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Multivariate analysis of sensory characteristics of coffee grains (*Coffea arabica* L.) in the region of upper Paranaíba

Marcelo Cláudio Pereira[1], Sara Maria Chalfoun[1*], Gladyston Rodrigues de Carvalho[1] and Taciana Villela Savian[2]

*[1]Centro Tecnológico do Sul de Minas Gerais, Empresa de Pesquisa Agropecuária de Minas Gerais, Secretaria da Agricultura do Estado de Minas Gerais, Cx. Postal 176, Lavras, Minas Gerais, Brazil. [2]Universidade de São Paulo, Piracicaba, São Paulo, Brazil. *Author for correspondence. E-mail: chalfoun@epamig.ufla.br*

ABSTRACT. This study aimed to examine the sensory characteristics of the grains of 21 cultivars of *Coffea arabica* L. and *Coffea canephora* Pierre from the essays of genetic improvement of EPAMIG, located in Patrocínio Municipality, Minas Gerais State, where they were collected through cloths stripping method and washed. Subsequently to dry (11 to 12% moisture b.u.), we obtained the coffee designated as "natural". The evaluated varieties were: Acaiá Cerrado MG 1474; Bourbon Vermelho DATERRA; Catiguá MG 1; Catiguá MG 2; Catuaí Amarelo IAC 62; Catuaí Vermelho IAC 15; H 419-3-1-4-2; H 419-6-2 -5-2; H 419-6-2-5-3; H 419-6-2-7-3 Vermelho; H 493-1-2-10; H 514-7-10-1 Vermelho; H 514-7-10-6; H 515-4-2-2; H 518-3-6-1; Icatú Amarelo IAC 3282; Mundo Novo 379-19; Mundo Novo IAC 376-4; Rubi MG 1192; Sacramento MG 1 and Topázio MG 1190, from 2005/2006 and 2006/2007 seasons. The cultivars according to the first principal component with notes above 80 points, regarded as superior drink according to attributes with the highest scores (flavor, sweetness, balance, acidity, clean drink, and aspect) were: Catiguá MG2, Rubi MG 1192, 514-7-10-6 H, H 419-3-1-4-2, H 419-6-2-5-2, 493-1-2-10 H, H 514-7-10-1 Vermelho, Catiguá MG1, Sacramento MG1, 419-6-2-5-3 H, H 515-9-2-2 and Catuaí Amarelo IAC 62.

Key words: *Coffea arabica* L., quality, natural coffee.

RESUMO. Análise multivariada de características sensoriais de grãos de café de cultivares (*Coffea arabica* L.) na região do alto Paranaíba. O objetivo deste trabalho foi verificar as características sensoriais dos grãos de 21 cultivares de (*Coffea arabica* L.) provenientes do ensaio de melhoramento genético da Epamig, Fazenda Experimental de Patrocínio, Estado de Minas Gerais. Posteriormente à secagem (11 a 12% de umidade b.u.), obteve-se o café designado como natural. Os frutos avaliados correspondiam às cultivares e progênies Acaiá Cerrado MG 1474; Bourbon Vermelho DATERRA; Catiguá MG 1; Catiguá MG 2; Catuaí Amarelo IAC 62; Catuaí Vermelho IAC 15; H 419-3-1-4-2; H 419-6-2-5-2; H 419-6-2-5-3; H 419-6-2-7-3 Vermelho; H 493-1-2-10; H 514-7-10-1 Vermelho; H 514-7-10-6; H 515-4-2-2; H 518-3-6-1; Icatu Amarelo IAC 3282; Mundo Novo 379-19; Mundo Novo IAC 376-4; Rubi MG 1192; Sacramento MG 1; Topázio MG 1190, das safras 2005/2006 e 2006/2007. As cultivares, em ordem decrescente segundo a primeira componente principal com notas acima de 80 pontos, portanto consideradas como de bebida superior de acordo com os atributos com os maiores escores (sabor, doçura, balanço, acidez, bebida limpa e aspecto), foram: Catiguá MG2, Rubi MG 1192, H 514-7-10-6, H 419-3-1-4-2, H 419-6-2-5-2, H 493-1-2-10, H 514-7-10-1 Vermelho, Catiguá MG1, Sacramento MG1, H 419-6-2-5-3, H 515-9-2-2 e Catuaí Amarelo IAC 62.

