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Qualitative and Quantitative Characteristics of Some Tomato Varieties (*Solanum lycopersicum* L.)

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ABSTRACT

Tomato plants, classified as *Solanum lycopersicum* L., are a popular vegetable crop within the Solanaceae family, grown and utilized extensively globally. Up to the year 2020, 204 tomato varieties have been introduced by the Minister of Agriculture, with the majority being hybrid varieties developed through collaboration with national and multinational private seed companies. This research aims to identify the distinctions in qualitative attributes among rose tomatoes, bareto tomatoes, and cherry golden tomatoes. The employed research approach involves a descriptive analysis of the qualitative and quantitative attributes of various tomato cultivars, specifically cherry golden, bareto, and rose. The study findings revealed notable variations in qualitative traits among different varieties of tomato plants, including cherry golden tomatoes, bareto tomatoes, and rose tomatoes. These differences were particularly evident in growth habit, leaf color, leaf morphology, flower structure, and fruit color. Furthermore, noticeable variations in quantitative traits, such as the height of the plants, were observed at regular intervals across the different tomato varieties.

Keywords: *Descriptive Analysis, Qualitative, Quantitative, Tomatoes, Varieties*

1. INTRODUCTION

Tomato plants, scientifically known as *Solanum lycopersicum* L., belong to the Solanaceae family and have a chromosome number of 2n = 2x = 24. They are extensively cultivated and consumed worldwide. In industries, tomatoes can be consumed fresh as vegetables or processed into tomato sauce. The demand for tomatoes is rising due to population growth, increased purchasing power, and global climate changes. According to PUSDATIN data from 2017, national tomato consumption is expected to increase by an average of 5.32% annually from 2017 to 2021. Urban farming activities utilizing available spaces and yards are being promoted to enhance food security in urban areas. Although urban communities recognize the significance of urban farming, they lack sufficient information on suitable varieties for urban cultivation. The existing tomato varieties, among others, have not been specifically developed for urban farming purposes. Up to the year 2020, the Minister of Agriculture has released 204 tomato varieties, predominantly in the form of hybrid varieties, developed by national and multinational private seed companies (Avivi et al., 2022).

Tomato plants are considered a valuable type of vegetable with significant economic worth. Its tart flavor can impart a refreshing experience and enhance the taste of culinary preparations. Furthermore, tomatoes contain a variety of constituents, including flavonoids, as well as vitamin C and vitamin E (Zer et al., 2023). Tomatoes are also rich in lycopene, a compound that acts as an antioxidant, effectively neutralizing free radicals and potentially reducing blood sugar levels. Lycopene plays a role in lowering blood glucose levels by preventing insulin hormone resistance, thus enhancing cellular tolerance to glucose and mitigating elevated levels of glucose.

Tomato cultivation is currently feasible in high-altitude regions and low-lying areas (Lakhdari et al., 2023). Nevertheless, tomato yield in low-lying regions remains considerably low, at 6.0 tons ha-1, whereas in high-altitude areas, tomato yield can reach 26.60 tons ha-1. The low tomato yield in low-lying regions may be attributed to various factors, including heightened pest and disease pressures, elevated temperature stress, and the impacts of climate change. Enhancing tomato plant productivity can be achieved through advancements in cultivation techniques. Opting to grow tomato plants in a greenhouse presents a viable solution to mitigate pest and disease pressures from the external environment and regulate the microclimate within the plant growth environment by assessing and comparing the uniformity among genotypes in tomato plants (Laginda, 2017). In hybrid plants, genetic diversity arises due to the distinct genetic traits inherited from both parent plants. As per Lakhdari et al. (2023), each successive generation exhibits varying levels of uniformity, with the uniformity of subsequent generations surpassing that of preceding ones.

High-quality tomatoes significantly affect the selling price and consumer satisfaction. Monitoring tomato ripeness is a crucial component in ensuring the production and distribution of high-quality tomatoes. If a tool can automatically classify tomatoes based on their ripeness, it will facilitate a reduction in manual labor for farmers, which is currently extremely time-consuming. Furthermore, implementing automatic tomato counting in the field is expected to enhance the effectiveness of assessing economic worth, resulting in heightened agricultural productivity. Hence, creating technology capable of facilitating this is imperative (Steven Cipta Putra, 2022).

