JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL. 7 NO. 2 May 2025

DOI :https://doi.org/10.36378/juatika.v7i2.4298
eissn 2656-1727
pissn 2684-785X
pages : 464 – 469

RESEARCH ARTICLE Open Access

The Effect of Tomato LOF and Planting Media on Cherry Tomato Production (*Solanum lycopersicum* var. cerasiforme) DFT Aquaponic System

M Nur[1,*], Rustam[1]

Abstract

Shallots are a high-value commodity due to their nutritional content and benefits for heart health, cancer prevention, and immune system support. This study aims to determine the effects of the interaction between Tomato LOF and planting media on the growth and production of cherry tomatoes. The research was conducted at Dokagu UIR Housing Block D No. 2, Air Dingin Village, Bukit Raya District, Pekanbaru City, over four months, from August to November 2024. The design employed in this study was a Factorial Completely Randomized Design. The Tomato LOF consisted of four treatment levels: 0, 5, 10, and 15 ml per 15 liters of water. The planting media (M) also consisted of four treatment levels: Rockwool, raw rice husks, cocopeat, and rice husk charcoal. The parameters observed included flowering age, the number of fruits per plant, fruit weight per individual fruit, and total fruit weight per plant. The results indicated that the interaction between Tomato LOF and planting media significantly affected the fruit weight per planting, specifically with 5 ml of water per 15 liters and rice husk charcoal, resulting in an average weight of 95.25 grams. For the primary treatment involving Tomato LOF, a significant effect was observed on the fruit weight per planting, particularly with 15 ml of water per 15 liters, yielding a weight of 66.94 grams. Additionally, the primary treatment of planting media significantly influenced the number of fruits per plant, with cocopeat yielding an average of 7.63 fruits, and the weight of fruit per planting with the rice husk charcoal treatment also measuring 66.94 grams.

Keywords: Aquaponics, Cherry Tomatoes, Planting Media, LOF Tomato, Tilapia

1. Introduction

Cherry tomatoes (*Solanum lycopersicum* var. cerasiforme) are a high-value commodity due to their nutritional content such as vitamin C, lycopene, and antioxidants which are beneficial for heart health, cancer prevention, and body immunity (Sahin, K., Orhan, C., Akdemir, F., Tuzcu, M., Sahin, N., & Yilmaz, 2022), and have stable market demand because they are often used in fresh and processed dishes (Ministry of Agriculture, 2024)

Land and water resources are the main things in agriculture. Problems arise especially in urban areas, where the lack of land that can be used for plant cultivation and conversion is a challenge to carrying out plant cultivation; therefore, solutions are needed to realize food security.

The number of urban farming businesses in Pekanbaru city is 27 business units spread across 15 sub-districts, these farmers cultivate their farms on limited land, most of them use planting media, not directly on the ground surface or using pots and the like, and use technology such as hydroponics, aquaponics, vertical culture, tarpaulin media and the like. (Central Bureau of Statistics of Indonesia, 2023)

Hydroponic cultivation techniques still have weaknesses, namely the use of expensive fertilizers and those derived from inorganic materials, so the best solution is the aquaponic cultivation technique which integrates fisheries and agriculture, thus producing two products that can be made at once and can also reduce the cost of using fertilizers that can be created from the feces of cultivated fish.

*Correspondence: mnur@agr.uir.ac.id
1) Universitas Islam Riau - Jl. Kaharuddin Nst No.113, Simpang Tiga, Kec. Bukit Raya, Kota Pekanbaru, Riau 28284, Indonesia

Aquaponics is an integrated system between aquaculture and hydroponics that utilizes mutualistic symbiosis between fish and plants (Rakocy et al., 2006). The Deep Film Technique (DFT) system was chosen because it provides stable and optimal plant nutrient circulation.