Palavras-chave: *Coffea arabica* L., qualidade, café natural.

Introduction

High quality coffee requires special care since the pre-harvest phase, through harvest, to post-harvest. In these phases, several factors may cause changes that may affect the future drink (SOUZA; CARVALHO, 1997). Produce coffees with better quality represents good differentials of product price and hence more profit for the producer.

The coffee quality is directly related to various constituents physical, physical-chemical and chemical that are responsible for the aspect of roasted grain, flavor and aroma of drinks, and among these compounds, we highlight the constituents volatile, phenolics (chlorogenic acid), fatty acids, proteins and some enzymes whose presence, levels and activities provide to the coffee a unique flavor

and aroma (AMORIM; SILVA, 1968; FELDMAN et al., 1969; GNAGY, 1961; LOCKHART, 1957; OLIVEIRA et al., 1977; VALÊNCIA-ARISTIZABAL, 1972).

Coelho and Pereira (2002) define the coffee quality as a more broadly drink, as follows: a) chemical composition of grains, determined by factors genetic, environmental and cultural, and mainly by the interactions among them; b) methods of harvesting, processing and storage; c) roasting and preparation of drink. According to the same authors, the roasting and drink preparation influence the modification of chemical constitution of grains, and emphasize that these changes are dependent on their original composition.

The quality of coffee drink is closely linked to its flavor and aroma, generating satisfaction of consumers to taste it. For Mendonça et al. (2005), the quality of coffee drink is especially associated to the satisfaction from consumers in the observation of balanced combination of flavors and aromas, which become perceptible only with the grain roasting that is dependent of chemical compounds in the green beans that are used in the formation of compounds responsible for these attributes.

Malavolta (2000) refers to coffee quality as the set of sensory traits from the grain or drink that provide commercial value, however, define the coffee quality is not an easy task, mainly when referring to a product consumed for a long time, but only now has prominent by its differentiated and unknown traits by most consumers, the roasted and ground coffee.

Beyond the set of attributes physical, chemical and sensory traits that are frequently mentioned in literature, it is worth emphasizing that the health and hygienic attributes should be considered of major importance to produce high quality coffee, to meet the exigencies from the most stringent consumers.

In gourmet coffees, the overall quality represents a combined perception of flavor, body and aroma of the drink, absence of beans black, green and sour, and inexistence of fermented taste, beans rotten or black-green; balance and harmony that will result in a pleasant sensation during and after the tasting (MORI et al., 2003).

According to Flament (2002), the aroma of green coffee, and the flavor of roasted bean is due to its compounds volatile and nonvolatile. The author assure that some nonvolatile compounds resist to roasting conditions, and consequently participate, more or less, to organoleptic quality of final drink, as the particular case of multifunctional acids and phenols.

Pimenta (2003) states that the application of adequate techniques for harvesting and preparation of coffee is an extremely important factor for coffee producers, by providing coffee with better quality, facilitating the marketing, and with greater economic returns. For the author, the proper time to harvest, besides a perfect drying, avoiding fermentation processes, among other factors, is essential for the obtaining a coffee with suitable chemical composition, with minor changes biochemical and undesirable, detrimental to the drink quality.

Historically, two distinct methods are used for coffee processing, the dry and wet methods. In the dry method, the fruits are processed integrally, i.e. with the bark, producing dry fruits known as natural coffee (BORÉM, 2008). The region of upper Paranaíba, by presenting weather conditions with low humidity during periods of fruit maturation and post-harvest, presents favorable conditions for this type of processing , with possibility of obtaining a final product with preserved quality and presenting characteristics differentiated from the coffee processed via wet method.

In certain regions, the production of quality coffees requires additional investments that need to be rationalized, aiming to associate the adequate quality with the lowest cost (COFFEE BUSINESS, 2001).

In this way, the environmental conditions, temperature, relative humidity and altitude may influence the quality of coffee still in plant, and mainly during harvest and post-harvest. Thus besides propitious place for cultivation, the management, the harvest, and post-harvest procedures are essential in the determination of final product quality (DAL MOLIN et al., 2008).

