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CHARACTERISTICS OF SPECIALTY FERMENTED COFEE: ARABICA OF KINTAMANI AND ROBUSTA OF PUPUAN WITH KEFIR STATER CULTURE

I Nyoman Sucipta, IB Putu Gunadnya, Made Sugitha, Wayan Citra Wulan Sucipta Putri, Ketut Suriasih dan Pande Ketut Diah Kencana

Udayana University

sucipta@unud.ac.id

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Abstract

The aim of the research was to determine the characteristics specialty coffee of Kintamani arabica and Pupuan robusta fermented with kefir starter culture. Making Kintamani Arabica and Pupuan Robusta specialty coffee drinks, by putting the coffee powder into the coffee machine, pouring water into the machine. Put the power mechine on and determine the best time to mix the coffee blend. The machine processed coffee drink which is still warm is put into a jar, the temperature is lowered to 28°C. After reaching this temperature, 10% concentration kefir starter is given, put into the jar, covered with gauze on the lid, and incubated for 24 hours in the incubator cupboard. Next, the kefir coffee is incubated for 16 hours, to separate the remaining kefir grains by filtering. Plus sugar concentration of 60% as much as 15%. stored at a temperature of 5ºC and tested for laboratory, caffeine, pH, acidity, nutritional and organoleptic levels. Chemical test results with pH 4.41 ± 0.0926, acid content 0.52 ± 0.0265, the caffeine fermentation process in coffee drinks undergoes an esterification process in which the alkaloid compounds in caffeine will be broken down into esters in the form of chlorogenic acid, the amount of LAB is 1.5-2.4 10^3, fat content 3.54± 0.0376%. protein content 12.27 ± 0.0104 %. carbohydrates 2.50±0.0855 %. The organoleptic test results of the Pupuan robusta kefir coffee drink with sugar have the highest color value of 3, namely light brown. From the taste, the highest score is 4, namely sour Pupuan robusta coffee with sugar, without sugar, Kintamani arabica kefir coffee without sugar and Pupuan robusta mixed kefir coffee,

Kintamani arabica without sugar. The aroma with the highest score of 4, which is rather strong, is Pupuan robusta coffee with sugar and without sugar. From the body of all formulas with a score of 3, which is a bit thick. The acidity of all formulations with a score of 3.5 is slightly acidic. Based on the level of liking with a score of 4.5-5, namely between somewhat like to like all formulations.

Key words: characteristics, specialty coffee drinks, Arabica Kintamani , robusta Pupuan

INTRODUCTION

Specialty coffee or speciality coffee is coffee of good quality. This quality is assessed not based on comments from coffee fans but is assessed by a certified Q Grader. This coffee is specially processed with special conditions starting from the initial process of planting the coffee until it is served in a cup. Q Grader is a title given to people who have passed a series of tests and are worthy of attaching the title of specialty to a type of coffee. The specialty coffee in this study from Kintamani arabica coffee and Pupuan robusta is referred to as Balinese coffee, because it meets the requirements such as red pick, which is then processed into green beans, has a cupping test value of >80. based on cupping tests based on Specialty Coffee Association of America/SCAA standards by trained panelists (Lingle, 2001; SCAA, 2009b). Specialty coffee indicators based on taste attributes that are assessed include aroma (the smell when brewed), flavor (taste on the tongue), body (thickness), acidity (acidity), aftertaste (the taste left in the mouth), sweetness (sweet taste), balance (aspect taste balance), clean cup (general taste impression), uniformity (the uniformity of taste in each cup), and overall (overall taste aspect) (Towaha, 2015)

The specialty coffee in this study was fermented from kefir starter culture. It is known that kefir contains complex microbes, namely lactic acid bacteria, Lactobacillus, Lactococcus, Leuconostocs, Acetobacteria) and yeasts (Otes and Cagindi, 2003). Lactic acid bacteria are the microorganisms with the largest number in kefir. According to Oktaviana et al. (2015), the use of a multiculture starter will cause symbiosis to occur so that fermentation can be accelerated or the processing process can take a shorter time. To obtain a good coffee taste, the fermented product requires the right starter culture and appropriate and controlled fermentation

Based on the above, a problem is formulated: what are the characteristics of Kintamani arabica specialty coffee, Pupuan robusta fermented with kefir starter culture?

