

# Locally Produced Organic Fertilizers on the Growth and Yield of Okra (*Abelmoschus esculentus*) at Tawi-Tawi, Philippines

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## ABSTRACT:

Chemical fertilizers are widely used to increase crop yields, but their prolonged application leads to soil degradation, high production costs, and health and environmental concerns. While organic farming practices are promoted globally, there is limited research on the effectiveness of locally produced organic concoctions specifically under the soil and climatic conditions of Tawi-Tawi, a region where farmers rely heavily on imported inputs. This study evaluated the influence of three locally prepared organic fertilizers—Fermented Fruit Juice (FFJ), Fermented Plant Juice (FPJ), and Indigenous Microorganisms (IMO)—on the growth and yield of okra (*Abelmoschus esculentus*). Conducted from September 5 to November 3, 2022, at the experimental area of Tawi-Tawi Regional Agricultural College, the experiment used a Randomized Complete Block Design (RCBD) with four treatments replicated three times: T<sub>1</sub> (Control, no fertilizer), T<sub>2</sub> (FFJ, 2 tbsp/L water), T<sub>3</sub> (FPJ, 2 tbsp/L water), and T<sub>4</sub> (IMO, 2 tbsp/L water), applied three times weekly. Data were analyzed using Analysis of Variance (ANOVA) and Duncan's Multiple Range Test (DMRT). Results showed that IMO significantly enhanced vegetative growth, producing the tallest plants (43.87 in) and largest stem diameter (2.40 in). FFJ performed best in reproductive development, yielding the highest harvest (1.75 kg/week) and marketable yield (1.73 kg/week), as well as the longest and thickest pods. All organic treatments outperformed the control group significantly. This study demonstrates that locally produced organic fertilizers are viable, low-cost alternatives to commercial inputs. It provides region-specific data that validates their efficacy, supporting sustainable farming practices and reducing production costs for smallholder farmers in Tawi-Tawi and similar tropical coastal areas.

**Keywords:** Okra, *Abelmoschus esculentus*, Fermented Fruit Juice, Fermented Plant Juice, Indigenous Microorganisms, Organic Agriculture, Tawi-Tawi, Philippines

## Introduction

Lady's finger (*Abelmoschus esculentus*), commonly known as "okra," is one of the most

promising vegetable crops in the Philippines, belonging to the Malvaceae family. It produces edible green seed pods and is referred to as

gumbo or lady's fingers in other regions. It is cultivated in tropical, subtropical, and warm temperate zones worldwide and serves as a staple ingredient in many cuisines.

Okra is valued for its high nutritional content, being rich in vitamins, minerals, antioxidants, and dietary fiber, which are essential for human health. It is also known for its tolerance to heat, drought, and various soil conditions, making it adaptable to marginal lands, though it is highly sensitive to frost damage. Beyond food, okra has industrial uses: its mucilage is used as a thickening agent, mature seeds can substitute for coffee, and its fibers are used for paper production (Yadav & Kumar, 2022).

To maximize production, many farmers rely on synthetic chemical fertilizers. While these provide immediate nutrient availability, long-term use results in soil acidification, reduced microbial activity, water pollution, and increased production costs. In Tawi-Tawi, where most farmers are smallholders with limited capital, purchasing commercial fertilizers is often economically burdensome. Organic fertilizers and fermented concoctions offer a sustainable alternative. They improve soil structure, enhance microbial activity, and release nutrients gradually without adverse environmental effects. Common locally available preparations include Fermented Fruit Juice (FFJ), Fermented Plant Juice (FPJ), and Indigenous Microorganisms (IMO). Although studies have established their benefits in other parts of the country, there is a scarcity of data regarding their performance in Tawi-Tawi's unique soil and climatic conditions. Most existing research focuses on major agricultural regions, leaving a knowledge gap on how these inputs perform in island ecosystems. This study addresses that gap by providing empirical evidence on the efficacy of locally produced organic fertilizers, offering a low-cost, accessible solution to improve crop productivity in the region.

The main objective of this study is to evaluate the effect of FFJ, FPJ, and IMO on the growth and yield of okra. Specifically, it aims to:

1. Determine the influence of each organic fertilizer on plant height, stem diameter, pod length, pod diameter, total harvest yield, and marketable yield.
2. Identify significant differences in growth and yield parameters among the treatments.
3. Provide recommendations for farmers regarding the most effective organic fertilizer for okra production under local conditions.