Other important factor affecting the coffee quality is the cultivated species. The genus *Coffea* has about 100 described species, and only two of them produce fruits with economical importance: *Coffea arabica* L. and *Coffea canephora* Pierre & Froehner, known as coffee Arabica and Robusta, respectively. The Arabica coffee is prominent by presenting quality attributes superior to Robusta coffee, and thus more valued in the market. It is the principal species cultivated in Minas Gerais State, mainly by favorable climatic suitability for development. Mendonça et al. (2005) emphasize the importance of knowing the quality of different cultivars through the assessment of chemical composition of grains, by the great potential that these material present, to enable them to contribute in the production of special coffees.

The great alternative to solve the bottlenecks that inhibit competition with other drink categories is to continue the expansion of consumption by offering diversified products with higher quality. The international market has increasingly demanded higher quality of coffee for consumption. The Brazilian coffee traditionally has good quality and remains for several years as a leading supplier for the principal markets, such as Germany, Italy and Japan. According to Vegro (1994), the coffee is one of the few agricultural products, in Brazil, which has a price associated to qualitative parameters, and thus the value increase with the increase in quality. In this way, through the Coffee Quality Program, the Brazilian Association of Coffee Industry aims to change the perception of the consumer, making him abandon the belief that the coffee are all equal, and points out that to change this perception, the consumer need to be constantly informed.

The demand for coffees with quality is increasingly. While the consumption of coffee worldwide grows around 1.5% per year, the special coffees, or special blends, increases between 10 and 12%. In the last years, this demand peaked at 260,000 bags of 60 kg, which equals about 2% of all coffee consumed in the country (PEROSA; ABREU, 2009).

Drinks with better quality are obtained by processing the coffee during the maturity state of cherry type, as can be seen in several studies published in academic circles. At this maturity stage, the fruit has a chemical composition suitable for obtaining coffees with higher quality.

Garruti and Gomes (1961), studying coffees at several maturity stages, observed that the highest fruit quality occurs at cherry maturity stage, ideal to harvest. On the other hand, the coffee harvested early with great percentage of green fruits, besides presenting prejudice to the type and drink, could reach a rate of 20% of loss in relation to final yield, and a classification by type inferior to 8, and neutral green drink (PIMENTA; VILELA, 2003).

According to Bandeira et al. (2009), the emergence or increase of astringency in coffee drink is mainly due to the presence of immature grains from the harvest of of green fruits. Thus, for special coffees is desirable for certain markets or competitions the absence of them or the presence in small quantities.

Borges et al. (2002) analyzed the influence of age of coffee plants, belonging to the same variety, and of grain maturity stages (dry, cherry and green) in the result of commercial classification and drink quality, and in general, the younger coffees presented better features. The authors verified that, in the classification by size and determination through medium sieve, the lots with 12 years presented medium sieve 15, inferior result to lots with three years, with medium sieve 16. In the commercial classification and of the drink, the results were better, in general, for the lots with three years in different mixtures, without influence of different maturity stages. In this study, we used an area with Arabica coffee, Catuaí variety with 12 years, and another with three years.

Regarding the need of further studies concerning the relevance of the relationship between the cultivar and drink quality, we accomplished the present study that basically consists in the sensory characterization of 21 coffee cultivars from the region of upper Paranaíba. The region was chosen by the high pattern productive and technologic of high quality coffees, with prominence as one of the principal productive regions of the country.

Material and methods

The present study was conducted at Experimental Farm from Epamig in Patrocínio Municipality, region of upper Paranaíba, Minas Gerais State.

Characteristics of the experiment

The grains of the following cultivars were used: Acaiá Cerrado MG 1474; Bourbon Vermelho DATERRA; Catiguá MG 1; Catiguá MG 2; Catuaí Amarelo IAC 62; Catuaí Vermelho IAC 15; H 419-3-1-4-2; H 419-6-2-5-2; H 419-6-2-5-3; H 419-6-2-7-3 Vermelho; H 493-1-2-10; H 514-7-10-1 Vermelho; H 514-7-10-6; H 515-4-2-2; H 518-3-6-1; Icatu Amarelo IAC 3282; Mundo Novo 379-19; Mundo Novo IAC 376-4; Rubi MG 1192; Sacramento MG 1; Topázio MG 1190.

Preparation of natural coffee

The fruits from each plot were collected through cloths stripping method (fruit processed integrally), in the years 2005/2006 and 2006/2007.

