# Effect of Moisture Contents and Roasting Degree on Quality of Wine Coffee from Arabica Gayo

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*Abstract*— **Wine coffee is a newly diversified coffee product with specific market segments. The term "wine coffee" indicates that the brewed drink has a wine-like flavor. This coffee is going through coffee cherries fermentation for 10 to 30 days. Wine coffee is also known as fermented coffee because it goes through the fermentation process of the fruit before it becomes the coffee beans. As a brand new product, wine coffee processing techniques such as drying and roasting condition are still varied between the producers. Therefore, wine coffee producers need references to have similar perceptions. Nevertheless, the information related to the suitable roasting degree of moisture contents that could elevate the cupping quality of wine coffee is still lacking or not yet available. This study aims to determine the effect of moisture content in wine coffee green beans and roasting degree (light, medium, and dark) on the quality of the coffee wine. The measured parameters were physicochemical properties and the cupping test based on the SCAA standard. This study indicates that the pH value of brewed wine coffee is between 5.02 - 5.37. As the moisture content of the green bean decreased, the pH of its brewed was also decreased. All produced wine coffee in this research had cupping test's total score varied from 82.00 - 83.75 and classified as specialty coffee qualifications. The distinctive flavor characteristics of coffee wines are obtained at the medium roast level with a total score of 83, 75, namely fruity, raisin, smoky, citrusy, good body, sweet, wine, banana, tangerine, dark caramel. Meanwhile, roasted coffee wine has a sourer taste; the resulting specific flavor such as burnt, tobacco, and a thick body at the dark roast level.**

*Keywords*— **Wine coffee; fermentation; flavors; roasting degree.**

## I. INTRODUCTION

Coffee (*Coffea* sp.) is an essential agricultural commodity in Indonesia because it is high. This is also felt by Aceh Province, as the largest Arabica coffee producing region in Indonesia. Gayo Arabica coffee (*Coffea arabica* L) is a superior coffee commodity originating from the Gayo Highlands(GH) area, where the main centers of Arabica coffee producers are Bener Meriah and Aceh Tengah [1], [2].

In the Gayo highlands during the coffee harvest season, the availability of coffee cherries is sometimes very abundant. Based on data from the Central Statistics Agency of Aceh Province in 2017, the amount of coffee production reached 68,493 tons with a planted area of 123,749 ha. Then these numbers are steadily increasing as the plant area (ha) increases. In 2019, coffee productivity in GH increases 0.8% from 2017 [3], [4]. The coffee collectors find it difficult to accommodate an enormous coffee capacity to do so. To obtain premium quality, the coffee cherries must be processed immediately after harvest so as not to cause the coffee beans to smell stinker. Stinker is a pungent, sour aroma that is undesirable in coffee processing due to the long fermentation process [5]–[8]. Wine coffee is a diversified product in the development of coffee products. The term wine coffee is used because when it is brewed, the taste and aroma of the coffee are considered to resemble the flavor and aroma of wine in general [9]. Wine is a drink from the fermentation of grapes. Meanwhile, the term wine coffee refers more to the post-harvest processing method of coffee that produces a unique taste that resembles wine. Wine coffee is also called fermented coffee or cherry coffee fruit fermented before becoming coffee beans. The difference between wine coffee processing and wet processing is the fermentation process. The wine coffee fermentation process is carried out on coffee cherries, while in the wet coffee process, the fermentation is carried out after the coffee is pulped [1], [10], [11].

The taste of coffee is influenced by many factors, such as soil conditions, the altitude level, the processing process, and the quality of the green coffee produced. Post-harvest coffee processing starts from the time of harvest to the coffee brewing process. At harvest time, the moisture content of the

coffee cherries can usually reach above 60%, so we must dry it to 12 to 14%. The aim is that the coffee beans will not break easily during the hulling process. Decreasing water levels can be done by drying in the sun. In general, drying is carried out for three days or more depending on the intensity of the sunlight [12].

Green beans should be roasted firsthand to be brewed. Roasting produces certain aroma and coffee flavors. Based on the coffee roasting temperature used, the roasting process is divided into three levels: light roast, medium roast, and dark roast. In the light roast process, the resulting high level of acidity, for medium roasting, the taste, aroma, and acidity produced are balanced and have a thick body. Meanwhile, heavy roasting (dark roast) produces a thick body with low acidity [15]. Different roasting levels will produce other coffee products, so it is necessary to test the quality and taste of coffee wine products. The characteristics of coffee in coffee wine that are roasted at several roasting levels need to be considered to determine the right roasting level for wine coffee products.

