

Evaluation of the proportion malt: “pinhão” (*Araucaria angustifolia*): Effect on acceptance in sensory analysis

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Abstract

We notice that in the last two decades has been grown the beer market that employ adjuncts. Aiming at adding different sensory characteristics acquired by exigent tasters, adjuncts such as unconventional black rice, banana, and “pinhão” appears as an alternative agent for the production of beer. The aim of this research was evaluate six different beer with “pinhão” and malt, and correlate if this increase of “pinhão” affect on the acceptance of the beverage in sensory analysis.

In this study was formulated six beers with different percentages of malt and “pinhão” (10, 45 and 80% with and without shell), in flasks with a capacity of 2L, containing 1.2 L of wort to 10.9 ° P.

The sensory evaluation shown the samples with 10% of “pinhão” (with or without bark), and 45% “pinhão” (with or without bark) didn’t present difference among them, however, the samples containing 80% of “pinhão” differ in level of 5% of probability. It was contacted that the increase of “pinhão” in the wort reduced the scores of the beverage, probably because the increase of astringency, provided by the bark of “pinhão”.

Keywords: Beer, Adjuncts, “pinhão”, *Araucaria angustifolia*, Sensory analysis.

Introduction

Beer is all Beverage obtained by alcoholic fermentation of the brewery wort made with barley malt and water, by action of yeast, with addiction of hop, and the malt used in the elaboration of beer and the hop can be substituted by your respective extracts. The malt can be substituted by malted cereals or not, and for carbohydrates of vegetal origin transformed or not¹.

Beer is a beverage consumed in the entire world, and at Brazil it's the alcoholic beverage most consumed, reaching a consume per capita of 65liters/person/year². Your distribution begins when the Dutchman come here in century VXII, and industrially at the end of XVIII century³.

In the composition of beer utilize raw material that includes water, barley malt, hop and yeast, and, in most cases, are used malted adjuncts or not, with the aim to modify the sensory characteristics⁴, besides that can contribute for the diminution of price of the beverage⁵. The pure malt beer is more expensive, because the malt used in large breweries in Brazil are imported from other countries⁶.

The brewery industry generally utilizes other fonts of carbohydrates designed as adjuncts as rice, wheat, sorghum, and have too the adjuncts designed as non-conventional, as banana, black rice and pupunha⁷. The adjuncts besides your contribution of diminution of production costs of the beverage, and to proportionate a beer with characteristics aroma⁸, should be chosen by the regional disponibility⁹. In this context the utilization of "pinhão" presents as an option of adjunct in beer production in function of your characteristics as appropriated amount of starch¹⁰, and easily find in the region, and cultivated at "Serra do Mar and Serra da Mantiqueira". Therefore, the utilization of "pinhão" as adjunct for obtaining beer can propitiate an alcoholic beverage with differentiate physic-chemical and sensory characteristics.

The sensory analysis is an important step in the process of beer production, that shows as an important parameter on the acceptance of the product, as, for example, to determinate the portion of Market that have purchase intentions¹¹. The use of sensory analysis developed more in the 1970 decade, with the emergence of descriptive methods of analysis that allows details the characteristics of a determined product¹².

Experimental

It was formulated six beer with different proportions of barley malt and "pinhão" (90, 55 and 20% of malt and 10, 45 and 80% of "pinhão", respectively, in versions of "pinhão" with and without bark). The malt was provided by Malteria do Vale, Taubaté, and the "pinhão" obtained of farms near of Cunha (SP).

Initially, all the "pinhão" was submitted to kiln at 60°C during 96h, to propitiate longer time of armazenatation of the seed. After this, the wort was boiled in autoclave (in Erlenmeyer flasks with capacity of 6L, containing approximately 0.5 to 2Kg of "pinhão", depending of the utilized proportion, and covered with water). The mass of "pinhão" and malt necessary to obtaining the six different proportion were calculated with basis on your moisture (40%), considering the yield of 75% of malt mass, and 73% of "pinhão".

