

# Flavor of arabica coffee grown in Gayo Palteau as affected by varieties and processing techniques

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**Abstract.** Coffee (*Coffea* sp) is one of the most popular drinks in Indonesia, as well as in the world. Coffee plantation has been grown in several areas in Indonesia, including Aceh province, and has become one of the most important plantation products with promising economic value. Both Arabica and Robusta are found in Aceh, however Arabica coffee grown more in the area because of its popularity in International market. This popularity is related to Arabica coffee distinctive flavor and aroma. To grow well, Arabica coffee requires land with altitude 1000 m or more above sea level. Therefore, in Aceh, it is grown in the Gayo Plateau with total area more than 90.000 hectares. As International market requires higher standard coffee, there is a need to provide a better quality coffee with a better taste, flavor and aroma. Several coffee varieties have been cultivated in the area for a long time, however the relation between variety and taste & flavor has not been fully investigated. Other factors that may affect the taste, flavor and aroma is processing technique applied during postharvest and handling. Both wet hulling and dry hulling are practiced by small holders and farmers in the area. This study is aimed to investigate taste and flavor of Arabica coffee as affected by varieties and processing technique. The already grown varieties used in this study were Ateng Super (V1), Bergendal (V2), Bor-Bor (V3), Tim-Tim (V4) and Lini\_S (V5). The processing techniques to be considered were Dry Hulling (TA) and Wet Hulling (TB). Observations to be recorded were organoleptic test (fragrance, acidity, body, flavor, aftertaste, balance), pH analysis and caffeine content. The result shows that the Tim-Tim variety get the highest organoleptic score, while between the two techniques, wet hulling provide a better acceptance from the panelist (get higher organoleptic scores).

**Key words:** coffee varieties, Gayo Arabica coffee, dry hulling, wet hulling, organoleptic test.

## Introduction

Coffee (*Coffea* sp) is one of the most popular drinks in Indonesia, as well as in the world. Coffee plantation has been grown in several areas in Indonesia, including Aceh province, and has become one of the most important plantation products with promising economic value. Both Arabica and Robusta are found in Aceh, however Arabica coffee grown more in the area because of its popularity in International market. This popularity is related to Arabica coffee distinctive flavor and aroma. To grow well, Arabica coffee requires land with altitude 1000 m or more above sea level. Therefore, in Aceh, it is grown in the Gayo Plateau with total area more than 90.000 hectares. Gayo plateau altitude varies from 100 meters to 1700 meters above sea level. More than 60% of the Gayo Plateau residence rely on coffee plantation (MPKG, 2009).

As International market requires higher standard coffee, there is a need to provide a better quality coffee with a better taste, flavor and aroma. Several coffee varieties have been cultivated in the area for a long time, however the relation between variety and taste & flavor has not been fully investigated. Other factors that may affect the taste, flavor and aroma is processing technique applied during postharvest and handling. Both wet hulling and dry hulling are practiced by small holders and farmers in the area. However, wet hulling was increasingly more popular among the farmers (Mawardi et.al., 2008).

Quality of coffee bean are determined by physical characteristic and organoleptic performance. Physical characteristic usually related to the nature of the coffee, including variety and growing location. Organoleptic or sensory parameter, on the other hand, related closely to the consumer preference which usually measured through cupping test. The Cupping provides a means of recording important flavor attributes for coffee, especially *Fragrance/Aroma, Flavor, Aftertaste, Acidity, Body, Balance, and Overall* (Anonym, 2009).

## Materials and Methods

### Sample collection

Samples for this research were collected from selected farmer garden that contain the five varieties to be tested, starting from Maret until Mei 2010. Samples were taken from farmer garden spread in Aceh Tengah and Bener Meriah Districts. The Arabica coffee varieties to be tested were Ateng Super, Bergendal, Bor-Bor, Tim-Tim dan Lini\_s

### Materials and equipment

Material used in this research were usable material for sample collection and storage. Several chemicals were used for analysis in the laboratory such as chloroform, KOH, aquadest, and H<sub>2</sub>SO<sub>4</sub>.

