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NP Concentration and Yield of Glutinous Corn Aplicated by Bio-ameliorant Treatment

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Abstract:- Until now, corn is still the second strategic commodity after rice because corn is a cereal commodity with high economic value. This experiment was conducted in Moncok, Ampenan District, Mataram City, at the Microbiology Laboratory and Soil Physics and Chemistry Laboratory, Faculty of Agriculture, Mataram University. The experimental design used was a Randomized Block Design (RBD) with three replications and five bio-ameliorant treatments, namely: P0: Control (without bio-ameliorant), P1: bio-ameliorant dose 5 tons/ha , P2: bio-ameliorant dose 10 tons/ha, P3 : bio-ameliorant dose 15 tons/ha , P4: bio-ameliorant dose 20 tons/ha. The observation data were analyzed using analysis variance followed by the honest significant difference test at a 5% significance level. Research results show the 20 t/ha bio-ameliorant treatment gave the best results compared to other bio-ameliorant treatments. Treatment with a bio-ameliorant dose of 20 t/ha gave the highest NP nutrient concentrations, and yield compared to other bio-ameliorant treatment. Treatment with a bio-ameliorant dose of 20 t/ha provided the best mycorrhizal development compared to other bio-ameliorant treatments.

Keywords:- *Concentration nutrients, mycorrhiza, soil fertility.*

I. INTRODUCTION

Until now, corn has been the second strategic commodity after rice because it is a cereal commodity with high economic value. In Indonesia, corn is an agricultural commodity that is a source of carbohydrates and popular among people because of its sweet taste, high content of carbohydrates, protein, vitamins, and low fat content. Corn contains relatively high sugar levels and is usually harvested young for consumption. For farmers, this commodity is a hope, because its selling value is quite high and it can be marketed to supermarkets or restaurants. Apart from being a source of food and feed, corn is also widely used as a raw material for energy and other industrial raw materials, whose demand continues to increase every year (Hermanto et al. 2009).

Corn production in 2021 is likely to increase by 62.72 thousand tons (CBS, 2021). This increase was caused by the expansion of planting areas, which was also supported by improvements in the application of corn cultivation technology. Efforts to increase the productivity of corn farming depend heavily on the ability to provide and implement cultivation system technology that truly complies with recommendations, such as the use of quality seeds, spacing of plants, irrigation, eradication of pests and diseases, and the use of fertilizer (Sudadi and Suryanto, 2001).

However, the main problem in the field is that the cultivation techniques used by farmers still use local corn, the selling price and yield of which are still low. The cultivation technique is still conventional and relies on high doses of inorganic fertilizer. Apart from that, the sandy soil used by farmers is porous, has very low water-holding capacity, and the organic matter content is also low, making it a major obstacle in increasing crop yields (Khair, 2013). However, on the other hand, around the cultivation location, there is a lot of cow dung waste, compost from agricultural products and unused rice husks. This waste material can be processed into bio-ameliorant as a soil conditioner, which can improve soil structure and increase the soil's water-holding capacity. In addition, the addition of native mycorrhizae to bio-ameliorant can increase nutrient availability for plants, which can increase the efficiency of plant roots to absorb nutrients by 2-3 times (Hartatik et al. 2015).

One concept that can be applied to increase soil fertility and glutinous corn yields is the application of bio-ameliorant, which is a combination of biological resources (mycorrhizal biological fertilizer) with soil amendments, especially organic fertilizers (compost, manure, and rice husk charcoal), which can increase water and soil fertility continuously (Astiko, 2015, Astiko 2016; and Simarmata et al, 2016). This bio-ameliorant can be made from agricultural waste that has not been used properly by farmers, namely cow drum fertilizer, agricultural waste and rice husks (Astiko, 2020; Astiko, 2022). These materials can be processed into mature drum fertilizer, which is good for plants; agricultural waste can be used as compost; and rice husks can be processed into biochar as a raw material for bio-ameliorant. The addition of bio-ameliorants to porous and nutrient-poor soil can glue crumbly soil particles together into unified soil aggregates. Bio-ameliorant can be enriched by adding mycorrhizal biofertilizer, which can help increase fertilization efficiency through its role in improving the physical, chemical, and biological properties of soil (Astiko, 2019; and Astiko, 2021).

