SENSORY ATTRIBUTES AND PHYSICO-CHEMICAL CHARACTERISTICS OF THE COFFEE BEVERAGE FROM THE IAPAR CULTIVARS

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ABSTRACT: The genetic characteristics together with environmental conditions determine the quality of coffee beverage, so the selection of new cultivars of coffee requires information from sensory attributes in different environmental conditions. The aim of the present study was to evaluate the physico-chemical and sensory characteristics of the coffee cultivars IPR 97, IPR 98, IPR 99, IPR 100 , IPR 101, IPR 102, IPR 103, IPR 104, IPR 105, IPR 106, IPR 107, IPR 108 and IAPAR 59, Bourbon , Icatu and Tupi grown in the municipalities of Paranavaí and Itaguajé - PR, season 2007-2008. We evaluated the characteristics of the roasting of the beans and beverage. The sensory attributes were evaluated by descriptive sensory analysis of Free Choice. Significant correlations were observed between the different characteristics of the roasted bean and the beverage. In the Principal Component Analysis (PCA), the variables of roasted bean and beverage grouped the coffees, observing that most cultivars from Itaguajé showed darker coffees with higher acidity and density of roasted bean when compared to Paranavaí. The attributes of color appearance and gloss of coffee, coffee aroma, green aroma, sour and bitter taste, green flavor and body texture were the main attributes responsible for the separation between sites. Bean color and acidity of the drink were physico-chemical and sensory characteristics important for discriminating coffee cultivars and production sites. This information serves to aid in the deployment of new crops enhancing desirable sensory attributes of each cultivar.

Index terms: *Coffea arabica* , free choice profiling , sensory attributes, roasted bean cultivars.

TRIBUTOS SENSORIAIS E CARACTERÍSTICAS FÍSICO-QUÍMICAS DE BEBIDA DE CULTIVARES DE CAFÉ DO IAPAR

RESUMO: *As características genéticas juntamente com as condições ambientais determinam a qualidade de bebida do café, de modo que a seleção de novas cultivares de café requer informações de atributos sensoriais em diferentes condições ambientais. Objetivou-se,no presente estudo , avaliar as características físico-químicas e sensoriais das cultivares de café IPR 97, IPR 98, IPR 99, IPR 100, IPR 101, IPR 102, IPR 103, IPR 104, IPR 105, IPR 106, IPR 107, IPR 108 e IAPAR 59, Bourbon, Icatu e Tupi cultivados nos municípios de Paranavaí e Itaguajé – PR, safra de 2007-2008. Avaliaram-se as características da torra dos grãos e da bebida. Os atributos sensoriais foram avaliados através da análise sensorial descritiva de Perfil Livre. Foram observadas correlações significativas entre as diferentes características do grão torrado e da bebida. Na Análise de Componente Principal (ACP), as variáveis de grão torrado e da bebida reuniram os cafés, observando-se que a maioria das cultivares de Itaguajé apresentou cafés de coloração mais escura, de maior acidez e densidade do grão torrado quando comparado à Paranavaí. Os atributos aparência cor de café e brilho, aroma de café, aroma verde, gosto ácido e amargo, sabor verde e textura corpo foram os principais responsáveis pela separação entre locais. Cor do grão e acidez da bebida foram características físico-químicas e sensoriais importantes para discriminar as cultivares de café e locais de produção. Essas informações servem de auxílio na implantação de novas lavouras potencializando atributos sensoriais desejáveis de cada cultivar.*

Termos para indexação: *Coffea arabica, perfil livre, atributos sensoriais, grão torrado, cultivares.*

1 INTRODUCTION

Countless coffee cultivars de café are launched by the coffee tree enhancement programs in different research institutions (EIRA et al., 2007) that, besides greater productivity, display mainly potentiated agronomic characteristics such as high production, resistance to diseases, lower presence, among others (Carvalho, 2007). The new cultivars are the result of crossbreeding that aim to deliver coffee types adapted to the many different environmental conditions throughout the national coffee regions. In Parana, the Parana Agronomic Institute (Instituto Agronômico do Paraná - IAPAR), in the past years, registered and released coffee cultivars that result from the crossbreeding between *Coffea arabica* (Villa Sarchi) and Híbrido de Timor, whose main characteristic is the resistance to rust (SERA et al., 1996). Lower presence cultivars, as well as ones more resistant to pests and diseases were also released (EIRA et al., 2007).