Equipment used in this research were pH meter, huller, screener, and analytical balance. There were several analytical instruments used in sample analysis in laboratory.

### Methodology

This research is aimed to investigate the organoleptic quality of coffee Arabica as affected by variety and processing technique. There are two factors involved in this research, i.e. five coffee Arabica variety (V) and two processing techniques (T). The varieties were V<sub>1</sub> = Ateng Super, V<sub>2</sub> = Bergendal, V<sub>3</sub> = Bor-Bor, V<sub>4</sub> = Tim-Tim and V<sub>5</sub> = Lini\_s. The processing technique applied were TA = dry hulling and TB = wet hulling. Since there were limited coffee plantations that contain the coffee varieties with similar conditions, the sample taken did not have replication, but the analysis were replicated three time from three small composite sub samples taken from the samples.

Research sites were determined based on the availability of the intended variety. Then, coffee red cherries from each location were harvested by hand for about 30 kg. The cherry immediately processed using wet processing with dry and wet hulling techniques using the procedure outlined by Mawardi (2008), to produce green coffee bean.

Coffee beans produced from each treatment were analyzed in laboratory to obtain the following parameters value, i.e., pH value, caffeine content, and organoleptic test covering *fragrance/aroma, flavor, aftertaste, acidity, body, balance and total score*. The samples were analyzed in food and agricultural product analysis laboratory, Department of Agricultural Product Technology, Syiah Kuala University, Banda Aceh, and in quality analysis laboratory, Indonesian Coffee and Cacao Research Institute (ICCRI), Jember. Organoleptic test was conducted by trained pannelis from ICCRI, Jember.

## Results and Discussion

### Effect of varietas on taste of coffee Arabica Gayo

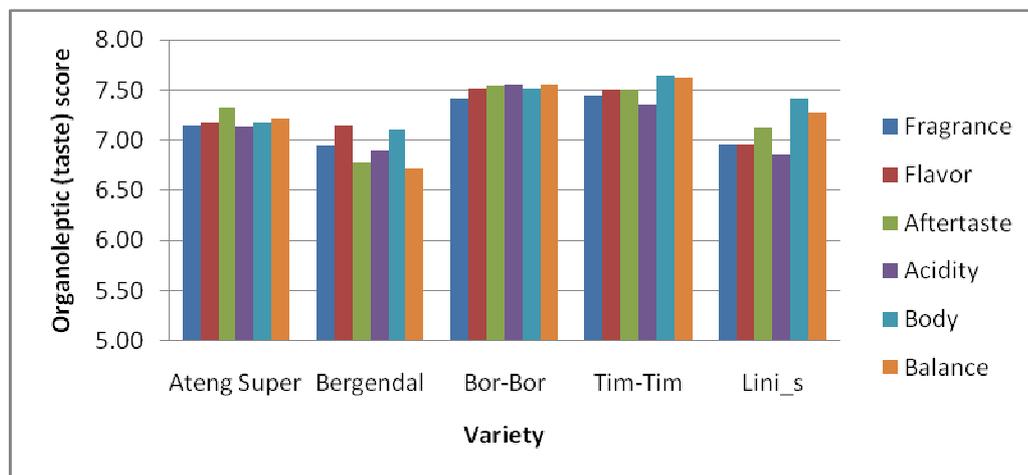


Figure 1. Result of organoleptic test of five varieties of arabica coffee grown in Gayo Plateau

Figure 1 and Figure 2 show that, in general, Tim-Tim variety gave the best taste, followed by Bor-Bor varieties, Ateng Super, Lini\_s, and Bergendal. High fragrance score for Tim-Tim indicating that the odor of Tim-Tim coffee powder produce the most pleasant smell compared to the others. Tim-Tim also had a good taste balance. Most of the time, consumer makes judgment on a coffee powder based on its fragrance (odor before it was brewed). Other factors that usually affect the consumer decision on coffee is its aroma which is the odor of the coffee after it was just brewed. Fragrance and aroma of arabica coffee actually could be affected by many factors, including the way the coffee bean was roasted and grinded. Therefore, during production of a good coffee, it is very important to apply a proper procedure at all stages (Sivetz and Foote, 1963). Nevertheless, all coffee

variety were actually accepted by the panelish with the score ranging from 6,72 to 7,56 (out of 1-9 scale).

