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Effectiveness of Ameliorants Addition and Mycorrhiza to Increase Yield and Uptake of NP by Sweet Corn in Sandy Soil

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Abstract:- This study aims to determine how effective the application of ameliorants containing mycorrhiza is in increasing the yield and uptake of nitrogen and phosphorus of sweet corn plants. Laboratorium Mikrobiologi dan Laboratorium Fisika dan Kimia Tanah Fakultas Pertanian Universitas Mataram menjadi lokasi percobaan yang dilaksanakan di Moncok Karya, Kecamatan Ampenan, Kota Mataram. Percobaan menggunakan rancangan acak kelompok dengan lima perlakuan amelioran sebagai berikut: PC yang merupakan kombinasi arang sekam padi, kompos, kotoran sapi, dan mikoriza (1:1:1:1); PA yaitu arang sekam padi ditambah mikoriza; PK yaitu kompos ditambah mikoriza; PS yaitu kotoran sapi ditambah mikoriza. The resulting research shows that plant yield, NP uptake, and mycorrhiza development are all effectively increased by applying a mixed ameliorant consisting of cow dung, compost, rice husk charcoal, and mycorrhiza (1:1:1:1). The combination of rice husk charcoal, mycorrhiza, compost, and cow manure produces a mixed ameliorant composition that effectively promotes the highest amount of sweet corn yield.

Keyword:- *Ameliorant, Mychorrhiza,Nitrogen, Phosphate.*

I. INTRODUCTION

Sweet corn is a variety of corn that has sweeter and softer seeds compared to regular corn. Sweet corn is usually consumed fresh or after being boiled. Farmers can be encouraged to develop sweet corn farming because market demand continues to increase and the price of sweet corn continues to improve so that this commodity can be cultivated profitably.

In Indonesia, sweet corn production at the farmer level is still very low, there are many obstacles faced in the cultivation of sweet corn, one of which is low soil fertility and the high price of inorganic fertilizers. (Akil, 2009) The productivity of sweet corn in the country is relatively low, with an average of 8.31 tons/ha, while the potential productivity of sweet corn can reach 12-18 tons/ha. Meanwhile, consumer demand for sweet corn continued to increase from 2014 to 2018. In 2014, sweet corn production was 19 million tons; in 2015, it was 19.61 million tons, in 2016, it was 23.57 million tons, in 2017, it was 28.92 million tons; and in 2018, it was 30.05 million tons (Central Statistics Agency, 2019).

The increasing need for sweet corn cannot be met because sweet corn productivity is still low. This is due to soil conditions that are dominated by porous sand particles, low water holding capacity, and low availability of nutrients and organic matter. This condition is exacerbated by high soil permeability, sensitivity to erosion, and cation exchange capacity (Astiko et al. 2016).

Rice husk charcoal biochar, compost made from city garbage, and cow dung compost are examples of organic ameliorants that can be used to enhance the quality of the soil. The physical, biological, and chemical qualities of soil can all be enhanced by composted chicken manure (Taufaila et al. 2014). Plant development, yield, and soil chemical characteristics can all be increased by applying 5 tons/ha of rice husk charcoal as a soil ameliorant (Onggo et al. 2017). Cow manure can increase nutrient content, lower soil pH, and increase water holding capacity in the soil as a nutrient solvent for plant growth (Muharam, 2017).

According to Astiko et al. (2019), inoculation with native mycorrhiza through seed coating can boost plant development, yield, uptake of N and P by the plants, and availability of nutrients in the corn-sorghum planting pattern in North Lombok's sandy soil.

II. MATERIALS AND METHODS

A. Tools and Materials

An oven, scales, binocular microscope, magnetic stirrer, beaker, tweezers, multi-level sieve, centrifuge, funnel, petri dish, smartphone camera, shovel, hoe, sickle, and hand counter were among the equipment used in this experiment. The Bonanza F1 variety sweet corn seeds, methylene blue, KOH 10%, sucrose, distilled water, raffia rope, cow dung, mycorrhizal biofertilizer, OrgaNeem pesticide, urea and Phonska fertilizers, soil samples, root samples, label paper, and writing utensils were the materials used in this experiment.