A hydroponic system can manage Tomato production with land efficiency and technology modification. The yield that can be obtained from a hydroponic system is five to ten times more than the yield obtained with a conventional cultivation system (Rakocy et al., 2006)

The use of fish feces as plant nutrients is still lacking in maximizing plant growth and development. Fertilizers also need to be given through leaves in the form of organic liquid fertilizer (LOF), the best LOF is fertilizer that comes from the plant itself because of the suitability of nutrients, Tomato plant residues (leaves, stems, rotten fruit) contain nutrients that are similar to the needs of new tomato plants, especially potassium (K) for fertilization and nitrogen (N) for leaf growth. Studies show that recycling plant biomass increases the efficiency of the nutrient cycle in sustainable agricultural systems. To accelerate the acquisition of these nutrients, fermentation needs to be carried out using EM4 to produce LOF (Rachmawati et al., 2023)

Previous research topics are Application of nutrient solution concentration and percentage of cocopeat-bokashi mixed media on the growth and production of butterhead lettuce (Lactuca sativa var capitata L.) Hydroponically. The innovation of this research from the previous one is that AB mix nutrients can be replaced with processed feces to become nitrate, previously using vegetable plants, and now fruit plants. Electrical energy sourced from PLN can be replaced with PLTS (Solar Power Plant) to produce independent electricity for plant irrigation. (Nur, 2016)

Planting media such as rockwool, cocopeat, or rice husk charcoal have different porosity characteristics and water retention capabilities, thus affecting root growth and plant productivity. (Nur & Agara, 2024) . The study aims to determine the interaction and main effects of Tomato LOF and planting media on the growth and production of cherry tomatoes.

2. Material and Methods

This research was conducted in Pekanbaru, Riau Province, Indonesia. Coordinate points: Lat 0.444216 0 N, Long 101.459743 0 E, altitude above sea level 12 M. This research started from August to November 2024.

The materials used in this study were cherry tomato seeds of the cerasiforme variety (Appendix 2), rock wool, net pots, water, and LOF t. The tools used in this study were trays, gutters, 2.5-inch PVC pipes, submersible water pumps, net pots, TDS meters, pH meters, buckets, 1.5 x 1 x 0.5 m tubs, mechanical and biological filters, 200 wp solar panels, 100 AH batteries, 25 watt DC pumps, measuring cups, rulers, analytical scales, cameras, stationery, sprayers and water filters.

The study used a Factorial Completely Randomized Design consisting of the first factor, Tomato LOF (T), consisting of 4 treatment levels and the second factor, Planting Media (M), consisting of 4 treatment levels, so that 16 treatment combinations were obtained. Each treatment was repeated 4 times, so 64 experimental units were obtained. Each experimental unit consisted of 3 plants, 2 of which were used as samples for 192 plants. The research stages can be seen from the following flow diagram:

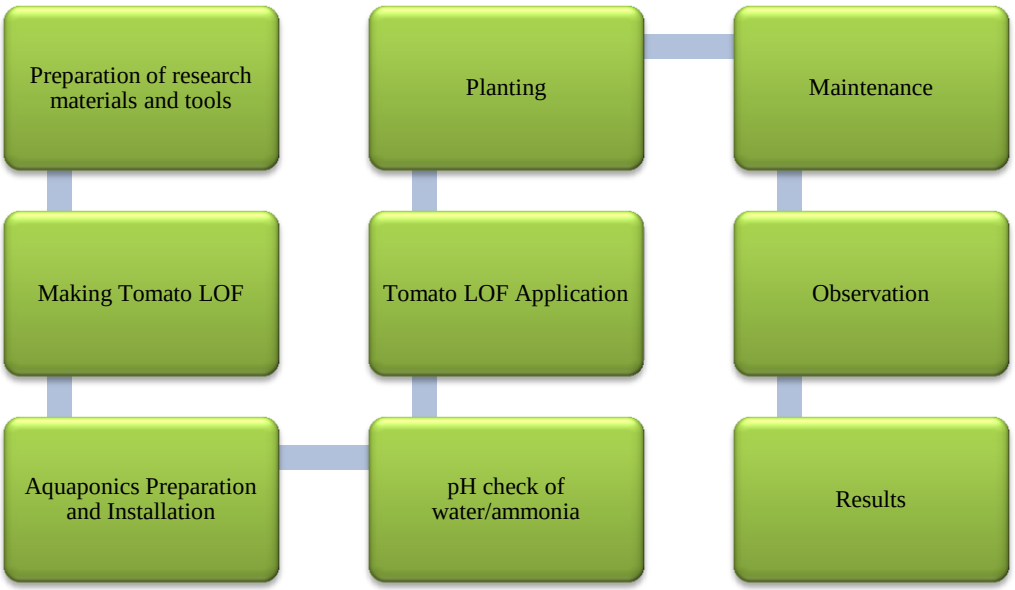

Figure 1. Research flow diagram

The implementation of the research includes: Preparation of materials and research tools, solar panel

insulation, vertical hydroponic installation and filling of 100 gourami fish seeds, filling of mechanical filters and biological filters, seeding, transferring to installation pipes with a planting distance of 30 x 30 cm, providing treatment, Maintenance of chemical characteristic analysis, Acidity Degree (pH), TDS, Ammonia content analysis, Pest and disease control.

3. Results and Discussion

3.1. Harvest Age (days)

The results of the variance analysis showed that the interaction and main treatment of tomato LOF and planting media did not significantly affect the flowering age of tomato plants. The average observation results show tall plant tomatoes after the BNJ test was carried out at the 5% level, as seen in Table 1.

Table 1. Average flowering age with tomato LOF treatment and planting media

LOF Tomato (ml/15 l water)	Growing media				Average
	Rock wool (M1)	Raw Husk (M2)	Cocopeat (M3)	Rice Husk Charcoal (M4)	
Control (T0)	30.5±0.71	29.5±0.71	29.0±1.41	29.5±0.71	29.63
5 (T1)	30.0±1.41	29.0±0.00	29.5±0.71	29.5±0.71	29.50
10 (T2)	30.5±0.71	29.0±0.00	29.5±0.71	29.5±0.71	29.63
15 (T3)	31.0±2.83	29.5±0.71	29.5±0.71	29.0±0.00	29.75
Average	30.5	29.25	29.38	29.38	
KK = 3.48%					

The numbers presented represent the mean ± standard error. Similar letters adjacent to the mean indicate statistically insignificant differences based on the Honestly Significant Difference test at the 5% level.

The data in Table 1 shows that the treatment of tomato LOF and planting media did not differ significantly in the flowering age of tomato plants. The average flowering age is 29-31 days. Compared to the description of cherry tomatoes, the rampai variety is 25 days.

The slow emergence of cultivated flowers is thought to be due to the lack of P nutrients produced from LOF t and nutrients made from fish ammonia to produce nitrate, washed away by rain because it does not use a greenhouse, thus inhibiting the growth and development of tomato plants during the flowering age.

The results of the study (Suryani et al., 2020) on the growth and production of tomatoes due to various types of organic fertilizers and doses of rice husk mulch showed that the best results were 31 days, when compared to this study the results were faster flowering age, namely 29 days, which states that plant flowering is a transition from the vegetative to the generative phase, the influence of which can come from internal and external factors. Environmental factors, such as the use of types of organic fertilizers and doses of rice husk mulch, are thought to be less dominant than genetic factors from plants. According to Hidayat et al. (2024), one such challenge is genetic susceptibility to certain fungal diseases, which can significantly impact crop yields.

According to (Yudiawati & Kurniawati, 2019), if the P and K nutrients are unavailable, it will inhibit the plant's generative growth, so the treatment does not show a real effect on the age at which it starts flowering.

3.2. Number of Fruits (day)

The results of the variance analysis showed that the interaction and main treatment of tomato LOF and planting media did not have a significant effect, but the main treatment of planting media was significantly different in the number of tomato plant fruits. The average observation results of the tall plant tomato after the BNJ test were measured at 5%, as seen in Table 2.