However, the optimum dose of bio-ameliorant that can increase corn growth and yield has not been widely studied. Therefore, this research will examine " NP Concentration and Yield of Glutinous Corn Aplicated by Bio-Ameliorant Treatment ". This research aim to determine the effect of bio-ameliorant treatment on NP concentration, and yield of glutinous corn.

II. MATERIALS AND METHODS

A. *Methods, Place, and Time of Experiment*

The research method used is an experimental method with experiments on dry land. This experiment was carried out in Moncok, Ampenan District, Mataram City, at the Microbiology Laboratory and Soil Physics and Chemistry Laboratory, Faculty of Agriculture, Mataram University.

B. *Tools and Materials*

The tools used in this experiment were buckets, pots, measuring spoons, ovens, scales, binocular microscopes, magnetic stirrers, cups, tweezers, graduated sieves, centrifuges, funnels, Petri dishes, shovels, hoes, sickles, and hand counters. Meanwhile, the materials used in this experiment were corn seeds of the Kumala F1 variety, Urea fertilizer, Phonsca fertilizer, cow manure, mycorrhizal biofertilizer, Orga Neem pesticide, plastic bags, tissue, label paper, soil samples, root samples, methylene blue , KOH 10%, sucrose, distilled water, filter paper, and writing utensils.

C. *C. Experimental Design*

The experimental design used was a factorial randomized block design (RBD) with three replications and five bio-ameliorant dose treatments, namely (Gomez et al. 1984): P0: Control (without bio-ameliorant), P1: bio-ameliorant dose 5 tons/ha , P2: dose bio-ameliorant 10 tons/ha, P3: bio-ameliorant dose 15 tons/ha , P4: bio-ameliorant dose 20 tons/ha.

D. *Preparation and Implementation of Experiments*

The field was cleared of weeds, and experimental plots measuring 3 m by 2 m were created for the ameliorant dose treatment. After that, irrigation channels were created between the plots, which were 50 cm wide, and the beds, which were 25 cm high, by hoeing the dirt.

The seeds used are the white pulut glutinous cornwith the trade name "Kumala F1". Pulut Kumala F1 Corn is a hybrid Pulut Corn seed that is very suitable for planting in lowland areas. The resulting plants are uniform with medium stem height; and the white corn kernels taste sweet, have a soft texture.

Using corn as host plants, mycorrhizal isolates were multiplied in culture pots using up to 5 kg of sterile cow dung mixed with soil (50%:50%). A combination of soil, roots, spores, and mycorrhizal hyphae is used in mycorrhizal inoculation. The funnel method of inoculation was used, which involved folding filter paper into a triangle, adding 40 g of MAA, and then placing the host plant on the filter paper. After that, soil is applied to the filter paper, and the plants are permitted to develop (Sastrahidayat, 2011; Simarmata, 2017). The plant roots are chopped after 50 days, and the soil in the culture pot is then blended until it is smooth. The culture potting media soil is then thoroughly combined with the blender's output. After that, this mixture was passed through a sieve with a diameter of 2 mm. Next, a uniform mixture of cow dung, rice husk charcoal, and compost is added to the mycorrhizal inoculant, with a percentage ratio of 25%: 25%: 25%: 25%. The mixture of ameliorant is subsequently sieved through a 2 mm diameter sieve, yielding flour as the ultimate output. Bio-ameliorant plus mycorrhiza is given at planting time. Bio-ameliorant plus mycorrhiza in powder form is placed at a depth of ± 10 cm evenly to form a layer. The bio-ameliorant plus mycorrhiza indigenous used is a mixture of root pieces, fungal spores, fungal hyphae, and pot culture medium in powder form at doses according to the treatment (Astiko, 2015; Astiko et al. 2016a).

