



The Effect Of Different Altitudes On The Quality Of Mangga (*Mangifera indica* L.) Variety Gedong Gincu

Chairunnisa Apriani¹, Ayu Sabrina Gunawan², Siti Wahyuni³

¹Swadaya Gunung Jati University, Cirebon, Indonesia, chairunnisa.april@gmail.com

²Swadaya Gunung Jati University, Cirebon, Indonesia, ayus3968@gmail.com

³Swadaya Gunung Jati University, Cirebon, Indonesia, sitiwahyuni@ugj.ac.id

Corresponding Author: sitiwahyuni@ugj.ac.id

Abstracts.

This study aims to determine the effect of different altitudes on the quality of Gedong Gincu mango fruit, and to determine which altitude has better quality of Gedong Gincu mango fruit. The research was conducted at the Laboratory of the Faculty of Agriculture, Universitas Swadaya Gunung Jati Cirebon, West Java. The research was conducted from July to August 2024. The research method used was the survey method, covering Jatibarang District (Krasak Village, Pawidean, and Jati Sawit) as a lowland, and Greged District (Gemulung Tonggoh Village, Jati Pancur, and Lebak Mekar) as a highland. From each altitude, 30 Gedong Gincu mangoes were taken. Variables measured included weight loss, fruit hardness, fruit diameter, total soluble solids, vitamin C content, and organoleptic test. Data were analyzed using two independent samples t-test, and Wilcoxon test for organoleptic. The results showed that differences in altitude made a difference to the 4th day weight loss, total soluble solids content, 4th day vitamin C content, 1st and 4th day hardness, as well as on taste, aroma and consumer preference. Gedong Gincu mango fruit from the lowlands had higher weight loss and total soluble solids than those from the highlands, while vitamin C content and hardness of Gedong Gincu mango fruit from the lowlands were lower than those from the highlands. The flavor and aroma parameters of highland Gedong Gincu mango fruit were preferred over Gedong Gincu mango fruit from the lowlands.

Keywords: Altitude, Quality of Gedong Gincu Mango.

INTRODUCTION

Horticulture is one of the industries that can play a role as a provider of food needs for the community and a contributor to foreign exchange. One commodity that has both functions is Gedong Gincu mango. Besides being consumed by the Indonesian people, Gedong Gincu mangoes are also exported to foreign markets, making Gedong Gincu mangoes have a high economic value. (Awaliyah, 2018).

Gedong mangoes are widely cultivated in West Java, making it one of the priority

commodities in the area. Therefore, West Java is known as the main producing province of Gedong Gincu mangoes (Hastuti et al., 2022). Total mango production in West Java in 2020

reached 4,116,750 quintals (BPS Jabar, 2021), of which 30% was Gedong Gincu mango. The main mango producing areas in West Java include Cirebon and Indramayu Regencies. (Sulistyowati L, 2016).

Mango is a horticultural commodity that is included in the category of climacteric fruit, which is a fruit that can continue the ripening process after being harvested. In climacteric fruits, even though they have been picked, metabolic activities such as respiration, transpiration, and ethylene production still occur. These activities drive the process of ripening, aging, wilting, and decay. (John, 2018). Respiration in climacteric fruits can be used to determine the duration of storage and ripening processes, making it possible to estimate the maximum storage time to obtain high-quality fruit. (Saiduna and Madkar, 2013).

One of the characteristics of horticultural crops is perishability. This characteristic makes the fruit difficult to sell because the shelf life is short and the quality tends to decrease, causing losses due to a decrease in price. Therefore, efforts are needed to overcome these problems, one of which is post-harvest processing. (Aisyah and Alifah, 2022).

One of the factors that influence the growth and production of Gedong Gincu mangoes is the altitude of the planting location. Differences in environmental conditions at various altitudes have a significant impact on the growth, development, and productivity of this mango plant. According to Suwardikee Putu et al., (2018) Mango plants usually do not grow and bear fruit optimally at high altitudes, so they often have to be cut down. Mango populations are more commonly found in lowland areas.

In general, fully ripe Gedong Gincu mangoes show a yellow color at the tip and center of the fruit, while the base of the fruit is red. However, differences in altitude affect the shape, color, and texture of the fruit flesh in different regions. These differences are caused by variations in microclimate, such as rainfall, temperature, and humidity (Jaenudin et al., 2019). According to Ariningsih et al. (2021) Gedong Gincu mangoes from Indramayu have a round shape, small size, striking red color, hard and thin flesh, fragrant aroma, and very soft taste. Meanwhile, Gedong Gincu mangoes from Cirebon are oval-shaped, red in color, with medium-sized and relatively thick flesh, fragrant aroma, and sweet taste.

Gedong Gincu mango is one of the most popular mango varieties in Indonesia. However, in-depth research on the effect of altitude on the growth and quality of Gedong Gincu mangoes is still limited. Altitude has great potential to affect the growth and quality of fruits, including mangoes. Therefore, the authors conducted this study to investigate how altitude can affect the growth and quality of Gedong Gincu mangoes.

LITERATURE

Fruit quality can be assessed by physical characteristics such as color, size, shape, and physical defects. As well as chemical characteristics such as sugar and nutrient content. Taste, aroma and color are the main factors that consumers consider when choosing fruits, including mangoes. Mango (*Mangifera indica* L) is one of the seasonal tropical fruits. In general, the final quality of the fruit is influenced by pre-harvest factors (seed/seed quality, growing environment, agro-climate, and cultivation techniques) and post-harvest factors (picking age, harvesting process, and handling of harvested products). (Oksilia, 2018).

