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C. Policy, Commercialization And Innovation (PCI) International Conference (Sfrn 2019)|C 38 The Role of Various Types and Dosage of Biological Compost (Bio-Compost) on Biology and Soil Fertility in Ginger (Zingiber officinale. L) Misfit Putrina, Yulensri, Kresna Murti Politeknik Pertanian Negeri Payakumbuh misfitputrina@yahoo.co.id Abstract. Prospects of ginger in Indonesia are still quite good, especially for exports, the traditional medicine industry, the food, and the beverage industry. Increasing crop productivity by using chemical fertilizers and pesticides is not a wise way.

Consumer pressure for agricultural products that are free of pesticide residues and chemical fertilizer has been increasing in expectation of a safe food for consumption and a healthy environment. The combination of using organic fertilizer and biological fertilizer is one solution to answer this challenge. This study aims to determine the role of various types and dosages of biological compost on biology and soil fertility planted with ginger (Zingiber officinale L).

The design used is factorial design with Randomized Block Design (RBD) (4 x 3), in which Factor K (bio- compost type) with 4 levels, were K1 = livestock manure compost, K2 = tithonia bio- compost, K3 = straw bio-compost, and K4 = without bio-compost. Factor D (dosage) with 3 levels, were D1 = 3 tons / Ha; D2 = 6 tons / Ha, D3 = 9 tons / Ha, so there were 36 experimental plots. The treatment is carried out at the time of planting by putting into the planting hole. Observations were made at the age of 60 days after planting. The data obtained were analyzed for variance (Anova) and continued by the Duncan test.

The results showed that the highest bacterial population was obtained in a treatment of without bio-compost, the highest pH in the bio-compost of livestock manure at a dose

of 6 tons/ha, the highest EH in a combination of straw bio-compost at a dose of 3 tons/ha, and the highest EC in the combination Tithonia bio-compost with a dose of 3 tons/ha. Keywords: bio-compost, ginger, soil biology, soil fertility. INTRODUCTION Ginger (Zingiber officinale Rosc) is one of the most commonly used herbs, traditional medicinal ingredients, spices, refreshments, and as a commodity export commodity for non-oil and gas.

The supply of ginger from Indonesia to importing countries of ginger in recent years is quite increasing. However, an increase in demand for ginger cannot be offset by an increase in ginger production. Indonesian ginger is exported to several destination countries such as Japan, UAE, Malaysia in the form of fresh ginger, dried ginger and processed (Paimin and Murhananto, 1999). Ginger has long been cultivated as an export commodity, but the development of ginger on a wide scale has not supported the optimal and sustainable cultivation so that productivity and quality are still low.

Various cultivation efforts need to be done to support the resulting good production. C. Policy, Commercialization And Innovation (PCI) International Conference (Sfrn 2019)|C 39 In addition to the use of organic matter is also very instrumental in supporting the increase in plant growth and development. Organic matter plays a role in improving the physical, biological and even chemical properties of the soil. According to Sulistyawati and Nugraha (2011), Soil structure and fertility can be improved with the use of compost.

Increasing the productivity of food crops by using inorganic fertilizers and pesticides (chemicals) is not a wise way, and currently, due to the consumer pressure to want agricultural products free of pesticide residues and artificial fertilizers so that these products must be safe for consumption and the creation of the healthy environment (Sutanto, 2002). The application of biotechnology and organic materials is an alternative that is considered very appropriate to answer all of these challenges, one of the ways by using multipurpose microorganisms that both as a fertilizer and biological pesticides and plant growth stimulants (PGR), then combined with an organic fertilizer in a form of bio-organic fertilizer.

Organic fertilizer is a fertilizer that consists mainly or entirely of organic material derived from plants and/or animals that have been produced by engineering process, which can be in the form of solid or liquid which is used to supply organic materials to improve physical, chemical, and biological properties of the soil. Whereas biological fertilizer is defined as inoculants made from active living organisms which are functional groups of soil microbes that have a function as providers of nutrients in the soil so that they can be available to plants (Suriadikarta and Simanungkalit, 2012). This study aims to

determine the role of various types and dosages of biological compost on biology and soil fertility planted with ginger (Zingiber officinale L).

MATERIALS AND METHOD The design used is factorial design with Randomized Block Design (RBD) (4 x 3), in which Factor K (bio-compost type) with 4 levels, were K1 = livestock manure compost, K2 = tithonia bio-compost, K3 = straw bio-compost, and K4 = without bio- compost. Factor D (dosage) with 3 levels, were D1 = 3 tons / Ha; D2 = 6 tons / Ha, D3 = 9 tons / Ha, so there were 36 experimental plots. The treatment is carried out at the time of planting by putting into the planting hole. Observations were made at the age of 60 days after planting. The data obtained were analyzed for variance (Anova) and continued by the Duncan test. Result and Discussion Results 1. Bacterial Population C.