Planting corn seeds is done by making a hole on the soil. Each hole is filled with two corn seeds with a corn planting distance of 60 x 40 cm. Embroidery is carried out by replanting corn seeds 7 days after planting to replace dead or abnormally growing plants. After the plants grow, thinning is carried out, leaving one plant at 14 days after planting (DAP). Meanwhile, fertilization is carried out by applying inorganic basic fertilizer with the application of half the recommended dose, namely urea fertilizer (175 kg/ha and phonska 125 kg/ha) (Astiko et al. 2016b). Inorganic fertilizer as basic fertilizer, is given 1/2 dose at the age of 7 days after planting and the remaining 1/2 dose is given 14 days after planting.

Weeding involves pulling weeds every time they grow as part of plant maintenance. Plants are irrigated based on the amount of rainfall in the field, or in the absence of rain, by watering. Meanwhile, the organic fungicide Azadirachtin, also known as Orga Neem, is sprayed on plants at intervals of seven days at a concentration of 3 milliliters per liter of water.

E. *Observation Parameters*

The parameters studied in this research include growth, yield, and yield components of corn plants, nutrient concentration, and mycorrhizal population. The growth parameters observed were plant height, number of leaves, wet weight of crown and roots, dry weight of crown and roots, wet stover weight per plot, dry stover weight per plot, then yield parameters and yield components, namely fresh cob weight per plant, dry ear weight per plant, ear length, ear diameter, fresh shell weight per plant, dry shell weight per plant, fresh ear weight per plot, soil nutrients, number of mycorrhizal spores and percentage of root colonization by mycorrhiza.

F. *Data Analysis*

The honest significant difference test (HSD) was used at the 5% level of significance to further test the analysis variance results, which revealed significant differences.

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III. RESULTS AND DISCUSSION

A. *Plant Height and Number of Leaves*

The results of the analysis variance showed that the treatment dose of 20 t/ha had a significant effect on plant height and the number of leaves of corn plants. Compared with giving doses of other bio-ameliorants when plants were 14-65 DAP. The average results for plant height and number of leaves at a bio-ameliorant dose of 20 t/ha can be seen in Table 1.

Table 1:- The average plant height and number of leaves at bio-ameliorant treatment.

Treatment	14 DAP	28 DAP	42 DAP	65 DAP
Plant height (cm)				
P0: (Without bio-ameliorant)	18.66^{b}	54.66^{c}	100.33^{d}	109.33^{d}
P1: Bio-ameliorant dose 5 t/ha	34.33^{a}	91.66^{b}	125.00^{c}	141.66^{c}
P2: Bio-ameliorant dose 10 t/ha	35.66^{a}	117.66^{a}	147.00^{b}	161.00^{b}
P3: Bio-ameliorant dose 15 t/ha	37.66^{a}	130.00^{a}	153.66^{b}	168.00^{b}
P4: Bio-ameliorant dose 20 t/ha	39.00^{b}	139.66^{a}	174.33^{a}	193.00^{a}
HSD 5%	0.09	18.76	4.58	8.98
Number of Leaves				
P0: (Without bio-ameliorant)	5.00^{a}	5.66^{d}	7.66^{d}	9.66^{d}
P1: Bio-ameliorant dose 5 t/ha	6.66^{a}	6.66^{c}	8.66^{c}	10.66^{d}
P2: Bio-ameliorant dose 10 t/ha	7.00^{a}	7.33^{c}	9.33^{c}	12.66^{c}
P3: Bio-ameliorant dose 15 t/ha	7.00^{a}	7.33^{b}	10.66^{b}	14.66^{b}
P4: Bio-ameliorant dose 20 t/ha	7.66^{a}	9.66^{a}	11.66^{a}	16.66^{a}
HSD 5%	1.45	0.95	0.48	0.84