The aim of the research was to determine the characteristics of Kintamani arabica specialty coffee and Pupuan robusta fermented with kefir starter culture.

The urgency of the research is that the results of fermentation using kefir starter culture produce healthy Kintamani arabica and Pupuan robusta coffee drinks with a taste favored by coffee lovers and connoisseurs.

RESEARCH METHODS

Place and time of research

The research site is at the Bali kefir probiotic product production house Gemitir N0. 40 street Denpasar, Udayana University Food Technology Laboratory. Research starts from April to September 2023

Objects And Samples

The objects of this research are Kintamani arabica coffee and Pupuan robusta. The samples from this research are red-picked coffee from smallholder plantations in Pupuan village, Pupuan Tabanan subdistrict and Catur village, Kintamani subdistrict, Bangli Regency.

Tools and materials

The tools and materials in this research consist of tools for processing coffee from picking to ground coffee, namely pulper machines, roasting machines, grinding machines, plastic sacks, buckets, pulpers, jars, scales, para-para, coffee drink machines, thermoses, glasses. , cup, spoon. Tools for chemical, microbiological and immune analysis in the Bali kefir production house, in the Food Technology laboratory, Immunology Laboratory, Faculty of Veterinary Medicine, Udayana University.

Research Implementation

The raw materials for the coffee fruit used are arabica Kintamani coffee and robusta Pupuan coffee. The coffee fruit is harvested from red picks and strictly selected, then the skin of the fruit is peeled using a pulper machine. As is known, coffee plants do not bear fruit simultaneously, therefore harvesting fully ripe coffee cherries must be done selectively. Harvesting coffee berries is done manually by

picking the ripe fruit. The peeled coffee beans (no later than 2 hours after removing the skin) are treated with kefir starter fermentation for 24 hours. After fermentation is complete, the next stage is washing and drying. This process is carried out to reduce the water content in the coffee beans so that it is at a ratio of 10-12%. After drying, the coffee beans are stored first to rest, where at this stage the coffee beans are put into a huller to remove the parchment skin (also called pergamino). so that dry coffee beans without horny skin (green bean coffee) are produced, then roasting and powdering are carried out

Specialty Healthy Coffee Drinks Manufacture

Making specialty healthy coffee drinks from arabica Kintamani coffee and robusta Pupuan coffee. The coffee from the above process is put into the coffee machine/Coffee Maker. Before starting to use a coffee maker, make sure the coffee maker you want to use is clean or has been washed first. Some coffee machines are equipped with their own filters, but some have to be installed manually. To get maximum coffee results, use branded paper filters or natural paper filters. Don't forget to throw the paper filter in the trash or wash the filter so that the bitter coffee grounds don't mix with the coffee mixture that has been made. After installing the coffee filter, it is necessary to pour the desired coffee. The combination of course varies depending on the ratio of water, coffee machine and type of coffee used. One of the most important things in the process of making coffee is the water ratio, which uses the measuring line on the coffee maker to determine the amount of water as desired. After pouring water into the coffee mixture, all you have to do is carry out the next process. Connect the machine to a power source to run it and determine the best time to mix the coffee blend. To find out if the coffee mixture you have prepared has been mixed completely. Some coffee makers have a "pause" feature which allows you to stop the coffee making process for a period of time. With this setting, you can determine the desired level of coffee mixture. Next, the coffee product is put into the container that has been provided to make specialty coffee in a jar, the temperature of the still warm machine processed coffee drink is lowered to 28°C, given a 10% concentration kefir starter, put in the jar, covered with gauze on the lid, incubated. 24 hours in the incubator cupboard. Next, the kefir coffee is incubated for 16 hours, to separate the remaining kefir grains by filtering. Plus sugar concentration of 60% as much as 15%. stored at 5ºC. then observed and carried out LAB, caffeine, pH, acidity tests, nutritional content tests and organoleptic tests.

Organoleptic test

Organoleptic taste tests were carried out on coffee drinks. Organoleptic testing is a method used to measure, assess or test the quality of commodities through the sensitivity of the human sense organs, namely the eyes, mouth, nose and fingertips. This organoleptic test was tested using consumer panelists. According to Cohen, et.al, (2007) when taking samples for a test, it is hoped that the number will be larger so that it will support better results. However, when there are limitations, the minimum number that must be taken by researchers is 30 respondents. This is in accordance with what was stated by Baley in Mahmud (2011) who stated that for research that uses statistical data analysis, the minimum sample size is 30.