Policy, Commercialization And Innovation (PCI) International Conference (Sfrn 2019)|C 40 Tabel 1. The effect of giving various types and dosages of bio-compost on microbial populations in ginger. Kind of Dosage Main effect of Bio-Compost D1 D2 D3 Bio-Compost K1 209,33 ab 197,33 ab 138,67 b 181,76 K2 181,33 ab 190,67 ab 188,00 ab 186,67 K3 193,33 ab 185,33 ab 166,67 ab 181,78 K4 Main effect of 289,33 a 174,67 ab 212,00 ab 225,33 Dosage 291,11 187,00 176,34 Note : Numbers in the same column followed by the same small letters and the Numbers on the same row followed by the same capital letters are not significantly different from the DNMRT test at a 5 % level.

Table 1 shows that the K4D1 (without provision of bio-compost) combination treatment gave the best interaction effect on the bacterial population variable on all kind of bio-compost treatments at all tested dose levels and the combination treatment of K1D3 (bio-livestock manure compost) provides the least favorable interaction effect. Through analysis of variance generally known that the kind of bio-compost treatment and the treatment of dosage gave a real interaction effect on the percentage of the microbial population.

The difference in the combination of treatment and dosage occurs in the treatment of bio-livestock manure compost with the treatment of both no treatments of type of bio-compost, whereas the treatment of giving other types of compost with various doses has no significant difference. Significant differences occur from the interaction of treatment without the provision of bio-compost with variables from various interactions of bio-compost treatment, because within 60 days, various treatment interactions have caused competition between microbes, both in the struggle for food (compost) as well as the predatory and parasitic nature of microbes, so the bacterial population in various treatment interactions decreases.

This is in accordance with the statement of Almustanadat (2015) that the negative relationship between 2 microbial populations, both of which have experienced a loss characterized by a decrease in living cells and growth. Competition occurs in 2 microbial populations that use the same nutrients/food, or in a limited nutrient state. C. Policy, Commercialization And Innovation (PCI) International Conference (Sfrn 2019)|C 41 2. EC (Electrical Conductivity) Tabel 2. The effect of giving various types and dosages of bio-compost on EC in ginger.

Kind of Dosage Main effect of Bio-Compost D1 D2 D3 Bio-Compost K1 0,2237 c 0,7937 ab 0,8697 a 0,6290 K2 0,4587 abc 0,3113 bc 0,5407 abc 0,4369 K3 0,5280 abc 0,3247 abc 0,2160 c 0,3563 K4 0,2867 bc 0,2347 c 0,2050 c 0,2421 Main effect of Dosage 0,3743 0,4161 0,4579 Note : Numbers in the same column followed by the same small letters and the Numbers on the same row followed by the same capital letters are not significantly different from the DNMRT test at a 5 % level. Table 2 shows that the treatment and the interaction of Livestock Bio -compost at a dose of 9 tons/ha (K1D3) provide the best interaction effect on the EC variable for all kinds of interaction treatments of bio-compost at all dose levels tested.

The combination treatment of K4D3 (without provision of bio-compost) provides the least favorable interaction effect. Through analysis of variance generally known that the kind of bio-compost treatment and the treatment of dosage gave a real interaction effect on the percentage of electrical conductivity. Significant differences occur from the interaction of treatment without the provision of bio-compost with variables from various interactions of bio-compost treatment, because within 60 days, various treatment interactions have caused the increase of solution concentration which can increase EC. Associations between species that cause one party harmed, the other party benefits or is not affected anything.

The relationship between microorganisms and other organisms that suppress each other's growth is called antagonism. This form of interaction is an asocial relationship. Usually, one species produces a chemical compound that can poison other species which causes the growth of other species to be disturbed. The chemical compounds produced can be secretions or secondary metabolites. Examples of antagonisms include Streptococcus lactis with Bacillus subtilis. Growth of B. subtilis will be inhibited because of lactic acid produced by S. lactis. Antagonistic interactions are also called antibiotics (Kusnaedi, 2018) C.

