EVALUATION OF NECTAR OF KIWI (Actinidia deliciosa) SUBMITTED TO THE GAMMA RADIATION

Marcia N. C. Harder¹, Taís C. F. de Toledo¹, Andréa C. P. Ferreira¹, Marta H. F. Spoto² and Valter Arthur¹

¹ Centro de Energia Nuclear na Agricultura (CENA/USP-SP)
Av. Centenário, 303
13.400-970 Piracicaba, SP
mnharder@cena.usp.br
tcftoled@cena.usp.br
andrea@dtr.com.br
arthur@cena.usp.br

² Escola Superior de Agricultura “Luiz de Queiroz” (ESALQ/USP-SP)
Av. Pádua Dias, 11
mhfspoto@esalq.usp.br

ABSTRACT

The kiwi is an exotic fruit, it is pertaining the Actinidaceae family, possesses high nutritional value, being rich mainly in vitamin C and fibers, calcium, iron and phosphorus, what turns it a good nutritious option, presenting an important associated attribute the quality of the fruits and the flavor, what be comes it a fruit with great acceptance in the consuming markets, mainly children. The irradiation is an excellent method of conservation, as well as an accomplice to reinforce the action of other applied processes with the same purpose. The objective of this work was to formulate a sweetened drink, no alcoholic, starting from the kiwi (Actinidia deliciosa), to submit its at the gamma radiation for source of Co⁶⁰ with doses of: 0 (control); 0.5; 1.0 and 2.0 kGy in a tax of dose of 0.712 kGy/hour, and subsequent physiochemical and sensorial analyses for detection of possible alterations provoked by the radiation. It is possible to conclude that the radiation in the doses used didn’t promote significant alterations in the physiochemical and sensorial characteristics of the kiwi nectar.

1. INTRODUCTION

The kiwi is a fruit exotic, is a specie of the family Actinidaceae, of China. The fruit is covered densely for the fine and silky coming with brown-clear color. It possesses resistance to low temperatures in the refrigeration, being possible its storage for a superior period to eight months [1].

It possesses high nutritional value, being rich mainly in vitamin C and fibers, calcium, iron and match, what turns a good nutritious option, presenting an important associated attribute the quality of the fruits and the flavor, what turns it a fruit of great acceptance in the consuming markets, besides children. It also possesses an enzyme, actinide, which has properties of softening meats [2].

The content and the composition of sugars have fundamental paper in the flavor. The kiwi has great amount of soluble sugars in matter the glucose, fructose and sucrose [2]. According to [3], the kiwi, when ripen, presents about 5.8% of fructose, 4.2% of glucose, 2.8% of sucrose, tends as tenor of total sugars around 12.8%.
The determination of the content of ascorbic acid, vitamin C, in fruits and vegetables is very important, because besides its fundamental role in the human nutrition, its degradation can favor the darkening no enzymatic and to cause emergence of strange flavor [4]. Besides, the ascorbic acid is an important quality indicator, because being the vitamin is more thermo unstable presence in the food, it indicates that probably the other nutrients are also preserved.

The irradiation is an excellent conservation method, as well as an accomplice to reinforce the action of other applied processes with the same purpose. The irradiation satisfies the objectives fully of providing to the foods nutritious stability, sanity conditions and of long storage period [5].

Researches demonstrate that the macronutrients, such as the proteins and the relatively stable healthy carbohydrates to the doses of up to 10 kGy, and that the micronutrients, mainly the vitamins, they can be sensitive the any method of treatment of foods. The sensibility of different types of vitamins is the irradiation method and the other methods of treatment of foods is varied; vitamins C and B1 (thiamine) they are more sensitive to the irradiation. In general, the irradiation process with the allowed doses, carts few chemical alterations in the foods, the nutritional quality of the food is not more affected than when the food is treated by other conventional methods of conservation [6].

Still, according to [7] the combined process of irradiation with heating or cooling, it has been used in the fruit juice preservation. However, the commercial use in the preservation of fruit juices, requests the adaptation of the dose, in order to minimize the emergence of characteristics and undesirable sensorial qualities, and to improve the economical aspects of the process.