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Studies show the strict quality relations with many diverse chemical compounds such as proteins, caffeine, trigoneline, carbohidrates, lipids and phenol compounds present in endosperm (Oosterveld; VORAGEN; SCHOLS, 2003). Many coffee bean compounds are genetically controlled such as, for example, caffeine, lipids, trigoneline and chlorogenic acids (KY et al., 2001; Montagnon et al., 1998) and others as saccharose and proteins are influenced by environmental conditions and/or cultivation handlings applied (GEROMEL et al., 2006; VAAST, 2006).

Coffee is consumed because of its typical smell and flavor formed during the roasting process. When subjected to temperatures between 200°C and 250°C, green beans components are transformed, generating new products responsible for the coffee's typical smells and tastes (DUTRA et al., 2001). As the roasting evolves, water is eliminated, gases and water vapors are formed, which promote the bean expansion. The bean color, which is initially yellow-green, darkens until it becomes dark brown. The roasting is interrupted when the luminosity suddenly diminishes so that the products formed do not degrade (PITTIA; DALLA ROSA; LERECI, 2001).

The sensory and physico-chemical features of roasted coffee depend fundamentally on the intensity of the roasting. It has been observed that the intensity of the sensory attributes of the coffee beverage, mainly in body, acidic and bitter taste depend on the roasting degree (NEBESNY; BUDRYN, 2006; YATE; TUO, 1995). Parameters such as smell, color, bean temperature, roasting time and weight loss can be used to control the coffee roasting (ALESSANDRINI et al., 2008; PITTIA; DALLA ROSA; LERECI, 2001; SCHENKER et al., 2000).

The coffee quality evaluation in Brazil, for commercial purposes, is done through coffee cupping, in which professional tasters qualitatively the beverage and which parameters are commercialization patterns of green coffee (BRASIL, 2003). However, these qualitative evaluations are not enough to describe the effects of cultivation, fertilization levels or harvesting process or when it is intended to describe the attributes of a new cultivar. In such occasions, the descriptive sensory analisys is recommended, for it allows choosing the previously defined attributes to more deeply describe the coffee beverage (NEBESNY; BUDRYN, 2006). However, many times this technique is costly and requires a long time of training in order to achieve the tasters' agreement to the interpretation of the terms to be used.

Among the many diverse descriptive sensory techniques the Free Choice Descriptive technique has been developed to decrease the need of long trainings. Such technique is based on the principle that people perceive the same sensory characteristics in the product, even if expressed in different ways. Tasters develop an own vocabulary (WILLIAMS; LANGRON, 1984), which, necessarily, varies from taster to taster, due to the experience and familiarity with the product and the number of attributes employed is limited only by the taster's aptitude in describing and perceiving the sensations (THAMKE; DURRSCHMID; ROHM, 2009).

The objective, in this study, was to evaluate the sensory attributes and physico-chemical characteristics of the roasted bean and beverage of IAPAR coffee cultivars, cultivated in two places of the Parana state coffee region.

2 MATERIALS AND METHODS

2.1.1 Materials

In IAPAR experiments in Paranavai (23° 04' 22" S 52° 27' 54" O) and Itaguajé (22° 37' 04" S 51° 57' 57" O), in the 2007/2008 harvest, around 5 kg of coffee were collected from 17 coffee cultivars (IPR 97, IPR 98, IPR 99, IPR 100, IPR 101, IPR 102, IPR 103, IPR 104, IPR 105, IPR 106, IPR 107, IPR 108, IAPAR 59, Catuaí, Bourbon, Icatu and Tupi). The hand-selected coffee cherries were sun-dried in sieves until they reached 12,5% humidity. The dried samples were kept in a dry place and after three months of storage were benefited and for all of the assays were used grains retained in sieves 14.

2.1.2 Samples preparations for the Free Choice descriptive sensory analysis

The coffee samples for the training and descriptive sensory analysis were roasted in a small sample roaster (Rod-Bel), in temperatures between 210° C and 220° C, for 8 to 10 minutes, until weight loss reached between 13% and 14% of initial weight and reached brown color. For the Free Choice sensory analysis, the coffee beverage was prepared with 70 g of grounded and roasted coffee for 1000 mL of filtered water heated to 96° C to 98° C. The mixture was poured into cone coffee filters (Melitta 102) and the beverage kept in thermic bottles and served 30 minutes after preparation maximum.

