

Original Research Article

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Seeds Treatment Using *Trichoderma* spp. Formulated in Bioslurry and Vermicompost to Induct the Resistance of the Peanut (*Arachis hypogaea*. L) Diseases

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ABSTRACT

From the results of several studies it is suspected that even though there is a Rhizobium microbial field that can provide nitrogen for plants, it is thought that very little population lives around the roots. In addition, few microbes are able to spur plant growth, namely Plant Growth Promoting Rhizobacteria (PGPR) Bacteria. And systemic inducing microbes or Systemic acquired resistance (SAR) to plant pathogens, even though microbes are only given to the roots, will be able to increase the resistance of all parts of the plant to disease. So in an effort to increase peanut production, research is needed to get systemic resistance-inducing microbes (SAR), using the *Trichoderma* spp, and as a Fungus carrier media is Vermicompost fertilizer and Bioslurry fertilizer is rich in nutrients. The mixture between *Trichoderma* and its carrier is formulated as biofertilizer and this biofertilizer will be applied as a seed treatment, ie biofertilizer is mixed with seeds before being planted. It is expected that from the results of this study peanut plants will have good growth and production as well as disease resistance. From the results of the study, it was found that peanut seeds after being given seed treatment, *Trichoderma koningii*, *T. viride*, *T. asperelum*, *T. resei* and *T. asperelum* formulated in Vermicompost or Bioslurry fertilizer were very good in increasing the growth and production of peanuts. compared Control (only using Vermicompost and Bioslurry without *Trichoderma*. *Trichoderma* which is formulated in Vermicompost fertilizer has better ability to increase plant growth compared to bioslurry fertilizer. *Trichoderma asperelum* is the best *Trichoderma* if applied to peanut plants in formulations with Vermicompost fertilizer both in vegetative growth and generative growth of peanut plants. And cause the peanut is able to produce up to 3.9 tons / Ha while the Control is only 1.65 tons per Ha as well as if *Trichoderma* has been formulated in Bioslurry fertilizer, the peanut plant is able to produce 3.70 Tons / Ha. So in an effort to increase peanut production to reach 3.9 tons / ha it is better to use *Trichoderma Asperelum* formulated in vermicompost or bioslurry fertilizer. In terms of increasing disease resistance it turns out that *Trichoderma asperilium* either formulated in vermicompost fertilizer or bioslurry fertilizer has the lowest infection rate against Mottle virus as much as 3.60% to 4.13% or leaf rust disease (*Puccinia arachidis*) with an intensity of infection of 15.70% and 14.06%.

Keywords

Peanut, Rhizobium, Systemic acquired resistance (SAR), PGPR, Vermicompost, Bioslurry. Paddy fields

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Introduction

According to Harman, (2000), *Trichoderma* spp. Is a fungus that lives in the soil and likes to live on the surface of the roots of plants, by utilizing the root exudate in his life. If *Trichoderma* spp, already found the roots quickly the fungus roams the roots and wraps the roots and protects plants from disease. *Trichoderma* spp., In addition to being hyperparasitic and mycoparasitic, as well as antibiosis but also able to induce the host's resistance to pathogens (Agrios, 2005; Sudantha *et al.*, 2014). According to Heil and Bostok (2002) in Syahri (2011), induction of plant resilience can occur in two ways, namely by directly producing pathogenesis-related protein (PR) and phytoalexin as a result of attacks by pathogenic microorganisms that are inhibited growth.

Thereby *Trichoderma* spp is very suitable to be applied as Seed treatment (seed treatment) with carrier carrying media Vermicompost or bioslurry (biogas waste), because Vermicompost and Biogas Waste is also rich in beneficial Microorganisms, namely as a phosphate solvent and nitrogen fixing from air so that it can be In addition, according to Harman, (2000), *Trichoderma* spp, which is attached to the roots of plants, also forms mycelia that can spread and extend beyond the root of an area of 1 meter or more, the hyphae will suck water and nutrient elements and carry near the roots of plants, this also helps plant enough water and nutrients in the cells. So the use of *Trichoderma* spp, which is formulated in Vermicompost and bioslurry is expected to increase peanut production (Hidayat and Mulyani, 2002).