Twenty liters of plantation coffee (coffee with all maturity stages) from each cultivar were dried in wooden trays with screen bottom (1 m^2), until reaching about 11 to 12% of humidity (b.u.). The process lasted about 15 days. After drying and processing, the coffees were taken to the Laboratory of Coffee Quality of Epamig, Dr. Alcides de Carvalho, where the coffees were submitted to physical and chemical analyses.

Evaluation of sensory attributes

The sensory analysis was undertaken by three accredited assessors, according to the methodology proposed by Brazil Specialty Coffee Association (BSCA). In accordance to this methodology, each evaluated attribute (drink, sweetness, acidity, body, flavor, aftertaste, balance and aspect) was rated from 0 to 8, according to the intensity present in the samples, thus is more objective than the conventional cup test. The sum of the scores corresponded to the final classification of the drink. Each sample begins with a pre-set score with 36 points, to which will be incorporated the scores of each attribute, and those that presented scores over 80 were classified as specialty coffee.

Experimental design and statistical analysis

For the final classification of the drink (variable G), the experiment was conducted in a randomized block design with 21 treatments (21 cultivars) in three replicates (3 judges). The mean values of the cultivars were tested through the Scott-Knott test, with a significance level of 5%. The univariate statistical analysis was performed using SISVAR software.

The statistical model that describes the data is:

$\gamma_{ij} = \mu + c_i + p_j + \varepsilon_{ij}$, where: γ_{ij} is the value of the variable response of the i-th cultivar attributed by the j-th judge; μ is a constant inherent to each observation; c_i is the effect of the i-th cultivar, with i = 1, ..., 21; p_j is the effect of j-th judge, with j= 1, 2, 3; ε_{ij} is the experimental error independent and identically distributed from a Normal with zero mean and variance σ^2.

For the traits evaluated in the sensory analysis of drinks (clean drink, sweetness, acidity, body, flavor, aftertaste, balance and aspect) we performed a principal component analysis using the proc princomp from the SAS statistic package (SAS, 1999). The ranking of 21 cultivars of coffee under study, from the Patrocínio Municipality, Minas Gerais State, was done for the years 2005/2006 and 2006/2007, considering the natural method of preparation.

Results and discussion

Principal Component Analysis for the variables of sensory analysis for the cultivars from the region of Patrocínio Municipality, Minas Gerais State, in the year 2005/2006

The interpretation of data from sensory analysis, using the Principal Component Analysis (PCA), is a clear example of the versatility of this method as demonstrated in other studies with similar goals (MAEZTU et al., 2001). The sensory analysis is a scientific method used to measure, analyze and interpret reactions of food characteristics, as they are perceived by the organs of vision, olfaction, taste, touch and sound. In this way, the sensory analysis is directly related to the acceptance or rejection of a given product. By using PCA, is possible to visualize complex and multidimensional data, extracting the most relevant information.

In this way, the PCA was employed to interpret the results from the sensory analysis of samples of 21 coffee cultivars. The measured variables were: clean drink, sweetness, acidity, body, flavor, aftertaste, balance and aspect.

The first principal component (PCA 1) is a global index of coffee quality according to the point of view of the three judges. The higher the numerical value, the better is the coffee quality.

In accordance to Table 1, the first two principal components explained 89.56% of total variability contained in the samples, 83.15% explained by the first component, and 6.41% by the second component.

The first principal component reflects a global index of coffee quality. This index is mainly influenced by the attributes balance, acidity, aspect, clean drink, sweetness, flavor, body and aftertaste, confirmed by the high values of correlation coefficients of these attributes with the principal component.

Table 1. Coefficients of principal components (and correlations), percentages of total explained variation and accumulated variation by the components for the year 2005/2006.

Variables	PCA 1	PCA 2
Clean drink	0.43 (0.91)*	-0.67 (-0.39)
Sweetness	0.35 (0.88)*	0.26 (0.18)
Acidity	0.38 (0.95)*	0.15 (0.10)
Body	0.24 (0.79)*	0.54 (0.49)*
Flavor	0.25 (0.86)*	-0.15 (-0.14)
Aftertaste	0.15 (0.77)*	-0.12 (-0.16)
Balance	0.45 (0.96)*	-0.17 (-0.10)
Aspect	0.43 (0.94)*	0.33 (0.20)
Explained variation	0.8315	0.0641
Accumulated variation	0.8315	0.8956

The results presented in Table 2 and Figure 1 evidenced that the cultivars Catiguá MG2, Mundo Novo 379/19, H 518-3-6-1, Catuaí Vermelho IAC 62, Icatu Amarelo IAC 3282 and Rubi MG 1192, obtained the higher scores in

accordance to the first principal component. These cultivars had prominence regarding the above-mentioned attributes. With scores above 80 points, according to BSCA, are considere specialty coffees.