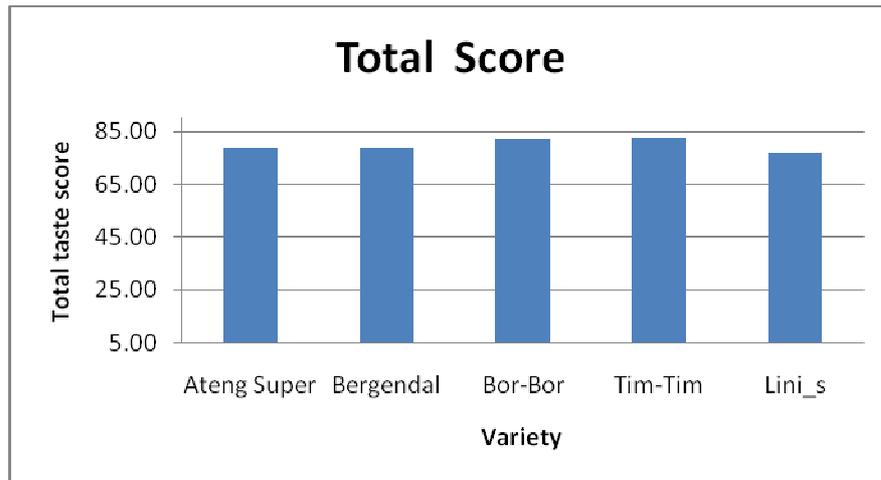


Figure 2. Total score of organoleptic test of five varieties of Arabica coffee grown in Gayo Plateau.

Based on the organoleptic test results, Tim-Tim coffee variety gave the best coffee taste, though the others also produce an acceptable taste. Furthermore, Tim-Tim also has very positive characteristics, such as high and strong tree, light green leaf, long and green colored young cherry, ripe in stages with a very good physical quality, and tolerant against rust-leaf disease caused by *Hemilia vastatrix*. B et Br.

Tim-Tim variety is an Arabusta coffee introduced by Dinas Perkebunan Kabupaten Aceh Tengah, a local government institution for plantation, in 1980 through a program called Rehabilitation of Plantation Plant for Expor, or locally known as PRPTE. This variety is a natural cross pollinated between Arabica and Robusta, and was brought from East Timor. Local community then call this variety Tim-Tim which mean East Timor. Tim-Tim variety has a very good physical quality such as large bean, green colored dry bean, etc. The trader also like this variety, therefore, local community plants the Tim-Tim variety in many area in Gayo Plateau (Mawardi et. al., 2008).

#### **Effect of processing technique on taste of coffee Arabica gayo**

Coffee processing is aimed to separate coffee bean from its cherry skin and hull to produce a dry bean which usually called coffee green bean. Organoleptic or sensory test shows that coffee bean resulted from wet hulling technique gave a better taste compared to that of dry hulling technique (Figure 3 and 4).