Peanut plants can meet their nitrogen needs by conducting symbiosis with nitrogen-fixing bacteria from the air, namely Rhizobium bacteria, but the symbiotic mechanism between peanut plants and Rhizobium is often

disrupted by physical, chemical and biological soil conditions (Sprent, 1976). In environmental conditions that meet the growing requirements, the symbiosis that occurs is able to meet 50% or even the entire nitrogen needs of the plant concerned by capturing free nitrogen (Saono, 1981). In addition, the Rhizobium bacterium has a positive impact both directly and indirectly on the physical and chemical properties of the soil, so as to increase soil fertility (Alexander, 1977).

In paddy soils, phosphate is generally very low available for plants, so to meet the availability of phosphate in the soil, it is necessary that Rhizobacteria solvent phosphate from solanaceae is able to dissolve phosphate that is bound to grains of soil organic matter, but can also stimulate the growth of Rhizobium bacteria (Rao, 1994).

So to increase the growth of Rhizobium in the soil, it is necessary to look for bacteria that live on the surface of the roots of plants (Rhizobacteria) and be able to stimulate the growth of Rhizobium bacteria, so that Rhizobium bacteria form more nodules forming nodules and more plants get nitrogen intake from the air so that plant growth becomes fertile and healthy. With good plant growth, the plant will produce exudates on the root surface of the plant, the exudate is rich in protein, carbohydrates and vitamins needed for the survival of Rhizobacteria in peanut roots.

Materials and Methods

The research was conducted at the Plant Disease Laboratory, Faculty of Agriculture, Udayana University and in the field in the Renon area which often cultivates peanuts. Field research was conducted to observe the ability of *Trichoderma* spp in stimulating Rhizobium bacteria to form root nodules on

plants and stimulate the growth of peanuts and stimulate peanut resistance. against disease attacks in the field, the stages of research include;

Propagation of *Trichoderma* spp.

The *Trichoderma* spp was obtained from the Microbiology Laboratory at the Bandung Institute of Technology and from the Biotechnology Laboratory of the Faculty of Agriculture, Udayana University, which consisted of

Trichoderma koningii,
Trichoderma viride,
Trichoderma asperelum
Trichoderma harzianum
Trichoderma reesei
Trichoderma asperelum RS

This *Trichoderma* is cultured on the media of Potato Pepton Glucose In order to restore its ability as a microbial antagonist or its ability as a Systemic acquired resistance (SAR) or induction of systemic resistance

Preparation of bioslurry and vermicomposting

Bioslurry which is a biogas reactor from cow dung is obtained from Simantri Pedawa, Pedawa Village, Banjar Singaraja sub-district, while Vermicompost fertilizer is obtained from the earthworm cultivation site CV. Bali Organic Agriculture in Denpasar belongs to Dr. Kartini.

Making bioslurry and vermicompost formulations as *Trichoderma* biofertilizer in peanut plants

Prepared sources of *Trichoderma* spp inoculums were cultured respectively in liquid Potato peptone glucose (PPG) media in the Shaker and incubated for 4-5 days until the

media appeared turbid and full of *Trichoderma* spp, then bioslurry was prepared and the raw material came from manufacturing waste. Cow manure in biogas. And Vermicompost obtained from the Worm farm CV. BOA Media bioslurry and vermicompost each pack in plastic bags each of 500 g and 10 grams of granulated sugar and 50 g of wood charcoal flour, to neutralize pH, and stir evenly, then cold compost media, the media inoculated with 250 ml each. *Trichoderma* spp. Furthermore, compost media that have been inoculated with *Trichoderma* spp are incubated for 7 days, while each day the culture is stirred.

Preparation of rhizobium bacteria inoculum source

The best Rhizobium isolate bacterium obtained in the study was Rhizobium Btl 8. This bacterium was cultured on liquid YEM (Yeast Extract Mannitol) media and incubated for 3 days. then the bacterial solution was diluted to obtain a concentration of 10⁶ cfu / ml Rhizobium bacteria then 1 ml of Rhizobium bikan was inoculated on compost formulation media to be applied to peanut plants together with *Trichoderma* formulations as above.

