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Response of Glutinous Corn *(Zea mays var.* Ceratina Kulesh) to Organic Fertilizer Application on Acidic Dry Land

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Abstract

Acidic drylands are classified as suboptimal lands due to their low soil fertility, characterized by poor nutrient content, low organic matter, poor soil structure, and inadequate drainage. Glutinous corn is one of the corn varieties susceptible to acidic dryland conditions, although some varieties exhibit greater tolerance. This study aims to evaluate the effects of various types of organic fertilizers on acidic drylands and on the growth and yield of glutinous corn (*Zea mays* var. Ceratina Kulesh). The study was conducted at Jl. Sukarela, Km 7, Sukarame District, Palembang City, using a field experiment with a non-factorial Randomized Block Design (RBD) consisting of four treatments, each replicated six times. The treatments included: no organic fertiliser, chicken manure fertiliser (30 tons/ha), liquid organic fertiliser from vegetable waste (20 mL/L), and a combination of chicken manure fertiliser with vegetable waste POC. The parameters observed were plant height, number of leaves, cob length, cob weight per plant, cob weight per plot, dry stalk weight per plot, and weight of 100 seeds. The results showed an increase in soil fertility, as indicated by improved soil structure and a rise in soil pH from 5.3 to 6.5. The liquid organic fertiliser from vegetable waste, at a dose of 20 ml/L, was the most effective treatment, with an average cob weight per plant of 240.3 g (equivalent to 1.28 tons/ha).

Keywords: Number of Leaves, Pearson Correlations, Plant Height, Seedling, Stem Diameter

1. Introduction

Glutinous corn (*Zea mays* var. Ceratina Kulesh) is gaining popularity in Indonesia due to its starch content, primarily amylopectin, which imparts a sticky and soft texture. Additionally, it serves as a source of slowly digested carbohydrates, helping to maintain stable blood sugar levels and prolong the feeling of fullness. According to. Syofia *et al.* (2014) note that corn has high economic value because nearly all parts of the plant—from the fruit and leaves to the stem—can be utilised.

Soil fertility problems reduce corn productivity because acidic soils and high aluminum saturation inhibit plant growth (Hakim, 2006). Successful corn cultivation depends heavily on fertilization. Mahdiannoor et al. (2016) emphasize that proper and balanced fertilizer application is essential, as soil nutrient availability is often insufficient to meet crop demands.

One solution to improving the fertility of acidic soil is the application of organic fertilizer. Organic fertilizer is the result of the decomposition of plant and animal parts or waste (litter), such as manure, green manure, compost, oil cake, bone meal, and others. Organic fertiliser can enhance soil structure, stimulate microbial activity, and improve water absorption and retention, thereby increasing soil fertility (Yuliarti, 2009).

Types of fertilizers that can be used include organic fertilizers, both liquid and solid. Organic fertilizers can play a vital role in acidic drylands, improving the physical, chemical, and biological properties of the soil, increasing nutrient availability for plants, and enhancing the soil's water-retention capacity.

Organic chicken manure fertiliser can play a crucial role in enhancing the growth of corn plants in acidic, dry land by improving the chemical, physical, and biological properties of the soil. This finding includes increasing soil pH, enhancing nutrient availability (especially phosphorus),

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adding organic matter, and stimulating soil microorganisms. The results of research by Tansidi et al. (2023) showed that a dose of 30 tons/ha of chicken manure fertiliser was the most effective in increasing the growth and production of glutinous corn plants.

The use of POC can also improve the growth and yield of corn plants. Its liquid form makes POC easily absorbed by plants, and it is rich in decomposed nutrients, organic matter, and essential nutrients. Research by Arifin et al. (2018) demonstrated that the application of POC at a dose of 20 mL/L in water had a significant effect on all growth parameters, resulting in the highest production of 11.77 tons/ha. Furthermore, according to Yanuarius *et al. (2025), a dose of 400 ml/L + 600 ml/L of POC vegetable waste* provided the highest average for plant height (155.8 cm) and weight of glutinous corn cobs (0.21 kg).

Based on the research results above, a study was conducted by combining liquid organic fertilizer (POC) derived from vegetable waste with organic chicken manure fertilizer as an effort to enhance the novelty of this research.

2. Material and Methods

The research was conducted on a farmer's land at Jalan Sukarela, Km 7, Palembang City, from September 2024 to January 2025. The research location was at a latitude -2.9220826, a longitude 104.7297061, and an altitude of 5.5 meters above sea level.