2.1.3 Tasters staff

IAPAR employees and interns and coffee tasters from the Northern Parana Coffee Commerce Center (Centro de Comércio de Café do Norte do Paraná) and the Londrina Crops and Commodities Stock Exchange (Bolsa de Cereais e Mercadorias de Londrina) formed the tasters staff. Those who achieved a smell recognizing test (applied during the first session) result of above 80% joined the staff (DUTCOSKY, 2007).

Initially, there was given a brief explanation on the objectives and the sensory analysis technique. After that, the basic tastes recognition test was applied to the tasters. In the next two sessions, a discussion took place on the smells and tastes usually found in coffee and the use of attribute intensity scales in food and beverages sensory evaluations.

2.1.4 Attributes enrollment and individual file

Three attributes enrollment sessions took place using the network method. Pairs of coffee samples with very different characteristics were simultaneously presented, aiming to raise the biggest number of attributes related to coffee appearance, smell, taste and texture possible. To the tasters was requested to identify and record in a specific file the similarities and differences found between samples. After the attribute enrollment, tasters and the leader individually discussed and formulated the attribute definitions for the individual taster file, with non-structured intensity scales for each attribute.

The samples were presented to the tasters in disposable plastic cups identified with three digits. Three four samples sessions and one three sample session were performed.

2.2 Roasted coffee analysis

The color analysis was performed using a Minolta CR 410 portable colorimeter employing C illuminant, set in a 10° angle and a CIE standard observer. Were obtained the values of L* (luminosity), chromatic components a* (red-green) and b* (yellow-blue), as described by Schenker et al. (2000).

The apparent green coffee and roasted coffee density was determined by the free fall method (Buenaventura-Serrano; Castaño-Castrillón, 2002). The volume expansion was calculated using the expression: Exp V (%) = {(Vtor-Vver) x 100)}/ Vtor, where Exp V= volume expansion; Vtor: volume of roasted coffee e Vver: volume of green coffee.

The 20ml beverage volume (at 25ºC) was titrated with NaOH 0,1N solution until pH 8,2, measured through digital potenciometer (Metrohm, mod. 744) (BUENAVENTURA-SERRANO; CASTAÑO-CASTRILLÓN, 2002). The beverage pH analysis method followed the Yate e Tuo (1995) proposal.

2.3 Data statistic analysis

The physico-chemical determinations were performed in duplicates and the variance analysis and Tukey test were employed for average comparison. The results of the sensory analyses were alocated in a matrix (atributes in lines and samples in columns) and analysed through Procrustes Generalized Analysis (Análise Procrustes Generalizada - APG). The statistic analyses were performed through the statistics program XLSTAT (ADDINSOFT, 2008).

3 RESULTS AND DISCUSSIONS

3.1 Physico-chemical analyses

During roasting, the Itaguaje and Paranavai cultivars showed, respectively, average weight loss of 14,29 and 14,18%, when coffe beans reached brown color (Chart 1). The red color formation increases as the roasting procedes, indicated by the negative and significative correlation (-0,38) between weight loss and chromatic component a* (Chart 2). This weight loss percentage corresponds to a light roasting, acording to Franca et al. (2009) or as average roasting acording to Oosterveld, Voragen and Schols (2003), for it is possible to obtain similar colors with different weight losses, due to the composition of analysed prime matter.

The coffee bean color changes progressively, as the roasting goes on: from green or green-yellow it becomes dark brown (PITTIA; DALLA ROSA; LERECI, 2001). The Itaguage coffees were significantly darker (lower L*) than the ones from Paranavai, with average values of 29,77 and 31,19, respectively, suggesting different chemical compositions (Chart 1). Values lower than these were found in coffees from different origins (ALESSANDRINI et al., 2008) and brazilian coffees evaluated by Franca et al. (2009).

To complement color description, it was observed that the chromatic components a*e b* of the Paranavai coffees indicated that these are significantly more yellow than the ones from Itaguajé, showing higher values of b* (Chart 1).