The quality of tomatoes can be determined by their qualitative characteristics, which can also influence consumer preferences. For instance,

research by Avivi et al. (2022) highlights that factors such as fruit color intensity, presence of green shoulders, fruit shape, and tip shape significantly determine consumer preferences for tomatoes. Moreover, the arrangement of tomato leaflets concerning the stem can impact the amount of light received and the photosynthesis process in tomato plants. Qualitative characteristics are also important in hybrid tomato seed production activities, where tests are conducted to assess hybridity. This study examines the qualitative traits of different tomato varieties, including cherry golden, bareto, and rose varieties (Waluyo, 2020).

Tomato plants with quantitative traits exhibiting high heritability values and promising genetic progress offer a strong foundation for selection purposes. Individuals in the F2 tomato population display high yields and a favorable response to organic cultivation. Given that numerous genes govern quantitative traits in tomatoes, focusing on selecting traits that enhance tomato productivity is essential. Purwati (2009) states that the objective of plant breeding is to enhance plants' genetic capacity, with the goal of developing new varieties possessing superior characteristics relative to those of the parent plants. The start of tomato plant breeding involves enhancing their genetic variation.

Based on the problem statement presented above, the researcher will conduct a study on the qualitative and quantitative characteristics of several tomato varieties. The research aims to determine the differences in qualitative characteristics among these tomato varieties.

2. MATERIAL AND METHODS

2.1 Place and Time

This research will be conducted at the Green House of Labuhanbatu University on Rantauprapat St, Labuhanbatu, North Sumatra, Indonesia. The research site is positioned at coordinates 1.7764° N and 99.4254° E, with an elevation of approximately 25 meters above sea level. The study is planned to take place from December 2023 to March 2024.

Tools and Materials

This research utilizes several measuring tools and materials, including a ruler or caliper to measure the length and width of fruit, an analytical scale to measure fruit weight, a thermometer to measure temperature, plain black fabric as a background for plant images, along notes and writing instruments. The varieties used include Cherry Golden, Bareti, and Mawar. The seed source for Cherry Golden is obtained from PT. Benih Unggul features registered seeds with certification. The Bareti variety is sourced from CV. Bunga Nusantara provides superior and labeled seeds. For the Mawar variety, seeds are taken from PT Agro Sejahtera, which offers tested and certified seed quality.

2.2 Research Method

The descriptive research method aims to illustrate a current phenomenon's qualitative and quantitative characteristics. The researcher establishes goals, formulates specific problems, identifies the population and sample, and prepares research instruments. Qualitative data, such as growth type, leaf color, leaf shape, flower shape, and fruit shape, are collected through field observations, whereas quantitative data, such as plant height, are obtained through direct measurements and surveys.

2.3 Observation Parameter

The observed parameters for qualitative characteristics include leaf color, leaf shape, fruit color, and flower shape. In contrast, quantitative characteristics are determined by calculating the average height of the plants.

2.4 Data Analysis

The data analysis of this study used qualitative descriptive analysis of growth type, leaf color, leaf shape, flower shape, and fruit shape, and quantitative

analysis of plant height in various tomato varieties (Ginting *et al*., 2022).

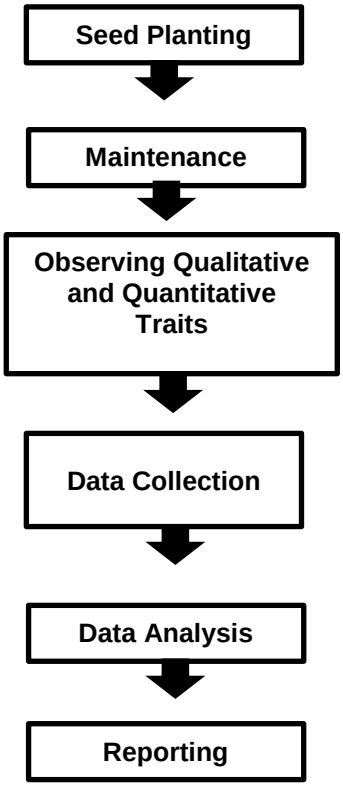

Figure 1. Research Flow Diagram

3. RESULT AND DISCUSSION

3.1 Qualitative Traits

3.1.1 Growing Type

Based on the results of field observations on the qualitative characteristics of the growth properties of tomato plants a. cherry variety, b. bareto and c. rose variety, presented in Figure 1.