Application of *Trichoderma* spp biofertilizer in peanut plants by seed treatment

Before the peanut seeds are planted in the plot of the experiment, the seeds are given Biofertilizer *Trichoderma* by seed treatment

1. For *Trichoderma* spp Biofertilizer formulated in the form of Compost, as many as 150 seeds of peanut seeds can be mixed with Biofertilizer until it is evenly distributed, that is, it appears that all seed surfaces are covered by Biofertilizer *Trichoderma* spp and the seeds are directly planted.

2. Provision of Rhizobium Btl 8 bacteria can be given to the seeds by mixing groundnut seeds that have been treated with *Trichoderma* spp Biofertilizer Imbibition, then the seeds can be directly planted into the experimental plot in accordance with the treatment

Planting peanut seeds that have received Biofertilizer treatment

Trichoderma spp in paddy field

The field research was carried out as the best adaptation test of Biofertilizer *Trichoderma* spp test results in the laboratory, the aim of which was to determine the stability of these microbes in stimulating the growth and production of peanut plants and resistance to disease in the field at that time.

It also stimulates Rhizobium bacteria to form nodules on peanut plants in the field, but in this field research, *Trichoderma* spp was formulated first into biofertilizer using the method of Hanuddin *et al.*, (2010), field research was carried out using a RAK research design using 3 replications, varieties of peanuts in plants were local varieties, the treatments being tested were:

Biofertilizer formulation carrier media

1. Bioslurry ctompos
2. Vermicompost

Trichoderma spp is able to induce plant growth

Trichoderma koningii,
Trichoderma viride,
Trichoderma asperelum
Trichoderma harzianum
Trichoderma reseii
Trichoderma asperelum RS

Control treatment

Peanuts are planted according to local farmers' habits. How to plant them does not provide biofertilizer,

Planting

Peanut seeds that have been treated with Seed Treatments Biofertilizer *Trichoderma* spp are planted in the field with a plant spacing of 20 X 20 cm in a cultivated plot with a depth of 15 cm, plot size 1 X 2 M, each planting hole is filled with 3 seeds, and after growing in the perarang into one plant per hole, the plants are kept well until harvest while observing

Height of peanut plants

Number of leaves, flowers and pods

Chlorophyll content in peanut leaves

Weight of seeds and seed production per plant

Number and weight of nodules per plant

The type and intensity of damage to diseases affecting plants is measured using methods;

The intensity of plant disease (Boggie & Hans, 1988)

$$I = \frac{\sum (n \times v)}{ZN} \times 100\%$$

Information

I = intensity of attack on leaf spot disease

n = Number of plants showing symptoms of leaf spot disease

v = Numerical price value (Score) of each category

Z = Value score from the highest category

N = number of peanut plants

Results and Discussion

After the treatment of peanut seeds with antagonistic fungi on several pathogens then the seeds were planted in paddy fields in the Sanur area, at first it appeared that the treatment of seed treatment using the fungus *Trichoderma* spp, apparently the growth of seedlings was somewhat stunted, but after the seeds grew, the seedlings grew quite quickly;

Vegetative growth of peanut plants

Plant height

After the peanut seeds were given seed treatment, *Trichoderma koningii*, *T. viride*, *T. asperelum*, *T. resei* and *T. asperelum* RS showed that there was a difference between the seeds planted on the land using vermicompost fertilizer, the growth was better than bioslurry fertilizer, this is because Vermicompost fertilizer is a fertilizer used for the cultivation of earthworms made by earthworm entrepreneurs.