CHART 1 - Average values of L* (luminosity), a* (red-green chromatic component) and b* (yellow-blue chromatic component), roasted bean density, bean volume expansion, pH and tittrable coffee acidity from Itaguaje e de Paranavai.

	Itaguaje	Paranavai
Weight loss (%)	14,29^{a} ±0,45	14,18^{a}±0,50
L*	29,77^{b} ±0,90	31,19^{a}±1,32
a*	10,70^{b}±0,23	10,95^{a}±0,26
b*	15,74^{b}±1,07	17,15^{a}±1,46
Roasted bean density (g/mL)	0,42^{a}±0,02	0,41^{a}±0,02
Bean volume expansion (%)	63,01^{a}±7,64	64,34^{a}±5,25
pH	5,12^{b}±0,09	5,24^{a}±0,15
Tittrable acidity[1]	3,21^{a}±0,30	2,73^{b}±0,43

Averages followed by the same letter in line do not differ between them through Tukey test above 5%.

[1]mL of NaOH 0,1 N for 20 mL of beverage to reach pH 8,2.

The density and expansion of roasted beans are similar in both the sampled places (Chart 1). Higher (0,60 g/mL) and lower (0,30 g/mL) values than those were observed, respectively, by Dutra et al. (2001) and Pittia, Dalla Rosa and Lereci (2001) in brazilian coffees, probably caused by higher roasting intensities applied.

The water vapor formation in the initial warmth phase causes the internal pressure of the bean to increase, promoting volume expansion. Therefore, as the roasting goes on it is possible to observe a decreasing in appearing density, due to weight loss and increase of bean volume (PITTIA; DALLA ROSA; LERECI, 2001). The roasted bean expansion depends on the resistance of the bean's celular wall (REDGWELL; FISHER, 2006). Coffees from the studied places presented similar bean density and expansion values, suggesting similar celular cells compositions and formations. This point of view is here corroborated by the correlations between density and roasted bean expansion (-0,87) and roasted bean density and roasting intensity (-0,41), measured through weight loss (Chart 2).

The diverse reactions between components present in beans determine the physico-chemical features of the beverage and depend fundamentally on the intensity of the roasting applied. Since roasting levels are similar for the coffees from the evaluated locations, the average beverage acidity (pH and tittrable acidity) of the coffees from Itaguaje, significantly higher than the ones from Paranavaí (Chart 1), could be due to environmental conditions. It could also be observed that the acidity levels (pH) of the beverages from the evaluated cultivars from both locations are accepted by the majority of consumers, whose acceptance levels is between 5,08 and 5,22 (MANZOCCO; LAGAZIO, 2009).

The Pearson correlations evidence the binary relations between the evaluated variables. Between tittrable acidity and pH there is a negative and significative correlation (-0,87) due to the ionization of most of the acidic components found in coffee beverage.

Beverage acidity is result of formation and later degradation of the compounds during roasting (DAGLIA et al., 2000; GINZ et al., 2000) só that the more intense the roasting, lower is the acidity found, as suggested by the negative and significative correlation between weight loss and tittrable acidity (-0,42).

In the present study, it was observed that lighter coffees (higher L* values) are less acid (higher pH), as demonstrated by the correlation between luminosity and pH (0,42).

Due to the dificulty to interpret and relate the large amount of roasted bean and beverage features from each cultivar, The Main Component Analysis (Análise de Componentes Principais – ACP) was applied, making possible to visualize the relation between cultivar and these features.

Through ACP it aws observed that the reduction of initial variables to two factors retains 72,55% (F1=38,36% and F2=34,19%) of the variability presented in original data.

CHART 2 - Correlation matrix between the roasted coffee variables from the different Itaguaje and Paranavai cultivars.

Variables	pH	Act	L*	a*	b*	DensT	Exp	Pp
pH	*1,00*							
Act	*-0,87*	*1,00*						
L*	*0,42*	-0,31	*1,00*					
a*	0,06	0,02	*0,74*	*1,00*				
b*	*0,39*	-0,28	*0,97*	*0,83*	*1,00*			
DensT	-0,35	0,35	0,00	0,13	0,03	*1,00*		
Exp	0,14	-0,21	-0,21	-0,17	-0,24	*-0,87*	*1,00*	
Pp	0,32	*-0,42*	-0,20	*-0,38*	-0,22	*-0,41*	0,26	*1,00*

The values in italic are significantly different than 0 with a significance level of α=0,05.