The main products obtained starting from fruits are the juices and nectars. In the present work, nectar of kiwi was elaborated, containing 50% of pure juice, sugar and ready for the consumption [8], which suffered irradiation to 0.5; 1 and 2 kGy.

The objective of this work was to formulate a sweetened drink, no alcoholic, starting from the kiwi (Actinidia deliciosa), to submit it at the gamma radiation for source of Cobalt 60 and subsequent physiochemical and sensorial analyses for detection of alterations provoked by the irradiation.

2. MATERIAL AND METHODS

This work was accomplished at the laboratory of Food Radiation on the CENA/USP (Centro de Energia Nuclear na Agricultura).

Kiwi was used (Actinidia deliciosa) in nature, acquired in the local trade.

The kiwi was washed in solution containing hypochlorite of sodium for superficial disinfection, the peels were removed, the fruits were cut to the middle and the extracted juice in domestic centrifuge Walita, pre-filtrate, centrifuged to 5000 rpm for separation of the solid part, filtrate, added 50% of mineral water and sugar up to 16th Brix and conditioned in flasks of plastic (PET) of 500 mL, been submitted and divided in the following treatments:
1 – Control; 2 - Irradiation with 0.5 kGy; 3 - Irradiation with 1.0 kGy; 4 - Irradiation with 2.0 kGy.

The irradiation was accomplished in irradiator of source of Cobalt 60, model Gammabeam 650, of Nordion (CENA/USP).
The tax of used dose was of 0.712 kGy/hour.

2.1. Physiochemical analysis

2.1.1. Tenor of soluble solids

Measured in refratometer RT-30ATC and expressed in degrees Brix, in agreement with methodology described by AOAC [9].

2.1.2. Acidity titulável

It was certain and made calculations as the volume in mL of NaOH requested to title 100mL of nectar to the pH 8.2, expressed in citric acid percentage, having been the nectar diluted in the proportion 1:10, according to AOAC [9].

2.1.3. pH

It was certain through pHmeter MB-10, according to the recommendations of AOAC [9].

2.1.4. Ascorbic acid

The analysis was accomplished according to methodology described by [10], with use of acid oxalic and title with dichlorine-benzeneindophenol solution.

It was certain and made calculations as the volume in mL of solution of 2.6 worn-out dichlophenolindophenol to title 50mL of nectar, even change slightly rosy, expressed in mg of acid nectar ascórbico/100mL.

2.2. Sensorial analysis

It was requested the healthy adults' participation (18 to 50 years), of both sexes that declared kiwi’s consumers and, that didn't present any reaction to the consumption of the same, and the same ones manifested its consent. Aleatoric selected. The sensorial analysis constituted of the aroma analyses, color texture, flavor and appearance, by test of multiple comparison, for the fitting room.

Test of acceptability of scale hedonic was used, since it is necessary to know the consumers' "affectionate status" regarding the product, inferring the preference, in other words, the most favorite samples are the more accept and vice versa [11].

The scales were balanced, once they present equal number of positive and negative categories, avoiding the induction of the fitting room for the positive or negative. It was used climbs hedonic, turning easier the understanding.
The samples were presented for a group of 41 fitting room, being served refrigerated to 4°C in white plastic glasses of 50 mL, under delineate of blocks entirely at random.

2.3. Statistical analysis

The employed experimental delineate was entirely at random, with three repetitions for treatment. The obtained results were submitted to the variance analysis by the test F, and the comparison of the averages obtained in the different treatments analyzed second test of Tukey (p <0.05), with use of the SAS program [12].

3. RESULTS AND DISCUSSION

3.1. Tenor of soluble solids

The obtained variations of Brix (degrees Brix) of the kiwi nectar irradiated to 0.5; 1.0; 2.0 kGy and, in the control they are in the Table 1.