Chemical test

Chemical tests include ash, fat, protein, carbohydrates, sugar, calories, pH and caffeine. Analysis of water and ash content was measured using the gravimetric method, fat content using the Kjeldahl method, protein content using the digestion method, and carbohydrate content using the by difference method.

Analysis of the caffeine content of coffee powder was weighed as much as 1 g and brewed with hot water at a temperature of 90ºC. The hot water temperature is controlled according to the needs used. The coffee solution is then filtered. After the filtering process, the coffee is put into a separating funnel which has previously been filled with calcium carbonate. Extraction was carried out using chloroform solvent. The solvent-free caffeine extract was dissolved in distilled water and the absorbance value was measured using UV-Vis spectrophotometry at a wavelength of 275 nm. 160 . Volatile compounds were analyzed using the solid-phase microextraction (SPME) method. The coffee sample was heated at a temperature of 90ºC, the coffee steam formed was absorbed with polydimethylsiloxane (PDMS) fiber for 30 minutes. The extraction results were then injected into the gas chromatography spectrophotometry (GCMS) for 10 minutes.

Volatile compound test procedures

According to Agresti et al. (2008) was carried out in the initial stage, namely adding ground coffee (3 ml) into a 5 ml vial. Then the sample was heated using a temperature of 70^{o}C for 10 minutes, then the SPME needle was inserted into the vial and the fiber was directed into the empty cavity above the coffee sample at a

temperature of 70^{o}C for 40 minutes. This test uses 3 phase SPME (divinylbenzene/carboxen/polymethylsiloxane) with 50/30 µm fiber. After that, the fiber that has absorbed volatile compounds is put into GC-MS. The column used was RTX-5MS (5% diphenyl, 95% dimethyl polysiloxane) 30 m x 0.25 mm internal diameter and the carrier gas was helium at a speed of 1 ml/minute. The injection temperature was set at 250^{o}C. The ion and interface temperatures are 300^{o}C and 275^{o}C respectively. The GC-MS oven temperature was set at 40^{o}C and held for 5 minutes, then increased to 180^{o}C at a speed of 3^{o}C/minute, then increased again at a speed of 10^{o}C/minute to a temperature of 250^{o}C (5 minutes). The GC injector is set in splitless mode.

The way to identify volatile compounds using GC-MS is (1) matching the MS (Mass Spectra) of the target chemical component resulting from sample injection with the MS contained in the software library (NIST Mass Spectral Library), (2) confirming the match between the LRI values of the pH test carried out using a pH meter that has been calibrated with a pH 7 buffer and a pH 4 buffer. The dried coffee beans that have been fermented are reduced in size. Dry coffee beans that have been crushed are dissolved using distilled water. Then the pH value is measured by placing an electrode on the sample and the pH value can be seen on the pH meter screen

Lactic Acid Bacteria Test

Testing for lactic acid bacteria is carried out by taking samples from fermented Arabica and Robusta coffee beans. The bacterial culture suspension was made by placing 5 g of coffee sample in a 100 mL Erlenmeyer containing 45 mL of sterile distilled water, then stirring thoroughly until homogeneous. Next, 1 mL of the culture suspension was taken and diluted in a test tube containing 9 mL of sterile distilled water for a dilution of 10^{-2}, stirred until homogeneous and the dilution continued to 10^{-7}. Samples of starter suspension from each dilution (10^{-5}, 10^{-6}, 10^{-7}) were taken 1 mL and put into a sterile petridish, then poured into it (pour-plate method). The media used are MRS Agar and CaCO3 as a growth medium for lactic acid bacteria. After the agar solidifies, the petri dishes are incubated in anaerobic conditions at a temperature of 370C for 48 hours. After incubation for 24-48 hours, the LAB population was calculated using the following formula.

$$N = \frac{\sum C}{[(1xn1) + (0.1xn2)] \times d}$$

N: Number of colonies per ml or per g
Σ C : Number of colonies on all plates counted
nl: Number of plates in the first dilution calculated n2: Number of plates in the second dilution calculated
d : Dilution in the first cup calculated

Data analysis

The explanation of the analysis results is carried out descriptively, depicted graphically.