B. Place and Experiment Design

Experiments were conducted on dry land with sandy soil. The study was carried out in the soil physics, chemistry, and microbiology labs of Mataram University's Faculty of Agriculture at Moncok Karya, Pejeruk Karya Village, Ampenan District, Mataram City, from May to July 2023. A randomized block design (RBD) with five ameliorant treatments was used to design the trial, i.e., PO in control (without ameliorant) and PC (for mixed ameliorant,

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comprising rice husk charcoal, compost, cow manure, and mycorrhiza (1:1:1). PA (for rice husk charcoal ameliorant + mycorrhizal); PK (for compost ameliorant + mycorrhizal); and PS (for cow manure ameliorant + mycorrhiza). With four repetitions there were twenty plots in total.

C. *Preparation and Implementation of Experiments*

Weeds were cleaned from the land before experimental plots measuring 3 m x 2 m x 0.25 m were created to be used for ameliorant treatment. Subsequently, a hoe was used to cultivate the soil, and 50-cm-wide irrigation ditches were created between each allotment. The Bonanza F1 variety of sweet corn, often known as Bonanza F, is the cultivar utilized in the seeds. When planting, both mycorrhiza and ameliorants are administered, with a dose of 20 t/ha, by equally applying the mixed ameliorant and mycorrhiza powder at a depth of ± 10 cm. The indigenous mycorrhizal type used comes from Wahyu Astiko's collection. Two corn seeds are planted in each hole, with a planting distance of 60 by 40 centimeters. Applying half the recommended dosage of inorganic basic fertilizer-urea fertilizer (175 kg/ha) and phonska fertilizer (125 kg/ha. The organic fungicide azadirachtin, also known as Orga Neem, is sprayed on plants at intervals of seven days with a concentration of 3 milliliters per liter of water. After the plants have been planted for ten weeks after planting (WAP), sweet corn is harvested. When harvesting, the cobs are removed from the stems, broken off on each plant, and then collected.

D. Observation Parameters

Height and number of plant leaves, wet and dry weight of shoots and roots, wet stover weight per plot, dry stover weight per plot, fresh cob weight per plant, dry ear weight per plant, ear length, ear diameter, fresh seed shell weight per plant, dry seed shell weight per plant, fresh ear weight per plot, soil nutrients, plant nutrient uptake, number of mycorrhizal spores, and percentage of root colonies by mycorrhiza are among the parameters observed in this research.

E. Data Analysis

Using Co-Stat software, an analysis of variance was performed on all observational data at a significance level of 5%. The honest significant difference test (HSD) was used at the same level of significance to further test the analysis variance results, which revealed significant differences.

III. RESULTS AND DISCUSSION

A. Plant Height and Number of Leaves

When the plants were 2 WAP-8 WAP, the analysis of variance results showed that providing an ameliorant combination consisting of rice husk charcoal, compost, cow manure, and mycorrhiza (1:1:1:1) significantly affected plant height in comparison to other ameliorant treatments (Table 1). The effect of the mixed ameliorant treatment shows that there is significant plant height, so in the process of growing the height of the corn plants, it gives better growth results. This is due to the availability and absorption of nutrients by the plant roots, where the roots play an important role because they function as absorbers and translocation of nutrients from roots to stems, leaves, or fruit (Roosmarkam & Yuwono, 2002). The facts above are based on the results of research by Astiko (2009), which evaluated the contribution of indigenous mycorrhiza combined with manure to increase corn yields on sandy soil in North Lombok. The mycorrhiza fertilization package combined with manure for corn plants also makes a significant contribution to soil nutrient concentrations, especially N, P, K, and organic C (Raya-Hernández et al. 2020).

Table 1:- Average plant height (cm) in ameliorant treatment ages 2, 4, 6 and 8 WAP

Ameliorative Treatment	**Plant height (cm)**			
	2 WAP	**4 WAP**	**6 WAP**	**8 WAP**
P0: Control (without ameliorant)	15.00^{c}	56.66^{b}	63.00^{d}	89.33^{e}
PA: Rice husk charcoal ameliorant	23.76^{ab}	92.66^{a}	110.66^{c}	139.00^{d}
PK: Compost Ameliorant	27.5^{ab}	99.66^{a}	112.33^{c}	171.66^{c}
PS: Amelioran Cow Manure	32.16^{ab}	98.30^{a}	133.66^{b}	187.66^{b}
PC: Mixed Ameliorant	32.56^{a}	100.66^{a}	177.00^{a}	191.33^{a}
HSD 5%	6.65	25.11	10.04	8.47

