

The Taste of Arabica Coffee in Several Altitude and Shading Condition

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Abstract. The research that aimed to analyze the relationship between altitude and shade of Arabica coffee plants on the taste of coffee has been conducted. This study uses an organoleptic analysis method that refers to the Specialty Coffee Association of America (SCAA) Standard with parameters are fragrance, acidity, body, flavor, after taste, and balance. Coffee flavor test results at all altitudes, coffee beans in the presence of shade have a positive effect on forming flavor, body, quality after taste, and balance, where the flavor of Arabica coffee in shaded conditions has a higher rating scale. In addition, based on the classification of taste quality, Arabica coffee in shaded conditions is included in the category of specialty Arabica coffee with a total scoring is 82.50 to 83.75.

Keywords: Climate, kahve, koffee, organoleptic, specialty coffee

1 Introduction

In Indonesia, 1 790 000 farmer families are directly involved in the coffee cultivation process both as farmers and 63 339 people as workers [1]. From 2010 to 2014, Indonesia became the third main coffee producing country in the world after Brazil and Vietnam [2]. However, in 2017 it was displaced by Colombia and occupied the fourth position with a contribution of 7 % of world coffee production [3]. North Sumatera Province Indonesia is in the fourth position in total production of Arabica and Robusta coffee, accounting for 9.52 % of national coffee production, after South Sumatra, Lampung, and Aceh, Indonesia, respectively [4–6].

Altitude is an environmental factor for coffee plant growth that affects coffee production and quality through variations in climate variables, especially air temperature and rainfall, which are limiting factors for coffee growth. Altitude affects air temperature and rainfall [7, 8]. According to [9], the most ideal altitude for Arabica coffee cultivation is between 1 200 m to 1 400 m above sea level. However, Arabica coffee grows and is still

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producing well at planting altitudes between 900 m to 1 700 m above sea level. [10] reports that in Humbang Hasundutan Regency, Arabica coffee tends to produce more at an altitude > 1 400 m asl, but the relationship to coffee quality has not been reported.

One aspect of cultivation that affects the production and quality of Arabica coffee is the provision of shading plants [11]. In Humbang Hasundutan, it was found that the ratio of the population and area of coffee plants with shading is lower than coffee plants with none shading. Various studies have found that shade trees play a positive role in improving coffee quality. The positive role of shade trees in coffee quality was found by [12] stated that shade tree species have a significant effect on overall coffee quality. Research by [13] in the world's largest Arabica coffee-producing region in the southern state of Minas Gerais, Brazil, concluded that there was a tendency for better coffee quality in the shade coffee farming system. Based on this background, research has been carried out that aims to analyze the relationship between the altitude and shading of the Arabica coffee plant on the taste of coffee.

2 Materials and methods

The research was conducted in Humbang Hasundutan Regency at three altitude classes above sea level (m asl). The altitude of the research location ranges from 1 200 m asl above sea level to > 1 500 m asl above sea level, which are divided into three groups, namely 1 200 m asl to 1 300 m asl, 1 300 m asl to 1 400 m asl, and 1 400 m asl to 1 500 m asl. The number of observation samples used for data analysis at each altitude was ten samples. The parameters of taste quality that were observed were the strength of taste (strength) or fragrance of taste (fragrance), the acidity of taste (acidity), the thickness of taste (body), enjoyment of taste (flavor), long felt on the tongue after tasted (after taste), and balance of taste (balance). Taste measurement (taste quality test) organoleptically refers to the SCAA (Specialty Coffee Association of America) Standard which has been translated by [14]. Test the taste quality of coffee with a special taste/unit (specialty) if it has a score of ≥ 6 . with a special taste/unit (specialty) if it has a score of ≥ 6 . Organoleptic tests were carried out by professional panelists of the Gayo Cupper Team, Bener Meriah, Aceh Province, Indonesia.

3 Results and discussions

The altitude of the Arabica coffee cultivation site is one of the most important land variables in the assessment of land characteristics in this study. The climate components that used in this study are uniformly derived from one nearest climate station. Many previous quality tests have been carried out. However, the study of the relationship between varieties and altitude of growing places on the quality of Arabica coffee is very limited [15]. The physical–organoleptic properties of Arabica coffee beans can be used as a parameter to predict the character of the taste [16]. In this case, the type or quality, and origin of Arabica coffee beans greatly affect the taste of Arabica coffee steeping.

The intensity of sunlight has a very important role in the taste of coffee. Caffeine content has a positive correlation with light intensity entering the garden, although the caffeine content does not directly affect the taste of Robusta coffee [17]. The results of the coffee taste test at all altitudes, the coffee beans in the presence of shading has a positive effect on forming flavor, body, quality aftertaste, and balance. This can be seen from the comparison of values on these four parameters, where the taste of Arabica coffee is shaded conditions has a higher rating scale (Figure 1 to Figure 6). Different conditions

were reported by [18] that in a limited agroforestry system (limited shade) the total flavor value of coffee does not reach a value of 80 based on SCAA standards.

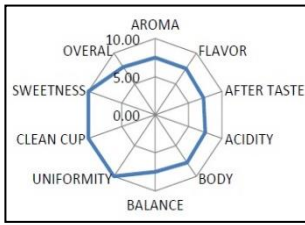


Fig. 1. The taste of Arabica coffee at an altitude of 1 200 m asl to 1 300 m asl in none shading condition.

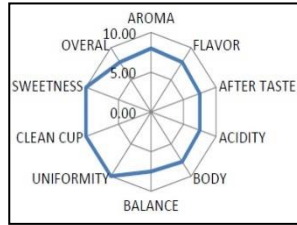


Fig. 2. The Taste of Arabica Coffee at an Altitude of 1 200 m asl to 1 300 m asl in shading condition.