Act = titratable acidity, L*=luminosity, a* = red-green chromatic component, b* = yellow-blue chromatic component, DensT = roasted bean density, Exp = bean volume expansion, Pp = weight loss.

The first component (F1) was formed from the variables related to coffee color (L*, a* and b*), while the second is the result of the correlations with beverage pH, titratable acidity, density and expansion of roasted bean and weight loss (Equation 1).

Equation 1:

F1 = 0,50 pH - 0,39 Acti **+ 0,96 L* + 0,81 a* +0,98 b***- 0,07 DensT - 0,26 Exp - 0,23 Pp

F2 = **- 0,71pH + 0,76 Acit** + 0,01L* + 0,27 a* + 0,04 b* + **0,81 DensT - 0,69Exp - 0,67Pp**

In the dispersion of the cultivars and the variables in the biplot formed by the two components (Picture 1), it is verified that roasted bean color was the main criteria that separated them when projected in opposite sides. It is só verified that, in average, the Paranavai coffees are lighter than the ones from Itaguaje. Cultivars such as IPR 105, IPR 102 and IPR 104 are among the lighter, suggesting that coffees with similar weight losses during roasting will not necessarily show the same color.

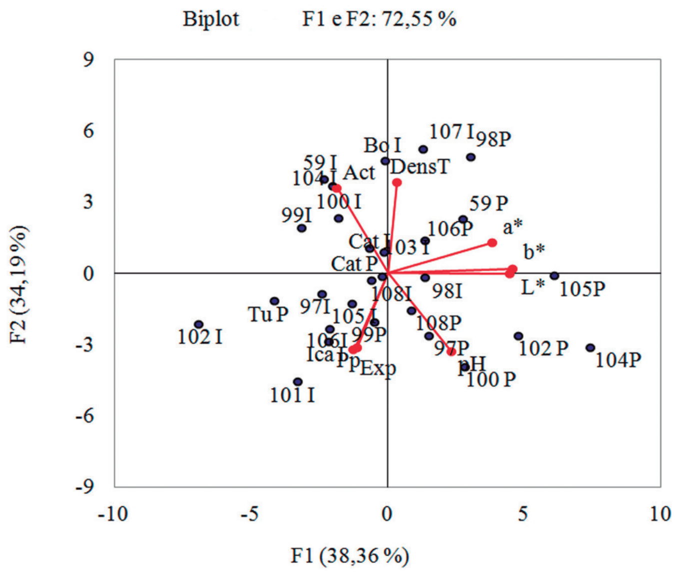
The criteria related to the roasting effect in bean structure (density and expansion) and beverage acidity identified the proper features for each cultivar. Some cultivars planted on both locations showed similar features, such as IPR 97, IPR 108, IPR 102, IPR 105 and Icatu, which showed low density, high expansion and weight loss during roasting, and low beverage titratable acidity.

It is noticeable that the cultivars IPR 98 and IPR 99 showed similar colors in both locations, however features related to density, expansion and weight loss were distinct. Cultivars as IPR 100 and IPR 106 displayed every feature different in the studied locations. The Catuaí cultivar displayed similar color, while for Iapar 59 such parameters are different in the sutdied locations. Coffees with the most acid beverages and low density and volume are Iapar 59, Bourbon, IPR 107, IPR 99 all cultivated in Itaguaje.

3.2 Sensory analysis

The atribute data of appearance, smell, taste and texture of coffee beverages subjected to APG indicated cumulative variance for first and second dimension of 21,20 and 16,04%, respectively, adding up 37,24% of the existing variability in coffees. This value is considered acceptable when compared to those found in literature, for other products (CALEGUER; BENASSI, 2007; GONZALEZ-TOMAZ; COSTEL, 2006).

14 tasters employed between 11 and 17 atributes, with 14 atributes in average to evaluate the beverages. Smell atribute was evaluated by 11 different atributes (Chart 3), being 7 of positive character (coffee smell, caramel, sweet, chocolate, acid, tea and burnt sugar-like) and four negative (bitter, green, fermented and raw). Beverage taste of the coffee cultivars was described through 14 atributes. Among basic tastes, acid and bitter were employed by every taster and sweer taste was employed by seven tasters (Chart 3). Caramel and chocolate coffee beverage tastes and good aftertaste indicated the positive features of beverage taste and 11 tasters employed also the astringent sensation.