Based on Table 2's results, the variance analysis's findings indicate that there was a significant difference in the 5% HSD test when the plants were 2 WAP-8 WSP, and the best result is a mixture ameliorant of rice husk charcoal, cow manure, and compost (1:1:1). The number of leaves on sweet corn plants in the combination ameliorant treatment produced the best result when the plants were age 8 WAP, and this number differed significantly from other ameliorant treatments. The highest number of leaves was obtained in the mixed ameliorant (PC) treatment at 2-8 WAP, namely 13.33 strands, significantly different from the cow manure ameliorant (PS), compost ameliorant (PK), husk charcoal ameliorant, and control (P0) treatments. To achieve the largest yields, the number of leaves on corn plants treated with a mixed ameliorant offers the optimal growth response. The primary reason is that mycorrhiza can significantly improve nutrient absorption, including both macronutrient and micronutrient absorption. In addition, nutrients that are unavailable to plants can be absorbed by roots containing mycorrhizal in bound form (Smith et al., 2011). Therefore, the height and quantity of plant leaves can be increased by using mixed ameliorants in which 25% mycorrhiza is added (Astiko et al., 2023).

Table 2:- Average number of leaves in the ameliorant treatment at 2, 4, 6 and 8 WAP

Ameliorative Treatment	Number of leaves (pieces)			
	2 WAP	4 WAP	6 WAP	8 WAP
P0: Ameliorant (No ameliorant)	5.00^{b}	7.33^{c}	7.33^{e}	8.33^{c}
PA: Rice husk charcoal ameliorant	7.33^{ab}	8.66^{bc}	9.00^{bc}	10.33^{d}
PK: Compost Ameliorant	8.66^{a}	10.33^{a}	10.66^{abc}	11.33^{c}
PS: Amelioran Cow Manure	8.00^{ab}	10.00^{ab}	11.33^{ab}	12.33^{b}
PC: Mixed Ameliorant	8.66^{a}	10.66^{a}	12.66^{a}	13.33^{a}
HSD 5%	2.65	1.08	2.51	0.32

B. Soil Nutrient Concentration and Plant Absrobtion

When the plants were 10 WAP, Table 3's analysis variance results showed treatment that the application of an ameliorant mixture consisting of rice husk charcoal, compost, cow manure, and mycorrhiza (1:1:1:1) had a significant impact on the available P (mg/kg) and total N concentration parameter (g/kg), as well as the absorption parameters N uptake (g/kg) and P uptake (g/kg), when compared to other ameliorants.

When compared to treatments without ameliorants, the average concentration of total N and accessible P in the soil can be considerably raised by providing mixed ameliorants. This demonstrates how applying the mixed ameliorant raises the soil's total N and accessible P levels. The outcomes of this experiment are consistent with those of Sufardi et al. (2013), who discovered that adding mycorrhiza and an organic ameliorant might raise the phosphate status of Andisol soil.

The same thing was reported by Maftu'ah et al. (2013), who concluded that the application of 20 t/ha of ameliorant mixed with 80% chicken manure and 20% dolomite provided the highest dry weight and NPK nutrient uptake in sweet corn plants. Furthermore, research results from Astiko (2013) stated that plant yields can be increased by applying sufficient P fertilization accompanied by the addition of organic material. Low-P fertilization conditions with the addition of compost will increase plant yields because it trigger the role of MA by increasing the number of spores. The increasing role of MA in increasing plant yields is also influenced by dynamic environmental factors, where conditions of low P fertilization with the addition of organic material will support anatomical and physiological changes in the roots, which stimulate increased spore sporulation and root infection.

Table 3:- Average concentrations of total N and available P nutrients in ameliorant treatment at 6 and 10 WAP

Ameliorative Treatment	N total (g/kg)		P available (mg/kg)	
	6 WAP	10 WAP	6 WAP	10 WAP
P0: Control (Without ameliorant)	0.913^{c}	9.373^{d}	17.756^{c}	20.953^{d}
PA: Rice husk charcoal ameliorant	1.150^{b}	18.840^{c}	18.133^{c}	37.600^{c}
PK: Compost Ameliorant	1.150^{b}	18.880^{c}	18.283^{c}	37.716^{c}
PS: Amelioran Cow Manure	1.166^{b}	44.543^{b}	36.96^{b}	50.533^{c}
PC: Mixed Ameliorant	1.756^{a}	68.166^{a}	62.966^{a}	75.436^{a}
HSD 5%	0.090	9.419	4.774	1.123