Table 1. Variation of Brix (degrees Brix), acidity titled, pH and ascorbic acid of the kiwi nectar irradiated to 0.5; 1.0; 2.0kGy and, in the control

<table>
<thead>
<tr>
<th>Dose</th>
<th>°Brix</th>
<th>Acidity titled (%)</th>
<th>pH</th>
<th>Ascorbic acid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>16.70±0.01</td>
<td>8.8±0.11</td>
<td>3.5±0.1</td>
</tr>
<tr>
<td></td>
<td>0.5</td>
<td>16.60±0.01</td>
<td>9.2±0.1</td>
<td>3.2±0.1</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>16.70±0.01</td>
<td>8.2±0.1</td>
<td>3.0±0.1</td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>16.80±0.01</td>
<td>8.8±0.1</td>
<td>3.0±0.1</td>
</tr>
</tbody>
</table>

1 Media ± Standard Deviation
2 medias with different word(s) in the vertical they differ significantly at the level of 5%.

It is possible to observe in agreement with the Table 1, that the treatment that received dose of radiation of 2.0 kGy presented a larger amount of soluble solids, following by the 0.5 kGy dose. Para the control and the nectar irradiated to 1.0 kGy found a same amount of soluble solids, in other words, the same value for Brix.

The difference statistics was verified among the treatments, indicating that the irradiation influenced this parameter, confirmed in a study accomplished [13], in orange juice irradiated in several doses, an increase was observed in the tenor of soluble solids.

In the research they were found values above the literature for fruit, because, the kiwi nectar needs sucrose addition to arrive to 15th Brix (ideal to nectar), what allowed an ideal palate for the consumption in terms of percentage of sugar.

3.2. Acidity titled

The obtained variations of the acidity titled (% of citric acid) of the kiwi nectar irradiated to 0.5; 1.0; 2.0 kGy and, in the control they are in the Table 1.
It is possible to observed through the Table 1, that the dose that received to smallest radiation (0.5 kGy) presented an increase in the tenor of acidity, indicating that the treatment influenced for the increase, following by the control that didn't differ statistically of the dose of 2.0 kGy and the dose 1.0 kGy presented a smaller acidity among the analyzed samples.

The tenors of total acids vary of 1.0-1.5%, being the citric acid the principal. In this work was found values above the one of the literature for kiwi.

In study accomplished by [14] found tenors of total acids for the sample no irradiated 16.04% and for the sample irradiated 16.58 and 15.85% for the doses of 1 and 2 kGy respectively. These values differ to the found in this work; an explanation for this situation is in the degree of maturation of the fruit.

3.3. pH

The obtained variations of the pH of the kiwi nectar irradiated to 0.5; 1.0; 2.0kGy and, in the control they are in the Table 1.

It is possible to observe that with the irradiation there was a decrease in the value of the pH, what resulted in more acid nectar, as it increased the radiation dose.

In agreement with [15], the pH value for the kiwi nectar should be around of 3.3. However, the sample that more approached this research was submitted to the irradiation in the 0.5 kGy dose.

In study accomplished by [14] found values of pH 3.38 for the samples irradiated in the doses 1.0 and 2.0 kGy and, 3.41 for the sample no irradiated. These values are close to the found for in this research.

3.4. Ascorbic acid

The tenor of ascorbic acid (nectar mg/100mL) of the kiwi nectar irradiated to 0.5; 1.0; 2.0 kGy and, in the control they are in the Table 1.

Regarding the tenor of acid ascorbic present (Table 1), it is noticed that the irradiation with doses of 1.0 and 2.0 kGy promoted reduction of 50% regarding the control and the samples irradiated with 0.5 kGy.

3.4. Sensorial analysis

For the Sensorial Analysis it was not found difference significant statistics among the aspects analyzed in the present study (color, aroma, flavor, texture and global acceptance) for the used doses.

4. CONCLUSION

It is possible to conclude that the irradiation didn't promote significant alterations in the physiochemical and sensorial characteristics of the kiwi nectar.
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REFERENCES