

EFFECTS OF GAMMA RADIATION ON SENSORIAL PROPRIETIES IN BLACK TEA

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ABSTRACT

The black tea (*Camellia sinensis*) is the most consumed beverage in the world and its consumption has increased, mainly in occidental countries, due to the fact that this drink has large antioxidants quantities. In this type of tea, the taste determines the product qualities and its final value. Several studies reported that food irradiation is an excellent process to disinfect food, reducing storage losses and extended its shelf life. This treatment can inhibit cellular division, promoting a molecular and DNA structural modification. Depending on the dose applied, the irradiation can modify sensorial properties, influencing the market cost. The sensorial analysis is one of the main tests to detect any better or worse changes, by consumers. The aim of this study is to evaluate the effect of ionizing radiation on sensorial properties in black tea. Samples will be irradiated with a ^{60}Co source, at doses of 0, 5, and 10kGy.

Keywords: Sensorial Analysis, Black Tea, Food Irradiation.

1. INTRODUCTION

Tea is the most consumed beverage in the world. Black tea is produced from leaves of *Camellia sinensis* and prepared in boiling water; variations during the manufacture process create different types of tea. Among different teas, black tea is the most consumed (76% of world consumption) [1].

This tea suffers a number of processing stages, such as withering, pre-conditioning, cutting and tearing or curling operation, fermentation, drying and others, which are involved in producing finished black tea [2]. The dark black color and unique flavor is produced when the leaves are deliberately crushed or broken, to facilitate oxidation of Epigallocatechin 3-gallate and other polyphenols [3].

The characteristics that make black tea the favorite by consumers are the refreshing taste and its unique aroma [4], which is determined by non-volatile and volatile components, respectively. The aroma has a large influence on flavor perception because, in humans, the smell perception is better developed compared to the taste [5].

Moreover, the consumption of black tea has increased due to the fact that this drink has many antioxidant substances. Several studies show that antioxidants can prevent cardiovascular diseases and cancer, besides having anti-inflammatory effects [6].

However, black tea may represent a potential health risk if the leaves are contaminated by pathogenic microorganisms. This contamination may happen during the manufacture process, when the tea is stored inappropriately [4].

Several studies reported that food irradiation is an excellent process to disinfect food, reducing storage losses and extended its shelf life [7]. On the other hand, depending on the radiation dose, the tea sensorial characteristics change and this is one of the factors that may affect the consumption of irradiated food [8].

For the purpose of evaluating if the manufacturing process cause changes in a product sensorial characteristics, sensorial analysis test has been created. In this test, consumers opinions are expressed by samplers, who taste the samples and use their sight, smell and taste to evaluate the product characteristics [9]. The aim of this study is to evaluate the effect of ionizing radiation on black tea sensorial characteristics.

2. MATERIALS AND METHODS

2.1. Samples

The black tea were donated by LEÃO JUNIOR S/A (Paraná/Brazil). The samples were packed in polyethylene bags and identified with its respective radiation doses.

2.2 Irradiation

Irradiations were performed at the Centro de Tecnologia de Radiações (IPEN-CNEN/SP) using ^{60}Co gamma cell, supplying a dose rate of 2.16 kGy/h. Tea samples were irradiated with doses of 5 and 10 kGy.

2.3 Infusion

The samples were submitted to the infusion into a boiling water contend 10 g/L each one and filtered using paper filters and later stored in thermal bottles of 1 L.

2.4 Sensorial Analysis

The sensorial test applied was the triangular test as described by Dutcosky (1996). Untrained volunteer panelist received three samples codified with three-digit random numbers, being two control samples and one the irradiated sample, and request to identify the sample that was different from others. About 33 panelists performed the sensorial analysis with dose of 5 kGy and 34 panelists with dose of 10 kGy.

2.5 Statistical Analysis

Statistical analysis was performed by binomial distribution $p < 0.05$, in order to evaluate significant differences among the irradiation doses analyzed [10].

3. RESULTS AND DISCUSSION

Among the panelists that tasted the 5 kGy irradiated tea, 36.4 % indicated the different sample correctly. For the 10 kGy irradiated tea, only 26.5% indicated the irradiated sample (Table 1).

These data indicate that there were no statistically significant differences ($p < 0.05$) between the non-irradiated and the irradiated black tea. A similar result was described by Furgeri *et al.* (2007) in maté tea (*Ilex paraguariensis*), irradiated with 5, 7 and 10 kGy. Fanaro *et al.* (2007) demonstrated that doses up to 10 kGy formed new compounds in green tea, promoting an increase of volatile compounds. Nevertheless, in black tea, these changes had no influence on consumer sensorial perception.

Table 1- Distribution of figures, according to type of answer and doses. São Paulo, 2009.

Doses	Right answers	Wrong answers	TOTAL
5kGy	12 ^a	21 ^a	33
10kGy	9 ^b	25 ^b	34

Different subscript letters in the same line indicate significant difference ($p < 0.05$)

During the test, the panelist was, also, required to give a score from 1 to 10 (1= disliked extremely and 10= liked extremely) to all samples tasted. The average for control, 5 kGy and 10 kGy tea were, respectively, 7.00, 7.39, 7.23 (table 2).

Table 2- Mean and standard deviation according to doses categories. São Paulo, 2009.

Doses	Score (DP)
0kGy	7.0 ±2.45
5kGy	7.39 ±2.49
10kGy	7.23 ±2.47

4. CONCLUSION

Irradiation did not have a significant influence on sensorial characteristics of the irradiated black tea, with doses up to 10 kGy.

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