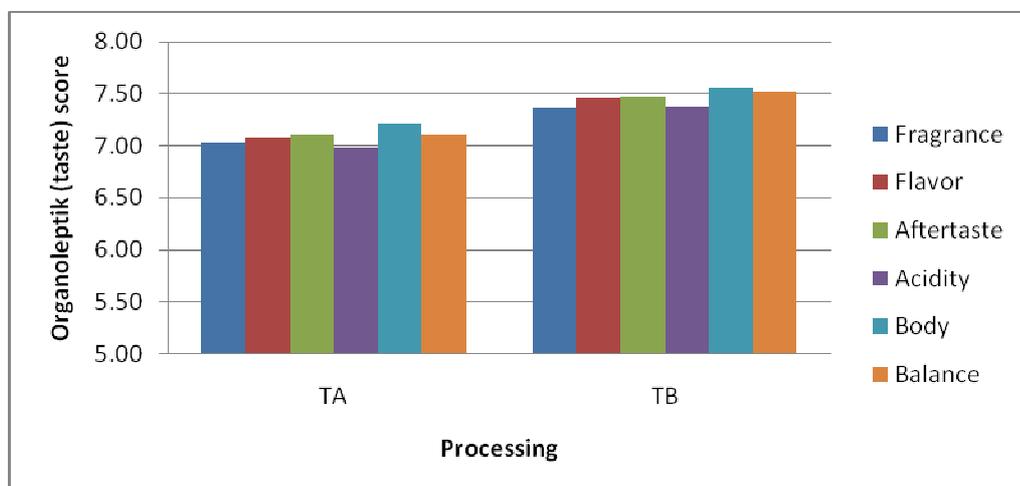


Figure 3. Result of organoleptic test of gayo arabica coffee processed with dry hulling (TA) dan wet hulling (TB).

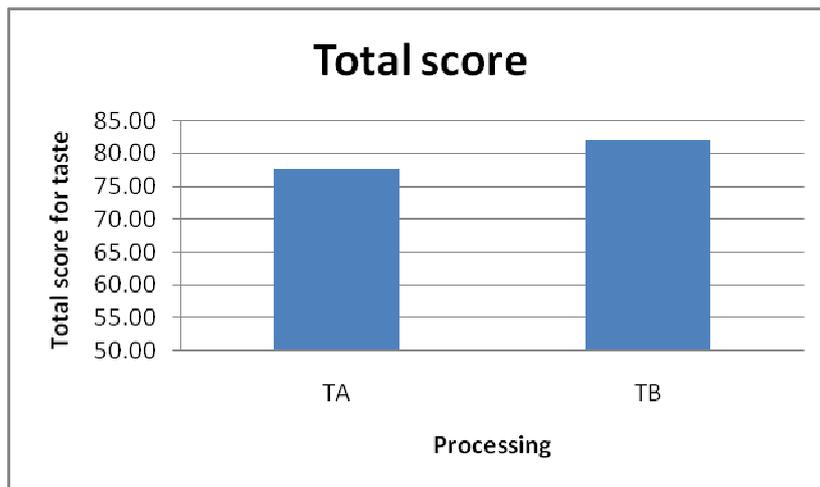


Figure 4. Total score of organoleptic test of gayo arabica coffee processed with dry hulling (TA) dan wet hulling (TB) techniques.

In wet hulling processing technique, coffee bean was sun-dried twice (in two stages). First, "gabah" (coffee bean with hull still intake) was dried until water content reached about 40%. Then, the "gabah" was dehulled using a hulling machine to produce unsorted green bean. The unsorted green bean then sun-dried again until about 12% moisture content. In the second drying, direct sunlight to the naked green bean may trigger fast drying and formation of taste-precursor compounds. Meantime, in dry hulling, the "gabah" was sun-dried only once, right after the washing until about 12% moisture content. Then the "gabah" was dehulled using a hulling machine (Mawardi et. al., 2008).

Special characteristics of green coffee bean processed using wet hulling technique are dark green color with a little bit curved bean. Arabica coffee processed with wet hulling technique usually has low acidity with strong body taste, compared to those processed using dry hulling. Effect of processing techniques on the varieties can be seen in Figure 5. Almost in all variety, wet hulling gave a better organoleptic score, especially for variety bergendal, ateng super and lini\_s.