Policy, Commercialization And Innovation (PCI) International Conference (Sfrn 2019)|C 42 3. EH (Redox Potential) Tabel 3. The effect of giving various types and dosages of bio-compost on EH in ginger. Kind of Bio-Compost Dosage Main effect of Bio-Compost

D1 D2 D3 K1 K2 K3 K4 126,93 cde 138,55 bcd 160,13 a 117,70 e 124,92 de 1 143,50 b 1 131,30 bcde 1 130,40 bcde 1 39,50 bcd 42,12 bc 38,80 bcd 17,70 bc 130,45 141,39 143,41 121,93 Main effect of Dosage 135,83 132,53 134,53 Note: Numbers in the same column followed by the same small letters and the Numbers on the same row followed by the same capital letters are not significantly different from the DNMRT test at a 5 % level.

Through analysis of variance is known that interaction of the provision of all kinds of bio-compost treatment and doses give a real interaction effect on EH, the provision of bio-straw compost for 3ton/ha (K3D1) combination treatment gave the best interaction effect on the EH variable for all K treatments at all tested dose levels. The combination treatment of K4D3 (without provision of bio-compost) provides the least favorable interaction effect. As on EC, microbial interactions in an environment will lead to an increase in solution levels in the microbial environment. The differences that occur in the EH are also caused by various microbial activities.

Enny Widyati (2013) stated that the area in the soil occupied by parts of plants (roots) that interact with microbes is commonly known as rhizosphere (rhizosphere). Rhizosphere is the environment in the soil around the roots of a plant where the chemical and biological activities are directly affected by the root. So the chemical and biological activities in the area are intensively influenced by the chemical compounds produced by the roots and by the microorganisms that inhabit the area.

Rhizo-sphere as an area of micro-ecology that is directly in contact with the roots of plants. So that rhizo-sphere is an area where there is an interdependence between the roots of plants and the associated microbes C. Policy, Commercialization And Innovation (PCI) International Conference (Sfrn 2019)|C 43 4. PH (Soil Acidity) Tabel 4. The effect of giving various types and dosages of bio-compost on PH in ginger. Kind of Bio-Compost Dosage Main effect of Bio-Compost D1 D2 D3 K1 K2 K3 K4 4,5467 a 4,2933 abc 3,8067 de 4,0700 cde 4,5633 a 3 4,2067 abc 4 4,2267 abc 4 4,2100 abc 4 ,7833 e ,0900 cde ,1533 bcd ,4633 ab 4,2978 4,1967 4,0622 4,2478 Main effect of Dosage 4,1792 4,3017 4,1225 Note: Numbers in the same column followed by the same small letters and the Numbers on the same row followed by the same capital letters are not significantly different from the DNMRT test at a 5 % level.

Through analysis of variance is known that interaction of the provision of all kinds of bio-compost treatment and doses give a real interaction effect on PH, the combination treatment of bio-livestock compost with 3 Ton/ha of dose (K1D1) and bio-livestock compost with 6 Ton/ha of dose (K1D2) gives the best interaction effect on the pH variable on all K treatments at all dose levels tested. The combination treatment of

bio-livestock compost with 9 Ton/ha of dose (K1D3) provides the least favorable interaction effect. The decrease in pH is generally caused by the addition of perishable organic compounds into the soil.

The decrease in pH will be faster if the addition of excessive organic compounds and the addition of microbes, both of which tend to produce acidic chemical compounds. Bio-livestock compost is a combination of organic compounds and microbes, it can greatly stimulate increased soil acidity. The chemical compounds produced can be secretions or secondary metabolites. Examples of antagonisms include Streptococcus lactis with Bacillus subtilis. Growth of B. subtilis will be inhibited because of lactic acid produced by S. lactis.

Antagonistic interactions are also called antibiotics (Kusnaedi, 2018) CONCLUSION From the research that has been carried out can be concluded that: 1. Interaction of the provision of all kinds of bio-compost treatment and doses give a real interaction effect on Microbial Population, EC, EH and PH in Ginger. 2. The treatment of without provision of bio-compost give the best interaction effect on the microbial population variable on all bio-compost treatments at all tested dose levels. C.

Policy, Commercialization And Innovation (PCI) International Conference (Sfrn 2019)|C 44 3. The treatment of bio-livestock compost with 9 Ton/ha of dose give the best interaction effect on the EC variable on all bio-compost treatments at all tested. 4. The treatment of bio-straw compost with 3 Ton/ha of dose give the best interaction effect on the EH variable on all bio-compost treatments at all tested. 5. The treatment of bio-livestock compost with 3 Ton/ha of dose and bio-livestock compost with 6 Ton/ha of dose give the best interaction effect on the PH variable on all bio-compost treatments at all tested.

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