Bio-ameliorant treatment at a dose of 20 t/ha had a significant effect on corn plant height at plant age 14-65 DAP. This can be seen from the effect of the bio-ameliorant dosage treatment, which shows that there are significantly different plant heights. Corn plants also gave the best growth response to the treatment with a bio-ameliorant dose of 20 t/ha so that in the process of height, growth the corn plants gave better growth results. This is because the compost content in bio-ameliorant has a fertility effect on the growth of corn plants. According to Prananda et al. (2014), the use of organic materials such as compost as an additional material or substitute for topsoil is known to increase the availability of nutrients in the soil. This situation causes the compost to improve the physical properties of the soil; the soil becomes crumbly, which in turn allows, the beneficial soil microbes to live more fertilely so that the growth of corn plants, in this case, the plant height parameters, has a very real or better effect.

The results of the research showed that the highest number of leaves was obtained in the treatment with a bio-ameliorant dose of 20 t/ha (P4) at 14-65 DAP, namely (16.66) strands, which was significantly different from the treatment with a bio-ameliorant dose of 15 t/ha (P3), the bio-ameliorant dose of 10 t/ha (P2), the bio-ameliorant dose of 5 t/ha (P1) and the control (P0). The number of leaves of corn plants given a bio-ameliorant dose of 20 t/ha gave the best growth response, resulting in the highest number of leaves. This indicates that the bio-ameliorant dose treatment provides sufficient availability of nutrients, in line with research by Astiko et al. (2022), which states that soil with good structure, in other words, soil that contains lots of microorganisms and reduced soil density, can absorb water and dissolved nutrients.

According to Sutedjo (2002), the type of manure in bio-ameliorant can be considered a complete fertilizer because, apart from producing available nutrients, it also increases the activity of microorganisms in the soil. In line with Asroh's (2009) research it is stated that cow manure can increase the growth and yield of corn plants, especially the number of leaves. This is thought to provide sufficient manure to provide nutrients in the soil and help the growth of corn plants. The function of cow manure in providing N for plants is to help the growth of leaves so that the number of plant leaves becomes larger and wider and also improves the quality of corn plants (Sutedjo, 2010). Apart from nitrogen, potassium is also a nutrient that corn plants need in large quantities. Element K is an essential element that plays a role in plant photosynthesis because it is involved in ATP synthesis, the production of photosynthetic enzymes such as RuBP carboxylase, and the absorption of CO_2 through the leaf mouth (Munawar, 2011).

B. *Wet and Dry Biomass Weight*

The results of the analysis of variance showed that administering a bio-ameliorant dose of 20 t ha $^{-1}$ had a significant effect on increasing the wet and dry weight of plant roots and canopy compared to administering other bio-ameliorant doses. The results of the HSD test at the 5% level showed that giving a bio-ameliorant dose of 20 t/ha compared to other treatments could increase the weight of wet and dry biomass of plant shoots and roots at the age of 42 DAP, namely (536.36 and 93.46) g/plant, while the dry biomass weight of shoots and roots was 135.31 and 64.53 g/plant. At 65 DAP, it was 317.00 and 120.33 g/plant and at dry weight it was 126.35 and 70.80 g/plant. The results of the average wet and dry biomass weights (shoot and roots) at 42 DAP and 65 DAP can be seen in Table 2.

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The bio-ameliorant dose treatment of 20 t/ha had a significant effect on the weight of wet stover and the weight of dry stover, which was thought to be because the higher the weight of wet biomass, the higher the weight of dry biomass in corn plantings. The weight of the dry biomass of the plant indicates a good plant response to the dose of bio-ameliorant. This shows that the wet and dry biomass weight of plant roots and shoots is increasing because it is thought that the applied organic material can cause the soil to become more crumbly so that the roots develop more easily and absorb nutrients more optimally (Sertua et al. 2014). According to Prasetyo et al. (2014), increasing soil pores causes air availability and root penetration to increase, affecting the processes of root respiration and nutrient absorption, which will later influence plant development and growth. In line with research by Agusni and Satriawan (2014), the function of plant roots is to absorb nutritional elements in the soil and translocate them to all plant tissues so that the formation of leaf chlorophyll will run optimally, which is used for the photosynthesis process. Increasing the photosynthesis process that occurs will increase the formation of photosynthesis produced by plants, namely in the form of organic compounds, which will be distributed throughout the plant tissue, so that it can increase the wet and dry biomass of corn plants.