The following are the growth types of several tomato varieties (Figure 2). The study results showed that the growth type of the cherry golden variety is relatively upright, the bareto variety is upright, and the rose variety is spreading. cherry golden sweet tomatoes (*Lycopersicum esculentum* Var. cerasiforme) are fruit vegetables classified as seasonal plants. The fruit is a source of vitamins and minerals. Its use is increasingly widespread because it is consumed as fresh tomatoes and for cooking spices, it can also be further processed as raw materials for the food industry, such as fruit juice and tomato sauce (Pan *et al*., 2023).

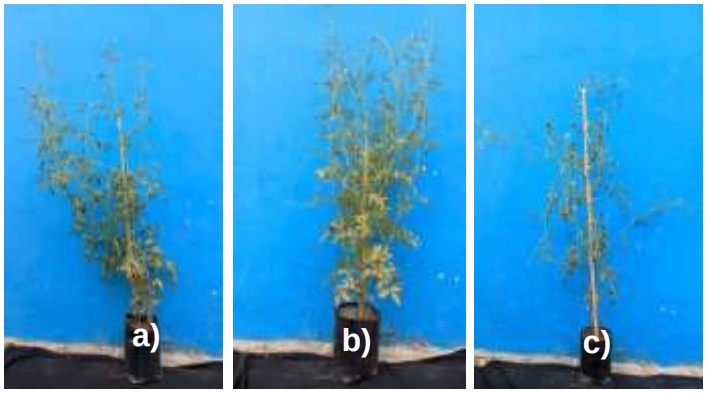

Figure 2. Tomato plant growth types: a) cherry golden, b) bareto variety, and c) rose variety.

According to Sari et al. (2023), Bareto tomatoes exhibit adaptability to medium to high elevations and are typically planted using an intermediate method. These tomatoes require a harvesting period of 85 to 95 days after planting and are characterized by their round shape with a groove. The Rose tomato is an indigenous cultivar known for its limited lifespan and determinate growth habit. The optimal time for harvesting rose tomatoes is approximately 60 hours after reaching physiological maturity, with plants typically reaching a height between 50 and 90 centimeters. The leaves exhibit a green hue and measure between 10 and 25 centimeters in width. The tomatoes are round with a groove, with approximately 20 fruits per kilogram. This variety is tolerant of wilt disease and well-suited for lowland cultivation (Pinayungan *et al*., 2021).

3.1.2 Leaf Color

Based on field observations regarding the leaf shapes of several tomato plants, such as golden cherry tomatoes, bareto tomatoes, and rose tomatoes, qualitative characteristics of the leaf shapes are presented in Figure 3.

Figure 3. Color of tomato plant leaves a) cherry golden variety, b) bareto, and c) rose tomato

The study findings indicated that the cherry golden tomato variety exhibited a medium green leaf color, as did the bareto variety. Conversely, the 'Mawar Hijau' tomato variety was noted for its characteristic medium green leaves abundant in chlorophyll, a crucial pigment that facilitates photosynthesis, the mechanism through which plants harness sunlight for their growth and maturation. The high concentration of chlorophyll found in these leaves fulfills the critical function of capturing sunlight, generating glucose, and ultimately sustaining the health and productivity of the plant. Lush green foliage serves as an essential indicator of a plant's overall health and can potentially enhance both the quality and quantity of tomato yield. Prior research, such as the investigations conducted by Rahmat et al. (2021) and Suryani et al. (2019), have indicated that tomato plants with elevated levels of chlorophyll tend to yield superior fruit and exhibit increased productivity. These findings underscore the significance of chlorophyll in the production of high-quality tomatoes.