This can be seen in Table 1 that peanuts that received *Trichoderma* treatment and given Vermicompost fertilizer have higher growth compared to the use of bioslurry fertilizer (Biogas Installation Waste). But from the type of *Trichoderma*, it turns out that *Trichoderma koningii* has not been good growth

Number of plant branches

Same with plant height observations, in Table 1, it turns out that the use of vermicompost fertilizer the number of branches produced by the plant is more than the plants that are fertilized with bioslurry, so vermicompost fertilizers are able to fertilize plants, because the vermicompost contains high nutrient and micro nutrient elements (Kuruparan, 2005).

When viewed from the antagonistic fungus, it turns out that *T. koningii* with the vermicompost fertilizer carrier and *T. asperelum* with the bioslurry fertilizer carrier, are also able to increase the number of peanut branches and differ from control.

Number of leaves of peanuts

In table 1, it appears that the number of leaves produced by peanut plants applied with Vermicompost or bioslurry fertilizer, a slight

difference in terms of increasing the number of plant leaves, but it is clearly seen that controls that are only given bioslurry without being given *Trichoderma*, the number of leaves is very low, while the control is only given vermicompost but without *Trichoderma* the number of leaves is quite a lot, here it is clear that organic vermicompost fertilizer is able to increase the growth of peanut plants

Leaf area of peanut leaves

In Table 1, it appears that the area of peanut leaves that are only given Vermicompost or bioslurry fertilizer, without being given *Trichoderma*, the area of the daa produced is smaller than the kascin and bioslurry fertilizers that are treated with *Trichoderma*.

According to some researchers, *Trichoderma* states that in addition to being a natural enemy of the pathogen, it also has the nature of a phosphate element solvent in the soil so that it is available for plants with sufficient P elements, the leaf area widens and also adds to the chlorophyll of the leaf.

Chlorophyll content in leaves

The chlorophyll content in peanut leaves can be seen in Table 1, it appears that the treatment of vermicompost fertilizer gives more amount of chlorophyll than bioslurry, although it does not give trichoderma. The seed treatment using *T. asperelum*, with bioslurry carrier produced the highest number of chlorophyll compared to other treatments.

Generative growth of peanut plants

Number of root nodules (*Rhizobium* Sp) /plant

After the peanut seeds were given seed treatment treatment, *Trichoderma koningii*, *T. viride*, *T. asperelum*, *T. resei* and *T.*

asperelum RS appeared to be no difference between the seeds planted on land using vermicompost fertilizers. The growth was better than bioslurry fertilizer. this is because Vermicompost fertilizer is a fertilizer used for the cultivation of earthworms made by earthworm entrepreneurs. This can be seen in Table 2, that the peanuts that received treatment given earthworm fertilizer (Vermicompost) growth appeared higher compared to the use of bioslurry fertilizer (Biogas Installation Waste), because the

vermicompost fertilizer contained microelement nutrients and growth hormones, higher than bioslurry fertilizer, as a result of good plant growth and increased production of peanut seeds. With the good growth of bean plants, the roots of the sign more and more formed, with the number of hair roots formed is a good opportunity for Rhizobium to enter into the root and live in the root cell and capture nitrogen from the air into the root (Fig. 1)

Table.1 Skor (nilai numerik) intensitas serangan penyakit Bercak daun (Sarwono, 1995)

Score	Percentage of leaf spot symptoms (%)
0	No symptoms of 0% disease, no symptoms of leaf spot
3	Symptoms are mild, 1% - 15% show symptoms of leaf spot
5	Symptoms are moderate, 16% - 35% show symptoms of leaf spot
7	Symptoms are severe, 36% - 75% show symptoms of leaf spot
9	Symptoms are very severe, 76% - 100% show symptoms leaf spot

Table.2 Vegetative growth of plants due to the use of *Trichoderma* and biological fertilizers