Elevation differences are positively correlated with microclimate, rainfall and temperature (Othman et al., 2015; Wijayanto & Nurunnajah, 2012; Martínez, 2021). The higher a place is from sea level, the more rainfall it receives, but the faster the decomposition of organic matter, the lower the temperature and the higher the nutrient content (Massacesiet al., 2020); Asriyani, 2021). In addition, altitude also affects the acceleration

of fruit ripening. The higher the location, the slower the fruit ripening process (Somporn et al., 2012; Asriyani, 2021).

Indramayu and Cirebon districts have different geographical conditions and climatic factors. Indramayu Regency, precisely in Jatibarang District, is a lowland area with an altitude of 2.08 meters above sea level (BPS Jabar, 2021). Cirebon Regency, more precisely in Greged District, is a plain with an altitude of 232 meters above sea level (masl) (BPS Cirebon Regency, 2022).

Research conducted by Ray et al. (2019) showed that mango plants require two main supporting factors, namely agro-climatic conditions and land carrying capacity. Agroclimatic conditions play a role in providing climate carrying capacity such as sun length and intensity, temperature, air humidity, wind behavior, and rainfall distribution.

According to research results Pedekawati et al. (2020) Cirebon Regency mango production is ranked third after Indramayu. There are differences in characteristics between Indramayu and Cirebon Gedong Gincu mangoes. Mango Gedong Gincu Indramayu Regency has the sweetest taste but with the smallest size. Cirebon Regency has a larger size than Indramayu Gedong Gincu mango with a sweeter and fresher flavor.

The results of Deliana's research (2011) in Ariningsih et al. (2021) revealed that Gedong Gincu mangoes from Majalengka and Cirebon are more desirable to consumers (domestic) than Gedong Gincu mangoes from Indamayu because the shape is rounder, the color is more attractive and the aroma is sharper.

According to Wijaya et al., (2018) in Bakhtiar et al., (2022) Optimal light intensity during the growing period is very important for plant growth and development because it affects fruit formation. An increase in temperature has an impact on increasing the size of the length and diameter of the fruit, the number of fruits and the time of first fruit emergence.

METHODS

The research will be conducted at the Laboratory of the Faculty of Agriculture, Universitas Swadaya Gunung Jati Cirebon, West Java. The research was conducted from July to August 2024. The tools used in this research are camera, stationery, lux meter, analytical balance, hand refractometer, thermohygrometer, penetrometer, burette, pipette, goblet glass, measuring cup, erlenmeyer glass, glass funnel, spatula, knife, sieve, mortar, spirtus lamp, plastic container, tissue, vernier term, paper label pole. The materials used in this study are 0.1 N Iodine, 1% amylum (cornstarch), aquadesh, and Gedong Gincu Mango fruit.

The research was conducted using a survey method by sampling from three farm locations representing each altitude. In the lowlands, samples were taken from Jatibarang Subdistrict in Krasak, Pawidean, and Jati Sawit Villages. While in the highlands, samples were taken from Greged sub-district in Gemulung Tonggoh, Jati Pancur, and Lebak Mekar villages. From each elevation, 30 Gedong Gincu mangoes were taken.

Observations were made on days 1, 4 and 7 during storage, which included weight loss, fruit hardness, fruit diameter, total soluble solids, vitamin C content, and organoleptic tests of Gedong Gincu mango fruit attributes (color, taste, aroma, texture and liking). Data from the experiment were analyzed using the t-test to test the mean comparison of two independent samples, while the organoleptic test used the Wilcoxon test for two paired samples. Data analysis using SPSS software version 27.0

DISCUSSION

Weight Loss

Weight loss on day 1 was not analyzed because the fresh weight of Gedong Gincu mango fruit on day 0 and 1 was relatively the same. Weight loss analysis was conducted on the 4th and 7th day of storage.

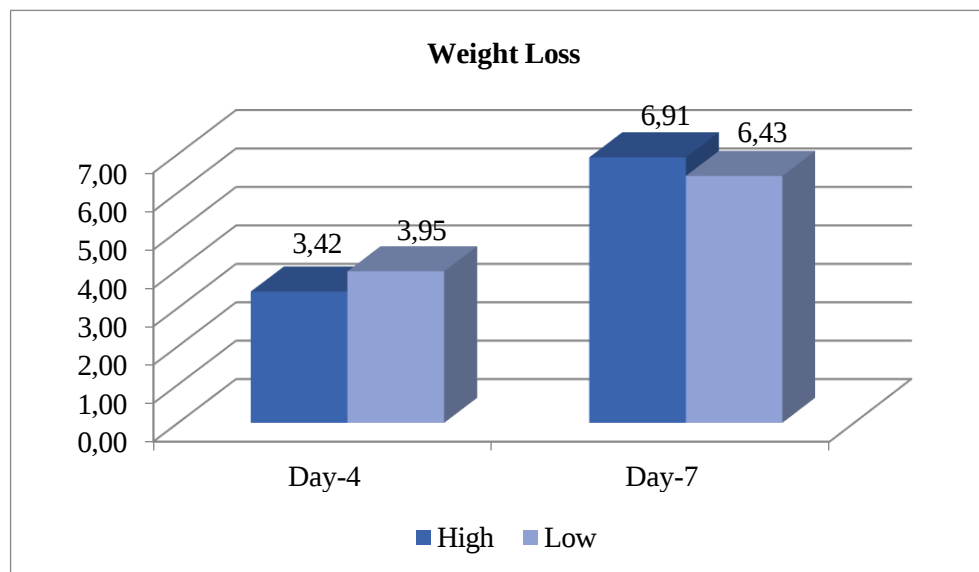


Figure 1. Average Weight Loss Days 4 and 7 (%)

The weight loss of Gedong Gincu mango fruit on day 7 is higher than day 4, this shows that the longer the fruit is stored, the weight loss will increase. Gedong Gincu mango fruit is classified as a climatic fruit, it still continues to carry out post-harvest metabolic processes, such as the process of respiration that goes hand in hand with the ripening process. Respiration will produce CO₂, water, and energy in the form of heat and gas. These respiration products will be evaporated through the surface of the fruit, causing weight loss during storage.

