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The Effect of Gamal Leaf Fertilizer Concentration on the Growth and Production of Glutenated Corn

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Abstract:
Excessive use of chemical fertilizers leads to soil degradation which gradually reduces corn productivity. Therefore, using organic fertilizers such as liquid organic fertilizers made from Gamal aka Gliricidia leaves and their proper application needs to be encouraged. This study aims to determine the growth and yield of waxy corn plants in response to the administration of liquid gliricidia leaf fertilizer with various concentrations and time intervals. This research was conducted in Politeknik Negeri Jember, East Java from July 2024 to October 2024. This research was conducted on a Non-Factorial Randomized Block Design where the treatment level was a combination of the liquid fertilizer concentration and application time interval consisting of control, 50 ml / l + 1 week, 50 ml / l + 2 weeks, 75 ml / l + 1 week, 75 ml / l + 2 weeks, 100 ml / l + 1 week, and 100 ml / l+ 2 weeks. The results showed that the treatment of 75 ml/l concentration + 2-week interval significantly showed the best results in stem diameter, cob length, cob diameter, and cob weight. It can be concluded that the application of liquid organic fertilizer made from gliricidia leaves can be an alternative to minimize the use of chemical fertilizers in waxy corn plants.

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INTRODUCTION

Corn is a plant that plays a crucial role in agricultural development and has high economic value (Rizqiati, 2020). Corn is used as food, feed, and industrial fuel (Lamakoma et al., 2019). According to BPS data (2024), total corn production in 2022 was 16.53 million tons, and in 2023, it reached 14.77 million tons. The decline in corn production is attributed to low land productivity resulting from the continuous use of high doses of chemical fertilizers. Soil degradation is characterized by increased acidity, a compacted texture, and a decrease in microbial activity (Dewanto et al., 2017). This problem can be addressed through sustainable land management, such as the use of organic fertilizers from local materials.

The use of liquid organic fertilizer from organic sources can reduce the need for chemical fertilizers, yielding optimal productivity results. According to Nawariah et al. (2022), Organic fertilizers contribute to the improvement of sustainable soil quality by enhancing the biological, chemical, physical, and structural properties of the soil, thereby supporting the creation of fertile soil conditions. Gamal plant leaves can be used as the main component in POC formulations (Paulus et al., 2020). The bioactive components of these leaves have the potential to increase plant development and act

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as a natural control against pests and pathogens (Triadiawarman and Rudi, 2019). Gamal leaf POC contains various essential nutrients that can meet plant nutritional needs (Novriani, 2016).

The application of liquid organic fertilizer to get effective results must be noted for principal accuracy. Wrong is the only one in the accuracy time. This includes selecting the application time interval that is appropriate to the plant growth phase (Julio et al., 2022).

METHOD

This research was conducted from July to October 2024 on the agricultural land of Jember State Polytechnic, East Java, at an altitude of approximately 100 meters above sea level and a temperature range of around 29 ℃ to 33 ℃.

The tools used in this research include tractors, calipers, sprayers, analytical scales, measuring cups, meters, mortars, hoes, buckets, sickles, scrapers, drills, hammers, watering cans, stationery, nameplates, knives, napkins, spoons, and cameras. The materials used in this study were arumba sticky corn seeds, leaf gamal, EM4, sugar red, fertilizer pen, urea, SP-36, KCL, furadan, and insecticide/fungicide.

Study This arranged based on Design Random Group (RACK) Non Factorial uses One factor with 7 level, Which consists of from 6 treatments + 1 control, namely: P0: Control P1: 50 ml/l + 1 Sunday once P2: 50 ml/l + 2 Sunday once P3: 75 ml/l + 1 week once P4: 75 ml/l + once every 2 weeks P5: 100 ml/l + 1 Sunday once P6: 100 ml/l + 2 weeks very.

Research activities were carried out in stages, starting from the manufacture of gamal leaf POC, seed preparation, soil processing, planting, treatment application, replanting, watering, weeding, hilling, fertilization, and pest and disease control. Treatment was given when the plants were 14, 21, 28, 35, 42, 49, and 56 days after planting.

The observed variables were plant height, stem diameter, cob diameter, and cob weight. Statistical analysis of the research data was conducted using the ANOVA (Analysis of Variance) method to test the significance of the treatment. Further testing using Honestly Significant Difference (HSD) at the 5% level was applied if significant differences were found, while very significant differences were further analyzed using HSD at the 1% level.

RESULTS

Recapitulation Results Analysis Fingerprint Variety

Table 1. Recapitulation of results analysis of variance sticky corn plants

No	Variables Observation	Notation
1	Tall Plant	ns
2	Diameter Stem	**
3	Diameter Cob	*
4	Heavy Cob	**

Information:
* = different real
** = different very real
ns = not significantly different

Plant Height (cm)

The treatment of the time interval and the concentration of gamal leaf POC administration showed notable differences. No real difference between tall and short plant corn sticky rice. This

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matter shows that an application at a 6-level concentration POC leaf gamal yields a high-yielding plant, with no significant difference at every level of concentration POC leaf gamal. Besides that, treatment interval time giving POC leaf Gamal once a week and once every two weeks also gave no significant difference in results on the height of the glutinous corn plants.