## II. MATERIALS AND METHOD

The instruments used in this study were transparent polyethylene (PE) plastic containers, analytical balance, pulper, roaster, grinder, scale, pH meter, and beaker, and William Edison roasting machine laboratory scale with a capacity of 1500 kg. The material used in this study was Arabica red coffee (cherry) fruit from Simpang Balik, Wih Pesam, Bener Meriah Regency with an altitude above 1,000-1,200 meters above sea levels.

The wine coffee production (from red cherries to green beans) took place in private coffee farmers in Wih Pesam, Bener Meriah regency. Sorting, roasting, and cupping tests were done in Gayo Cupper Team, Takengon-Aceh Tengah. Then the quality properties (pH, moisture contents, and total solids solvent) were done in Laboratory Analisis Pangan dan Hasil Pertanian, Department of Agricultural Product Technology- University Syiah Kuala.

### A. Research Procedure

*1) The processing of wine coffee:* The processing of wine coffee started with the manual picking of red coffee cherries. Ripe red coffee (cherry) is sorted separated from damaged fruit and impurities such as leaves and branches of coffee. Then the sorted fruit is washed under running water, put in a transparent PE plastic container, and closed tightly. Furthermore, the red coffee fruit fermentation is carried out for 12 days, where every five days, the container is opened to regulate the air pressure during fermentation. After 12 days, the coffee cherries are dried without direct exposure to sunlight. First, the coffee cherries are dried for 3 hours (09.00-12.00) at room temperature. After drying in the sun, the coffee cherries are put back in a closed transparent PE plastic container until drying the next day. This process is repeated every day for 18 days until the water content of the coffee cherries is ± 20%. Then the semi-dry coffee cherries are separated from the skin of the coffee pods and the skin of the coffee horns through the hulling process. Finally, the green bean obtained was dried until the moisture content was obtained according to the treatment level (10%, 12%, and 13%).

*2) The roasting process of wine coffee:* Coffee beans with their respective moisture content that have dried are sorted for quality and defects of coffee beans according to (SNI 01-2007-2008) [14]. Then the coffee is roasted according to the treatment, namely light, medium and dark. The roasting process is carried out at a temperature of 200ºC, where the roasting time for the degree of light roast is 9 minutes, medium roast for 12 minutes, and dark roast for 15 minutes. Roasting degree calibration is done by comparing the color of the coffee produced with the agtron scale. Then the coffee beans are ground using a grinder with a medium size (20 mesh).

### B. Data analysis

This study used a factorial randomized block design (RBD) with two factors: the moisture content of the coffee beans and the roasting level. The moisture content factor of coffee beans consists of 3 (three) levels, namely K1 = 10%, K2 = 12.5%, and K3 = 13%. The roasting level factor consists of 3 (three) levels, namely P1 = (light roast), P2 = (medium roast), and P3 = (dark roast). And three replications with a total of 27 experimental units. If there is a significant effect on the treatment, then the analysis is continued using a further test, namely the DMRT (Duncan Multiple Range Test).

### C. Sample Analysis

In this study, the quality of the coffee wine produced was observed based on the quality of coffee beans (SCAA) [15], the pH of coffee wine brewing, and the cupping test based on the SCAA [15]. Three certified coffee graders carried out the Cupping test from the Gayo Cupper Team (GCT) [16]. The cupping test was carried out on all 27 samples. The GCT assessed ten standard attributes of coffee, namely aroma/fragrance, flavor, acidity, aftertaste, body, balance, overall, sweetness, cleanup according to SCAA standards. In SCAA cuptest, 6-9 scale is used. The description of these scales is presented in Table I. Then, all of the attribute scores are summed up as final scores. Final scores consider coffee quality. This sum-up score is used to classify coffee quality as shown in Table 2.

