

INFLUENCE OF GAMMA RADIATION ON GRAPES COLOR DURING STORAGE PERIOD

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ABSTRACT

In general food contains some components that are very sensible to irradiation processing and if radiation dose is higher, can cause some harmful transformation in taste, odor and flavor in these foods, present in very lower concentrations, regulating their appearance and nutritious value. The ionizing radiation application in order to preserve and disinfect food is used for the reduction of pathogenic microorganisms, extending the shelf life and reducing the loss of crops during storage of the product. The genus *Vitis* is the main representative of the *Vitaceae* family due to the nutritional importance of the grape (*Vitis vinifera* L.), widely consumed "*in natura*". The *V. vinifera* produces a fruit of great nutritional value to humans. The quality and acceptance of products are associated with sensory parameters such as color, which is the primary criterion for acceptance by the consumer. Anthocyanins are generally unstable when exposed to sources of ionizing radiation. The flavonoids are largely distributed in nature and are responsible for most of blue, purple and all shades of red colors. In vines, these compounds are responsible for the color of the grape skin and are also found in the flesh of some varieties of grapes. The objective of this study is to analyze the effects of gamma radiation on color of grapes at different days of storage. The irradiation will be in ⁶⁰Co source at doses of 0 and 4.5 kGy. The samples will be stored at room and refrigerated temperature for 21 days. The evaluation of color will be analyzed through "L", "a" and "b" parameters.

Keywords: Grapes, *Vitis vinifera*, Anthocyanins, Food Irradiation.

1. INTRODUCTION

The quality evaluation of the grape is based, traditionally, in the external characteristics of size, coloration and absence of rind defects. The consumption of dark grape juice protects against the oxidation of LDL, thus the flavonoids present in this type of fruit may play an important role in inhibition of atherosclerosis [1]. Anthocyanins are flavonoids that are widely distributed in nature and are responsible for most of the colors blue, purple and all shades of red that appear on flowers, fruits, some leaves, stems and roots of plants [2, 3]. Studies with black grapes of the genus *Vitis* verify the presence of anthocyanins, resveratrol and phenolic compounds such as flavonoids, which demonstrate its antioxidant capacity and its effect on prevention of various diseases such as cardiovascular, cancer and neurological [4, 5]. In grapevines, they accumulate in leaves during senescence and are responsible for the color of dark skins of the grapes, and also found in the flesh of some varieties of grapes [6].

2. MATERIAL AND METHODS

2.1. Samples

The grapes were purchased from a supermarket in São Paulo, Brazil, packed in polyethylene bags, labeled and identified. The samples were stored at refrigerated temperature of 8°C for 21 days at Instituto de Pesquisas Energéticas e Nucleares (IPEN). Each week were used 6 bunches of grapes, 3 irradiated and 3 non-irradiated. Were chosen random 3 grapes to perform the readings, totaling 9 readings per dose.

2.2. Irradiation Treatment

Samples were irradiated using a Multipurpose ^{60}Co Irradiator at Instituto de Pesquisas Energéticas e Nucleares – IPEN/CNEN. The applied dose was 4.5kGy with dose rate of 9.3kGy/h. Harwell Gamma Chrome YR Bath dosimeters were used for the measurement of radiation dose. After irradiation, the samples were immediately stored at 8°C.

2.3 Measurement of color / color analyses

Using a Minolta Chroma Meter CR-400 colorimeter color was measured in terms of “L” (lightness; 0 = dark and 100 bright), “a” (negative = greenness and positive = redness) and “b” (negative = blueness and positive = yellowness). Color values for grapes were measured on days 1, 7, 14, 21.

3. RESULTS AND DISCUSSION

The irradiated grapes showed a greater change in color than the control. According to Han (2004) [7] ribs and leafs of Roman lettuce treated with 3.2kGy induced the loss of green pigmentation (increasing “a” value), accelerating the discoloration (increasing “b” value); vegetables became more yellowish, increasing darkening (decreasing “L” value), with more accentuated results for the ribs. Irradiated almonds at doses of 3.0, 7.0 and 10kGy became darker during storage and remained constant until the 8th week of storage [8]. Blueberries exposed to 1.1kGy and 1.6kGy became darker after irradiation and the “L” values increased. The “a” and “b” values decreased in all samples, compared with the control at the end of storage [9]. Gomes *et al.* (2008) [10] irradiated spinach leaves up to 1.0kGy showing that the color was not affected, however after 7 days, “b” value became significant higher (more yellowish), “a” value became lower (decrease of greenness), but no significant differences between the irradiated sample and control sample were observed in 15 days of storage. Silva *et al.* (2009) [11] analyzing palm *in nature* observed that the color results showed a significant change on irradiated samples with 2.0kGy after 14 days of storage. Nunes *et al.* (2009) [12], found under other conditions, that the color quality attribute of collards did not change when

submitted to e-beam treatment, with doses of 1.0 and 1.5kGy, for the fresh product package, at controlled refrigerated temperature.

Table 1. Grapes (control) during stockage of 4 weeks.

SAMPLES CONTROL			
	L	a	b
DAYS	\bar{x}	\bar{x}	\bar{x}
1	21,95	3,07	-0,14
7	20,26	3,64	0,50
14	19,74	3,90	0,67
21	19,71	3,99	0,45

Table 2. Grapes (radiated) during stockage of 4 weeks

SAMPLES RADIATED 4,5kGy			
	L	a	b
DAYS	\bar{x}	\bar{x}	\bar{x}
1	23,57	3,09	-1,17
7	23,69	3,53	-0,88
14	23,20	4,98	0,18
21	24,25	5,57	0,97

4. CONCLUSION

After irradiation with 4.5 kGy in grapes we found an increase in durability and a darkness color. These results possibly are due to the increase of phenolic compounds such as anthocyanins which are responsible for the color of the fruit. In our conditions we concluded that irradiation promote an extension in the shelf life of the grapes.

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