POTENTIAL OF PLANT GROWTH PROMOTING RHIZOBACTERIA (PGPR) AS GROWTH STIMULANT FOR ARABIKA COFFEE PLANT (*COFFEA ARABICA* L.)

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ABSTRACT

Enhancement production Arabica coffee plants (*Coffea arabica* L.) are influenced by quality stages nursery. Quality nursery determined by type treatment fertilizer used, start from type and dose used. One of type fertilizer optimal biological use For coffee breeding is Plant Growth Promoting Rhizobacteria (PGPR). For optimizing use of PGPR is necessary exists combination of planting media compost in stages nursery . The purpose of study was for knowing treatment best from results combination treatment between giving PGPR and compost to growth arabica coffee seed. This research used Completely Randomized Design with 2 replications. First treatment consists from addition of PGPR as 0 ml, 20 ml, 40 ml, 60 ml and 80 ml and second treatment consists by giving compost with comparison as much as 0 gr; 100 gr; 200 gr; 300 gr and 400 gr. Parameters observed in the study was plant height, total leaves and stem diameter. Observation result plant height showed that treatment best indicated on the gift concentration of 60 ml PGPR with plants height as 9.76 cm and the lowest in the control treatment with plant height as 6.45 cm. Observation of total leaves treatment best when additon 60 ml of PGPR with total leaves as many as 8.35 strands and the lowest in the control treatment with total leaves as 3.56 pieces. Observation of stem diameter showed that the best result was treatment PGPR addition of 40 ml with diameter of 4.67 mm. By general results testing show that addition of PGPR with combination of compost media influenced significant to coffee growth.

Keywords: *Plant Growth Promoting Rhizobacteria, Arabica Coffee, Compost*

1. Introduction

Stages coffee breeding is very important part in matter determination productivity plant at the moment harvest later . Stages nursery must managed with Good . Election seeds is step beginning in determine success coffee cultivation. Nursery requires planting media with characteristic good physical, chemical and biological conditions (Mansur & Indrawan , 2019). Frequent seeding medium used was top soil layer with mixed with fertilizer organic so that obtained media with good fertility (Nurhakim and Rahayu, 2014). Apart from elections the right seeds, fertilization is also a the most important stage for its creation growth maximum breeding.

One of potential fertilizer in arabica coffee cultivation was biofertilizer. Fertilizer biological was Fertilize frequently called as fertilizer microbes, are microbes life given to in land as inoculant for help plant provide certain nutrients for growth (Yunidawaati et al., 2020). One of biofertilizer potential for growth plant was *Plant Growth Promoting Rhizobacteria* (PGPR). PGPR is gathering microbes like *Pseudomonas, Azotobacter, Seratia* and *Bacillus* (Rahni, 2012) which is capable increase growth plant because its abilities synthesize hormone IAA (Indole-3-Acetite-Acid) (Dewi et al, 2015), cytokinins and gibberellins which function help extension roots (Bolero et al, 2007), and induce plants to survive to pathogen attacks (Azmi & Ari, 2018).

Apart from use fertilizer biological, addition of planting media organic is also necessary For effort enhancement effectiveness use of planting media can done through giving fertilizer organic and or fertilizer bioavailability to provide the required nutrients seeds fulfilled (Data and Information Center Agriculture , 2019). Use fertilizer the will increase growth coffee seeds so generated seeds with optimal growth. One of way that can be taken is mix the soil medium with *Plant Growth Promoting Rhizobacteria*. Growing media capable produce growth healthy seeds if in the application mixed with fertilizer organic like compost (Fery et al., 2015) and availability mineral nutrients for plant good macro nutrients and micro nutrients can attempted through addition bacteria from group rhizobacteria that can added through addition of PGPR.

Based on explanation above, it was necessary for research about potency use of PGPR with combination of planting media compost to growth arabica coffee seeds. This research purposed for knowing the right dose in fertilization for getting optimal growth.

2. Research Method

Study carried out from July to October 2023 at the Laboratory Microbiology Faculty of Science and Technology, University of Pembangunan Panca Budi. The process of making PGPR was carried out with soak root bamboo for 4 days, then results marinade mixed with solution additionally consisting distilled water, bran ground, sugar, shrimp paste and cooked lime until blended. Mixture this suspension then filtered and entered to in jerry canned and fermented for 14 days. Stages PGPR application was carried out when the coffee ready sprout and grow leaves at 50 days of age after plant.

Method of this research used Completely Randomized Design with 2 replications. First treatment consists by addition of PGPR as 0 ml, 20 ml, 40 ml, 60 ml and 80 ml and treatment second consists from giving compost with comparison as much as 0 gr; 100 gr; 200 gr; 300 gr and 400 gr. Parameters observed in the study was plant height, total leaves and stem diameter .

3. Results and Discussion

Height Growth of Arabica Coffee Plants (*Coffea arabica* L.)

Based on observations made for 4 months after planting, obtained average height data tested plants with Duncan's Test for see the difference. Data retrieved every One month after plant (MAP). High data plants in each treatment by addition of PGPR and additions compost can be seen in Table 4.1 below.

Table 1. Observation Data on the Height of Arabica Coffee Plants (*Coffea arabica* L.)