When mixed ameliorants are applied, the average concentration of total N and accessible P in the soil can be greatly increased. When compared to the control at 6 WAP, the results of the HSD test at the 5% level indicated that applying a mixture of rice husk charcoal with compost and cow manure (1:1:1) may considerably boost plant N and P nutrient uptake. Table 4 shows that the treatment without an ameliorant (control) had the lowest N uptake (g/kg), at 25.466 g/kg, whereas the combination of treatments with mixed ameliorants had the highest value, at 44.966 g/kg. Meanwhile, the P absorption (g/kg) at the age of 6 WAP was 2.62 g/kg and in the mixed ameliorant treatment it increased to 4.10 g/kg. This shows that the mixed type of ameliorant plus mycorrhiza is better at contributing soil P because based on soil analysis results, it has been proven that the mixture of these four ingredients has a higher P content (Astiko et al. 2022). The absorption of nutrients by plants is related to several movements of water and nutrients to the surface of root hair cells, namely mass flow, root interception events, and diffusion events (Wiraatmaja, 2016). Organic materials have a significant effect on increasing mycorrhizal infections in the roots of corn plants and the number of mycorrhizal spores in the root area (Pratikno et al. 2002). The density of spores is one of the factors that influence mycorrhizal infection of roots. The greater the number of spores in the soil, the greater the possibility of plant roots being infected with mycorrhiza (Widiastuti, 2002).

Table 4:- Average N and P nutrient uptake in several ameliorant treatments at 6 WAP

Ameliorative Treatment	N and P uptake of plants aged 6 WAP	
	N uptake (g/kg)	P Absorption (g/kg)
P0: Control (without ameliorant)	25.466^{e}	2.62^{e}
PA: Rice husk charcoal ameliorant	30.773^{cd}	2.92^{d}
PK: Compost Ameliorant	32.950^{bc}	3.64^{c}
PS: Amelioran Cow Manure	34.406^{b}	3.88^{b}
PC: Mixed Ameliorant	44.966^{a}	4.10^{a}
HSD 5%	2.419	0.077

C. Number of Spores and Mycorrhizal Colonization

When mixed ameliorants are applied, the average concentration of total N and accessible P in the soil can be greatly increased. The result of the analysis variance in Table 5 indicates that the treatment of providing an ameliorant mixture of rice husk charcoal with compost and cow manure (1.1.1) is significantly different from other ameliorants in terms of the parameters of the number of mycorrhizal spores and the percentage of root colonization in 6 and 10 WAP, as determined by the 5% HSD test. The highest values for the number of spores and percentage of colonization were found in the mixed ameliorant treatment, namely 424.33 and 750.50, and colonization gave the highest results, namely 80.66 and 90.73. Good results were also obtained from the ameliorant treatment of cow manure, namely 563.66 mixed ameliorants of 44.966 g/kg.

The control treatment (without ameliorant) had the lowest results for both the number of spores and the percentage of colonization, with 71.33 spores per 100 g of soil and 20.30 percent colonization. Additionally, according to Oades (2003), well-structured soil is not dense and has a large number of soil microbes. This allows roots to grow and penetrate the soil through its pores to absorb water and dissolved nutrients. An additional outcome is that soil microorganism development also gets better. The increase in the number of mycorrhizal infections in the roots is caused by 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 (Dhonaet et al. 2013). The density of spores is one of the factors that influence mycorrhizal infection of roots. The greater the number of spores in the soil, the greater the possibility of plant roots being infected with mycorrhiza (Widiastuti, 2002).

Table 5:- Average number of spores (spores per 100 g soil) and colonization value (% Colonization) in ameliorant treatment ages 6 and 10 WAP

Ameliorative Treatment	Number of spores		Colonization	
	6 WAP	10 WAP	6 WAP	10 WAP
P0: No ameliorant	71.33^{e}	92.33^{e}	20.30^{e}	40.36^{d}
PA: Rice husk charcoal ameliorant	173.33^{d}	373.33^{d}	40.46^{d}	60.53^{c}
PK: Compost Ameliorant	253.66^{c}	385.00^{c}	50.50^{c}	60.60^{c}
PS: Amelioran Cow Manure	302.66^{b}	563.66^{b}	60.56^{b}	70.56^{b}
PC: Mixed Ameliorant	424.33^{a}	750.50^{a}	80.66^{a}	90.73^{a}
HSD 5%	40.125	40.388	384.45	3.361