TABLE I
LEVELS OF QUALITY BETWEEN NUMERIC VALUES

| Quality scale | | | |
|---|---|---|---|
| 6.00 Good | 7.00 Very Good | 8.00 Excellent | 9.00 Outstanding |
| 6.25 | 7.25 | 8.25 | 9.25 |
| 6.5 | 7.5 | 8.5 | 9.5 |
| 6.75 | 7.75 | 8.75 | 9.75 |

Source: SCAA [17]

TABLE II
RANGE OF COFFEE QUALITY FOR FINAL SCORE

| Total Score Quality Classification | | |
|---|---|---|
| 90-100 | Outstanding | |
| 85-89.99 | Excellent | Specialty |
| 80-84.99 | Very Good | |
| >80.0 | Below Specialty Quality | Not Specialty |

Source: SCAA [17]

## III. Results and Discussion

### A. Physical Quality of Coffee Beans Wine Coffee

The results of the physical quality defect testing of coffee beans were that there was a total of 33.50 defects per 300 grams of coffee beans. The defect value test in green bean coffee is one of the requirements to determine the quality of coffee beans and a requirement for world coffee exports. According to the Specialty Coffee Association of America (SCAA) standard methods, coffee bean defect value testing is conducted. The results of the coffee wine coffee bean defect test results can be seen in Table III.

The most significant defect in coffee bean-wine coffee is a seed with many holes (holey beans). This damage was caused by the coffee fruit borer (*Hypothenemus hampei* Ferr). These pests enter from the tips of the seeds that are still on the tree and fall to the ground [18]. From seven kinds of defects in Table 1, white beans are not found in the coffee wine-green beans. Therefore, the wine processing method of coffee does not impact the quality of the coffee wine produced.

TABLE III
RESULT OF DEFECT OF COFFEE BEAN-WINE COFFEE (PER 100 G GREEN BEANS)

| Kind defect | Value |
|---|---|
| Black | 13 |
| Brown | 12 |
| Holey | 60 |
| White | - |
| Unripe | 12 |
| Broken | 28 |
| Perforated | 31 |
| Total defect | 33,50 |

### B. Quality of wine coffee as a brewed drink

Roasting and grinding are the next processes in coffee processing. Roasting produces roasted coffee beans, which change coffee's physical and chemical properties and provide ready to brew coffee drinks. Commonly coffee bean is roasting at 200ºC. In this research, coffee is roasted in three different degrees/levels. All roasting degrees used similar temperatures but at different times, which are 9 minutes at light roast level, 12 minutes at a medium roast level, and 15 minutes at a dark roast level.

After roasting, the coffee is grounded into a powder with a size of 20 mesh. The color of the coffee beans is produced according to the roasting level, as shown in Fig 1. The longer the roasting process is, the darker the resulting color will be, and the quality of the brew will produce a different cupping quality.



Fig. 1 Differences in roasting levels of wine coffee

### C. pH Analysis

The results showed the pH of wine coffee steeping samples ranged from 5.02-5.37 with an average value of 5.17. Gayo coffee, generally processed semi-wash, has an intermediate pH level of 5.47 [19]. Arabica coffee generally has a pH value between 4.80-5.80 [20]. Therefore, this wine coffee, namely fermented coffee, is still suitable for consumption if the pH value exceeds 4[13]. As also stated by Sulaiman [21], the pH of coffee in the range of 4.9-5.2 will provide the preferred aroma.

The results of variance showed that the water content, roasting level, and interaction had a very significant effect (P≤0.01) on the pH value of wine coffee. Interaction between both independent variables is shown in Figure 2. The lowest pH (5.02) was belonged to coffee wine, with a water content of 10% and a medium roast level (K1P2). The DMRT test clearly shows that the higher the water content of green beans, the pH of the coffee brew tends to increase. This trend is seen at all three degrees of roasting. Then coffee beans with a water content of 10% (K1) and 12% (K2) produce a brew with a pH that is not significantly different at the three roasting levels, while in coffee beans with a content of 13% (K3), the pH of the resulting brewed coffee tends to increase.
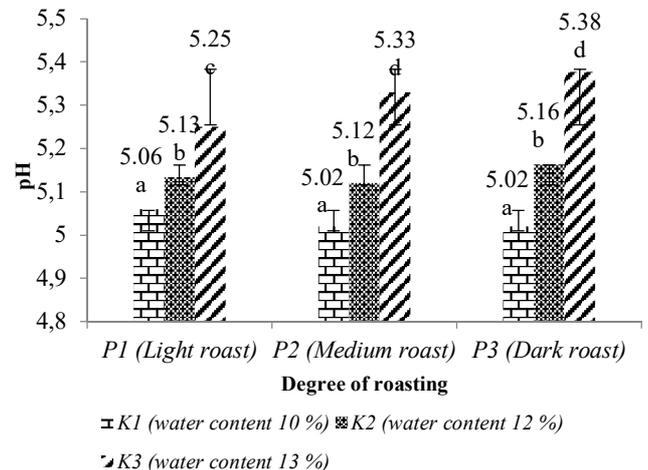