Table 2. Average number of fruits with tomato LOF treatment and planting media

LOF Tomato (ml/15 l water)	Growing media				Average
	Rock wool (M1)	Raw Husk (M2)	Cocopeat (M3)	Rice Husk Charcoal (M4)	
Control (T0)	3.25±0.35	7.00±0.71	7.25±0.35	7.50±0.00	6.25
5 (T1)	5.75±1.06	5.50±2.83	6.75±0.35	8.50±2.83	6.63
10 (T2)	4.75±0.35	7.50±0.71	9.00±2.12	6.75±0.35	7.00
15 (T3)	5.25±1.76	5.50±0.71	7.50±0.71	5.75±0.35	6.00
Average	4.75 b	6.38 ab	7.63 a	7.13 a	
KK = 15% BNJ M = 1.87					

The numbers presented represent the mean ± standard error. Similar letters adjacent to the mean indicate statistically insignificant differences based on the Honestly Significant Difference test at the 5% level.

Based on the data in Table 3, it shows that in the treatment of tomato LOF and planting media, the interaction and primary treatment of tomato LOF did not differ significantly in tomato plant production but differed substantially from the primary treatment in the planting media (Prasetya, 2014). The average flowering age was 3.25 - 9 fruits. Compared to the description of cherry tomatoes, the rampai variety had 8 - 10 fruits.

The number of fruits with tomato LOF treatment did not show any significant difference, and this is thought to be because the concentration given is still relatively low. Hence, the elements in the tomato LOF are insufficient to support the number of fruits.

From the research results (Suryani et al., 2020) the number of fruits produced per best planting was 17.32 fruits, while from this study the number of fruits produced per best planting was only 9 fruits, this happened because of a disease attack which caused plant production to decrease including the number of fruits and the nutrients produced were also small.

This research was conducted to make the growth of branches that emerge from the leaf axils more effective in increasing the number of fruits. (Safitri, 2020) stated that the purpose of pruning is to make the growth and development of plants more productive and to increase the efficiency of nutrient use.

3.3. Fruit weight (grams)

The results of the variance analysis showed that the interaction and main treatment of tomato LOF and planting media did not significantly affect the weight of tomato plant fruit. The average observation results of the tall plant tomato after the BNJ test were measured at 5%, as seen in Table 3.

Table 3. Average fruit weight with tomato LOF treatment and planting media

LOFTomat (ml/15 l water)	Growing media				Average
	Rock wool (M1)	Raw Husk (M2)	Cocopeat (M3)	Rice Husk Charcoal (M4)	
Control(T0)	8.12±1.77	5.60±1.84	8.47±0.53	8.40±1.84	7.65
5 (T1)	7.32±2.58	7.87±0.95	9.11±0.41	9.45±0.49	8.44
10 (T2)	10.20±0.42	8.13±0.33	10.15±2.33	7.90±0.56	9.1
15 (T3)	7.25±1.62	9.12±1.94	9.72±0.53	9.45±0.84	8.89
Average	8.22	7.68	9.36	8.8	
KK = 14.50%					

The numbers presented represent the mean ± standard error. Similar letters adjacent to the mean indicate statistically insignificant differences based on the Honestly Significant Difference test at the 5% level.

The data in Table 4 shows that the treatment of tomato LOF and planting media did not significantly differ in the tomato plant's fruit weight. The average age of flowering is 5.6 - 10.2 grams. When compared with the description of cherry tomatoes, the rampai variety is 11 g

P is one type of macronutrient needed to increase the growth and yield of tomato plants. Adding P fertilizer is one effort that can be made to improve the availability of P in the soil. Guano fertilizer is one P source that plants easily absorb to support plant growth and development.

According to Fadhillah (Nur Alfiah et al., 2023), the meristem part at the growing point and the fruits in development are throughout the plant body. If photosynthesis is carried out by plants can take place.

The study's results (Suryani et al., 2020) showed that the weight of the fruit per plant was 12.8 grams, which was greater than that produced by this study, which was 10.2 grams. When the harvested plants experienced a disease attack in the form of leaf rust, which reduced the harvest yield, the tomato harvest could only be done 4 times, and the high frequency of rain caused this leaf rust attack, while the research location did not use a greenhouse.