RESULTS AND DISCUSSION

Acid Content, pH,Caffeine and LAB of Arabica Kintamani and Robusta Pupuan Kefir Coffee Drinks

The results of the pH test, acid content, caffeine and laboratory for Kintamani Arabica and Robusta Pupuan kefir coffee drinks are as shown in the following Table:1

Tabel 1. pH, Acid cntent, Cafein and LAB content of Kintamani Arabica and Robusta Pupuan kefir coffee drinks

Formulation	pH		Acid content (%)		Cafein content (%DW)	LAB content
	Before Fermentation	After Fermentation	Before Fermentation	After Fermentation		
Rb 1	4,85	4,38	0,35	0,55	2,6	1,9 x 10^3
Ar 1	4,74	4,55	0,36	0,50	1,4	1,8 x 10^3
Cp 1	4,62	4,44	0,34	0,51	2,0	1,9 x 10^3
Rb 2	4,58	4,28	0,32	0,52	2,5	1,5 x 10^3
Ar 2	4,62	4,45	0,34	0,53	1,35	2,4 x 10^3
Cp 2	4,52	4,38	0,56	0,55	1,90	2,1 x 10^3
Average	4,65±0,1196	4,41±0,0926	0,38±0,8998	0,52±0,0265		

Information
Coffee formulation
Rb1: Pupuan Robusta Kefir Coffee Drink with sugar
Ar1: Kintamani Arabica Kefir Coffee Drink with sugar

Cp1: Kefir coffee drink, a mixture of Pupuan Robusta and Kintamani Arabica with sugar
Rb2: Pupuan Robusta Kefir Coffee Drink without sugar
Ar2: Kintamani Arabica Kefir Coffee Drink without sugar
Cp2: Kefir Coffee Drink, a mixture of Pupuan Robusta and Kintamani Arabica without sugar

pH

It can be seen in Table 1 that the fermentation process produces changes in pH, namely a decrease in pH before and after fermentation from 4.65 ± 0.1196 to 4.41 ± 0.0926. The decrease in pH is due to the release of H+ ions that occur during the fermentation process which originates from the breakdown of lactic acid by lactic acid bacteria. The accumulated acid produces H+ and CH3CHOHCOO- ions so that if the higher the H+ ions produced, the pH of the preparation will become lower (Khotimah and Kusnadi, 2014).

Acid Level

In this research, the results showed that the acid content after fermentation would increase from 0.38 ± 0.8998 to 0.52 ± 0.0265, due to the breakdown of lactose becoming more and more. (Setioningsih, et al, 2004; Surono, 2004).

Caffeine Levels

During the fermentation process, caffeine in coffee drinks undergoes an esterification process where the alkaloid compounds in caffeine are broken down into esters in the form of acids.
chlorogeanate (Kristiyanto & Pranoto, 2013).

Lactic Acid Bacteria

Based on the data above, it can be seen that the amount of laboratory in coffee is 10^3. growth along with increasing length of fermentation period. Bacterial growth has phases, namely the lag phase (adaptation phase), log phase (exponential phase), stationary phase and death phase. The lag phase is a phase where bacteria need time to adapt to their new environment. The second is the log phase, the cell division phase where cells will divide and reach the maximum value of cell growth which occurs quickly. The third is the stationary phase, which is the growth phase where the number of dead bacterial cells increases until it reaches the same value as

the number of living bacterial cells and it is as if no growth occurs (Pelczar and Chan, 2007). The differences in growth of these bacterial isolates are caused by physiological diversity and the different responses of each bacteria to the physical and environmental conditions in which they grow (Sumarsih, 2003). LAB is also known to have different generation times depending on the type and location of the environment that supports its growth or not (Kusnadi et al., 2003). Isolate growth with long fermentation time. The growth of LAB colonies in this study was also influenced by the glucose content in coffee which can be degraded into lactic acid and as a carbon source during the fermentation process. Glucose is an important nutrient for the growth of LAB as an energy source. The presence of nutrients from glucose in a medium or food can trigger the rapid growth of LAB colonies in large quantities (Rizal et all., 2007). In various fermentation processes, glucose will usually be broken down into two molecules of pyruvate 0 0.5 1 1.5 2 2.5 3 3.5 0 24 48 72 BONA 2 BONA 4 41 pyruvate in the glycolysis process accompanied by the formation of two NADH + H+ Glucose which contained in the coffee substrate, will be broken down into smaller complex compounds depending on the type of fermentation. (Pelczar and Chan, 2008).