Carrier Type (Fertilizer)	Kind of Trichoderma	Plant height (Cm)	Number of branches	Number of leaves (sheet)	Leaf area (l X w) Leaves (Cm2)	Chlorofil in the leaves (SPAD)
Vermicom post	<i>T. koningii</i>	55.67b	7.00	68.67de	55.04b	40.10
	<i>T. viride</i>	59.33c	6.67	67.67cd	60.61d	40.47
	<i>T. asperelum</i>	59.00c	6.67	71.00e	63.99e	39.17
	<i>T. harzianum</i>	59.50c	5.33	66.33c	63.75e	40.03
	<i>T. resei</i>	56.67bc	5.67	69.67cd	59.02cd	39.00
	<i>T.asperelum-RS</i>	59.03c	4.67	67.00c	61.20d	38.57
	Control	50.50a	5.33	68.67cd	55.04b	39.33
Bioslurry	<i>T. koningii</i>	51.13a	5.66	54.33ab	52.69ab	38.49
	<i>T. viride</i>	51.17a	6.33	57.33b	58.74cd	37.6
	<i>T. asperelum</i>	56.33bc	7.00	62.00c	68.01e	42.30
	<i>T. harzianum</i>	54.93a	6.33	61.67b	54.32b	36.48
	<i>T. resei</i>	55.10b	6.33	59.67b	54.79b	36.04
	<i>T. asperelum-RS</i>	54.03ab	6.33	60.67bc	62.49d	40.54
	Control	48.77a	5.00	47.00a	50.64a	36.18

Table.3 Generative plant growth due to *Trichoderma* and biological fertilizers

Carrier Type (Fertilizer)	Kind of Trichoderma	Number of Root Nodule / plant	Fresh Weight a crop/ plants (g)	Number of Pods Containing seeds/Plant	Weight of Pods Containing seeds/Plant (g)
Vermicompost	<i>T. koningii</i>	217c	126c	33cd	45.24a
	<i>T. viride</i>	311d	129cd	29bc	64.83cd
	<i>T. asperelum</i>	305d	157de	31bc	73.34d
	<i>T. harzianum</i>	304d	154d	40d	58.26b
	<i>T. resei</i>	179bc	164e	33cd	48.42a
	<i>T.asperelum</i> -RS	289cd	145d	31bc	63.53cd
	Control	217c	123c	23bc	39.34a
Bioslurry	<i>T. koningii</i>	127a	96.58b	20a	52.76b
	<i>T. viride</i>	137a	95.67b	21ab	62.00b
	<i>T. asperelum</i>	136a	97.58c	22b	63.78cd
	<i>T. harzianum</i>	137a	102.83c	18a	47.27a
	<i>T. resei</i>	152b	93.67a	20a	51.72ab
	<i>T. asperelum</i> -RS	100a	99.83c	21ab	56.79b
	Control	122a	77.83a	14a	33.22a

Table.4 Crop production due to *Trichoderma* and biological fertilizers

Carrier Type (Fertilizer)	Kind of Trichoderma	Number of seeds / plants	Seed weight / plant (g)	Peanut Seed Production (Ton / Ha)
Vermicompost	<i>T. koningii</i>	58bc	45.28c	3.84d
	<i>T. viride</i>	50a	30.29a	2.57a
	<i>T. asperelum</i>	80d	46.14c	3.92d
	<i>T. harzianum</i>	66cd	40.41c	3.43cd
	<i>T. resei</i>	66cd	33.66ab	2.86b
	<i>T.asperelum</i> -RS	64cd	42.86c	3.64d
	Control	49a	31.48a	1.67a
Bioslurry	<i>T. koningii</i>	59bc	38.88b	3.30c
	<i>T. viride</i>	61c	40.64bc	3.45cd
	<i>T. asperelum</i>	64cd	43.71bc	3.71d
	<i>T. harzianum</i>	53ab	29.63a	2.51a
	<i>T. resei</i>	57b	32.69a	2.77b
	<i>T. asperelum</i> -RS	57b	34.85ab	2.96bc
	Control	32a	19.72a	1.45a