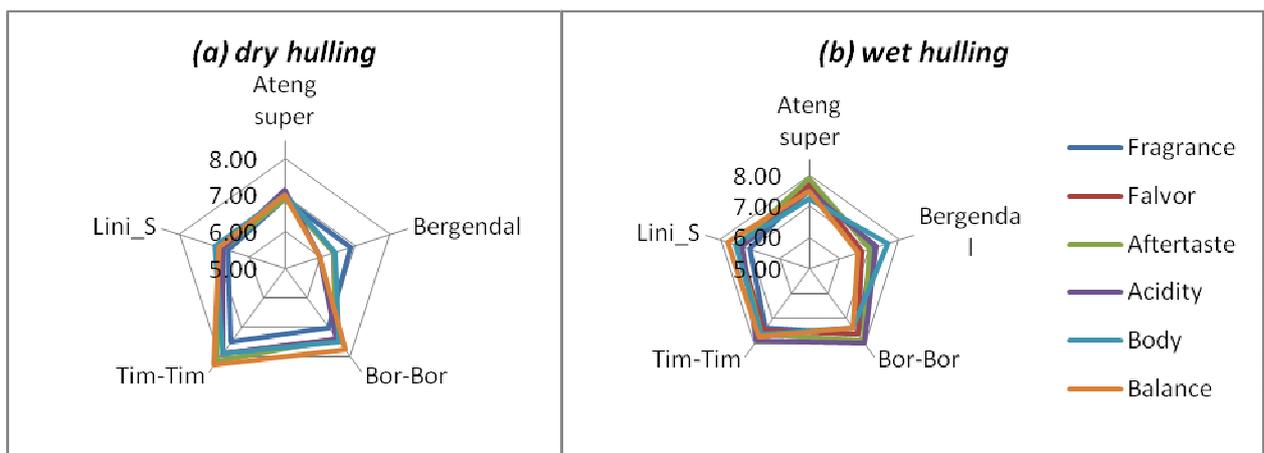


Figure 5. Result of organoleptic test of five varieties of gayo arabica coffee processed with dry hulling (a) dan wet hulling (b).

**Analysis of acidity (pH value)**

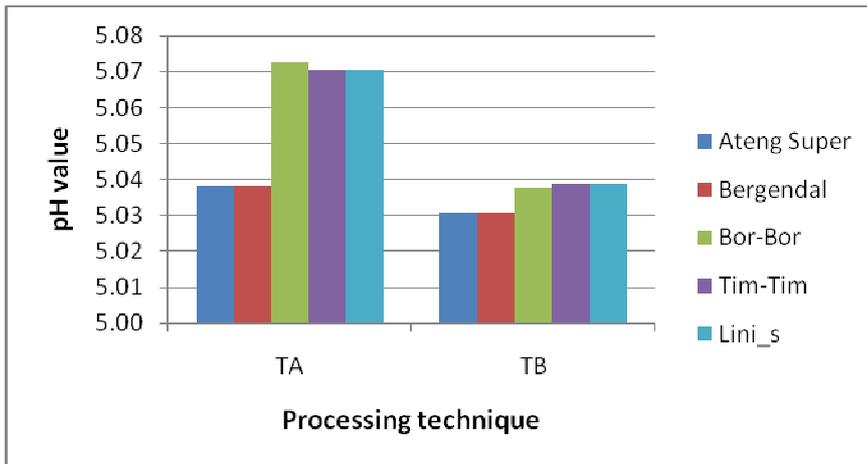


Figure 6. Effect of varieties and processing technique (TA=dry hulling, and TB=wet hulling) on Arabica coffee pH value

Figure 6 shows that pH value of Arabica coffee influenced by variety and processing technique. In dry hulling, coffee variety that has high pH value is Bor-Bor, then followed by variety Tim-Tim, and Lini\_s. Meanwhile, using wet hulling technique, variety Tim-Tim has a high pH value, followed by Lini\_s and Bor-Bor. In general, pH value for Arabica coffee ranging from 5,3 until 6,0 (Anonym, 2009).