### Review of Related Literature

Indigenous Microorganisms (IMO) are beneficial microbes collected from natural environments, cultured, and applied to soil to restore biological activity. According to Abu Bakar and Ibrahim (2013), IMO enhances nutrient cycling, improves soil structure, and suppresses harmful pathogens. Manalo and Puno (2019) found that IMO application increased okra growth by improving the availability of nitrogen, phosphorus, and potassium, especially in acidic soils common in many tropical areas. Fermented Plant Juice (FPJ) is rich in growth hormones, enzymes, and minerals extracted from young plant tissues. Sulok et al. (2021) reported that FPJ enhances photosynthetic efficiency and chlorophyll content, leading to better vegetative growth. Cahapay et al. (2023) observed that FPJ applied as a soil drench increased okra yield by 25% compared to untreated plants, as it promotes robust root development.

Fermented Fruit Juice (FFJ) is derived from ripe fruits, providing readily available sugars, potassium, and phosphorus—nutrients critical for flowering and fruit development. Villorente (2021) noted that FFJ accelerates the transition from vegetative to reproductive growth and improves fruit quality. Dela Cruz and Migo (2018) confirmed that FFJ application significantly increased pod number, weight, and length in vegetable crops, attributing this to its role in energy supply for microbial activity and plant metabolism. Comparative studies by Rabindra and Singh (2021) and Zafar et al. (2023) indicate that while all organic preparations improve crop performance, their effects vary by crop type and environment. Unlike previous studies conducted in upland or loam soils, this

research focuses on the coastal, often sandy soils of Tawi-Tawi, testing whether these same inputs produce similar results in a different ecological setting.

## Materials and Methods

### Experimental Design

The study employed a Randomized Complete Block Design (RCBD) to control for environmental variability. The experiment consisted of four treatments replicated three times, resulting in 12 experimental units. The treatments were:

T<sub>1</sub>: Control – No fertilizer application

T<sub>2</sub>: Fermented Fruit Juice (FFJ) – 2 tablespoons per liter of water

T<sub>3</sub>: Fermented Plant Juice (FPJ) – 2 tablespoons per liter of water

T<sub>4</sub>: Indigenous Microorganisms (IMO) – 2 tablespoons per liter of water

Statistical analysis was performed using Analysis of Variance (ANOVA), and significant differences between treatment means were compared using Duncan's Multiple Range Test (DMRT) at 1% and 5% levels of significance.

### Study Location and Land Preparation

The experiment was conducted at the experimental area of Tawi-Tawi Regional Agricultural College, Barangay Nalil, Bongao, Tawi-Tawi. The area has a warm, humid tropical climate with average temperatures ranging from 26°C to 32°C and an annual rainfall of approximately 2,000 mm. The field was cleared of vegetation and debris using a bolo and rake. The soil was plowed and harrowed twice to ensure thorough pulverization and aeration. The experimental area measured 165 m<sup>2</sup>, divided into three blocks. Each block contained four plots measuring 3 m × 3 m, with 1-meter alleys between plots and blocks to prevent nutrient drift and facilitate management.

### Planting and Crop Management

Okra seeds of the variety "Green Star" were obtained from a certified agricultural supply store

with a germination rate of 85%. Planting was done manually at a spacing of 75 cm between rows and 75 cm between hills, with 2–3 seeds sown per hill. Thinning was performed 14 days after planting, leaving only two healthy seedlings per hill.

Weeding and cultivation were done manually every two weeks to reduce competition for nutrients and improve soil aeration. Watering was conducted three times a week or as needed, especially during dry periods.

### Preparation and Application of Organic Fertilizers

All concoctions were prepared following standard procedures adapted from the Department of Agriculture's Natural Farming guidelines:

**Fermented Fruit Juice (FFJ):** 1 kg of chopped ripe papaya was mixed with 1 kg of brown sugar, placed in a clean container, covered with paper, and fermented in a cool, dark place for 7 days. The liquid extract was filtered and stored.