The primary reason is that mycorrhiza can significantly improve nutrient absorption, including both macro- and micronutrient absorption. In addition, mycorrhizal roots can absorb nutrients in bound forms that are unavailable to plants. Fresh root weight increases with increased mycorrhizal colonization. This is because mycorrhizal plants have a greater capacity to translocate carbon into their roots than do non-mycorrhizal plants.

Table 2:- The average weight of wet and dry biomass of shoot and root at bio-ameliorant treatment per plant aged 42 and 65 dap.

Treatment	Shoot (g)		Root (g)	
	42 DAP	65 DAP	42 DAP	65 DAP
Wet Biomass				
P0: (without bio-ameliorant)	166.56^{e}	106.33^{e}	27.66^{e}	64.66^{e}
P1: Bio-ameliorant dose 5 t/ha	212.93^{d}	134.33^{d}	39.26^{d}	73.33^{d}
P2: Bio-ameliorant dose 10 t/ha	305.90^{c}	186.33^{c}	44.36^{c}	81.33^{c}
P3: Bio-ameliorant dose 15 t/ha	453.60^{b}	216.33^{b}	64.53^{b}	114.66^{b}
P4: Bio-ameliorant dose 20 t/ha	536.36^{a}	317.00^{a}	93.46^{a}	120.33^{a}
HSD 5%	24.69	2.35	0.65	1.19
Dry Biomass				
P0: (without bio-ameliorant)	41.45^{e}	37.1^{e}	14.56^{e}	37.51^{d}
P1: Bio-ameliorant dose 5 t/ha	49.53^{d}	56.58^{d}	18.18^{d}	38.07^{cd}
P2: Bio-ameliorant dose 10 t/ha	68.36^{c}	67.74^{c}	27.72^{c}	39.11^{c}
P3: Bio-ameliorant dose 15 t/ha	125.75^{b}	102.11^{b}	42.11^{b}	67.52^{b}
P4: Bio-ameliorant dose 20 t/ha	135.31^{a}	126.35^{a}	64.53^{a}	70.80^{a}
HSD 5%	0.86	0.45	0.15	0.70

C. C. Wet and Dry Weight of Corn Plant Stover per Plot

The results of the analysis of variance showed that the weight of wet and dry stover per plot at a bio-ameliorant dose of 20 t/ha showed the highest weight values, namely 7.00 and 6.13, and was not significantly different from the bio-ameliorant treatment at a dose of 15 t/ha , 10 t/ha and 5 t/ha . Meanwhile, the treatment without bio-ameliorant (control) showed wet and dry stover weight values of 2.26 and 1.96, which were significantly different from the other treatments.

Table 3:- Wet and Dry Stove Weights Per Plot (kg) at bio-ameliorant treatment age 65 DAP.

Treatment Dosage	Wet stover weight	Dry stover weight
P0: (without bio-ameliorant)	2.26^{b}	1.96^{b}
P1: Bio-ameliorant dose 5 t/ha	4.80^{a}	4.03^{ab}
P2: Bio-ameliorant dose 10 t/ha	5.56^{a}	4.50^{ab}
P3: Bio-ameliorant dose 15 t/ha	6.30^{a}	5.03^{a}
P4: Bio-ameliorant dose 20 t/ha	7.00^{a}	6.13^{a}
HSD 5%	2.13	2.65

Bio-ameliorant treatment with a dose of 20 t/ha can increase wet stover per plot of roots and crown of corn plants. The increase in wet stover weight per plot in the bio-ameliorant treatment with higher doses is thought to undergo the decomposition process more quickly so that the nutrients can be directly utilized by the plants. Plants given bio-ameliorant which comes from organic fertilizers and mycorrhizal biofertilizers can grow better than plants

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without bio-ameliorant treatment and without mycorrhiza (control). According to Asroh (2010), activity microbes can also increase the soil's ability to store water nutrients are more easily absorbed by plants.