3.4. Fruit Weight Per Plant (day)

The results of the variance analysis showed that the interaction and main treatment of tomato LOF and planting media had a significant effect on the weight of fruit per tomato plant. The average observation results show that the fruit weight per plant after the BNJ test was carried out at the 5% level, as seen in Table 4.

Table 5. Average fruit weight per plant with tomato LOF treatment and planting media

LOFTomat (ml/15 l water)	Growing media				Average
	Rock wool (M1)	Raw Husk (M2)	Cocopeat (M3)	Rice Husk Charcoal (M4)	
Control(T0)	26.25±8.84 c	38.75±0.96 bc	62.00±1.41 abc	64.25±1.67 abc	47.81 b
5 (T1)	54.00±8.48 c	47.25±0.25 bc	60.50±7.78 abc	95.25±9.54 a	64.25 a
10 (T2)	46.00±4.94 c	60.75±3.18 bc	66.00±9.80 abc	53.75±6.70 abc	56.63 ab
15 (T3)	44.50±4.85 c	44.25±1.67 bc	72.75±1.67 ab	54.50±8.48 abc	54 ab
Average	42.69 b	47.75 b	65.31 a	66.94 a	
KK T = 14, 52 % BNJ T = 14.75 BNJ M = 14.75 BNJ TM = 41.28					

The numbers presented represent the mean ± standard error. Similar letters adjacent to the mean indicate statistically insignificant differences based on the Honestly Significant Difference test at the 5% level.

The data in Table 5 shows that in the treatment of bokashi LOF tomatoes and planting media, both in terms of interaction and the main effect, there is a significant difference in the weight of the fruit per tomato plant. The average weight of the fruit per plant is 26.25 - 95.25 grams. When compared with the description of cherry tomatoes, the rampai variety is 3 - 3.5 Kg

The LOF used in this study contains 2% P and 1% K.

The P nutrient element is a storage and transfer of energy for all metabolic activities of tomato plants, which can stimulate flower formation and fruit ripening, thereby accelerating the harvest period. The K element can help transport assimilation results from leaves to plant tissues. If the plant's photosynthesis process is optimal, the photosynthate results produced will also be optimal, thus affecting the weight of the fruit produced by the plant.

Figure 2. Tilapia pond and aquaponic filtration system

Figure 3. Solar power plant (PLTS) system for an aquaponic irrigation system

The amount of LOF content used is indeed inadequate. Still, it can supply nutrients from the fishpond; in this case, it is 100 gourami fish weighing 20 grams per fish. In addition, nutrients are also produced from the plant media used, especially burnt and raw rice husks.

According to Ginanjar et al. (2021), optimal plant growth requires a planting medium with good porosity, aeration, and light, so that the plant roots are strong and not easily damaged, able to maintain humidity, and store water.

The nutrients P and K affect the generative phase of tomato plants; organic materials can increase generative growth, high phosphorus can increase flower formation and produce many fruits.

Compared to the research results (Mas'ud & Widhiant, 2021), namely 270 grams with substrate media treatment and different concentrations of ab mix, the results are better, because the weight of the fruit per plant in this study was only 95 grams, this difference in results is suspected to be due to a disease attack in the form of leaf rust which causes crop failure and has an impact on observations of the weight of the fruit per plant.

Figure 4. Tomato plants 40 days after planting

4. Conclusion

The interaction between tomato LOF and planting media significantly affected only the measurement of fruit weight per planting. The primary treatment of tomato LOF had a notable impact solely on fruit weight per planting. In contrast, the planting media's primary treatment significantly influenced the number of fruits and the fruit weight per planting. Therefore, it is recommended that the concentration of tomato LOF be increased.

Acknowledgments

We are grateful to the Chancellor, Head of the Directorate of Research and Community Service of Riau Islamic University, Dean of the Faculty of Agriculture, Head of the Agrotechnology Study Program, team of lecturers, and students of the Agrotechnology study program for their assistance in this research.

References

Badan Pusat Statistik Indonesia. (2023). *Hasil pencacahan lengkap Sensus Pertanian 2023*. Sensus Pertanian, 28.