Nutrient levels of Arabica Kintamani and Robusta Pupuan kefir coffee drinks

The results of the nutritional content test for Kintamani Arabica kefir and Pupuan Robusta coffee drinks are as shown in Figure 2

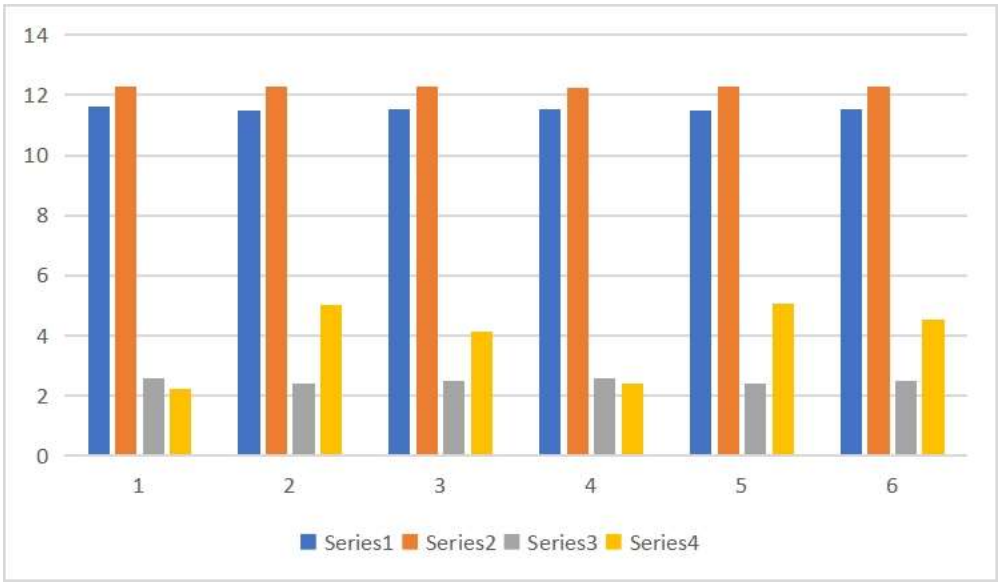

Figure 2. Nutrient levels of Kintamani Arabica kefir and Pupuan Robusta coffee drink

Information
Series 1. Fat content
Series 2. Protein content
Series 3. Carbohydrate levels
Series 4. Sugar content
0-14. Nutrient levels
1,2,3,4,5,6. Coffee formulation

Fat level

In this study, the fat analysis value was obtained, namely 3.5417 ± 0.0376%. These results show that the value meets the SNI 7552:2009 standard, namely the fat content of fermented drinks is at least 0.6%. Hydrolysis of triglycerides in fat by the lipade enzyme will produce fatty acids and fat. Thus, the greater the concentration of bacteria used, the greater the fat content produced (Yusmarini, et al, 2004).

Protein Content

In this study, the protein content of probiotic coffee drinks was 12.2650 ± 0.0104%. This level is in accordance with the SNI 7552:2009 standard which states that the minimum protein content for flavored fermented milk drinks is a minimum of 3.0%. The protein content contained in fermented milk is the total amount of protein from the ingredients used and the protein from the lactic acid bacteria contained in it (Yusmarini and Effendi, 2004).

Carbohydrate Levels

The carbohydrate yield was 2.4950 ± 0.0855 %. The sugar yield is obtained from the sugar content in the ingredients and bacteria used. According to the Indonesian Ministry of Health, 1996 stated that the carbohydrate content contained in granulated sugar is very high, namely 95% per 100 grams of sucrose. The fermentation process is able to break down carbohydrates by bacteria so that in the fermented milk there are simple compounds such as glucose (Yusmarini, et al , 2004).