Increasing the yield of plant wet stover weight can achieve results optimal, because the plant gets the nutrients it needs so that the increase in the number and size of cells can reach optimal levels,which also as allows for an optimal increase in plant water content. As added by Levy (2007), part of the weight of plant waste is caused by water content. Furthermore, according to Shinners et al. (2007), the weight of the stover plant wetness generally fluctuates greatly, depending on the circumstances plant humidity, while according to Jurmin (2002), explains that the amount of water needed for each growth phase is directly related to physiological processes, morphology, and environmental factors.

D. Soil Nutrient Concentration

The results of the analysis variance showed that administering a bio-ameliorant dose of 20 t/ha gave significantly different results on the parameters of total N concentration (g/kg) and available P (mg/kg). Compared with other bio-ameliorant dose treatments when the plants were 42 and 65 DAP. The 20 t/ha bio-ameliorant dose treatment provided a significant difference in the 5% HSD test when the plants were 42 and 65 DAP. It can be seen that the soil nutrient concentration provide the highest yields and are significantly different (Table 4).

Apart from the availability of nutrient concentrations in the soil, the air structure and air conditioning of the soil also greatly influence the growth and development of plant roots. The development of a good plant root system greatly determines plant nutrient uptake, which will ultimately determine plant vegetative growth. Administering bio-ameliorants containing mycorrhiza, soil available P tends to increase.

Table 4:- Average concentrations of N total and P available at bio-ameliorant treatment age 42 and 65 DAP.

Treatment	N total (g/kg)		P available (mg/kg)	
	42 DAP	65 DAP	42 DAP	65 DAP
P0: (Without bio-ameliorant)	0.94[d]	24.80[d]	17.19[d]	1.11[d]
P1: Bio-ameliorant dose 5 t/ha	1.56[c]	28.64[c]	17.45[d]	1.22[c]
P2: Bio-ameliorant dose 10 t/ha	1.70[b]	19.03[c]	35.02[c]	1.24[c]
P3: Bio-ameliorant dose 15 / ha	1.71[b]	50.50[b]	60.80[b]	1.50[b]
P4: Bio-ameliorant dose 20 t/ha	1.92[a]	72.26[a]	77.56[a]	1.79[a]
HSD 5%	0.08	2.15	5.64	0.04

The research results showed that giving a bio-ameliorant dose of 20 t/ha gave the highest results, namely (1.92) and (72.26) for total N uptake when the plants were 42 days old and 65 days old. Then the available P is (77.56) and 1.79) compared with other treatments. This shows that there is the ability of mycorrhiza to release soil P from a form that is difficult to dissolve into a soluble form so that available P increases. The mycorrhiza contained in bio-ameliorant is thought to be able to absorb P from P mineral sources, which are difficult to dissolve because it produces organic acids and phosphotase enzymes. This compound can release difficult-to-solve P bonds, such as Al-P and Fe-P so that P availability increases (Sufardi et al. 2013). The highest P availability was obtained when administering bio-ameliorant at a dose of 20 t/ha. Increasing P availability indicates that the ameliorant dose is capable of releasing greater P in the soil, thereby increasing its availability. The higher the P availability index, the greater the ratio of P released (Cleveland et al. 2007). The results of this experiment are in line with the research results of Sufardi (2001), who found that the application of organic material was able to increase the P availability index in Ultisol order soils.

The nutrient content of the plant tissue growing in the soil can be used to determine the current state of nutrients in the soil. This is due to a correlation between the nutrients in plant tissue and the nutrients in the soil (Suharto et al. 2018).

