 (-) (control treatment without Tricho Zia and Fusarium oxysporum disease) of 24.45 strands. This is because the onion plants that do not get the treatment of Tricho Zia more susceptible to *Fusarium oxysporum*. attack can affect the increase of the number of leaves of plants and cause plants to wither and die due to blockage of nutrient transport.It is in accordance with the opinion Nugroho et al. (2011) that the disease moler is the main disease of onion caused by Fusarium *oxysporum*. The symptoms caused by the pathogen that is yellowing and tend to *terpelintir.infeksi* on the roots or stems adjacent to the soil surface is the beginning of ground infestation of soil pathogens in plants. This causes the transportation of nutrients and clogged water so that the plants wither (*Sumartini, 2012).*

3.4 Weight of Onion Bulbs (gr)

Based on the results of variance indicate that the treatment of several ways of application *Tricho* Zia 1.0 WS to suppress the disease *Fusarium oxysporum* significantly affect the weight of onion tuber bulbs. The results of the average treatment test of several ways of application of *Tricho Zia* 1.0 WS on the weight of onion tuber bulbs are presented in table 6.

Table 6: Onion Tuber Weight Average After Application Of Tricho Zia 1.0 WS To Suppress F. Oxysporum Attack F. Sp. Cepae.

Treatment	Weight of Onion Red Onion Age
T0(+)	28,15 a A
T0(-)	12,38 c C
T1	20,45 b B
T2	28,21 a A
T3	17,88 b B

Description: The numbers followed by the same letter in the same column show different unreal at 95% (lower case) and 99% (upper case).

Based on the results of the variation of tuber weight of onion plants presented in the table above, shows that the various ways of giving *Tricho Zia* 0.1 WS application to suppress *Fusarium oxysporum* wilt disease have a very real effect on the weight of onion tuber bulb. Onion seed bulb yields the best result in T2 treatment (watering *Tricho Zia* solution to planting medium) with average tuber weight of 28,21 gr and not significantly different with T0 (+) treatment (control without *Tricho Zia* 1.0 WS treatment and *Fusarium oxysporum* disease) is 28,15 gr and very different from T1 treatment (soaking tuber with Tricho Zia 1.0 WS solution) that is 20,45 gr, T3 (spraying *Tricho Zia* solution when attack symptom) is 17,88 gr, and T0 (-) (control treatment without *Tricho Zia* and *Fusarium oxysporum* disease) of 12.38 gr. The growth of the production part such as the number of tuber weight per plant is the main part of the harvested crop. And low tuber weight in the control treatment because it depends on the vegetative growth of the crops that occur. In plants the vast surface of photosynthesis and strong root structure is necessary before the plant is able to form the bulbs. According to Gardner (1991), vegetative early growth of plants allows plants to absorb more light energy for photosynthesis as the size of the plant increases, and allows the absorption of water and nutrients sufficient to support leaf growth as the center of photosynthetic reactions.

3.5 House Temperature

From the observation of the temperature in the screen house during the study it was found that at the time of incubation process after inoculation of *Fusarium oxysporum* to the planting medium the temperature of the screen house became high with an average of 37 ° C. The high temperature of the screened house is suspected to cause stunted growth and development disease.Been and *Stihinenberg (1994)* suggested that *Fusarium* wilt symptoms caused by *Fusarium oxysporum* were influenced by ambient temperature. Each plant has the lowest temperature limit to support the growth of the disease. For *Oxysporum Fusarium* the temperature that supports for growth and development is 28 ° C.

IV. Conclusion

An antagonistic test between the *Trichoderma* and *Fusarium oxysporum* fungi in the laboratory showed that the growth of the *Fusarium oxysporum* colony pressed on growth by *Tricho Zia* 1.0 WS to 23.55 cm2 compared with the control colony treatment area of 62.65 cm ^ . The use of *Tricho Zia* Products by means of watering to the planting medium is the most effective treatment to suppress *Fusarium oxysporum* in pepper attack onion plants.

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