According to Alexandra (2014), weight loss is a condition caused by the process of respiration and transpiration in post-harvest fruits. During this process, oxygen is used to burn organic matter in the fruit, producing energy followed by the release of combustion residues in the form of carbon dioxide gas and water that is evaporated. A similar statement was also conveyed by Roiyana et al. (2012) in Andriani, et al, (2018) that an increase in the respiration rate will cause the breakdown of compounds such as carbohydrates in the fruit, producing CO₂, energy, and water that evaporates through the surface of the tomato skin, thus causing weight loss.

The results of the t-test analysis showed that on the 4th day observation, the probability value or Sig. (2-tailed) of 0.025 is smaller than 0.05, meaning that on the 4th day observation there is a real difference in weight loss between Gedong Gincu mango fruit from the highlands and lowlands. While on the 7th day observation, the probability value of 0.258 is greater than 0.05 so it does not show a real difference in weight loss.

**Table 1. Results of T-test Analysis of Weight Shrinkage Variables
Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2- tailed)	Mean Diff.	Std. Error Diff.
Shrink_ Weight_4	Equal variances assumed	3.165	.106	-2.637	10	.025	-.52500	.19913
	Equal variances not assumed			-2.637	5.861	.040	-.52500	.19913
Shrink_ Weight_7	Equal variances assumed	2.740	.129	1.200	10	.258	.48333	.40290
	Equal variances not assumed			1.200	6.013	.275	.48333	.40290

It is suspected that in storage from day 1 to day 4 the decrease in fresh weight is relatively fast, while from day 4 to day 7 the decrease in fresh weight is relatively smaller. Winarno (1993) in Kalsum, et al. (2018) explained that weight loss in fruits and vegetables during storage is caused by water loss due to the evaporation process and carbon loss during respiration. This can result in damage and a decrease in the quality of the product. Furthermore, Lestari et al. (2013) in Gumaran, et al. (2023), explained that during storage the process of transpiration and respiration cannot be stopped so that the fruit experiences an increase in weight loss. Symptoms of water loss in tissues are caused by changes in ambient air vapor pressure. The transpiration process causes loss of cell turgor which results in softening of tomato fruit.

Fruit Hardness

Figure 2 shows that the firmness of Gedong Gincu mango fruit decreased with increasing length of storage, both in Gedong Gincu mangoes from highlands and lowlands. According to Santosa and Hulopi (2011) in Kalsum, et al. (2018), fruit hardness decreases with the length of storage. Respiration and transpiration activities continue, causing the fruit to experience significant water loss. Cell size and the pressure of the cell contents against the cell wall are reduced so that the texture of the fruit becomes soft. Furthermore, Winarno (1993) in Kalsum, et al. (2018) stated that when the fruit begins to ripen and becomes ripe, the firmness of the fruit decreases because insoluble pectin (proto-pectin) has been broken down into soluble pectin.

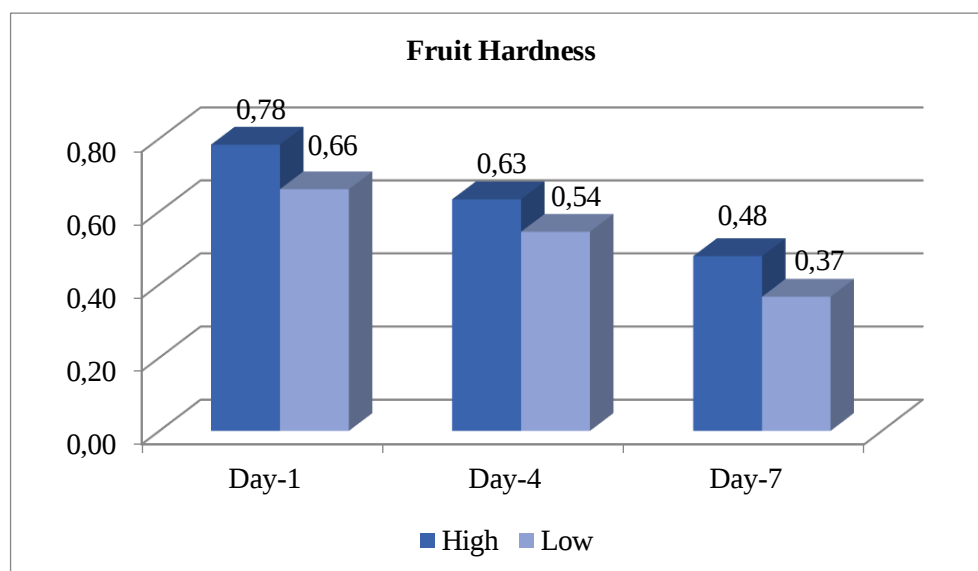


Figure 2. Average Fruit Hardness (kg/cm)²

The results of the t-test analysis on the 1st and 4th day observations showed that the hardness of Gedong Gincu mango fruit from the highlands was significantly different from the hardness of Gedong Gincu mango fruit from lowland, while on the 7th day observation showed no significant difference (Table 2).