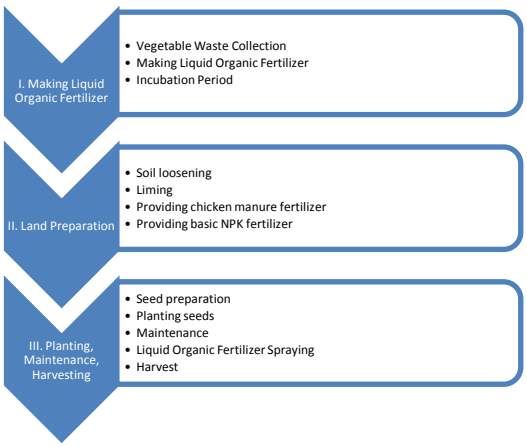

Figure 1. Research Flowchart

The materials and tools used include glutinous corn seeds (Bonanza variety), EM4, Non-Green Vegetable Waste (such as cabbage and mustard greens), Fungicide (Banlate), and the following tools: hoes, sickles, cutters, buckets, labels, scissors, meters, and scales. The method used is a field experiment, employing a Non-Factorial Completely Randomised Design. The number of treatments is four (4), namely without organic fertiliser, Solid Organic Fertiliser (chicken manure, 30 tons/ha), Liquid Organic Fertiliser (20 mL/L), and Solid Organic Fertiliser + Liquid Organic Fertiliser. Each treatment is repeated six times. The total number of treatments is 24. The planting distance between replications is 100 cm. The work methods used include making vegetable waste POC, liming, land processing, preparation of plant materials, planting, fertilizing, plant maintenance, and harvesting. The parameters observed are plant height (cm), number of leaves (strands), cob length (cm), cob weight per plant (g), cob weight per plot (g), dry hull weight (g), weight of 100 grains (g)

Data analysis using Analysis of Variance (ANOVA), and continued with Honestly Significant Difference Test at 5% Level (BNJ 0.05%) for variable data that have a real influence, using the Microsoft Excel application.

3. Results and Discussion

3.1. Acidic Dry Land

The provision of lime in the initial stages of soil cultivation can improve soil pH, as evidenced by a pH increase from 5.3 to 6.5. These conditions can support corn growth, as Elfianis (2020) notes that corn grows optimally in loose, humus-rich soil with a pH between 5.5 and 7.5.

Furthermore, the application of manure also has a positive impact on increasing soil fertility. This change is evident in improvements in the physical, chemical, and biological properties of the soil. Chicken manure plays a role in improving the physical properties of the soil by loosening the structure and making it more easily penetrated by roots, resulting in better aeration. Chemically, this fertiliser can provide plants with the necessary nutrients (Thamrin & Hama, 2022). According to Sulaeman (2017), the use of manure or sludge can also increase soil organic carbon levels by 0.01–0.06 units, which results in increased soil pH and decreased Al saturation.

3.2. Growth Response and Yield of Purple Glutinous Corn

The study's results showed that the application of organic fertilisers, including chicken manure and vegetable waste POC, had an effect on growth and production outcomes. Although the results of the analysis of variance showed no significant impact on the number of leaves, weight of 100 grains, and dry stalk weight, a significant effect was seen on the Length of the cob and plant height, and a very substantial effect was seen on the weight of the cob per sample plant, and the weight of the cob per plot (Table 1).

Overall, the results of the BNJ (5%) test (Table 2) showed that treatment with Liquid Organic Fertiliser (POC) derived from vegetable waste yielded the best results, while the treatment without organic fertiliser produced the lowest results. This finding is because plants more readily absorb the nutrients contained in the POC from vegetable waste. According to Murdaningsih *et al.* (2020), vegetable waste has a water content of 88.78%, a pH of 7.68, and a C/N ratio of 33.56. Furthermore, Afiyah *et al.* (2021) reported

that the fermentation results on the 14th day produced POC with an organic carbon content of 0.63%, Nitrogen of 0.23%, Phosphorus of 0.03%, and Potassium of 0.41%. In contrast, the treatment without organic fertiliser did not provide additional nutrients, so the available soil nutrients were insufficient to meet the needs of the glutinous corn plants. Febrianna *et al.* (2018) stated that the addition of organic material can increase the availability of soil nitrogen. Nitrogen, broken down into amino acids, plays a role in increasing microbial activity, thereby increasing the soil's total N content. This increase in total N results in increased nitrogen uptake by plants.

Table 1. Results of diversity analysis on all observed variables

NO	Treatment	Observed variables						
		Plant height (cm)	Number of leaves (blades)	Length of corn cob (cm)	Weight of the cob/ tnmn (g)	Heavy Cob/ Plot (g)	Weight of the suitcase Dry (g)	Weight 100 Item (g)
1	Without Organic Fertilizer	190.58 "	54.00 tn	25.00**	212.67**	1056.00**	58.42 tn	18.17 tn
2	Chicken Manure Fertilizer	202.50*	58.00 tn	26.08**	229.50**	1173.83**	73.75 tn	20.17 tn
3	POC vegetable waste	213.67*	59.00 tn	26.75**	240.33**	1288.00**	86.75 tn	20.00 tn
4	Chicken Poultry Fertilizer + Vegetable Waste POC	203.75*	59.00 tn	25.33**	230.83**	1197.00**	75.58 tn	17.83 tn
	Family Card (%)	3.3	6.29	2.73	2.44	0.6	4.79	7.84
	F-Table (5%)	3.1	3.1	3.1	3.1	3.1	3.1	3.1