Fig. 2 The interaction effect of water content of coffee beans (K) and degree of roasting (P) on the pH value of coffee brew (the value followed by the same letter shows an insignificant level difference) the DMRT value is 0.05, P2 = 0.041, P3 = 0.043, P4 = 0.045, P5 = 0.045, P6 = 0.046, P7 = 0.046, P8 = 0.047, P = 0.047 and the KK value = 0.154.

The pH value will increase along with the more prolonged roasting process. The formation of acid components causes an increase in pH value during roasting. Acid components in green beans evaporate due to the high thermal process, forming other acids. According to Mulato [22], coffee beans naturally contain various acid and volatile compounds such as aldehyde, furfural, ketol, alcohol, formic acid esters, and acetic acid, which have volatile properties. The pH value affects the taste and aroma of coffee. During roasting, these acidic and volatile compounds turn into acetic acid, malic acid, citric acid, and phosphoric acid, which form an image of a sour taste in coffee [2].

## D. Sensory Quality of Wine Coffee Arabica Gayo (Cupping Test)

The cupping test is a sensory assessment done by the coffee quality grader. This test is used to describe the sensory properties of a product clearly. The taste test includes aroma, flavor, after taste, acidity, body, balance, uniformity, clean cup, sweetness, overall and total score [17]. This cupping test's preparations and measurements followed the SCAA standard [23].
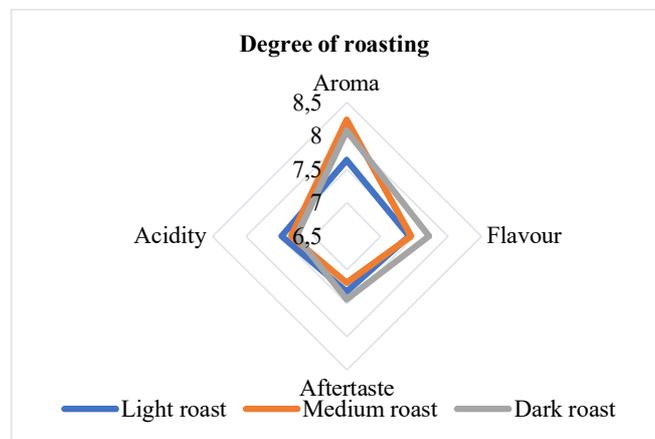


Fig. 3 The effect of degree of roasting on the value of aroma, flavor, aftertaste and acidity (6= good, 7 = very good, 8= exellent, 9 = outstanding).

### 1) Aroma:
Aroma is the first attribute to assess in the cupping test. After the coffee grounds are infused with water, it forms the coffee crusts on the surface and is left unbroken to let the water infuse all coffee aroma. After 3-5 minutes, the crust is broken by three times stirring, and the aroma of wine coffee is measured by sniffing and spooning the liquor at the same times [17].

The aroma value obtained is 7.50-8.25, with an average of 7.90. Meanwhile, Gayo single-origin coffee, which is processed semi-wash, produces aroma scores varying from 7.60-8.16 (excellent quality scale) with an average value of 7.89. The team's variety of aroma scores was 7.76 [19]. The variance results showed that the water content treatment did not affect the aroma produced. Roasting level treatment had a significant effect (P≤0.05) on the aroma of coffee wine (Figure 3). On the other hand, the moisture contents and the interaction between the two factors had no significant effect (P≥0.01) on the aroma value of coffee wine.

During the roasting process, the coffee beans is heating up. It has a non-direct contact with hot air, which causes the Maillard reaction. As temperature rises, protein and carbohydrates transform and form many volatile compounds. Maillard reaction also gives rise to aromatic compounds such as melanoidin, pyrazine, furan, and pyridine [7], [23]. In this research, medium roast is considered the roasting degree that produces wine coffee with the highest aroma attributes (8.28), followed by the dark and light roast. Light roast occurs to have a shorter roasting time, while the dark roast is the longest. Therefore, as the time shorter in light roast, the aroma is not well-developed. Meanwhile, in the dark roast, the burnt aroma, which is an undesired aroma might be formed due to longer roasting time. Bhumiratna [18] also stated that medium roast is considered the optimum degree to maximize an aroma intensity of single-origin coffee such as Gayo coffee.