3.1.3 Leaf Shape

Based on field observations regarding the qualitative characteristics of various tomato plants, the Cherry Golden variety, Bareto variety, and Mawar variety can be seen in Figure 4.

Research findings indicate that the golden cherry tomato variety's leaf shape

is elongated, the bareto variety's leaf shape is elongated and pointed, and the leaf shape of the mawar variety is serrated and tapering (Figure 3). These leaf shapes may serve as distinctive characteristics that differentiate various tomato varieties. Some tomato varieties exhibit compound leaves consisting of several leaflets, which grow alternately along the plant's stem. Leaves are categorized as semi-erect, horizontal, or hanging based on their position. Tomato leaves can also be differentiated based on the type of leaflets: pinnate (without leaflets) and doubly pinnate (with petiolated leaflets) (Dwinanti & Damanhuri, 2021).

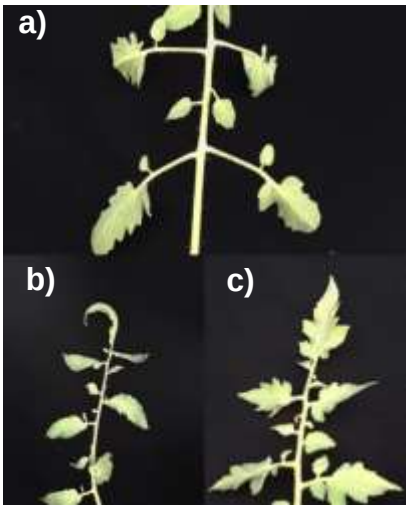

Figure 4. The shapes of tomato plant leaves: a) cherry golden variety, b) bareto, and c) rose tomato.

3.1.4 Flower Shape

Based on field observations regarding the flower shapes of various tomato varieties, such as cherry golden, bareto, and mawar, the analysis results are presented in Figure 5.

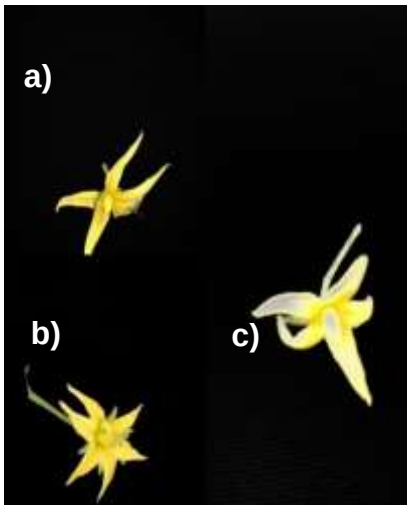

Figure 5. Flower shape of tomato plants a) cherry golden variety, b) bareto, and c) rose tomato

Based on the floral morphology of various tomato cultivars, it is evident that the cherry golden tomato variety exhibits a symmetrical arrangement of 4 petals around its central axis, the bareto variety displays 5 regularly arranged petals, and the rose variety features 5 petals forming an open funnel shape (Figure 5). In general, the primary advantages of different tomato varieties are primarily associated with their aesthetic appeal and the potential to enhance pollination

efficiency, which can indirectly impact the yield and quality of the fruit. Tomato flowers can self-pollinate due to their monoecious nature, although this does not preclude the possibility of cross-pollination. The flowers are typically clustered, with 5-10 flowers per cluster, depending on the specific variety (Permata Sari & Astija, 2020).

3.1.5 Fruit Shape

The fruit form of various tomato plant varieties is analyzed qualitatively, with the results presented in Figure 6.

This research suggests that the ripe fruit of various tomato varieties, such as the cherry golden variety, exhibit a yellow color, while the bareto and rose varieties exhibit a red color (see Figure 4). Certain types of tomatoes contain the potent antioxidant lycopene, which is crucial in shielding cells from harm caused by free radicals. Once the fruit reaches maturity, it typically exhibits a red or yellow coloration. This disparity suggests a variance in nutritional composition, with red fruits possessing a high lycopene content and yellow fruits containing high levels of vitamin C (Dwinanti & Damanhuri, 2021).