Table 2. Scores from the global index of coffee quality according to the first principal component and Scott-Knott test for the general variable of sensory analysis, for the year 2005/2006.

Cultivar	Score from the first	Rank	Scott-Knott
1. Acaiá Cerrado MG 1474	12.9751	11	75 b
2. Bourbon Vermelho DATERRA	11.4988	16	71 c
3. Catiguá MG 1	13.3262	10	76 b
4. Catiguá MG 2	16.0135	1	83 a
5. Catuaí Amarelo IAC 62	14.3147	7	79 b
6. Catuaí Vermelho IAC 15	15.8224	4	83 a
7. H 419-3-1-4-2	8.0520	21	64 d
8. H 419-6-2-5-2	14.0575	8	78 b
9. H 419-6-2-5-3	10.9402	17	71 c
10. H 419-6-2-7-3 Vermelho	9.8334	19	68 d
11. H 493-1-2-10	11.6894	15	72 c
12. H 514- 7-10-1 Vermelho	10.4909	18	68 d
13. H 514-7-10-6	12.0381	14	73 c
14. H 515-4-2-2	8.8945	20	65 d
15. H 518-3-6-1	15.9729	3	83 a
16. Icatu Amarelo IAC 3282	15.3001	5	82 a
17. Mundo Novo 379/19	16.0114	2	83 a
18. Mundo Novo IAC 376/4	12.3014	13	73 c
19. Rubi MG 1192	15.1809	6	81 a
20. Sacramento MG1	12.7676	12	75 c
21. Topázio MG 1190	13.6037	9	77 b

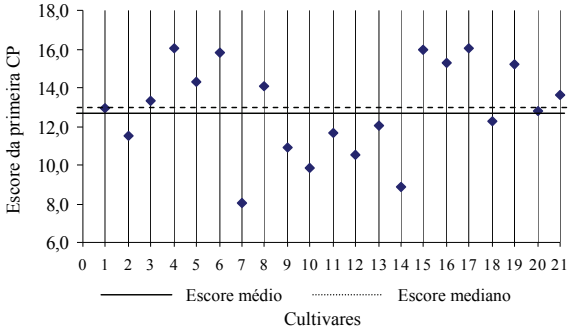

Figure 1. Scores from the first principal component for each cultivar of coffee from the region of Patrocínio Municipality, and natural method of preparation, for the year 2005/2006.

The second principal component describes the coffee cultivars mainly in relation to the attribute 'body' (positively correlated), clean drink, flavor and balance (negatively correlated). The Table 3 and Figure 2 indicate that for all coffee cultivars, the attribute 'body' overcomes the attributes clean drink, flavor and balance.

The cultivars with best attribute are Catiguá MG1, H 514-7-10-6, Sacramento MG 1, Acaiá Cerrado MG 1474, Mundo Novo IAC 376/4 and Catuaí Amarelo IAC 62.

Table 3. Scores and ranking of cultivars, according to the second principal component, for the year 2005/2006.

Cultivar	Score from the second principal component	Ranking
1. Acaiá Cerrado MG 1474	1.2241	4
2. Bourbon Vermelho DATERRA	0.7780	14
3. Catiguá MG 1	1.8879	1
4. Catiguá MG 2	1.0934	7
5. Catuaí Amarelo IAC 62	1.1448	6
6. Catuaí vermelho IAC 15	1.0278	8
7. H 419-3-1-4-2	0.9302	11
8. H 419-6-2-5-2	0.7506	15
9. H 419-6-2-5-3	-0.3387	21
10. H 419-6-2-7-3 Vermelho	0.7212	16
11. H 493-1-2-10	1.0004	9
12. H 514- 7-10-1 Vermelho	0.7869	13
13. H 514-7-10-6	1.8078	2
14. H 515-4-2-2	0.1777	20
15. H 518-3-6-1	0.9697	10
16. Icatu Amarelo IAC 3282	0.6835	17
17. Mundo Novo 379/19	0.8133	12
18. Mundo Novo IAC 376/4	1.1764	5
19.Rubi MG 1192	0.3084	19
20. Sacramento MG1	1.4892	3
21. Topázio MG 1190	0.5351	18