Treatment	Average Plant Height (cm)			
	1st MAP	2nd MAP	3rd MAP	4th MAP
Addition of PGPR				
Control : 0 ml	4.63 chAP	6.47 cB	6.89 cC	8.76 cC
P 1 : 20 ml	4.65 aA	6.81 cAP	8.66 aA	11.89 aA
P 1 : 40 ml	3.94 abAB	6.79 aA	7.86 bB	10.29 bB
P 2 : 60 ml	2.98 bB	5.70 cB	7.59 bB	14.55 bB
Addition of Compost				
I0 = 0 gr	3.31 aA	6.60 aA	7.01 aA	10.07 a A
I1 = 5 gr	3.67 aA	5.95 aA	7.21 aA	10.18 bB
I2 = 10 gr	3.78 aA	5.83 aA	7.36 aA	10.19 abAB
I3 = 15 gr	4.01 aA	5.87 aA	8.03 aA	10.25 aA

Based on observing the data above, can be seen that the highest data on week first in treatment P1 with addition of PGPR 20 ml with average height 4.65 cm. Meanwhile, the lowest data was in treatment P2 (addition of PGPR 60 ml) with average height 2.98 cm. Observations on week to four highest data shown in treatment P2 (addition of PGPR 60 ml) with tall plants 14.55 cm and the lowest data was in the control treatment without exists addition of PGPR. This result showed that with PGPR administration provides significant results to arabica coffee growth .

Growth Number of Arabica Coffee Leaves (*Coffea arabica* L.).

Based on observations for 4 months after planting (MAP), obtained data on the average total leaves with Duncan's Test for see the difference . Data retrieved every One month. Total leaves data in each treatment of PGPR addition and compost additions can be seen in Table 4.2 below.

Table 2. Observation Data Number of Arabica Coffee Leaves (*Coffea arabica* L.)

Treatment	Average of Total Leaves		
	1st MAP	2nd MAP	3rd MAP
Addition of PGPR			
Control : 0 ml	3.49 aA	5.99 bB	8.24 aA
P 1 : 20 ml	4.24 aA	6.74 aA	9.74 aA
P 1 : 40 ml	3.49 aA	5.24 bB	9.74 aA
P 2 : 60 ml	3.49 aA	5.24 bB	9.24 Ah
Addition Compost			
I0 = 0 gr	3.39 aA	5.04 aA	9.99 aA
I1 = 5 gr	3.74 aA	5. 49 aA	9.24 aA
I2 = 10 gr	3.74 aA	5.24 aA	9.24 aA
I3 = 15 gr	3.74 aA	5.49 aA	9.14 aA

Based on observing the data above, you can seen that the highest data on week first in treatment P1 with addition of PGPR 20 ml with total leaves average as 4.24. Meanwhile, the lowest data was in treatments I1, I2 and I3 (Addition Compost 5 gr, 10 gr, 15 gr) with amount leaf average 3.74. Observations on week to four highest data shown in treatment I0 (without compost) with an average total leaves as 9.99 and the lowest data was in the control treatment without addition of PGPR to the average amount leaf as much as 8.24. This matter show that with PGPR administration provides significant results _ to growth Arabica coffee leaves . This matter in accordance with results study Muliasari (2016) that amount leaf correlated positive with tall seeds , then amount leaf There is connection positive to increase tall seeds . The more tall seeds so the more there are lots of them the resulting leaves . There are two factors main influence, first actor was including genetics, hormones, size , level maturity and hardness seeds, meanwhile factor second origin from outside such as water, temperature, oxygen, growth media. Giving of PGPR was factor from beyond capable produced phytohormones so that induced germination (Yunidawati et al., 2020).

4. Stem Diameter Growth (*Coffea arabica* L.)

Based on observations made for 4 months after planting (MAP), obtained data on the average diameter of the tested stems with Duncan's Test for see the difference. Data retrieved every one month. Stem diameter data for each treatment administration of PGPR and additions compost can be seen in Table 4.3 below.

Table 3. Observation Data on Arabica Coffee Stem Diameter (*Coffea arabica* L.)

Treatment	Average stem diameter (mm)		
	1st MAP	2nd MAP	3rd MAP
Addition of PGPR			
Control : 0 ml	1.65 a A	1.85 a A	2.08 a A
P 1 : 20 ml	1.74 a A	2.95 a A	2.18 a A
P 2 : 40 ml	1.85 a A	2.08 a A	2.34 a A
P 3 : 60 ml	1.85 a A	2.04 a A	2.22 a A
Addition of Compost			
I0 = 0 gr	1.83 a A	2.02 a A	2.26 a A
I1 = 5 gr	1.86 a A	2.07 a A	2.31 a A
I2 = 10 gr	1.73 a A	1.94 a A	2.15 a A
I3 = 15 gr	1.67 a A	1.90 a A	2.10 a A

Based on observing the data above, you can seen that the highest data is on week first in treatment P1 with addition of 20 ml PGPR with average stem diameter as 1.74 mm. Meanwhile, the lowest data was in the control treatment (without PGPR) with an average stem diameter as 1.65 mm. Observations on week to four highest data shown in treatment P3 (addition of PGPR 60 ml) with an average stem diameter of 3.00 mm and the lowest data in treatment I3 (addition compost 15 gr) with an average stem diameter as 2.69 mm. This result showed that with PGPR administration provides

significant results to growth arabica coffee leaves. Rokhani *et al*. (2016) stated type and ability rhizobacteria contained in PGPR was different and has implications for the production of IAA which is hormone growth .

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