Description: tn = not real; '* = real; ** = very real; KK = Coefficient of Diversity

Table 2. Results of the Honestly Significant Difference Test at 5% Level for the variables plant height, cob length, cob weight per plot and cob weight per planting

NO	Treatment	Observed variables						
		Plant height (cm)	Number of leaves (blades)	Length of corn cob (cm)	Weight of the cob/ tnmn (g)	Heavy Cob/ Plot (g)	Weight of the suitcase Dry (g)	Weight 100 Item (g)
1	Without Organic Fertilizer	190.58ab	54.00 tn	25.00a	212.67a	1056.00a	58.42 tn	18.17 tn
2	Chicken Manure Fertilizer	202.50b	58.00 tn	26.08bc	229.50b	1173.83ab	73.75 tn	20.17 tn
3	POC vegetable waste	213.67d	59.00 tn	26.75d	240.33d	1288.00c	86.75 tn	20.00 tn
4	Chicken Poultry Fertilizer + Vegetable Waste POC	203.75bc	59.00 tn	25.33ab	230.83c	1197.00ab	75.58 tn	17.83 tn
	BNJ 5%	± 15.36	-	± 1.48	± 21.72	± 362.95	-	-

Note: Numbers followed by the same letter in the same column and row are not significantly different at the 5% level.

3.3. Plant Height

The highest average plant height, 213.67 cm, was obtained in the vegetable waste POC treatment, while the lowest, 190.56 cm, was found in the treatment without organic fertilizer. The results of Yanuarius's (2025) study showed that the application of POC at a treatment level of 400 ml/L vegetable waste + 600 ml/L resulted in a plant height of 155.8 cm. Quantitatively, the results for plant height in this study were better. This finding is thought to be due to the main nutrient content in POC, such as Nitrogen (N), Phosphorus (P), and Potassium (K), being available, which meets the needs of plants during the vegetative phase. Nazira *et al.* (2023) stated that the elements N, P, and K play a crucial role in promoting the vegetative growth of plants. Nitrogen is essential for the formation of amino acids, which are then synthesised into proteins, chlorophyll, nucleic acids, and enzymes, all of which support plant growth and height. According to

Sumiati (2018), potassium enhances the development of corn plants, preventing them from falling over easily, facilitates the transport of nutrients from the roots to the leaves, and promotes the translocation of assimilates from the leaves to all parts of the plant. Quantitatively, the plant height in this study was superior to the results of previous research.

3.4. Length of the cob

The best average cob length was obtained in the vegetable waste POC treatment with a length of 26.75 cm, while the treatment without organic fertilizer produced the shortest cob with an average of 25 cm. This finding is thought to be due to the availability of the Phosphorus (P) element being sufficient to support the process in the generative phase. Lamakoma *et al.* (2019) stated that the P element plays a crucial role in the development of flowers and fruit. Wahyudin *et al.* (2017) noted that the availability of the P element enables more photosynthates to be allocated to the cob, resulting in increased fruit size. Additionally, plant metabolism becomes more active, supporting the processes of elongation, division, and cell differentiation, which ultimately contribute to an optimal increase in fruit weight.

3.5. Weight of Ears per Plant and Weight of Ears per Plot

The treatment of vegetable waste POC also yielded the best results in terms of cob weight per plant and per plot, with averages of 240.33 g per plant and 1,288 g per plot, respectively. This outcome is attributed to the sufficient availability and absorption of phosphorus (P) and potassium (K) during the generative phase of glutinous corn plants. Lamakoma et al. (2019) explained that phosphorus is essential for fruit or seed formation, serves as an energy source in metabolic reactions, and enhances the allocation of photosynthates to seeds, thereby increasing seed yield. Meanwhile, potassium plays a crucial role in determining fruit size and quality during the generative phase. The application of POC effectively meets the nutrient requirements of plants during this stage. According to Azrul *et al.* (2023), nutrient availability affects the seed-filling process, during which absorbed nutrients are accumulated as proteins, resulting in seeds with maximum size and weight. Metabolic processes that optimise seed formation result in increased seed size and quality. Furthermore, sufficient nutrient availability accelerates the rate of photosynthesis, allowing the resulting assimilates to be translocated to the fruit and seeds. The greater the accumulation of assimilates in the fruit, the higher the weight of the plant's cob, ultimately increasing corn production (Puspadewi *et al.,* 2016). In contrast, treatment without organic fertiliser yielded the lowest results, with an average cob weight of 212.67 g per plant and 1,056 g per plot. This finding is likely due to the absence of added organic matter, which reduces nutrient availability in the soil and results in lower production yields.

4. Conclusion

The application of 20 ml/L liquid organic fertilizer (POC) can enhance the growth and yield of glutinous corn plants, resulting in a cob weight of 1,288 g per plot..

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