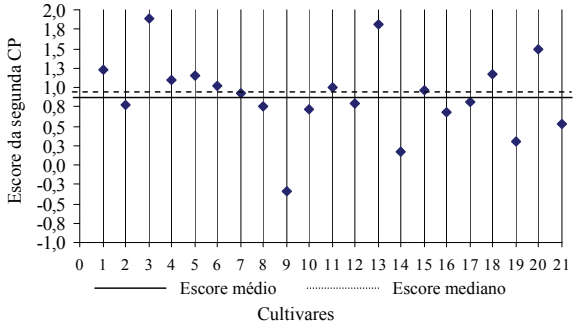

Figure 2. Scores from the second principal component for each cultivar of coffee from the region of Patrocínio Municipality, and natural method of preparation, for the year 2005/2006.

Principal component analysis for the sensory analysis variable for the cultivars from the region of Patrocínio Municipality, and natural method of preparation, for the year 2006/2007

The data for the interpretation of sensory analysis of the first two principal component explained 71.47% of variation, 59.16% explained by the first component, and 12.31% explained by the second principal component.

The greater contributions for this component are the variables related to aspect, sweetness and flavor, although all of them, except aftertaste are significantly correlated with the first principal component (Table 4).

The results presented in Table 5 and Figure 3 showed that the cultivars Catiguá MG 2; Sacramento MG1; Mundo Novo IAC 376/4; H 514-7-10-6; H 514- 7-10-1 Vermelho; H 419-6-2-7-3 Vermelho; H 419-3-1-4-2 and Catuaí Vermelho IAC 15 obtained higher scores according to the first component. These cultivars were prominent

regarding the attributes: sweetness, flavor and aspect. The cultivars H 518-3-6-1; H 515-4-2-2; Topázio MG 1190 and Mundo Novo 379/19 although statistically inferior to the first cultivars, obtained scores above 80 points, and may be considered specialty coffees, according to BSCA.

Table 4. Coefficients of principal components (and correlations), percentages of total explained variation and accumulated variation by the components for the year 2006/2007.

Variables	PCA 1	PCA 2
Clean drink	0.37 (0.82)*	0.30 (0.30)
Sweetness	0.46 (0.86)*	-0.40 (-0.35)
Acidity	0.31 (0.71)*	0.03 (0.04)
Body	0.24 (0.60)*	0.56 (0.65)*
Flavor	0.43 (0.83)*	-0.34 (-0.30)
Aftertaste	0.14 (0.39)	0.52 (0.65)*
Balance	0.29 (0.65)*	-0.20 (-0.20)
Aspect	0.47 (0.89)*	0.13 (0.11)
Explained variation	0.5916	0.1231
Accumulated variation	0.5916	0.7148

Table 5. Scores from the global index of coffee quality according to the first principal component and Scott-Knott test for the general variable of sensory analysis, for the year 2006/2007.

Cultivar	Score from the first principal component	Rank	Scott-Knott test for G
1.Acaiá Cerrado MG 1474	14.4017	13	79 b
2.Bourbon Vermelho DATERRA	14.0626	19	78 b
3. Catiguá MG 1	14.2963	15	79 b
4. Catiguá MG 2	17.0531	1	86 a
5. Catuaí Amarelo IAC 62	14.3111	14	79 b
6. Catuai vermelho IAC 15	15.5612	8	83 a
7. H 419-3-1-4-2	15.8648	7	84 a
8. H 419-6-2-5-2	14.2500	16	79 b
9. H 419-6-2-5-3	14.0655	18	78 b
10. H 419-6-2-7-3 Vermelho	15.9292	6	84 a
11. H 493-1-2-10	12.5081	21	73 c
12. H 514- 7-10-1 Vermelho	15.9338	5	84 a
13. H 514-7-10-6	15.9664	4	84 a
14. H 515-4-2-2	14.8888	10	81 b
15. H 518-3-6-1	14.9358	9	81 b
16. Icatu Amarelo IAC 3282	14.2449	17	79 b
17. Mundo Novo 379/19	14.4018	12	81 b
18. Mundo Novo IAC 376/4	16.2040	3	84 a
19. Rubi MG 1192	13.0348	20	75 c
20. Sacramento MG1	16.6474	2	84 a
21. Topázio MG 1190	14.6177	11	81 b