Nitrogen is a macronutrient that is absorbed by plants in large quantities, but for soil in tropical areas, N is one of the elements that is often found to be deficient or deficient to increase plant production (Maschner, 2002). This is one of the causes of the increasing use of inorganic fertilizers, especially fertilizers that contain macronutrients such as phonska which contains the nutrients N, P, and K, resulting in the transport of nutrients by plants from the soil in high quantities.

E. Number of Spores and Mycorrhizal Colonization

The results of the analysis variance showed that bio-ameliorant treatment with a dose of 20 t/ha gave the highest results compared to other bio-ameliorant doses. It can be seen the results of the average number of mycorrhizal spores and root colonization by mycorrhiza at 42 and 65 DAP. The number of spores and root colonization by mycorrhiza increases with increasing plant age.

Table 5:- The average number of spores (spores per 100 g of soil) and colonization value (%-colonization) at bio-ameliorant treatment age 42 and 65 DAP.

Treatment	Number of spores		Colonization	
	42 DAP	65 DAP	42 DAP	65 DAP
P0: (Without bio-ameliorant)	220.33[e]	423.00[d]	21.66[d]	50.00[e]
P1: Bio-ameliorant dose 5 t/ha	288.33[d]	656.66[c]	41.66[c]	60.00[d]
P2: Bio-ameliorant dose 10 t/ha	338.66[c]	831.00[b]	53.33[b]	75.00[c]
P3: Bio-ameliorant dose 15 t/ha	460.33[b]	966.66[a]	68.33[a]	81.66[b]
P4: Bio-ameliorant dose 20 t/ha	52.00[a]	1009.66[a]	78.33[a]	93.33[a]
HSD 5%	3,01	51.74	7.29	3.84

Treatment with a bio-ameliorant dose of 20 t/ha gave the highest results on the number of spores and root colonization of corn plants at 42 and 65 DAP, giving the highest results, namely 52.00 and 93.33, and on colonization, it gave the highest results, 78.33 and 93.33. This is because the higher the root infection, the better to the mycorrhiza's ability to develop. It can be seen from the increase in population on the roots of corn plants, which can increase with bio-ameliorant treatment at a dose of 20 t/ha. Oades (2003) claims that well-structured soil has a high concentration of soil microorganisms and can encourage the establishment of roots that pierce the soil through its pores to collect water and dissolved nutrients. An additional outcome is that soil microorganism development also gets better. According to Astiko (2013) and Kato and Miura (2008), the addition of organic material can trigger the development of microorganisms in the soil, including the mycorrhizal population. After infecting the host plant, and the mycorrhiza will get a carbon supply from the host plant, then the carbon obtained by the mycorrhiza becomes the main factor in its cultural development activities. On the other hand, infected plants will benefit by increasing the absorption of nutrients, water, and minerals in the soil, which will further increase plant growth. The increase in the number of mycorrhizal infections in the roots is due to an increase in plant metabolism such as photosynthesis. The results in the form of photosynthate are then distributed by the plant to the roots as a carbon source for mycorrhizal fungi, with the carbon supply from the plant allowing the mycorrhiza to develop by forming more spores (Dhona et al, 2013). In line with the opinion of Aher (2009), which states that the greater the level of root infection that occurs, the longer the external hyphae network that is formed will allow the roots to be able to absorb more nutrients and phosphorus more quickly so that they will become effective roots for forming associations.

F. *Yield Components*

The results of the analysis variance showed that the treatment dose of 20 t/ha provided significant differences in the parameters wet cob weight, plant harvest dry cob weight, wet cob weight per plot, ear diameter, cob length, wet shelled weight, and planted dry shelled weight. compared with other bio-ameliorant dose treatments when the plants were 65 DAP. The treatment dose of 20 t/ha bio-ameliorant provided a significant difference in the 5% HSD test when the plants were 65 DAP. It can be seen that the corn crop yield components provide the highest yields and are significantly different.