The milling of the grains of malt was realized dried in roller mill. The distance between the rolls was adjusted in a distance of 1.3mm, and after was 0,7mm. After milling the malt and "pinhão" was put in appropriated pot with capacity of 4L, with the relation of 4:1 (water: mixture of malt and "pinhão"). It was realized the mosturation, with the following temperature/time: 47°C/20min, 52°C/40min, 62°C/50min; 72°C/30min and 78°C/10min, and at the end of temperature 72°C/10min was realized the iodine test. The principle of this test is mixture few drops of iodine solution (0.2N) at the wort to verify the total sacharification of the starch. If the color presented brown, it was completely saccharified, and if it presented purple, should have presence of starch, that necessity longer time to baking in the temperature of 72°C, until it can raise the temperature of 78°C for enzymatic inactivation. The step of filtration/clarification was realized transferring the volume of this pot for an Erlenmeyer flask early autoclaved (121°C/20min), with porcelaion filter, and a steel sieve, and recirculating this wort through bagasse of malt and "pinhão" for maximum remotion of solids. After this process had the water addiction (early heated to 78°C), added until complete the desired volume. After this step, the filtered and clarified wort was returned to a new pot, were had the boiling (1h), during that was addicted hop (1.5g/L), in the initial and final 15minutes. After the boiling, the wort was refrigerated until the temperature of 12°C, when it was added the yeast previously cultivated in a wort pure malt with 10.9°P. The prepare of this medium with pure malt followed the same

steps realized until here, except that this wort was maintained in shaker in 200rpm, in 30°C, during 30h, in 3 Erlenmeyer flasks with capacity of 250mL, containing 50mL of wort each one, added in approximately 1.2L of wort (relation near of 10% of inoculum volume: wort with “pinhão”). The inoculum was prepared with a *Saccharomyces cerevisiae* PPB01, isolated from sugarcane, and was storage at the Microbiology Laboratory of the School of Engineering of Lorena. It was cultivated on medium malt extract agar (Difco). The fermentation was conducted in Erlenmeyer flasks with capacity of 2L, containing approximately 1.2L of wort, in 12°C, during 5 to 7 days. The finish was contacted by the non-alteration of extracts content, and after this it was realized the maturation in 0°C by 14 days, followed by bottling and carbonation in the bottle (the beer was transferred in Erlenmeyer flasks to an Becker, previously sterilized (121°C/20min)). The carbonation was realized heating a solution of water and sugar in a concentration of 5g of sugar for each liter of beer produced, and the it was realized during 14 days, in ambient temperature.

After those steps was realized sensory analysis of the six beer produced (preference tests) evaluating the attribute global impression. In the same form, it was present data referring to age. The form with the informations is presented in Figure 1.

Figure 1 – Form used during the acceptance test during sensorial analysis.

Sensory Analysis of Beer	
Name: _____ . Age: _____	
It will be served two samples of beer, codified with numbers of three digits. Taste and analyze to right to left. You should attribute a note between 1 and 9 like criteria below in relation to global impression, besides to mark the sample that you most like. You should eat a cream cracker and drink water between each sample, to diminish the residuals tastes of the previous sample. Please put the name and age too.	
(9) Extremely liked	
(8) Much liked	
(7) Moderately liked	
(6) Slightly liked	
(5) Nor liked nor disliked	Sample _____ Sample _____
(4) Slightly disliked	() Global impression () Global impression
(3) Moderately disliked	
(2) Much disliked	
(1) Extremely disliked	
Commentaries: _____	
<i>Thankyou, Raquel de Almeida Batista</i>	

Results and Discussion

In relation of sensorial analysis realized with the proportion of 10, 45 and 80% of “pinhão” (with or without bark), the Tables 1, 2 and 3 presented the variance analysis. In the cases that F_{table} was higher than $F_{calculated}$, the samples do not differ among them statistically in level of 5% of probability.

Table 1–Variance analysis for the samples containing 10% of “pinhão”

Sources of variation	DF	SS	MS	F _{calculated}	F _{table (5% 1,42)}
Samples (2)	1	1.16279	1.16279	0.643974241	4.072
Judges (43)	42	206.023	4.90532	2.716651917	
Residue	42	75.8372	1.80565		
Total (86)	85	283.023			

Source: author. DF: degree of freedom; SS: sum of squared; MS: medium of squared.

Table 2 - Variance analysis for the samples containing 45% of “pinhão”

Sources of variation	DF	SS	MS	F _{calculated}	F _{table (5% 1,26)}
Samples (2)	1	6.68519	6.68519	3.878512397	4.2283
Judges (27)	26	150.37	5.8348	3.355371901	
Residue	26	44.8148	1.72365		
Total (54)	53	201.87			

Source: author. DF: degree of freedom; SS: sum of squared; MS: medium of squared.

Table 3 - Variance analysis for the samples containing 80% of “pinhão”

Sources of variation	DF	SS	MS	F _{calculated}	F _{table (5% 1,24)}
Samples (2)	1	7.22	7.11	5.918*	4.26
Judges (25)	24	78.08	3.25333	2.666	
Residue	24	29.28	1.22		
Total (50)	49	114.58			

Source: author. * The samples presented statistic difference in 5% of probability. DF: degree of freedom; SS: sum of squared; MS: medium of squared.