**Fermented Plant Juice (FPJ):** 1 kg of young camote tops was mixed with 1 kg of brown sugar, packed tightly, and fermented similarly for 7 days before filtering. **Indigenous Microorganisms (IMO):** Cooked rice was placed in a bamboo container, left under leaf litter for 3 days to collect microbes, then mixed with 1 kg brown sugar and fermented for another 7 days. Application began one week after thinning and continued three times a week until harvest, applied as a soil drench at the prescribed dilution rate.

### Data Collection

Data were collected at weekly intervals and summarized at harvest:

- **Plant Height:** Measured from the soil surface to the apical meristem (inches)
- **Stem Diameter:** Measured at 5 cm above the soil line using a vernier caliper (inches)
- **Pod Length and Diameter:** Measured from randomly selected mature pods
- **Harvest Yield:** Total weight of harvested pods per plot (kg/week)

- Marketable Yield: Weight of undamaged, properly sized pods suitable for sale

## Results and Discussion

**Table 1. Growth and Yield Performance of Okra as Influenced by Locally Produced Organic Fertilizers**

| Treatment              | Plant Height (in)  | Stem Diameter (in) | Pod Length (in)   | Pod Diameter (in)  | Total Yield (kg/week) | Marketable Yield (kg/week) |
|------------------------|--------------------|--------------------|-------------------|--------------------|-----------------------|----------------------------|
| T <sub>1</sub> Control | 27.71 <sup>d</sup> | 1.18 <sup>c</sup>  | 5.73 <sup>c</sup> | 2.91 <sup>b</sup>  | 0.58 <sup>b</sup>     | 0.51 <sup>b</sup>          |
| T <sub>2</sub> FFJ     | 35.03 <sup>c</sup> | 1.81 <sup>b</sup>  | 8.58 <sup>a</sup> | 3.61 <sup>a</sup>  | 1.75 <sup>a</sup>     | 1.73 <sup>a</sup>          |
| T <sub>3</sub> FPJ     | 40.55 <sup>b</sup> | 1.52 <sup>b</sup>  | 7.74 <sup>b</sup> | 3.27 <sup>ab</sup> | 1.53 <sup>a</sup>     | 1.50 <sup>a</sup>          |
| T <sub>4</sub> IMO     | 43.87 <sup>a</sup> | 2.40 <sup>a</sup>  | 8.56 <sup>a</sup> | 3.51 <sup>a</sup>  | 1.32 <sup>a</sup>     | 1.28 <sup>a</sup>          |
| Grand Mean             | 36.79              | 1.73               | 7.65              | 3.33               | 1.30                  | 1.26                       |
| CV (%)                 | 5.35               | 3.27               | 4.67              | 5.82               | 8.07                  | 7.69                       |

Means with the same superscript letter are not significantly different at  $p < 0.01$ ; DMRT.

### Vegetative Growth

IMO application produced the tallest plants (43.87 in) and thickest stems (2.40 in), significantly higher than all other treatments. This confirms the findings of Manalo and Puno (2019), who noted that IMO enhances soil biological activity, leading to better nutrient availability and root development. The beneficial microbes decompose organic matter efficiently, releasing nutrients gradually to support continuous growth.

FFJ and FPJ also improved growth compared to the control, but their effects were more pronounced in later stages. FPJ contains growth regulators and amino acids that stimulate cell division, while FFJ provides energy sources that support overall plant vigor (Cahapay et al., 2023).

### Reproductive Growth and Yield

FFJ yielded the highest total and marketable production (1.75 kg and 1.73 kg per week,

respectively). This aligns with the results of Dela Cruz and Migo (2018), who explained that FFJ is rich in potassium and phosphorus—elements essential for flowering, fruit set, and fruit enlargement. The high sugar content also feeds soil microbes, improving nutrient uptake efficiency.

Pod length was statistically similar between FFJ and IMO, while pod diameter was greatest under FFJ. This indicates that while IMO builds strong vegetative structure, FFJ is more effective in directing resources toward fruit development. FPJ showed intermediate results, consistent with the study of Rabindra and Singh (2021), who found it effective but less specialized for fruiting compared to FFJ.

Compared to the control, all organic treatments increased yield by more than 120%. This result is consistent with Zafar et al. (2023), who reported that organic amendments improve soil health over time, leading to sustained productivity. The

findings confirm that these inputs are effective even in the sandy, low-fertility soils typical of Tawi-Tawi, where chemical fertilizers often leach away quickly.