PICTURE 1 - Biplot of the variables and cultivars on plane formed by the components through ACP.

Letter P designates Paranavai coffees and letter I Itaguaje coffees. Cultivar acronims: number indicates cultivar name (Example: 105 = IPR 105), Cat = Catuaí, Ica = Icatu, Bo = Bourbon, Tu = Tupi. Variable codes: Act = titratable acidity, L*=luminosity, a* = red-green chromatic component, b* = yellow-green chromatic component, DensT = roasted bean density, Exp = bean volume expansion, Pp = weight loss.

Unpleasant taste due to the presence of unripe beans was described by the green and fermented tastes and bad aftertaste. Beverage texture was described by the body, watered and viscous atributes.

Sensory description of coffee cultivars is comparable to other studies of the same nature, as quality concers. Usually, the description is obtained through identification and quantification of beverage atributes (NEBESNY; BUDRYN, 2006). In beverage evaluations, tasters analise coffee in search of balance between positive and negative terms in the many categories of smell, taste, texture and aftertase atributes.

Atributes considered positive such as, for example, fruity, acid, citric, caramel, chocolate and others of negative character such as bitter, wooden, astringent, green or fermented (LELOUP et al., 2004; NEBESNY; BUDRYN, 2006) are always mentioned in coffee beverage evaluations. Other atributes of aroma such as floral, malt, sweet, caramel, acid, sour, green, earthy, bitter, burnt, chemical, were employed in the analysis of eight coffee blends by tasters from different european countries (JONG; HEIDEMA; KNAAP, 1998) and to describe coffee commercialized in sachets (NARAIN; PATERSON; REID, 2003).

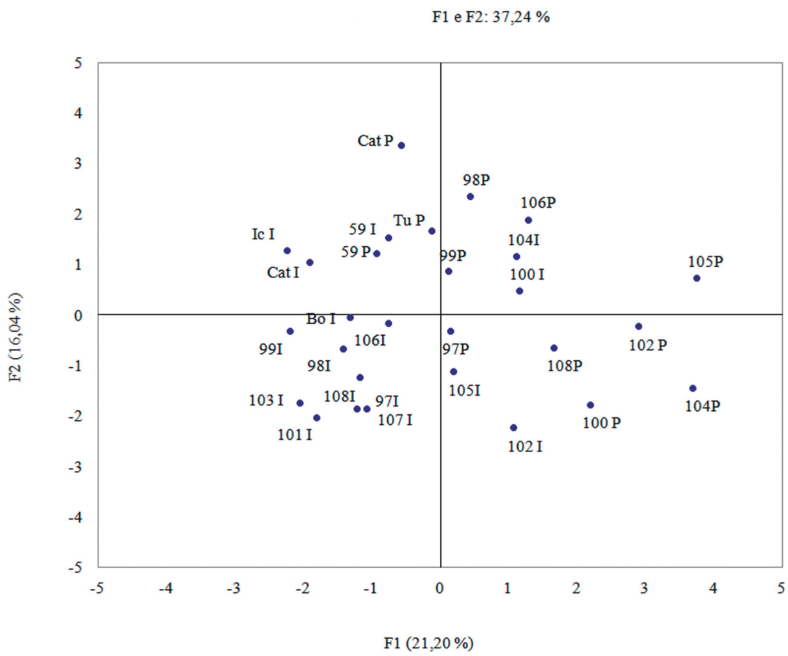
Although the atributes are quoted by many tasters, were took into consideration only those with three or more citations with correlation above |0,35| for the formation of each dimension. These informations allowed to identify the most important atributes to describe the coffees. Coffee groups were formed with distinct qualities due to the atributes chosen by the tasters contributing for the separation of those atributes quoted in larger numbers and more correlated to the dimensions formed in the APG. The frequency of atribute use and the correlation with the respective dimension showed its importance in product description (THAMKE; DURRSCHMID; ROHM, 2009). Therefore, the first dimension was formed by the coffe color and shiny atributes, coffee and green smell, acid and bitter taste, green taste and body texture (Chart 3), which allowed the vertical separation of the coffees (Picture 2). On the second dimension, the appearance atributes (coffee color and turbidity), sweet smell, sweet taste and astringent taste, fermented smell and taste, were responsible for the horizontal separation of coffees.