It can be noticed that the utilization of 80% “pinhão” with and without bark (Table 3) presented significative difference among the samples in level of 5% of probability. How it was evaluated two samples, the test is conclusive, pointing that one that has higher media (80% of “pinhão” without bark) was preferred than those with 80% “pinhão” with bark, and it doesn’t need the application of a medium test, for example, Tukey.

It can be noticed in Table 4 that doesn’t have difference among the samples of 10% “pinhão” with and without bark, neither in samples with 45% “pinhão” with and without bark, however, both the samples with 80% of “pinhão”(with and without bark) presented difference. Among the samples of 10% “pinhão” and 45% “pinhão” have difference, and with the samples 45% and 80%“pinhão” (in the condition without bark) didn’t have statistical difference.

Table 4–Value of the medium of the sensorial analysis accompanied of standard deviation for acceptance (global evaluation) of the samples of beer using “pinhão”.

Percentage of “pinhão”	With bark	Without bark
10%	5.3 ± 1.87a	5.06 ± 1.79a
45%	3.4 ± 1.52b	4.11 ± 2.27bc
80%	3.84 ± 1.02b	4.6 ± 1.84c

Source: author. Samples followed by same letter didn’t differ among them in 5% of probability.

In relation of preference test, with 10% “pinhão”, 24 in 43 tasters (55%) preferred the sample of beer with bark, that doesn't present statistical difference among them in a level of probability of 5% (the minimum of tasters to have difference in a level of 5% of probability is 29). For the samples of 45% “pinhão” with and without bark, in 27 tasters, 22 preferred the sample without bark, that indicates that has significative difference in the level of 0.5%, the same noticed for the samples with 80% of “pinhão”, where 20 in 25 tasters preferred the sample without bark. This results were superior that found by Andrade¹¹ (2007), but using black rice as adjunct. In that research was contacted a preference of the tasters for the commercial beer (14 in 44 tasters – 31% - preferred the one with black rice, while the other 30 preferred the commercial sample).

In relation of the distribution of the ages of tasters during the sensorial analysis, for the samples with 10% of “pinhão” the largest number of tasters (43) are between 18 and 24 years (88.4%), followed by 25 to 34 years (9.3%) and 45 to 60 years (2.3%). In the total number (43), 24 are man (55%) and 19 woman (45%). The media of the ages was 21.39 years. Studies made by Laranjeira¹³ showed that the medium ages of consumers of beer is between 18 and 25 years, that confirms our results of media of 21,39 years.

For the samples of 45% “pinhão”, that had 27 tasters, had 19 man (70%) and 8 woman (30%). The media of the ages was 21.51 years. For all those tasters 92% had the ages between 18 and 24 years, and 4% between 25 to 34, and 4% between 45 and 60 years.

For the samples of 80% “pinhão”, that had 25 tasters, had 18 man (72%) and 7 woman (28%). The media of the ages was 22 years. For those 72% had the ages between 18 and 24 years, and 28% between 25 to 34. This dates are similar that found by Laranjeira¹³ et al (2007) that says the people who consume more alcoholic beverage are teens with 18 to 24 years. It's important to consider that this age can be justified by the fact that the place that were realized the analysis was a university ambient.

Also according to the parameter global evaluation, the results of sensorial analysis obtained by Brunelli¹⁴ (2012) who works with honey as adjunct the scores were superior (6.63) of these work (5.3). This can be explained for the fact that she used different extracts contents with the adjunct honey, indicating that this interferes significantly in the global evaluation of the beer. The tasters preferred that one produced with 40% of honey, that obtained for global evaluation the score of 6.63 (for 11°Brix or 11.64°P), locating between slightly liked and moderately liked. In this work (with “pinhão” as adjunct) the beer containing 10% “pinhão” with bark present the media of 5.27 locating between neither liked nor disliked and slightly liked.

Conclusion

For the sensorial analysis of bench scale, the sample with the beer containing 10% “pinhão” with bark and 45% “pinhão” without bark, present significative difference in level of 5% of probability. In relation of the same proportions (with and without bark) the only case that presented difference was in 80% “pinhão”. The samples with 45% “pinhão” (with or without bark) didn't differ to the sample of 80% “pinhão” with bark, and those presented the lowest scores on acceptance in the sensory test. With these points, it is possible to conclude that the large amount of “pinhão” with bark diminished the scores during the sensory evaluation, probably because of the fact of higher astringency provided by the bark of “pinhão”.

Acknowledgments

Capes

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