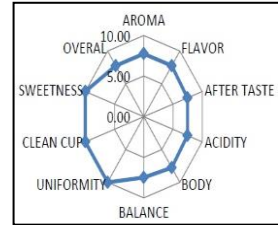


Fig. 3. The Taste of Arabica Coffee at an Altitude of 1 300 m asl to 1 400 m asl in none shading condition.

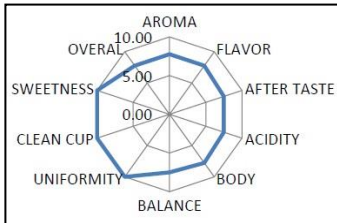


Fig. 4. The Taste of Arabica Coffee at an Altitude of 1 300 m asl to 1 400 m asl in shading condition.

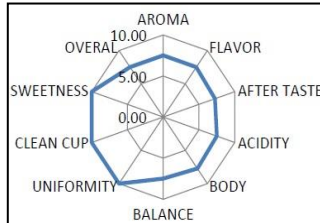


Fig. 5. The taste of Arabica coffee at an altitude of 1 400 m asl to 1 500 m asl in none shading condition

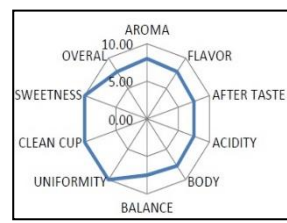


Fig. 6. The Taste of Arabica Coffee at an Altitude of 1 400 m asl to 1 500 m asl in shading condition.

In Figure 1 to Figure 6, it can also be seen that flavor elements such as sweetness, clean cup, and uniformity have a maximum value of 10. The sweetness flavors are caramel, choco, and brown sugar. This parameter interprets that the higher the sweetness value in the radar diagram, the sweeter the taste. The resulting sweet taste comes from the carbohydrate element in the form of sucrose found in Arabica coffee beans. The parameters of a clean cup and uniformity indicate that there are no flavors in the brewing of Arabica coffee and have a uniform taste, both from aroma and flavor variables.

Apart from the flavor elements depicted in the radar images, in general, there was a slight difference in the taste profiles of the Arabica coffee samples grown in shaded and unshaded conditions, although the total taste scores for all the Arabica coffee samples were 82.50 to 83.75. Likewise, based on the taste defect category, this Arabica coffee example does not have taste defects such as foul odor, mold, and earthiness. Therefore, if based on the classification of taste quality, this Arabica coffee is included in the category of specialty arabica coffee. The total score of Arabica coffee flavor produced in this study was lower than that of Arabica coffee taken from the same area by [19], where the total score obtained was 87.69, although it is still in the same category, namely specialty coffee. This result is also in line with the opinion of [20], that coffee beans produced from plants in an unshaded condition produce beans with lower organoleptic quality (in terms of acidity, body and taste) compared to coffee grown in shaded conditions.

The relationship between altitude and coffee flavor is quite strong (0.698 1), although not significantly different (Table 1), the higher the altitude the coffee tastes better. This result is in line with the research of [15], that the Gayo Arabica coffee variety has better physicochemical quality when planted at an altitude > 1 500 m asl. Likewise, [21] concluded that the quality of Arabica coffee in the Ateng variety increased from an altitude

of 1 200 m asl to 1 400 m asl. Table 1 shows that the parameters of flavor, aroma, flavor, after taste, and overall have a positive correlation with the total score of the quality of the Arabica coffee flavor. On the other hand, the balance parameter has a negative correlation with the total flavor score. Meanwhile, body, acidity, uniform, sweetness, and clean cup did not have a correlation to the total flavor score. Compared to other parameters, the flavour has the greatest influence on total flavor (correlation = 1). [19] report a different matter, in which acidity was the strongest correlation with the total flavor score.

Table 1. Correlation between coffee flavor parameters with altitude and shading

Altitudes + Shading	Aroma	Flavor	Aftertaste	Acidity	Body	Balance	Uniform	Clean cup	Sweetness	Overall	Total
1	0.775	0.775	0.447	.a	.a	-0.258	.a	.a	.a	0	0.674
	1	1.000**	0.577	.a	.a	-0.333	.a	.a	.a	0.577	0.87
		1	0.577	.a	.a	-0.333	.a	.a	.a	0.577	0.87
			1	.a	.a	0.577	.a	.a	.a	0	0.905
				.a	.a	.a	.a	.a	.a	.a	.a
				.a	.a	.a	.a	.a	.a	.a	.a
				.a	.a	.a	.a	.a	.a	.a	.a
						1	.a	.a	.a	-0.577	0.174
							.a	.a	.a	.a	.a
							.a	.a	.a	.a	.a
							.a	.a	.a	.a	.a
								.a	.a	.a	.a
									.a	.a	.a
										1	0.302
											0.698

Altitude is correlated with temperature, rainfall, and sunlight. In connection with this condition, the higher the place of cultivation, the lower the temperature with high sunlight intensity. The taste of Arabica coffee gets better the higher the place gets. This condition is related to the presence of temperature during flowering, fruit filling, and fruit ripening. This is thought to affect the taste of Arabica coffee. The higher the location, the better the physical quality of the coffee beans, as indicated by the low percentage of black beans, pests, and defects [22].

4 Conclusions

Based on the diagram values for these four parameters, the taste of Arabica coffee in shaded conditions has a higher rating scale, with a total taste score of 83.75 versus 82.5 for unshaded coffee. This taste score value places Arabica coffee in the specialty coffee class.

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