Table.5 The level of damage due to virus strips and leaf rust disease

Carrier Type (Fertilizer)	Kind of Trichoderma	Disease rate of the Striped Virus (%)	Intensity of Leaf Rust Disease (%)
Vermicompost	<i>T. koningii</i>	9.46	30.30
	<i>T. viride</i>	6.10	18.30
	<i>T. asperelum</i>	3.60	15.70
	<i>T. harzianum</i>	6.50	22.04
	<i>T. resei</i>	6.03	33.93
	<i>T.asperelum</i> -RS	10.40	34.25
	Control	30.86	55.79
Bioslurry	<i>T. koningii</i>	7.23	43.33
	<i>T. viride</i>	16.60	28.72
	<i>T. asperelum</i>	4.13	14.06
	<i>T. harzianum</i>	5.56	29.33
	<i>T. resei</i>	6.20	33.50
	<i>T. asperelum</i> -RS	6.30	36.83
	Control	28.76	60.45

Fig.1



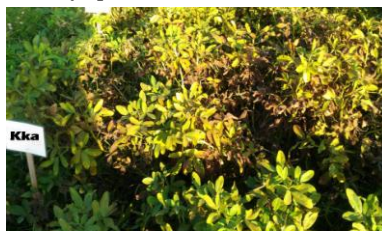
Observing Mottle Virus in Peanuts Only infects Young plants



Symptoms of leaf rust disease



Kontrol hanya memakai Bioslurry



Kontrol hanya memakai Kencing



T. asperelum with Vermicompost carrier

Fresh weight of stover / plants

In Table 2 it appears that the application of Vermicompost organic fertilizer produces plant growth that is far better than the provision of bioslurry fertilizer on peanut plants, this is clear because the macro and micro nutrient elements in vermicompost fertilizer are far more complete than bioslurry. In addition, it is also said high levels of ZPT hormone content (Tiunov *et al.*, 2002). Microbials of *T. asperelum*, *T. harzianum* and *T. reichei* with Vermicompost fertilizer carriers produce the highest crop stover weight when compared with other treatments, thus it appears that the carrier media of vermicompost fertilizer is also able to increase *Trichoderma* pupil compared to bioslurry (Munroe, 2003; Kuruparan, 2005)

Number of pods containing / plant

Peanut plants that received *Trichoderma* treatment with vermicompost fertilizers produced a much higher number of pods containing plantations compared to *Trichoderma* with bioslurry carriers, possibly with Vermicompost carriers (Table 2) *Trichoderma* was more susceptible than bioslurry carriers. Likewise, plants which were only given a vermicompost amount of pods were much higher than bioslurry fertilizer, and *T. harzianum* treatment with vermicompost carriers resulted in the highest number of pods containing compared to other treatments.

Weight of contained pods / plants

In Table 2, it appears that tanman which is only given a vermicompost fertilizer and Biosluri fertilizer without microbial *Trichoderma* (Control) has the ability to produce the smallest pod weight compared to the fertilizer given *Trichoderma*, here it is clear that *Trichoderma* is indeed true as can help the availability of phosphate elements

and produce phytohormone, IAA, Geberelin, which is able to stimulate plants to form a lot of hair roots, with the number of roots formed by the hair will make it easier for the *Rhizobium* bacteria to enter the plant roots and help provide nitrogen for plants, while also able to provide nitrogen for plants (Harman 2000). From the observation it turns out that *T. asperelum* with Vermicompost carriers has the ability to increase the weight of filled pods compared to lainina treatment.

Number of seeds / plant

In table 3, it appears that the control plants (only given Vermicompost fertilizer or bioslurry fertilizer without *Trichoderma*, produced a much lower number of seeds compared to plants treated with *Trichoderma*. This is clear because *Trichoderma* as a fungus that can provide N and P fertilizers is also able to provide growth hormone for plants. In table 3, it can be seen that *T. asperelum* with Vermicompost fertilizer carriers produced the maximum number of seeds per plant 80 seeds / plant followed by *T. asperelum* and *T. harzianum*, and here it is clear that *Trichoderma* alone is indeed a growth stimulating fungus of peanut plants.

Weight of seeds / plants

From the results of the study (Table 3), it appears that plants that were treated with *Trichoderma* with a fertilizer carrier or bioslurry produced a higher seed weight compared to control (only the treatment of fertilizer vermicompost and Bioslurry only. This proved that *Trichoderma* was very potent as a growth stimulator plants and also as natural enemies of pathogens that cause plant diseases. The treatment of *T. koningii*, *T. asperelum* with the vermicompost carrier produced the highest seed weight compared to other treatments followed by *T. viride* with the bioslurry carrier.