**Table 2. Results of t-test Analysis of Fruit Hardness Variables
Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
Hard_1	Equal variances assumed	1.527	.245	3.996	10	.003	.12167	.03045
	Equal variances not assumed			3.996	8.420	.004	.12167	.03045
Hard_4	Equal variances assumed	.230	.642	2.370	10	.039	.09000	.03798
	Equal variances not assumed			2.370	9.773	.040	.09000	.03798
Hard_7	Equal variances assumed	.211	.656	2.063	10	.066	.11000	.05331
	Equal variances not assumed			2.063	9.971	.066	.11000	.05331

The results of fruit hardness analysis are in line with the results of fruit shrinkage analysis, there is no significant difference in fruit hardness on the 7th day observation, this is thought to be due to the overhaul of insoluble pectin (proto-pectin) has been overhauled

Apriani

DOI 10.62885/agrosoci.v2i3.516

into soluble pectin which is relatively the same. Ali et al. (2010) *in* Kalsum et al. (2018) stated that fruit softening occurs due to cell damage or deterioration as well as damage to the

cell wall and intracellular composition of the fruit. Damage to cell wall components due to changes in protopectin to pectin which causes a decrease in cohesion between cell walls.

Increased respiration during fruit ripening accelerates the breakdown of polysaccharides and changes in cell walls. The more polysaccharides that are broken down, the softer the texture of the fruit. This is caused by changes in the compounds that make up the cell wall, namely the breakdown of insoluble protopectin into soluble pectin (Purwadi, 2007 in Abdi et al., 2017).

Fruit Diameter

Fruit diameter is a fruit characteristic that is considered by consumers in purchasing fruit. According to Ariningsih et al. (2021), the Gedong Gincu mango fruit from Indramayu has a round shape, small size, and hard and thin flesh, while the Gedong Gincu mango fruit from Cirebon has an oval shape, medium size and relatively thick flesh.

In line with the observations of weight loss variables and fruit hardness, the measurement of fruit diameter also showed a decrease with increasing length of fruit storage (Figure 3).

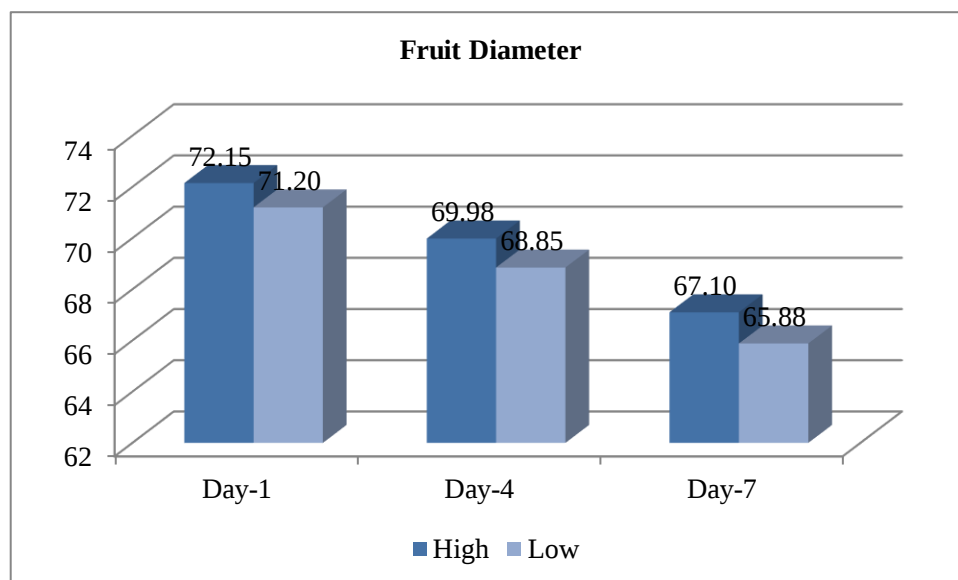


Figure 3. Average Fruit Diameter (mm)

From the results of the t-test analysis in Table 3, it was found that differences in altitude had no significant effect on fruit diameter at each observation period (Sig. 2-tailed value greater than 0.05). These results illustrate that although there are significant differences in the variables of weight loss and fruit hardness, in terms of volume reflected by fruit diameter, there are no significant differences.

**Table 3. Results of t-test Analysis of Fruit Diameter Variables
Independent Samples Test**

			Levene's Test for Equality of Variances		t-test for Equality of Means				Std. Error Diff.
			F	Sig.	t	df	Sig. (2- tailed)	Mean Diff.	
Diamet _1	Equal variances assumed		.543	.478	-.722	10	.487	-.9500	1.3155
	Equal variances not assumed				-.722	8.030	.491	-.9500	1.3155
Diamet _4	Equal variances assumed		2.520	.144	- 1.077	10	.307	-1.1333	1.0520
	Equal variances not assumed				- 1.077	7.234	.316	-1.1333	1.0520
Diamet _7	Equal variances assumed		.085	.777	- 1.025	10	.329	-1.2167	1.1864
	Equal variances not assumed				- 1.025	9.946	.329	-1.2167	1.1864

Total Dissolved Solids

Total dissolved solids are often referred to as total sugar content. Total soluble solids (TPT) are the total elements or mineral elements dissolved in a solution. TPT is also called total sugar content, because the sweetness quality of fruit is measured by measuring sugar content. The content of total soluble solids can indicate the maturity level of the fruit. Ripe fruits generally have higher values of total soluble solids than immature fruits. Figure 4 shows that the average total soluble solids of Gedong Gincu mango fruit in the highlands and lowlands tend to decrease along with the length of storage. It is suspected that at the time of harvesting the Gedong Gincu mango fruit has experienced an increase in sugar content, so that during storage there is a decrease.