D. Wet and Dry Biomass Weight

The administration of an ameliorant mixture consisting of rice husk charcoal, compost, cow manure, and mycorrhiza (1:1:1:1) had a significant effect on increasing the weight of wet and dry biomass of plant roots and shoots when compared to the control (without ameliorant), according to the results of the analysis variance in Table 6. The application of mixed ameliorant, as opposed to the control (without ameliorant), may raise the wet biomass weight of plant roots and shoots from 16.77 and 137.20 g/plant to 129.23 and 400.40 g/plant, according to the results of the HSD test at the 5% level. In the meantime, at the age of 6 WAP, the dry biomass weight of the roots and shoots grew from 6.40 and 30.46 g/plant to 90.41 and 106.10 g/plant. Similarly, at 10 WAP, the dry biomass weight of roots and shoots went from 12.28 and 34.43 g/plant to 71.41 and 95.00 g/plant, while the wet biomass weight grew from 16.23 and 142.26 g/plant to 116.43 and 278.86 g/plant. Average biomass weights (shoot and roots) at 6 WAP and 10 WAP for both wet and dry conditions increased.

When compared to the control treatment (which does not include an ameliorant), the average weight of the wet and dry biomass of plant roots and shoots can be considerably increased by providing a mixed ameliorant. The physical, chemical, and biological qualities of the soil can all be enhanced by adding mixed ameliorants This is because mixed ameliorant is a material that stabilizes soil aggregates and is also a source of nutrients for plants. Besides that, mixed organic ameliorant materials are an energy source for most soil microorganisms, including mycorrhizae (Luo et al. 2018). In line with research by Prasetyo et al. (2014), increasing soil pores causes air availability and root penetration to increase, affecting the process of root respiration and nutrient absorption, which will later influence plant development and growth.

This demonstrates that there is an increase in the plant's wet and dry biomass when sweet corn plants are treated with a mixed ameliorant. Increases in N and P concentrations in the soil, which are critical for plant growth, cause this increase (Shen et al. 2011). According to Mohammadi et al. (2011), the capacity of mycorrhiza to enhance plant growth and phosphorus nutrient uptake is the primary advantage of symbiosis between plants and mycorrhiza. Plant nutrition can be enhanced, and mycorrhiza can boost plant development and productivity. The description above indicates that the application of mixed organic ameliorant plus mycorrhiza can generally be effective in increasing plant growth (Astiko et al. 2022).

Table 6:- Average wet and dry biomass weight of shoot and root (g/plant) in ameliorant treatment at 6 WAP and 10 WAP

Ameliorative Treatment	Shoot (g)		Root (g)	
	6 WAP	10 WAP	6 WAP	10 WAP
Wet Biomass				
P0: Control (without ameliorant)	137.20^{e}	142.26^{e}	16.77^{d}	16.23^{d}
PA: Rice husk charcoal ameliorant	219.36^{d}	191.13^{d}	25.38^{c}	68.38^{c}
PK: Compost Ameliorant	240.40^{c}	225.26^{c}	25.55^{c}	73.90^{c}
PS: Amelioran Cow Manure	275.58^{b}	246.50^{b}	72.58^{b}	91.23^{b}
PC: Mixed Ameliorant	400.40^{a}	278.86^{a}	129.23^{a}	116.43^{a}
HSD 5%	8.35	7.90	0.79	5.32
Dry Biomass				
P0: Control (without ameliorant)	30.46^{e}	34.43^{f}	6.40^{d}	12.28^{c}
PA: Rice husk charcoal ameliorant	47.80^{d}	56.76^{c}	12.83^{c}	23.46^{bc}
PK: Compost Ameliorant	72.06^{c}	60.76^{d}	14.20^{c}	35.73^{bc}
PS: Amelioran Cow Manure	85.10^{b}	72.80^{c}	48.95^{b}	46.93^{ab}
PC: Mixed Ameliorant	106.10^{a}	95.00^{a}	90.41^{a}	71.41^{a}
HSD 5%	5.00	5.35	3,84	25,98

E. Yield

The mixed ameliorant treatment significantly outperformed the other ameliorant treatments in terms of increasing wet cob weight, dry cob weight, wet shell weight, dry shell weight, ear diameter, and ear length per plant, according to the analysis of variance results at age 10 WAP. Table 7 shows that the mixed ameliorant treatment resulted in wet stover weight, dry stover weight, wet cob weight per plot, wet cob weight, dry cob weight, and cob diameter being the highest results. This is consistent with the resulting research of Fageria et al. (2008) and Rismunandar (2012), who claim that plant development and productivity will function normally if the nutrient requirements for both micro and macro elements are met. According to Wananda and Wahditiya (2023) and Nurhayati (2002), the amount of photosynthate that enters the cob is directly correlated with the weight increase of the cob.