It can be seen in Table 6 bio-ameliorant treatment with a dose of 20 t/ha gave the highest yield compared to the treatment other bio-ameliorants, seen in the parameters of wet cob weight and weight Planting dry cobs gave the highest yield, namely 226.33 g and 197.66 g; the wet cob weight parameter per plot gave the highest results, namely 5.43 g, the cob diameter parameter gave the highest results of 5.06 cm; and the cob length parameter gave the highest result of 17.66 cm, wet and dry shell weight parameters gave the highest results of 127.59 g and 62.13 g/plant.

Table 6:- Wet cob weight, dry cob weight (g/plant), wet cob weight per plot (kg/plot), cob diameter and cob length, wet cob weight, and dry cob weight g/plant at bio-ameliorant treatment age 65 DAP.(Note: wet cob weight (WCW), dry cob weight (DCW), wet cob weight per plot (WCWP), cob diameter (CD), cob length (CL), wet shell weight (WSW), and weight dry shelling (WDS).

Treatment	WCW	DCW	WCWP	CD	CL	WSW	WDS
P0: No bio-ameliorant	105.00[d]	76.66[e]	2.30[b]	2.00[d]	9.66[e]	44.42[e]	12.21[e]
P1: Bio-ameliorant dose 5 t/ha	155.00[c]	1 11.66[d]	3.80[ab]	3.26[c]	14.00[d]	84.22[d]	25.06[d]
P2: Bio-ameliorant dose 10 t/ha	170.00[c]	1 51.66[c]	4.20[a]	3.96[b]	15.33[c]	87.92[c]	35.49[c]
P3: Bio-ameliorant dose 15 t/ha	192.66[b]	1 68.33[b]	4.63[a]	4.16[b]	16.66[b]	114.11[b]	54.02[b]
P4: Bio-ameliorant dose 20 t/ha	226.33[a]	1 97.66[a]	5.43[a]	5.06[a]	17.66[a]	127.59[a]	62.13[a]
HSD 5%	10.24	8.42	1.18	0.19	0.64	1.89	0.90

The results showed that the wet cob weight and wet shelled weight of corn plants in the bio-ameliorant treatment with a dose of 20 t/ha compared to other bio-ameliorant dose treatments showed that the wet cob weight and wet shelled plants gave a better response to the growth and yield of corn plants. Bio-ameliorant treatment in the form of compost can produce photosynthene, which can increase seed weight in corn plants (Wangiyana et al. 2010). According to Hasanah et al. (2010),. bio-ameliorant treatment with higher doses can form sugars and other compatible compounds more optimally. If sugar formation occurs optimally, the translocation of carbohydrates to the cobs will also increase, so the weight of the resulting shelled cobs will also be heavier. Nurhayati (2002) stated that increasing cob weight is closely related to the amount of photosynthate that flows into the cob. If photosynthate transport to the cobs is high, the larger the cobs produced will be, and the amount of photosynthete translocated to the cobs will be greater. The greater the photosynthate that is translocated to the cob, the greater the fresh weight of the cob. According to (Budiman, 2004), mycorrhizal biological fertilizer can help provide P nutrients that are located far from the roots through their hyphae so that P nutrients are available and the photosynthetic results are translocated to the fruit so that the weight of the cobs and shells increases. The availability of sufficient nutrients during growth causes the process of plant metabolism is active, so that the process of differentiation, elongation, and division seems to improve in encouraging seed growth.

IV. CONCLUSION

Bio-ameliorant treatment dose of 20 t/ha gave the best results for the parameters of plant height, number of leaves, wet and dry biomass weight, wet and dry cob weight, wet cob weight per plot, diameter ear, ear length, wet and dry shell weight per plant, soil nutrient concentration as well as the number of spores and mycorrhizal colonization. The wet biomass weight of the shoot and roots of corn plants, which had the best results at 65 days after planting, were 3.17 g/plant and 120.33 g/plant, respectively. The yield component were a wet cob weight of 226.33 g/plant and a dry shell weight of 62.13 g/plant at a treatment dose of 20 t/ha . The parameters of total N and available P nutrient concentrations had the best results at the age of 65 DAP at 72.26 g/kg and 1.79 mg/kg in the treatment dose of 20 t/ha.

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