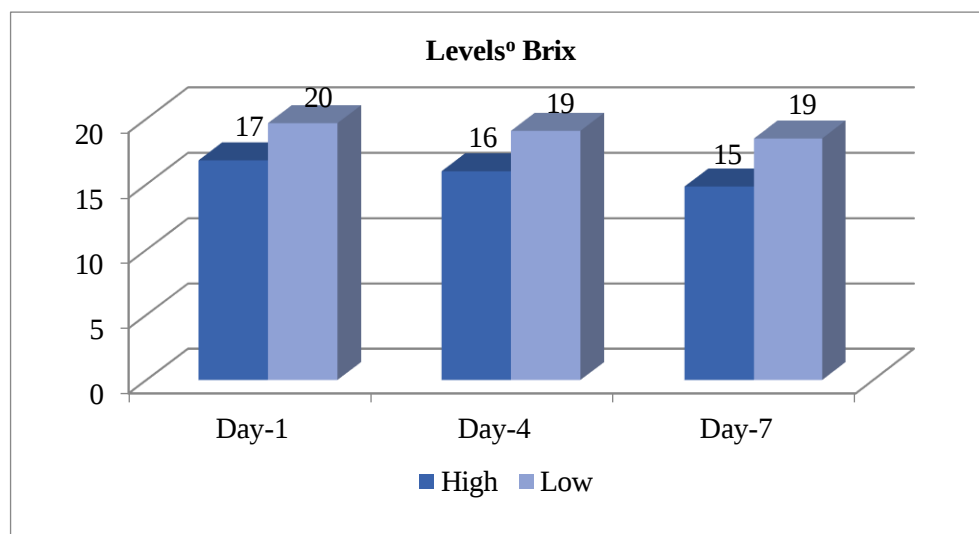


Figure 4. Average Total Dissolved Solids (° Brix)

After harvesting, mango fruits still carry out metabolic processes, such as respiration, using the food reserves contained in the fruit. As a result of this metabolic process, the food reserves in the fruit will continue to decrease and cannot be replaced because the fruit has separated from the tree. The ongoing metabolic process in the fruit will accelerate the process of loss of nutritional value of the fruit and accelerate the ripening process. Suter (1996) *in* Rusmanto et al. (2017) added that the decrease in sugar content in tomato fruit is caused by the process of transpiration and respiration that occurs quickly and continuously. The results of the t-test analysis in Table 4 show that differences in altitude have a significant effect on the total soluble solids of Gedong Gincu mango fruit at each observation period (Sig. 2-tailed value is smaller than 0.05).

Table 4. Results of T-test Analysis of Total Dissolved Solids Variables Independent Samples Test

			Levene's Test for Equality of Variances		t-test for Equality of Means				
			F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
Brix_1	Equal variances assumed	variances	.859	.376	-2.390	10	.038	-2.8333	1.1856
	Equal variances not assumed				-2.390	9.693	.039	-2.8333	1.1856
Brix_4	Equal variances assumed	variances	3.638	.086	-4.071	10	.002	-3.0833	.7574
	Equal variances not assumed				-4.071	7.177	.004	-3.0833	.7574
Brix_7	Equal variances assumed	variances	.856	.377	-4.250	10	.002	-3.6667	.8628
	Equal variances not assumed				-4.250	8.691	.002	-3.6667	.8628

From the results of the study, the value of total soluble solids of Gedong Gincu mango fruit from the lowlands was higher than the total soluble solids of Gedong Gincu mango fruit from the highlands. This is thought to be because the air temperature in the lowlands is relatively higher than the highlands, so that the respiration process takes place relatively faster. The increased respiration process will trigger increased hydrolysis of starch substances into sucrose which then turns into reducing sugars.

According to Santosa and Hulopi (2011) *in* Gumaran & Hutabarat (2023), the availability of oxygen from outside plays an important role in the breakdown of sugar that occurs in fruits during respiration. This process consists of three stages, polysaccharides are broken down into simple sugars then oxidized into pyruvic acid and other organic acids resulting in a decrease in sugar content and finally, aerobic transformation of pyruvic acid and organic acids into CO₂, water, and energy. Ultimately, this process ends with the formation of CO₂, water, and energy.

Elevation differences are positively correlated with microclimate, rainfall and temperature (Othman et al., 2015; Wijayanto & Nurunnajah, 2012; Martínez, 2021). The farther a place is from sea level, the more rainfall it receives, but the faster the decomposition of organic matter, the lower the temperature and the higher the nutrient content

(Massacesiet al., 2020; Asriyani, 2021). In addition, altitude also affects the acceleration of

fruit ripening. The higher the location, the slower the fruit ripening process (Somporn et al., 2012; Asriyani, 2021).

Vitamin C content

Mango fruit contains vitamin C which is quite high (Hasanah, 2018). The results of the study on day 1 observation obtained vitamin C content of Gedong Gincu mango fruit in the highlands amounted to 28.33 mg/100 g and in the lowlands amounted to 22.50 mg/100 g. These results are in accordance with the results of research by Novia et al. (2015), that the vitamin C content of mango fruit amounted to 27.7 mg/100 g. The results of the study in Table 9 show that vitamin C content in Gedong Gincu mango fruit, both from the highlands and lowlands, has increased along with the length of storage.