Ginanjar, M., Rahayu, A., & Tobing, O. L. (2021). Pertumbuhan dan produksi tanaman kailan (*Brassica oleracea* var. *alboglabra*) pada berbagai media tanam dan konsentrasi nutrisi AB mix dengan sistem hidroponik. *Jurnal Agronida*, 7(2), 86.

Hidayat, R., Saragih, S. H. Y., Adam, D. H., & Triyanto, Y. (2024). Optimizing tomato Bareto (*Lycopersicum esculentum* Mill) varieties growth and production using gamma ray radiation technology. *Jurnal Agronomi Tanaman Tropika (Juatika)*, 6(2).

https://doi.org/10.36378/juatika.v6i2.3639

Kementerian Pertanian. (2024). *Angka tetap hortikultura tahun 2023*. Kementan.

Mas'ud, H., & Widhiant, L. (2021). Pertumbuhan dan hasil tanaman tomat (*Lycopersicum esculentum* Mill) pada media substrat hidroponik dengan konsentrasi nutrisi AB mix yang berbeda. *Agrotekbis*, 9(2), 495–503.

Nur Alfiah, L., Siregar, K. A., & Novianto, E. (2023). Increasing the growth and yield of tomato plants (*Lycopersicum esculentum* Mill) by applying palm oil compost. *Jurnal Agronomi Tanaman Tropika (Juatika)*, 5(2), 330–338. https://doi.org/10.36378/juatika.v5i2.3062

Nur, M. (2016). Aplikasi kepekatan larutan nutrisi dan persentase media campuran cocopeat-bokashi pada pertumbuhan dan produksi butter head lettuce (*Lactuca sativa* var. *capitata* L.) secara hidroponik. *Dinamika Pertanian*, 194–202.

Nur, M., & Agara, O. (2024). Pengaruh ketinggian talang dan media tanam secara hidroponik vertikultur terhadap pertumbuhan selada Chris Green (*Lactuca sativa* L.). *Dinamika Pertanian*, 2024, 209–218.

Prasetya, M. E. (2014). Pengaruh pupuk NPK mutiara dan pupuk kandang sapi terhadap pertumbuhan dan hasil tanaman cabai merah keriting varietas Arimbi (*Capsicum annuum* L.). *Agrifor*, 13(M), 191–198. http://ejurnal.untag-smd.ac.id/index.php/AG/article/view/862

Rachmawati, E. P., Titania, V., & Chempro, S. (2023). Pemanfaatan kulit nanas dan kulit pisang sebagai pupuk organik cair. *Chempro*, 2(1), 53–58. https://doi.org/10.33005/chempro.v2i01.92

Rakocy, J. E., Masser, M. P., & Losordo, T. M. (2006). *Recirculating aquaculture tank production systems: Aquaponics - integrating fish and plant culture* (SRAC Publication No. 454). Southern Regional Aquaculture Center.

Safitri, E. L. (2020). Aplikasi PGPR (*Plant Growth Promoting Rhizobacteria*) dan Gandasil B dalam meningkatkan pertumbuhan dan produksi tanaman cabai rawit (*Capsicum frutescens* L.).

Sahin, K., Orhan, C., Akdemir, F., Tuzcu, M., Sahin, N., & Yilmaz, I. (2022). Tomato lycopene in the prevention of cardiovascular diseases: Mechanisms and clinical evidence. *Critical Reviews in Food Science and Nutrition*, 62(15), 4223–4235.

Suryani, Y. R., Sudarma, A. D., & Sumarsono. (2020). Growth and production of tomatoes (*Lycopersicum esculentum*) as affected by various types of organic fertilizer and rice husk mulch dosage. *NICHE Journal of Tropical Biology*, 3(1), 18–25. https://ejournal2.undip.ac.id/index.php/niche

Yudiawati, E., & Kurniawati, E. (2019). Pengaruh berbagai macam mikroorganisme lokal (MoL) terhadap pertumbuhan tanaman tomat (*Lycopersicum esculentum* Mill) varietas Permata pada tanah Ultisol. *Jurnal Sains Agro*, 4(1). https://doi.org/10.36355/jsa.v4i1.241