**Analysis of caffeine**

In coffee processed using dry hulling, highest caffeine content found in Bor-Bor variety, then in bergendal, lini\_s, ateng super and tim-tim (Figure 7). Meanwhile, in wet hulling, highest caffeine content found in Bor-Bor variety, bergendal, tim-tim, lini\_s and ateng super. In general, coffee processed using dry hulling contain higher caffeine compared to that of wet hulling. Lower caffeine in wet hulling coffee may caused by damage of the caffeine due to direct sun light exposure of the green bean during the second stage of sun-drying.

Caffein is a plant originated chemical-compound that can stimulate barain and nerve system. It is also categorized as alkaloid known as trimetilsantin. Other than in coffee, caffeine also found in tea, cola, cacao, energy drink, and medicine (Clarke and Macrae, 1987a). By variety, highest caffeine contain was found in bor-bor, bergendal, ateng super, lini\_s and tim-tim, respectively (Figure 8).

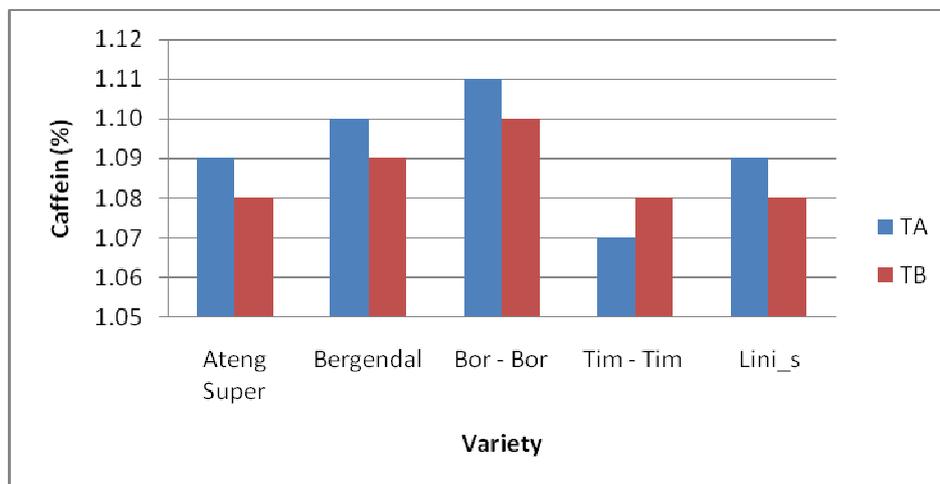


Figure 7. Effect of variety and processing technique on caffeine content.

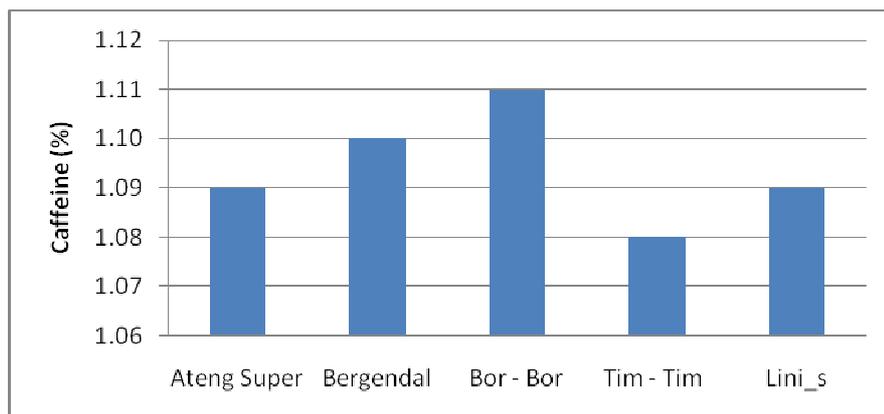


Figure 8. Caffeine contain in gayo Arabica coffee by variety.

### Conclusion

In general, based on the test results, the following conclusion can be made:

1. From five varieties tested, best Arabica coffee taste obtained from Tim-Tim variety.
2. Arabica coffee processed using wet hulling technique was preferred than that of dry hulling.

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