Table 7:- Averageyyield components of sweet corn plants in several ameliorant treatments at 10 WAP

Ameliorative Treatment	WCW	DCW	WCWP	CD	CL	WSW	DSW
P0: Control (without ameliorant)	78.33^{d}	20.67^{d}	4.86^{E}	2.06^{E}	11.8^{c}	90.63^{E}	22.77^{E}
PA:Rice husk charcoal ameliorant	182.00^{c}	24.88^{d}	6.53^{d}	2.46^{d}	19.5^{b}	114.20^{d}	47.34^{d}
PK: Compost ameliorant	218.00^{b}	30.74^{c}	7.33^{c}	3.53^{c}	20.8^{b}	131.00^{c}	49.17^{c}
PS: Amelioran Cow Manure	225.00^{b}	37.83^{b}	8.36^{b}	3.9^{b}	22.63^{a}	152.66^{b}	67.83^{b}
PC: Mixed Ameliorant	247.00^{a}	41.55^{a}	9.36^{a}	4.16^{a}	22.7^{a}	174.70^{a}	79.22^{a}
HSD 5%	7.16	1.34	0.50	0,.41	0.89	5.29	0.056

Note: WCW (Wet cob weight), Dry cob weight (DCW), Wet cob weight per plot (WCWP), Cob diameter (CD), Cob length (CL), Wet shelled weight (WSW), Dry shelled weight (DSW).

Wet stover weight, dry stover weight, and wet cob weight per plot were all significantly affected by the mixed ameliorant treatment, which differed significantly from the treatment that did not apply any ameliorant, according to the analysis of variance results (Table 8). Applying fertilizer containing N to plants will enhance the dry weight of the seeds because, after being absorbed by plants, the N element found in compost, rice husk charcoal, and manure becomes a constituent of organic matter in both the leaves and the seeds (Matthew et al., 2017). In addition to N, ameliorant has a significant amount of P, which is necessary for seed filling, blossom growth, and seed quality. Cow manure, according to Kuntyastuti et al. (2020), can enhance soil aggregates and pores, improving soil drainage and aeration as well as roots' capacity to absorb nutrients. Adding manure as an organic fertilizer also actively contributes to raising the soil's N content, which is necessary for plants.

Table 8:- Wet stove weight, dry weight, and wet cob weight per plot in the ameliorant treatment

Ameliorative Treatment	WSW (kg)	WCW (kg)
P0: Control (without ameliorant)	6.02^{c}	2.16^{b}
PA: Rice husk charcoal ameliorant	7.40^{b}	3.33^{b}
PK: Compost ameliorant	7.96^{bc}	3.56^{ab}
PS: Amelioran Cow manure	8.56^{ab}	4.03^{a}
PC: Mixed Ameliorant	9.80^{a}	4.53^{a}
HSD 5%	0.84	1.11

Note: WSW (Wet Stove Weight), BBK (Dry Stove Weight), and WCW (Wet Cob Weight)

Subowo (2010), reported ameliorant from manure also plays a role in improving the physical, chemical, and biological properties of the soil so that it makes the soil loose, air can enter the soil, can hold water and nutrients so they don't wash away and increase the activity of soil microorganisms. The nutrient content contained in this bio-ameliorant is classified as having a high content of N, P, and K nutrients so that it can be absorbed by plants in sufficient quantities (Ramakrishnan et al. 2023).

IV. CONCLUSION

The resulting research shows that plant yield, NP uptake, and mycorrhiza development are all effectively increased by applying a mixed ameliorant consisting of cow dung, compost, rice husk charcoal, and mycorrhiza (1:1:1:1). The combination of rice husk charcoal, mycorrhiza, compost, and cow manure produces a mixed ameliorant composition that effectively promotes the highest amount of sweet corn yield.

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