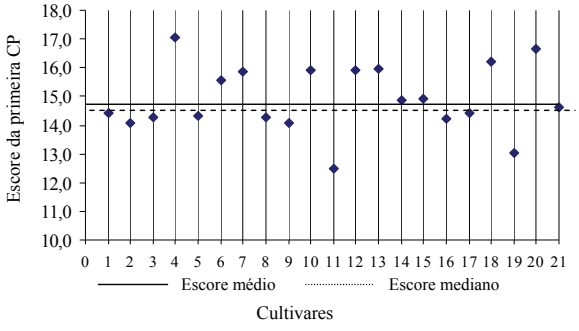

Figure 3. Scores from the first principal component for each cultivar of coffee from the region of Patrocínio Municipality, and natural method of preparation, for the year 2006/2007.

The second principal component is a comparison between the quality index relative to clean drink, acidity, body, aftertaste and aspect (positively correlated), with an index referring to sweetness, flavor and balance (negatively correlated). Results in Table 6 and Figure 4 indicate that for all coffee cultivars, the attributes body and aftertaste overcome the attributes sweetness, flavor and balance, since the scores are all positive. The cultivars with the best attributes of body and aftertaste, and with the greater contribution for the index are Mundo Novo 379/19; H 515-4-2-2; Catuaí Amarelo IAC 62; H 514-7-10-1 Vermelho and H 518-3-6-1.

Table 6. Scores and ranking of cultivars, according to the second principal component, for the year 2006/2007.

Cultivar	Score from the second principal component	Ranking
1. Acaiá Cerrado MG 1474	3.4087	15
2. Bourbon Vermelho DATERRA	3.5045	13
3. Catiguá MG 1	3.8037	9
4. Catiguá MG 2	3.1263	19
5. Catuaí Amarelo IAC 62	4.0726	3
6. Catuaí vermelho IAC 15	3.1750	18
7. H 419-3-1-4-2	3.8325	8
8. H 419-6-2-5-2	3.4067	16
9. H 419-6-2-5-3	3.0946	20
10. H 419-6-2-7-3 Vermelho	3.6492	11
11. H 493-1-2-10	2.6803	21
12. H 514- 7-10-1 Vermelho	4.0412	4
13. H 514-7-10-6	3.8440	7
14. H 515-4-2-2	4.1052	2
15. H 518-3-6-1	3.9486	5
16. Icatu Amarelo IAC 3282	3.6459	12
17. Mundo Novo 379/19	4.1547	1
18. Mundo Novo IAC 376/4	3.4989	14
19. Rubi MG 1192	3.1992	17
20. Sacramento MG1	3.7649	10
21. Topázio MG 1190	3.8489	6

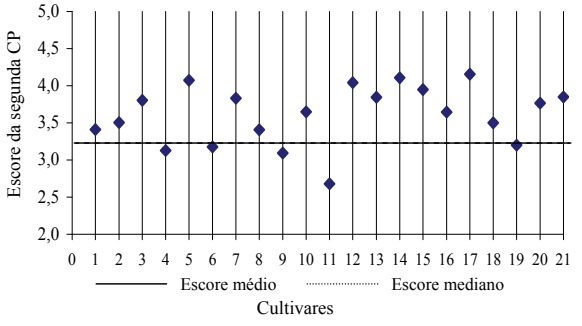

Figure 4. Scores from the second principal component for each cultivar of coffee from the region of Patrocínio Municipality, and natural method of preparation, for the year 2006/2007.

Conclusion

The cultivars, in descending order, according to the first principal component (scores above 80 points) are considered as superior drink in accordance to the attributes with the highest scores (flavor, sweetness, balance, acidity, drink clean and aspect) for the natural method of preparation during

the two studied years were: Catiguá MG 2, Rubi MG 1192, H 514-7-10-6, H 419-3-1-4-2, H 419-6-2-5-2, H 493-1-2-10, H 514-7-10-1 Vermelho, Catiguá MG 1, Sacramento MG 1, H 419-6-2-5-3, H 515-9-2-2 and Catuaí Amarelo IAC 62.

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