### 2) Flavor:
After fragrance and aroma, several attributes such as flavor, aftertaste, acidity, body, and balance are tested in sequences. These five attributes above are evaluated roughly 8-10 minutes after infusion [17]. Based on the cupping test, the wine coffee has flavor attributes with ranged from 7.00-8.00, with an average value of 7.50, described as very good to excellent quality. Abubakar et al. [19] reported that Gayo single-origin coffee has a flavor value that varies from 7.60-8.10 (excellent quality scale) with an average score of 7.91, which is influenced by the variety and processing process [19]. Then, based on coffee Gayo local varieties (Timtim, Borbor, and Ateng Super) and treated with the semi wash method were reported to have a flavor score of 7.80.

The variance results showed that the roasting degree had a significant effect (P≤0.01) on the flavor value of coffee wine steeping, as shown in Figure 3. Meanwhile, the water content factor and the interaction of both factors had no significant effect (P≥0.05) on the flavor of steeping coffee wine.

The flavor continues to form during the roasting process and the more prolonged roasting process. GCT[16] coffee grader evaluated that flavor of this coffee wine descriptively increased based on its roasting levels; as we can see in Figure 4, from light roast to dark roast. During the roasting process, the carbohydrate content in the coffee beans will produce several compounds such as carboxylic acids, furans, and aldehydes that affect the coffee flavor. The sucrose content is rapidly destroyed in the initial roasting stages, such as light roasts. It becomes the primary source of aliphatic acids (formic, acetic, glycolic, and lactic), the main precursors in forming sour tastes and flavors. With a longer roasting time, sucrose turns into caramel, including a burning layer around the coffee beans, resulting in a caramel flavor and other intense and rich flavors [24]. As roasting gets longer, a burnt smell that is undesired might be produced [7].

### 3) Aftertaste:
Aftertaste defines a positive quality of coffee in the upper palate after the liquor is drunk. As the brewed coffee is evaluated by aspirating the liquor into the mouth, it can contact all surfaces of the mouth, especially the tongue and upper palate. Therefore, coffee graders can assess this attribute together with flavor, acidity, body, and balance.

Aftertaste of this wine coffee is descriptively valued in the range from 7.00-7.50 with an average of 7.30. Compared to a Gayo single-origin coffee, especially the similar variety used in this research (Tim-tim variety) which is processed by the semi-wash method, it has an aftertaste score of 7.80 [19].

Furthermore, the variance results showed that the roasting level had a significant effect (P≤0.05) on the aftertaste value of steeping coffee wine. However, the water content factor and their interaction had no significant effect (P≥0.05) on the aftertaste value of coffee wine.

Fig 3 showed that medium roast has a lower aftertaste. However, this value is insignificant with the other two treatments. The chlorogenic acid might be present in a higher percentage [25], [26]. Therefore, gives a pleasant light and acid aftertaste to the coffee liquor. Meanwhile, at the dark roast level with a longer roasting time, the resulting coffee liquor is thicker so that when the coffee is cupped, the aftertaste has an extreme intensity. This is consistent with this study done by Brioschi et al. [25]; brew wine coffee from

roasting dark roasts is considered to have a stronger aftertaste than the other two treatments.

*4) acidity:* Acidity is defined as a pleasant-rich tarty sensation of coffee when it is highly slurping through the tongue and palate. In this study, wine coffee has an acidity value between 7.25-7.50 with an average of 7.30. Abubakar et al. [19] stated that Gayo single-origin coffee has an acidity value ranging from 7.47-7.87 (excellent quality scale) with an average score of 7.91. The coffee varieties and processing process vary this value. Moreover, Timtim, as a local variety in Gayo Highland and handled with semi-wash processing, has an acidity score of 7.50. This Tim-tim variety is also used in this research.