Yields of peanut /Ha

In Table 3, it appears that the production of peanuts per Ha, after the plants were given *Trichoderma* mushrooms with a carrier of fertilizer Vermicompost or bioslurry, obtained that the control treatment which is only fertilized with Vermicompost or bioslurry alone produces low production of only about 1.6 tons while those that get *Trichoderma* treatment with a cascade or bioslurry carrier is between 2.5 - 3.9 tons per Ha so it is double the control. Table 3 shows that the treatment of *T. asperelum*, *T. koningii* and *T. harzianum* with vermicompost fertilizer carriers can increase soybean yields to nearly 4 tons, followed by *T. asperelum* with bioslurry carriers. So from the results of this study it is clear that the fungus that stimulates plant growth and that is able to increase peanut production is the fungus *T. asperelum*, and *T. koningii*, so it needs to be studied further, what compounds are produced so as to stimulate plant growth

Level of damage of the Striped Virus in peanuts

Table 4 shows the level of streak virus disease in peanut plants that have received seed treatment and application of vermicompost fertilizer and bioslurry can be seen in Table 4. In the table it appears that the treatment of vermicompost and bioslurry without given *Trichoderma* is very sensitive to virus attacks mottled, but *T. asperelum* although it has been given Vermicompost and bioslurry fertilizer, it is the same as the control, so *T. asperelum* is not good to be used as biological pesticide agent. However, peanut plants that were treated with *Trichoderma viride* and *T. harzianum* were slightly attacked by the striped virus compared to other treatments, when viewed from the *Trichoderma* carrier media, it turns out that bioslurry fertilizer carriers produce a percentage of small striped

disease compared to Vermicompost fertilizer media,

Intensity of leaf rust disease

In table 4 it appears that the control plants were only given a vermicompost fertilizer or bioslurry fertilizer, without being given *Trichoderma* very easily attacked by Belang Virus disease with attack rates of 30.60% to 28.76%, then leaf rust disease to intensities between 55.79 and 60.45%. But for all treatments that received *Trichoderma*, the rate of disease attack was far lower than control. From the research results it turns out that *Trichoderma asperilium* either formulated in vermicompost fertilizers or bioslurry fertilizers has the lowest attack rates of striped virus disease (3.60% and 4.13%) or leaf rust disease with attack intensity of 15.70% and 14.06%.

From the results of this study it can be concluded that;

After the peanut seeds are given seed treatment, *Trichoderma koningii*, *T. viride*, *T. asperelum*, *T. resei* and *T. asperelum* RS formulated in Vermicompost or bioslurry fertilizer are very good in increasing the growth and production of peanuts and increasing resistance plants against striped virus and leaf rust disease compared to Control (only using Vermicompost and bioslurry without *Trichoderma*)

Trichoderma which is formulated in Vermicompost fertilizer has better ability to increase plant growth compared to bioslurry fertilizer

Trichoderma asperelum is the best *Trichoderma* if applied to peanut plants because in the formulation with fertilizer Vermicompost produces plant height, number of branches, number of leaves, amount of leaf

chlorophyll, number of root nodules, fresh plant weight, weight of filled pods, number and weight of planting seeds and cause peanuts can produce 3.9 tons / Ha while Control only 1.65 tons per Ha as well as if *Trichoderma* has been formulated in bioslurry fertilizer, peanut plants can produce 3.70 Tons / Ha

4. In terms of increasing disease resistance it turns out that *Trichoderma asperilium* either formulated in vermicompost fertilizers or bioslurry fertilizers has the lowest attack rates of striped virus disease (3.60% and 4.13%) or leaf rust disease with attack intensity of 15.70% and 14.06%.

5. In the case of increasing peanut production to reach 3.9 tonnes perha, it is better to use *Trichoderma asperelum* formulated in vermicompost or bioslurry fertilizer

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