Stem Diameter (cm)

Table 2. Results of further tests on the diameter of glutinous corn stalks

Concentration + Time interval	Average (mm)
(P0) 0 ml/l	11.20a
(P5) 100 ml/l + 1 week	11.87ab
(P2) 50 ml/l + 2 weeks	12.21b
(P6) 100 ml/l + 2 weeks	12.32b
(P3) 75 ml/l + 1 week	12.58bc
(P1) 50 ml/l + 1 week	13.23c
(P4) 75 ml/l + 2 weeks	13.37c

Information: The numbers that followed with a small letter Which The same show no significant difference in the BNJ test at 1% level

Statistically, the best stem diameter was obtained with a concentration of 75 ml/L + 1 week (12.58 mm), 50 ml/L + 1 week (13.23 mm), and 75 ml/L + 1 week (12.58 mm). ml/l + 2 Sunday (13.37 mm). About mark middle obtained on concentration 50 ml/l + 2 Sunday (12.21 mm), 100 ml/l + 2 Sunday (12.32 mm), and where the lowest result on corn stalk diameter variable is in the treatment 100 ml/l + 1 Sunday (11.87mm), and 0 ml/l with average (11.20 mm). As shown in the table above, the best value in terms of economics is achieved at a concentration of 75 ml/L with a time interval of once every 2 weeks, which yields the highest average of 13.37 mm.

Corn Diameter (cm)

Table 3. Results of further tests on the diameter of glutinous corn cobs

Concentration + Time interval	Average (mm)
(P0) 0 ml/l	40.24a
(P1) 50 ml/l + 1 week	41.43ab
(P6) 100 ml/l + 2 weeks	42.20bc
(P5) 100 ml/l + 1 week	42.51bcd
(P3) 75 ml/l + 1 week	43.21 cd
(P2) 50 ml/l + 2 weeks	43.26 cd
(P4) 75 ml/l + 2 weeks	43.48d

Information: The numbers that followed with a small letter Which The same show no significant difference in the BNJ test at 5% level

The best treatment was achieved by concentrations of 100 ml/l + 1 week (42.51 mm), 75 ml/l + 1 week (42.21 mm), 50 ml/l + 2 weeks (43.26 mm), and 75 ml/l + 2 weeks (43.48 mm), and the mean value was obtained by concentration 50 ml/l + 1 week (41.43 mm) and 100 ml+ 2 weeks. while the smallest cob diameter was achieved by the 0 ml/l concentration control, with an average of 40.24 mm. For the best overall economic value, a concentration of 50 ml/l and an interval time of 2 weeks yielded an average of 43.26 mm.

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Heavy Cob (g)

Table 4. Results of further tests on the weight of glutinous corn cobs

Concentration + Time interval	Average (mm)
(P0) 0 ml/l	240.75a
(P3) 75 ml/l + 1 week	265.18b
(P6) 100 ml/l + 2 weeks	265.50b
(P5) 100 ml/l + 1 minggu	267.46b
(P2) 50 ml/l + 2 minggu	269.21b
(P1) 50 ml/l + 1 minggu	277.36bc
(P4) 75 ml/l + 2 minggu	284.50c

Information: The numbers that followed with a small letter Which The same show no significant difference in the BNJ test at 5% level

Statistically, the best value for cob weight was obtained at concentrations of 50 ml/L + 1 week and 75 ml/L + 2 weeks. Meanwhile, the middle value was obtained at treatments of 75 ml + 1 week, 100 ml/l + 2 weeks, 100 ml/l + 1 week, and 50 ml/l + 1 Sunday. Results are lowest on treatment 0 ml/l, which produces an average of 240.75 g. Viewed from an economic perspective, the highest value is obtained with treatment at 75 ml/l, administered every 2 Sundays, which yields an average of 248.50.

DISCUSSION

The application of gamal leaf POC is not only seen from the height of the plant as an indicator of effectiveness, but also from parameters such as stem diameter, cob diameter, and cob weight, which showed significant results. The application of Gamal leaf POC with a concentration of 75 ml/L and a range of 2 Sundays has been proven sufficient to fulfill Nutritional requirements, supporting the growth and production of glutinous corn. Optimal nutrient application of 75 ml/L at biweekly intervals is more supportive of the plant's generative phase, such as grain filling and cob growth, thereby increasing overall productivity.

Study Su'ud et al. (2018) showed that liquid organic fertilizer (POC) contains sufficient N for plant tissue development. In addition to nitrogen, the P nutrient content in POC functions to transfer energy, which is useful in encouraging root formation, strengthening stems, and fruiting (Nata et al., 2020). Lestari (2018) stated that the fulfillment of P nutrients in liquid organic fertilizer will affect plant growth. diameter of cob, and full line seed on cob. Hello et al. (2019) also stated that the size and weight of corn cobs are influenced by the content of nutrients Hara in POC.

According to Zulfahmi and Suminarti (2019), one of the conditions for normal plant growth is that nutrients are provided in sufficient quantities and in a balanced manner. Matter This is in line with Izzah (2019), which states that in an attempt to get production with results, which tall and quality, the main requirement is sufficient nutrients for the plants, especially during the flowering period until fruit formation.

Mahendra (2018) stated that adding organic material to the land will increase the absorption of macro- and micro-nutrients needed by plants, resulting in efficient nutrition and increased plant production. In this study, it is suspected that the administration of gamal leaf POC can contribute positively to the vegetative and generative parameters of sticky corn through improved soil aggregates, which in turn increase soil organic matter, ultimately affecting root conditions and nutrient absorption.

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CONCLUSION

The best concentration and time interval in this study was the POC concentration. Leaf gamal 75 ml/L with an interval time of 2 Sundays has an influence on the production results of glutinous corn plants. Based on the findings, researchers recommend applying 75 ml/L of POC from gamal leaves at a biweekly interval, due to its impact on many of the tested variables. This treatment can be applied to other food crops in the same family as glutinous corn.

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