The atributes of coffee smell, green taste and body texture appeared by the same quotation frequency in both dimensions, emphasizing the importance of such atributes for the tasters in coffee description.

CHART 3 - Frequency of quoted atributed to describe the coffee cultivars, in the dimensions F1 (F1+; F1-) and F2 (F2+; F2-) and the correlation number above |0,35|, for the formation of the dimensions.

		F1+	F1 -		F2+	F2-
Appearance						
Turbidity	2	1	1	4	1	3
Coffee / dark color	4	1	3	3		3
Shiny	3	2	1	2		2
Transparent				2	2	
Smell						
Burnt sugar smell						
Cofee smell	4	1	3	4	2	2
Caramel smell	1	1				
Tea smell	2	2				
Acid smell	1	1				
Raw cofee smell	1	1				
Sweet smell	2	1	1	4	3	1
Bitter smell	1	1				
Fermented smell	2	1	1	3	2	1
Green smell	5	3	2	1	1	
Taste						
Coffee taste	2		2	2	2	
Caramel taste	1		1	1	1	
Sweet taste	1		1	3	1	2
Acid taste	6	1	5	2	2	
Bitter taste	3		3	1		1
Green taste	3	1	2	3	1	2
Astringent taste	2	1	1	4		4
Fermented / sour taste	2	1	1	2	1	1
Ash taste	1	1				
Bad aftertase	1	1				
Texture						
Dense / body texture	3	1	2	3	1	2
Viscous texture				1	1	

Picture 2 represents the coffee cultivars dispersion, in the plane formed by the dimensions F1 and F2. Considering the formation atributes of these dimensions (Chart 3) it was verified that the coffees were separated by the F1 formation atributes, and the majority of the Itaguaje coffees were allocated to the right side of the graph, opposing the Paranavai coffees.



PICTURE 2 - Coffee cultivar dispersion on the plane formed by the dimensions F1 and F2 of the Free Choice analysis.

The coffee cultivars showed different behaviors in the locations studied, not making possible to associate specific sensory features for each cultivar, suggesting different responses for the same cultivar in different locations.

IPR 98, IPR 99 and IPR 105 cultivars, cultivated in Paranavaí, showed higher intensity of sweet smell, were less bodied and more transparent, when cultivated in Itaguaje due to the F2 dimension separation. IPR 100 and IPR 104 cultivars showed these same atributes, however with inverted intensities on both locations.

Cultivars IPR 97 e IPR 108 showed similar coffee smell, shine and sweet and green taste features (separation by F2), however when cultivated in Paranavaí higher green smell and watered texture was observed due to the separation by the F1 formation atributes.

Cultivars such as Iapar 59, Catuaí cultivated on both locations and Tupi and Icatu showed similar sensory features, setting them appart from the other cultivars by F2 formation atributes.

The group formed by Bourbon, IPR 97, IPR 98, IPR 99, IPR 101, IPR 103, IPR 106, IPR 107 and IPR 108 cultivated in Itaguaje stood out by presenting full bodied beverages with intense coffee smell, coffee color, acid and bitter tastes and low intensity of green smell.

When the physico-chemical (ACP) and sensory (Perfil Livre) evaluations were compared, it was possible to observe that the physico-chemical features (color parameters and pH) were perceived by the tasters (color appearance atributes and acid taste) and became important factors to describe and discriminate the coffee cultivars in the evaluated locations.

4 CONCLUSIONS

Through physico-chemical analyses of roasted coffee and beverage sensory analyses it was possible to characterize the Itaguaje coffees as darker in color, more acid and higher in roasted coffee density, when compared to Paranavai coffees.

The results encountered indicated that, in complex matrices such as coffee, complementary analyses can be used as a way to establish efficient relations between sensory atributes and physico-chemical features of the roasted bean and beverage in order to discriminate cultivars and cropping locations.

The knowledge of cultivar reactions to the production environment related to their sensory features is an important tool for directing new plantations potentiating the best atributes of each cultivar.

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