The variance results showed that only the roasting degree factor had a significant effect (P≤0.05) on the results of the acidity value of brewed wine coffee. .According to Muslimin et al. (2021)[4], the longer and darker the roasting process is, the lower the acidity. The too-long roasting process will cause the acidity character of the coffee to be lost, replaced by a bitter taste due to the increase in phenolic compounds [4]. Level roasting is also proportional to the pH value obtained in wine coffee.

*5) Body:* The body is a touch of feeling heavy/thick or light in the mouth, especially between the tongue and the roof of the mouth. The data analysis shows that the body value of all wine coffee samples is 8.00. Meanwhile, when compared with the body value of single-origin Gayo Arabica coffee, it generally ranges from 7.87-8.27 with an average of 7.99. The Tim-tim variety with the semi-wash process has a body score of 7.87[19]. Based on the results of variance, it was found that the water content factor, roasting level, and the interaction between the two had no significant effect (P≥0.05) on the body value of the resulting steeping coffee wine, so that what did not continue the DMRT test.

Based on the research of Fadri [3] that citric acid and malic acid are components of the sour taste of unroasted coffee beans (green beans). The acid will gradually degrade when roasted with a darker level of maturity. In general, the total acidity value of coffee decreases during the roasting process; this makes coffee roasted at light roasts more acidic than those roasted at medium and dark roasts.

*6) Balance:* Balance is all aspects of flavor, aftertaste, acidity, and body balance in the sample. If one is reduced, the balance value is also reduced. The balance value of wine coffee obtained ranged from 7.00-7.75 with an average of 7.77. Abubakar et al. [19] team Gayo variety single-origin coffee processed using the semi wash method has a balance score of 8.00. The results of the variance fingerprint showed that the roasting level and the interaction of the two had a very significant effect (P≤0.01) on the balance value of steeping wine coffee. There was no significant effect for the water content factor (P≥0.05) on the balance value of wine coffee.

The DMRT test results show that brew wine coffee from beans with a medium roast level at all water levels of coffee beans at a light roast level at a moisture level of 12% (7.5), and a dark roast roasting level at a moisture content of 13% (7, 33) has the highest balance value when compared to other levels. According to the SCAA [23], balance includes flavor, aftertaste, acidity, and body from coffee that are balanced

with one another. The balance of coffee flavors can be related to other sensory attributes such as acidity, bitterness, or roasting level [3]. In this case, the roasting level will affect the balance value. Different levels of roasting produce different flavors, acidity, and body.
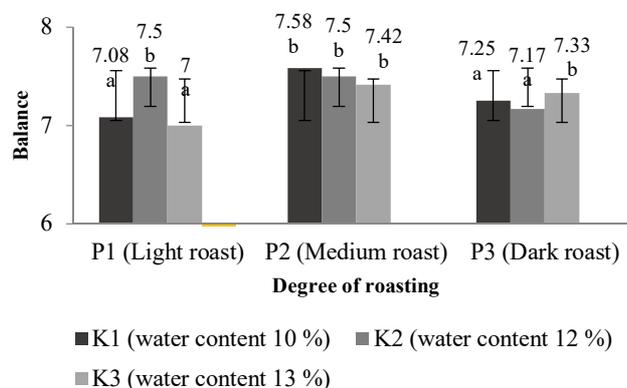


Fig. 4 The interaction effect of coffee bean moisture content and roasting level on the balance value followed by the level of P2 = 0.237, P3 = 0.249, P4 = 0.256, P5 = 0.261, P6 = 0.265, P7 = 0.267, P8 = 0.269, P9 = 0.271 and the KK value = 0.625

*7) Overall:* The results showed that the overall value of the coffee wine sample ranged from 7-7.25, with an average value of 7.16. Gayo single-origin coffee varieties Teams processed using the semi wash method have an overall score with an average of 7.75 [19]. The overall value of Gayo single-origin Arabica coffee beans ranges from 7.60-8.00. With an average of 7.83. In comparison, the variety of teams produced an overall score of 7.78. The variance results show that the water content and the interaction of the two have a very significant effect (P≤0.01).

In contrast, the roasting level has a significant effect (P≤0.05) on the value of overall wine coffee. Therefore, the overall value for wine coffee obtained is in the range of 7.00-7.75. Based on the results of the DMRT test, it can be seen that the highest overall value is obtained in the 12% moisture content treatment at the medium roast roasting level.