Organoplastic testing of Kintamani Arabica and Robusta Pupuan kefir coffee drinks

Organoplastic test results for Kintamani Arabica and Pupuan Robusta kefir coffee drinks are as shown in Figure 3.

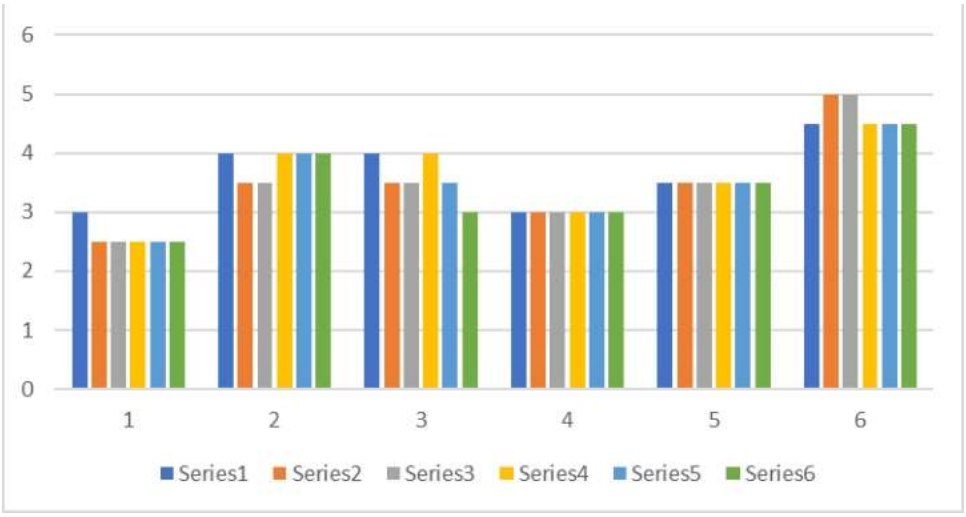

Figure 3 : Organoplastic test results for Kintamani Arabica and Pupuan Robusta kefir coffee drinks

Information :
Series 1. Color
Series 2. Taste
Series 3. Aroma
Series 4. Body
Series 5. Acidity
Series 6. Favorites
1,2,3,4,5,6. Coffee formulation
1-5. respondent assessment score

Based on the data above, it can be seen that the Pupuan robusta kefir coffee drink with sugar is the color with the highest score of 3, namely light brown. From the taste of the kefir coffee drink with the highest score of 4, namely sour taste, it is the Pupuan robusta coffee formula with sugar and without sugar, Kintamani arabica kefir coffee without sugar and Pupuan robusta coffee kefir mixture, Kintamani arabica without sugar. From the aroma of the kefir coffee drink with the highest score of 4, namely rather strong, it is the Pupuan robusta coffee formula with sugar and without sugar. From the body to all formulas with a score of 3, which is a bit thick. The acidity of all formulations with a score of 3.5 is slightly acidic. Based on the level of liking with a score of 4.5-5, namely between somewhat liking and liking all kefir coffee formulations.

CONCLUSION

The characteristics of Kintamani arabica specialty coffee drinks, Pupuan robusta fermented with kefir starter culture are as follows:

1. Chemical test results with pH 4.41 ± 0.0926, acid content 0.52 ± 0.0265, the caffeine fermentation process in coffee drinks undergoes an esterification process in which the alkaloid compounds in caffeine will be broken down into esters in the form of chlorogenic acid, the amount BAL 1.5-2.4 10^3, fat content 3.5417 ± 0.0376%. protein content 12.2650 ± 0.0104 %. carbohydrates 2.4950±0.0855 %.
2. Organoleftic test results for the Pupuan robusta kefir coffee drink with sugar with the highest color value of 3, namely light brown. From the taste, the highest score is 4, namely sour Pupuan robusta coffee with sugar, without sugar, Kintamani arabica kefir coffee without sugar and Pupuan robusta mixed kefir coffee, Kintamani arabica without sugar. The aroma with the highest score of 4, which is rather strong, is Pupuan robusta coffee with sugar and without sugar. From the body of all formulas with a score of 3, which is a bit thick. The acidity of all formulations with a score of 3.5 is slightly acidic. Based on the level of liking with a score of 4.5-5, namely between somewhat like to like all formulations.

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