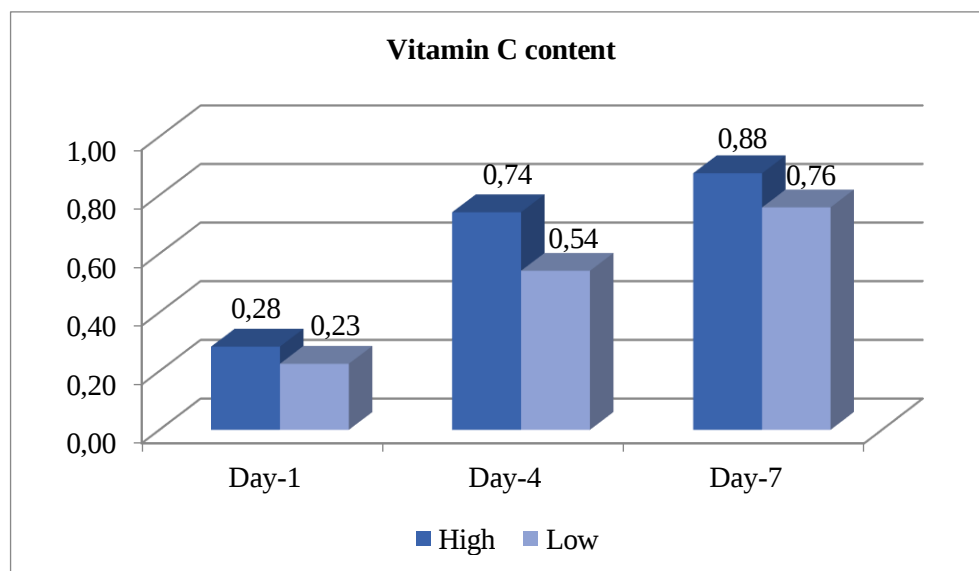


Figure 5. Average Vitamin C Content (mg/g)

The results of the t-test analysis in Table 10 show that differences in altitude have a significant effect on vitamin C levels on day 4 (Sig. 2-tailed value 0.037 smaller than 0.05), but no significant effect on day 1 and 7 observations of each observation period (Sig. 2-tailed value 0.192 and 0.348 greater than 0.05).

There is a significant difference in vitamin C content on day 4, where the vitamin C content of Gedong Gincu mango fruit in the lowlands is smaller than the highlands. This is probably because the air temperature in the lowlands is relatively higher than the air temperature in the highlands, thus it will spur the oxidation process to take place faster. According to Winarno (2002) in Verawati et al. (2020), oxidation reactions cause damage to vitamin C and vitamin C is also easily dissolved in water.

Table 5. Results of T-test Analysis of Vitamin C Level Variables Independent Samples Test

			Levene's Test for Equality of Variances		t-test for Equality of Means				
			F	Sig.	T	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
Vit_C_1	Equal variances assumed		.125	.731	1.400	10	.192	.05833	.04167
	Equal variances not assumed				1.400	9.194	.194	.05833	.04167
Vit_C_4	Equal variances assumed		.054	.820	2.401	10	.037	.15833	.06593
	Equal variances not assumed				2.401	9.890	.037	.15833	.06593
Vit_C_7	Equal variances assumed		.011	.920	.984	10	.348	.15833	.16094
	Equal variances not assumed				.984	9.769	.349	.15833	.16094

According to Nunes and Emond (2003) in Abdi et al. (2017), during fruit storage, vitamin C oxidation occurs which is influenced by temperature, light and air. Vitamin C in food ingredients will decrease along with the increase in temperature and the longer storage.

Organoleptic Test

One of the parameters to assess the quality of Gedong Gincu mangoes is the appearance of the skin, especially in terms of color and smoothness. A good and attractive skin appearance will influence consumer tastes. Besides skin color, other parameters such as taste and aroma are the main considerations for consumers in choosing Gedong Gincu mangoes.

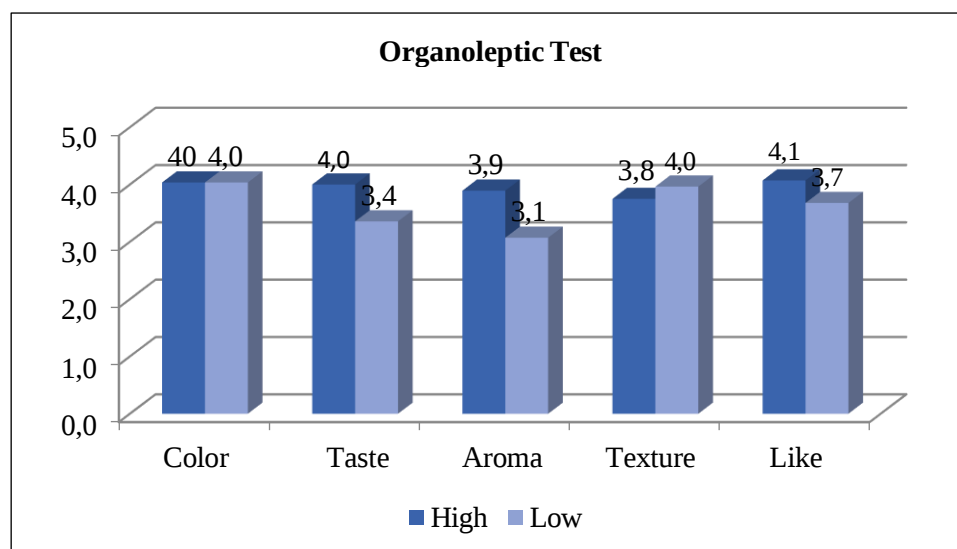
**Figure 6: Average Organoleptic Test**

Table 6 presents the results of organoleptic analysis using the Wilcoxon test, it was found that differences in altitude gave a significant difference to taste, aroma and liking (Sig. 2 tailed value is smaller than 0.05), while the color and texture did not show a significant difference (Sig. 2 tailed value is greater than 0.05). In the highlands, the median score for taste and aroma was 4 while for the lowlands it was 3. These results indicate that the taste and aroma of Gedong Gincu mango fruit from the highlands are more preferred than the lowlands.