Overall, an assessment reflects all of the above aspects of a coffee sample that each assessor feels (GCT) [16]. Coffee with a high overall value of taste aspects will have a high overall score [7], [8]. The medium roast level of wine coffee has the highest average attribute value of each taste test, so the highest overall value is obtained at the medium roast roasting level.

*8) Total score:* Based on the cupping score, the assessment categories for the coffee taste test are <75: off grade, 75-80: fine commercial coffee,> 80: specialty coffee> 84: cup off excellent. The total score for wine coffee ranges from 82.00 to 83.83, with an average of 82.6. In this case, all coffee wine samples have an excellent value and are classified as specialty coffee. Gayo single-origin coffee varieties of processed teams using semi-wash have a total score of 84.17 [19]. The variance results showed that the water content, roasting level, and their interaction had an incredibly significant effect (P≤0.01) on the total score of wine coffee.

Table IV showed a total score from the cupping test. It can be seen that medium roast produces better cupping quality

than other roasting degrees at any level of water contents. At the medium roast level for each treatment, the water content has a higher total score than the level of light roast (P1) and dark roast (P3). This is presumably because the taste of coffee wine is more obtained at the medium roasting level because the sour taste obtained is not too high, and the aroma of wine is still felt. In contrast to the light roast level, the taste obtained is predominantly sour, while the flavor tends to be more bitter for the dark roast level.

Table IV also shows the fragrance notes of each treatment. The fragrance attribute is assessed by smelling the coffee ground powder. From all three, medium roast has highest score and more complex notes. Coffee bean became darker, bigger and has sweet and intense flavor. GCT [16] also noticed the winey fragrance in this degree.

TABLE IV
TOTAL SCORE AND FRAGRANCE NOTES OF GAYO WINE COFFEE

| Treatment | Total Score[a] | Fragrance Notes |
|---|---|---|
| K1P1 | 82,00a | *Fruity, raisin, citrusy, jackfruit, salty, nutty, banana, cereal, tarty, dry wood.* |
| K1P2 | 83,75b | *Fruity, raisin, smoky, citrusy, good body, sweet, wine, banana, dark caramelly.* |
| K1P3 | 82,50b | *Burnt, toasty, lemony, smoky, butternut, tobacco, coffee pulp, nutty, malty, slicy* |
| K21P1 | 82,00a | *Fruity, raisin, citrusy, jackfruit, salty, nutty, banana, cereal, tarty, smoky, dry wood.* |
| K2P2 | 83,75c | *Fruity, raisin, smoky, citrusy, good body, sweet, wine, banana, tangerine, dark caramelly.* |
| K2P3 | 82,50b | *Burnt, darkness, toasty, lemony, smoky, butternut, tobacco, coffee pulp, nutty, malty, slicy* |
| K3P1 | 82,00a | *Fruity, raisin, citrusy, starfruit, salty, banana, cereal, tarty, dry wood.* |
| K3P2 | 83,75c | *Fruity, raisin, smoky, citrusy, good body, sweet, wine, banana, dark caramelly.* |
| K3P3 | 82,50b | *Burnt, toasty, lemony, smoky, butternut, tobacco, coffee pulp, nutty, scorched rice.* |

[a]Effect of interaction between water contents and roasting degree

Coffee from light roast tends to have fruity, citrusy, and salty notes. This kind of fragrances commonly notified on unwell roasted coffee. Due to a short time, profile of roasted coffee is not well developed, the aroma is thin but high in acidity. On the other hand, dark roast produced a darker and bigger volume of coffee bean. It produces burnt and smokey sensation, which might be covered the unique fragrances notes of coffee. Dark roasted coffee has a bitter taste and thicker body. In this research, coffee from dark roast is still classified as specialty coffee [20].

## IV. CONCLUSION

The coffee bean defect test results were 33.50 total defects per 300 grams of coffee beans. The results of pH analysis on coffee wine samples ranged from 5.02-5.37, with an average value of 5.17. The roasting level significantly affects taste,

namely aroma, flavor, aftertaste, acidity, balance, overall, and the total score of Arabica Gayo coffee wine. Meanwhile, the water content of the coffee beans did not significantly affect the taste of Gayo Arabica coffee wine. The interaction between the water content of coffee beans and roasting level had a significant effect ($P \leq 0.01$) on pH value, balance, and overall wine coffee. The highest final score for all treatments, namely 83.75, is included in the specialty category.

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