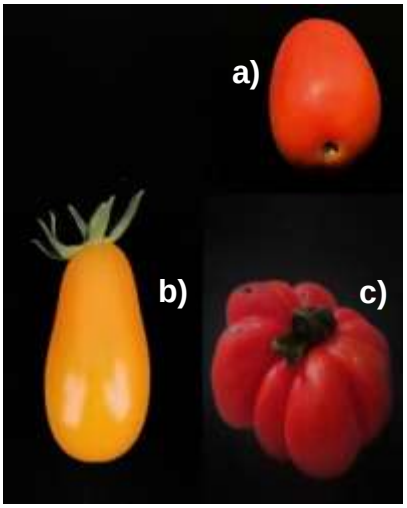

Figure 6. Fruit shape of tomato plants a) cherry golden variety, b) bareto, and c) rose tomato

3.2 Quantitative Traits

Quantitative characters in various tomato plants with tomato plant height parameters that have results obtained in the field are presented in Figure 7.

The study findings indicated that cherry golden exhibited the tallest average height among various tomato varieties, while bareto variety had the shortest height (Table 1). Tomato plants typically reach a height ranging from 0.5 to 2.0 meters. Due to their creeping nature, tomato plants can be trained to grow vertically by being supported on bamboo or wooden poles during cultivation (Wahyurini & Suryawati, 2021).

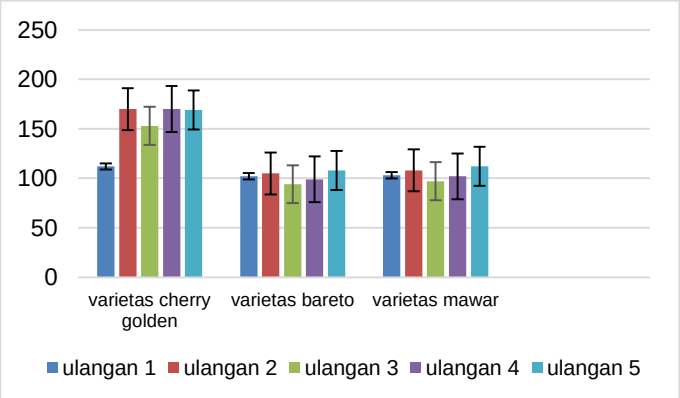

Figure 7. Average plant height of several tomato varieties at 7 MST

4. CONCLUSION

The outcomes of qualitative attributes in different tomato plant varieties, including cherry golden tomatoes, bareto tomatoes, and rose tomatoes, exhibit notable disparities in growth patterns, leaf color, leaf shape, and fruit color. Similarly, the quantitative characteristics of plant height in various tomato plant cultivars also show significant differences across different observation intervals.

REFERENCES

Avivi, S., Mufidah, A. I., Siswoyo, T. A., & Restanto, D. P. (2022). Pengaruh cekaman genangan terhadap pertumbuhan dan hasil beberapa varietas tomat (*Lycopersicum esculentum* Mill.). *Agrovigor: Jurnal Agroekoteknologi, 15*(1), 1-5. https://doi.org/10.21107/agrovigor.v15i1.8866

Daryanto, A., Istiqlal, M. R. A., Kalsum, U., & Kurniasih, R. (2020). Penampilan karakter hortikultura beberapa varietas tomat hibrida di rumah kaca dataran rendah. *Jurnal Agronomi Indonesia (Indonesian Journal of Agronomy), 2*(48), 157-164.

De Luna, R. G., Dadios, E. P., Bandala, A. A., & Vicerra, R. R. P. (2020). Tomato growth stage monitoring for smart farm using deep transfer learning with machine learning-based maturity grading. *Agrivita, 42*(1), 24-36. https://doi.org/10.17503/agrivita.v42i1.2499

Dwinanti, A. W., & Damanhuri, D. (2021). Uji daya hasil calon varietas hibrida tomat (*Lycopersicum esculentum* Mill.) pada musim hujan. *PLANTROPICA: Journal of Agricultural Science, 6*(1), 38-48. https://doi.org/10.21776/ub.jpt.2020.006.1.5