**Table 6. Wilcoxon Test Analysis Results
Test Statistics^a**

		Color_R - Color_T	Taste_R - Taste_T	Aroma_R - Aroma_T	Texture_R - Texture_T	Like_R - Like_T
Z		-.097 ^b	-2.549 ^c	-3.518 ^c	-1.084 ^b	-2.030 ^c
Asymp. Sig. (2-tailed)		.923	.011	.000	.278	.042

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.

According to research results Pedekawati et al., (2020) Cirebon Regency mango production is ranked third after Indramayu. There are differences in characteristics between Indramayu and Cirebon Gedong Gincu mangoes. Mango Gedong Gincu Indramayu Regency has the sweetest taste but with the smallest size. Cirebon Regency has a larger size than Mango Gedong Gincu Indramayu Regency with a sweeter and fresher flavor. The results of Deliana's research (2011) in Ariningsih et al. (2021) revealed that Gedong Gincu mangoes from Cirebon are more attractive to consumers (domestic) than Gedong Gincu mangoes from Indamayu because the shape is rounder, the color is more attractive and the aroma is sharper.

CONCLUSIONS

Differences in altitude gave differences in weight loss on day 4, total soluble solids content, vitamin C content on day 4, hardness on day 1 and 4, as well as on taste, aroma and consumer preference. Gedong Gincu mango fruit from the lowlands had higher weight loss and total soluble solids compared to those from the highlands, while vitamin C content and hardness of Gedong Gincu mango fruit from the lowlands were lower than those from the highlands. The flavor and aroma parameters of highland Gedong Gincu mango fruit were preferred over Gedong Gincu mango fruit from the lowlands.

BIBLIOGRAPHY

- Abdi, Y. A., Rostiati., & Syahraeni, K.. 2017. Mutu Fisik, Kimia Dan Organoleptik Buah Tomat (*Lycopersicum Esculentum* Mill.) Hasil Pelapisan Berbagai Jenis Pati Selama Penyimpanan. *e-J. Agrotekbis*, 5 (5) : 547-555, Oktober 2017
- Aisyah Alifatul Zahidah Rohmaha, Alifah Nur Aini Fajrinb, S. G. (2022). *Jurnal 07 Its*. 2(2), 120–136. [Http://Lib.Unnes.Ac.Id/35728/](http://Lib.Unnes.Ac.Id/35728/)
- Alexandra, Y. (2014). Aplikasi Edible Coating Dari Pektinjeruk Songhi Pontianak (*Citrus Nobilis Var Microcarpa*) Pada Penyimpanan Buah Tomat. 3(4).