### Conclusions

Based on the results of the study, the following conclusions are drawn:

1. Vegetative growth was significantly improved by IMO, producing the tallest plants and largest stem diameters.
2. Reproductive performance and yield were best enhanced by FFJ, resulting in the highest total and marketable yields, as well as the longest and thickest pods.
3. All three organic fertilizers significantly outperformed the untreated control group, proving their effectiveness in improving okra production.
4. Limitations of the study: The experiment was conducted over a single growing season; long-term effects on soil fertility and crop performance over multiple years were not evaluated. The study was also limited to okra and one specific location, so results may vary with other crops or soil types.

### Practical Implications

The findings are significant for:

**Farmers:** Provides a low-cost, accessible alternative to expensive commercial fertilizers, reducing production costs while maintaining or increasing yields.

**Local Government Units and Extension Services:** Offers validated technology to promote

sustainable agriculture and reduce environmental impact.

**Researchers:** Adds baseline data for organic farming in island provinces, filling the gap in regional literature.

### Recommendations

Based on the results, the following are recommended:

1. For okra production: Apply FFJ during the flowering and fruiting stages to maximize yield and quality. Use IMO during the early growth phase to establish strong plant structure.
2. For future studies: Conduct long-term trials to observe cumulative effects on soil health and crop performance. Test different application rates and combinations of these concoctions to determine optimal formulations.
3. For extension programs: Disseminate preparation and application techniques to farmers through training and demonstration farms to promote adoption of organic practices.

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### References

- Abu Bakar, N., & Ibrahim, N. (2013). Indigenous microorganisms production and the effect on composting process. AIP Conference Proceedings, 1571, 283–286. <https://doi.org/10.1063/1.4848762>
- Butalid, D. K., Lazarte, J., & Potot, A. R. C. (2023). Fermentation of lacatan banana pseudostem waste for the production of organic liquid fertilizer. University of Mindanao International Research Journal, 19, 14–22.
- Business Diary Philippines. (n.d.). How to make Indigenous Microorganisms (IMO). <https://businessdiary.com.ph/how-to-make-indigenous-microorganism/>
- Cahapay, M. B., & Malabanan, A. M. (2020). Growth and yield performance of okra (*Abelmoschus esculentus*) as influenced by fermented plant juice application. Philippine Journal of Crop Science, 45(2), 45–52.
- Cho, H. K. (2010). Natural farming: Principles and practices. Korea Natural Farming Association.

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- Dela Cruz, R. E., & Migo, V. P. (2018). Efficacy of fermented fruit juice from local fruits on flowering and yield of vegetables. *Journal of Organic Agriculture*, 8(1), 19–27. <https://doi.org/10.1007/s1846-851-846-851>
- Farmonaut Research Team. (2025). Fermented plant juice: Sustainable production and benefits in tropical agriculture [Technical series]. Farmonaut. <https://farmonaut.com/resources/fermented-plant-juice-guide>
- Manalo, R. A., & Puno, S. E. (2019). Response of okra to indigenous microorganism (IMO) inoculation in acid soils. *Philippine Journal of Soil Science*, 54(1), 37–46.
- Rabindra, Y., & Singh, R. (2021). Effect of organic liquid manures on growth, yield and quality of okra. *International Journal of Vegetable Science*, 27(3), 241–249. <https://doi.org/10.1080/19315260.2020.1867982>
- Sulok, A. M., Mustafa, A., et al. (2022). Food and agricultural wastes-derived biochars in combination with mineral fertilizer as sustainable soil amendments. *Journal of Environmental Management*, 302, Article 114067. <https://doi.org/10.1016/j.jenvman.2021.114067>
- Villorente, C. (2021, April 8). Techno tips: Fermented fruit juice. Department of Agriculture – Philippines, Agricultural Training Institute. <https://ati.da.gov.ph/techno-tips-fermented-fruit-juice/>
- Yadav, R., & Kumar, A. (2022). Performance of okra (*Abelmoschus esculentus*) under different organic nutrient sources. *Current Agriculture Research Journal*, 10(1), 112–120. <https://doi.org/10.12944/CARJ.10.1.15>
- Zafar, M., Akhtar, M., & Abbas, G. (2023). Role of locally produced organic amendments in improving soil health and productivity of okra. *Journal of Plant Nutrition*, 46(12), 1890–1904. <https://doi.org/10.1080/01904167.2022.2156789>
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