Ginting, Y. B., Yamani, H. A. Z., & Sunaryati, R. (2022). Analisis pendapatan usahatani tomat (Lycopersicum esculentum) di Kelurahan Kalampangan Kota Palangka Raya. *Journal Socio Economics Agricultural, 17*(1), 21-29. https://doi.org/10.52850/jsea.v17i1.4323

Laginda, Y. S. (2017). Aplikasi pupuk organik cair berbahan dasar batang pisang terhadap pertumbuhan dan produksi tanaman tomat (Lycopersicum esculentum Mill.). *Jurnal Galung Tropika, 6*(2), 81-92.

Lakhdari, Y., Soldevila, E., Rezgui, J., & Renault, É. (2023). Detection of plant diseases in an industrial greenhouse: Development, validation & exploitation. *2023 International Symposium on Networks, Computers and Communications (ISNCC)*. https://doi.org/10.1109/ISNCC58260.2023.10323932

Nur Alfiah, L., Abdilah Siregar, K., & 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

Pan, F., Zhang, Q., Zhu, H., Li, J., & Wen, Q. (2023). Transcriptome and metabolome provide insights into fruit ripening of cherry tomato (*Solanum lycopersicum* var. cerasiforme). *Plants, 12*(19). https://doi.org/10.3390/plants12193505

Permata Sari, W., & Astija. (2020). Analisis tingkat keberhasilan penyerbukan bunga dari tanaman tomat (*Solanum lycopersicum* L.) dan pemanfaatannya sebagai bahan ajar. *Journal of Biology Science and Education, 8*(2), 623-629. http://jurnal.fkip.untad.ac.id

Pinayungan, R., Hayati, M., & Syafruddin, S. (2021). Pengaruh dosis pupuk hayati mikoriza terhadap pertumbuhan dan hasil pada beberapa varietas tomat

(*Lycopersicum esculentum* Mill.). *Jurnal Ilmiah Mahasiswa Pertanian, 6*(4), 819-828. https://doi.org/10.17969/jimfp.v6i4.15027

Rahmat, A., Kusnadi, M., & Harahap, S. (2021). Pengaruh kandungan klorofil terhadap kualitas dan kuantitas buah tomat. *Jurnal Hortikultura, 27*(2), 123-134.

Sari, W., Oksilia, & Lusmaniar. (2023). Pengaruh konsentrasi pupuk organik cair terhadap komponen hasil dan hasil dua varietas tanaman tomat (*Lycopersicum esculentum* Mill.). *Jurnal Ilmu Pertanian Agronitas, 15*(1), 169-181.

Steven Cipta Putra. (2022). Fakultas Pertanian Universitas Islam Riau Pekanbaru 2022. Pengaruh aplikasi kompos limbah akasia dan pupuk NPK 16:16:16 terhadap pertumbuhan serta hasil tanaman tomat (*Solanum lycopersicum* L.), Fakultas Pertanian Universitas Riau Pekanbaru, 14.

Suryani, D., Pratiwi, R., & Wulandari, N. (2019). Korelasi klorofil dengan produktivitas tanaman tomat. *Jurnal Tanaman Hortikultura, 18*(1), 45-52.

Wahyurini, E., & Suryawati, A. (2021). Growth and yield variability performance in ten genotype of tomatoes (*Lycopersicum esculentum* Mill.). *RSF Conference Series: Engineering and Technology, 1*(1), 185-190. https://doi.org/10.31098/cset.v1i1.393

Waluyo, T. (2020). Analisis finansial aplikasi dosis dan jenis pupuk organik cair terhadap produksi tanaman tomat (*Lycopersicum esculentum* Mill.). *Jurnal Ilmu dan Budaya*, 8357-8372.

Zer, P. P. P. A. N. W. F. I. R. H., Tambunan, F. N., Rosnelly, R., & Wanayumini, W. (2023). Comparison of tomato leaf disease classification accuracy using support vector machine and k-nearest neighbor methods. *Sinkron, 8*(2), 939-947. https://doi.org/10.33395/sinkron.v8i2.12195