- Andriani, E. S., Nurwantoro, & Antonius, H. 2018. Perubahan Fisik Tomat Selama Penyimpanan Pada Suhu Ruang Akibat Pelapisan Dengan Agar-Agar. *Jurnal Teknologi Pangan*, 2(2)176-182.
- Ariningsih, E., Saliem, H. P., Maulana, M., & Sari Septanti, K. (2021). Kinerja Agribisnis Mangga Gedong Gincu Dan Potensinya Sebagai Produk Ekspor Pertanian Unggulan Agribusiness Performance Of Gedong Gincu Mango And Its Potential As A Superior Agricultural Export Product. *Forum Penelitian Agro Ekonomi*, 39(1), 51–74. [Http://Dx.Doi.Org/10.21082/Fae.V39n1.2021.51-74](http://Dx.Doi.Org/10.21082/Fae.V39n1.2021.51-74)
- Asriyani, A. (2021). Identifikasi Sifat Kimia Tanah, Serapan Hara Dan Sifat Pertumbuhan Tanaman Jambu Mete Pada Ketinggian Tempat Berbeda Di Kota Baubau, Sulawesi Tenggara. *Jurnal Technopreneur (Jtech)*, 9(2), 98–103. [Https://Doi.Org/10.30869/Jtech.V9i2.775](https://Doi.Org/10.30869/Jtech.V9i2.775)
- Awaliyah, F. (2018). Keragaan Agribisnis Komoditas Mangga Gedong Gincu Di Kabupaten Cirebon. *Mahatani*. 1(2), 129–141.
- Bakhtiar Rinaldi, F., Rachmawati, J., & Erlin, E. (2022). Pengaruh ketinggian tempat terhadap karakteristik buah kacang panjang.
- Gumaran, S., & Hutabarat, F. T. (2023). Aplikasi Pelapisan Buah Tomat (*Solanum lycopersicum*) Berbasis Kitosan dengan Penambahan Nanopartikel ZnO. *Jurnal Teknologi Pengolahan Pertanian*, 5((1)), 20–26.
- Hasanah, U. (2018). Penentuan Kadar Vitamin C Pada Mangga Kweni Dengan Menggunakan Metode Iodometri. *Jurnal Keluarga Sehat Sejahtera*, 16(31), 90–95. [Https://Doi.Org/10.24114/Jkss.V16i31.10176](https://Doi.Org/10.24114/Jkss.V16i31.10176)
- Hastuti, S. S., Hardiansyah, W., Yulianty, P. D., & ... (2022). Pengembangan Dodol Gedong Gincu Sebagai Produk Olahan Desa Sedong Lor. *Dimasejati: Jurnal*, 4(2), 207–222. [Https://Www.Syekhnurjati.Ac.Id/Jurnal/Index.Php/Dimasejati/Article/View/12052%0ahttps://Www.Syekhnurjati.Ac.Id/Jurnal/Index.Php/Dimasejati/Article/Download/12052/4780](https://Www.Syekhnurjati.Ac.Id/Jurnal/Index.Php/Dimasejati/Article/View/12052%0ahttps://Www.Syekhnurjati.Ac.Id/Jurnal/Index.Php/Dimasejati/Article/Download/12052/4780)
- Jaenudin A. Suradinata T, M. M. (2019). The Effect Of Micro-Climate To Quality And Existence Of Gedong Gincu Mango. *Journal Of Physics Conference Series*, 1360. [Https://Doi.Org/10.1088/1742-6596/1360/1/012003](https://Doi.Org/10.1088/1742-6596/1360/1/012003)
- John, D. (2018). Pengaruh Suhu Dan Lama Simpan Pada Buah Pepaya Madu. *Jurnal Pertanian Agros*, 20(2), 114–122.
- Kalsum, U., Sukma, D., & Susanto, S. (2018). Pengaruh Kitosan Terhadap Kualitas Dan Daya Simpan Buah Tomat (*Solanum Lycopersicum L.*). *Jurnal Pertanian Presisi (Journal of Precision Agriculture)*, 2(2), 67–76. <https://doi.org/10.35760/jpp.2018.v2i2.2531>
- Martínez, G. M. (2021). The Effect Of Altitude On The Prediction Of Momentum For Rainfall Erosivity Studies In Mexico. *Catena. Vol 207*, 105604, Vol 207.
- Novia, C., Syaiful, S. and Utomo, D., 2015. Diversifikasi mangga off grade menjadi Selai dan dodol. *Teknologi Pangan: Media Informasi dan Komunikasi Ilmiah Teknologi Pertanian*, 6(2).
- Oksilia, O. (2018). Hubungan Karakteristik Fisik Dan Kimia Beberapa Jenis Buah Mangga (*Mangifera Indica L*) Terhadap Penerimaan Konsumen. *Jurnal Agrium*, 15(1), 51. [Https://Doi.Org/10.29103/Agrium.V15i1.689](https://Doi.Org/10.29103/Agrium.V15i1.689)
- Othman, R., Nur H.M.L., Izawati T., & K. (2015). Effects Of Altitude And Microclimate On The Distribution Ferns In And Urban Areas. *Jurnal Teknologi (Sciences & Engineering)*, 77(30),125-131.
- Pedekawati, C., Karyani, T., & Sulistyowati, L. (2020). Uji Beda Pendapatan Usahatani Mangga Gedong Gincu Pada Saat On Season Dan Off Season. *Composite: Jurnal Ilmu*

- Pertanian*, 2(02), 82–89. <https://doi.org/10.37577/Composite.V2i02.239>
- Ray, P., Singh, S. K., Jena, R. K., & Das, B. (2019). Mango (*Mangifera Indica*) Cultivation In North-Eastern Region Of India Mango (*Mangifera Indica*) Cultivation In North-Eastern Region Of. January.
- Rusmanto, E., Rahim, A., & Hutomo, S. (2017). Karakteristik Fisik Dan Kimia Buah Tomat Hasil Pelapisan Dengan Pati Talas Physical and Chemical Characteristics of Tomato Fruit as Results of Coating with Taro Starch. In e-J. Agrotekbis (Vol. 5, Issue 5).
- Saiduna, dan Oktap Ramlan Madkar. 2013. “Pengaruh Suhu dan Tingkat Kematangan Buah terhadap Mutu dan Lama Simpan Tomat (*Lycopersicum esculentum* Mill).” *Jurnal Agrosiwagati* 1(1):43–50. doi: 10.33603/agrosiwagati.v1i1.788
- Somporn, C., Kamtuo, A., Theerakulpisut, P., & Siriamornpun, S. (2012). Effect Of Shading On Yield, Sugar Content, Phenolic Acids And Antioxidant Property Of Coffee Beans (*Coffea Arabica* L. Cv. Catimor) Harvested From North Eastern Thailand. *J. Sci. Food Agric*, 92(9), 1956–1963.
- Sulistiyowati L, N. R. (2016). Commercialization Determinant Of Mango Farmers In West Java-Indonesia. *Ijaber*.
- Suwardikee Putu, Nyoman Rai, Rindang Dwiyan, & Eniek Kriswiyanti. (2018). Kesesuaian Lahan Untuk Tanaman Mangga (*Mangifera Indica* L.) Di Buleleng. *Agro Bali : Agricultural Journal*, 1(1), 1–7.
- Verawati, N., Aida, N., & Muttaqin, K. (2020). Pemanfaatan Chitosan Dari Limbah Udang Galah Sebagai Edible Coating Buah Tomat Dengan Variasi Waktu Penyimpanan Utilization Of Chitosan From Waste Giant Prawns As Edible Coating Tomato Fruit With Long Variation Of Storage. 8(3), 134–144.