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MICROBIOLOGICAL ANALYSIS OF PEACH PALM *IN NATURA* SUBMITTED TO ^{60}CO RADIATION

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ABSTRACT

The palm tree (*Bactris gasipaes Kunth*) is a species with high potential benefits, because of the nutritional value of its fruits that could be used both in human and animals feeding and mainly for peach palm extraction. It represents a great source of dietary fiber and a moderate source of magnesium and iron. Food irradiation is a worldwide technology that aims to improve the product quality, in order to eliminate diverse microorganisms that can spoil the food. Radiation processing, in the recommended doses, causes very few chemical alterations and nutritional losses in foods, being considered insignificant and/or similar to other food treatments. The objective of this study was to evaluate the effect of irradiation on microbiological counts of mesophilic aerobic in the peach palm *in natura.* Samples were irradiated with 1.0 and 1.5kGy using a ^{60}Co multipurpose irradiator. Radiation treatment appeared to be a useful alternative to reduce microbial contamination in the samples analyzed.

1. INTRODUCTION

The peach palm tree, a native plant from Latin America, has been used extensively for centuries by natives of this region as an important food source. Heart of palm is extracted from several palm genera and species; however, those from genus *Bactris* are preferred because they are abundant, palatable, highly productive, and fast growing. The main countries exporters, in order of importance are Brazil, Costa Rica, Colombia, Venezuela, and Peru [1,2].

Peach palm tree yields two food products with potential commercial exploration: its fruit and the heart of palm. The fruits can be used for direct consumption (pulp), production of flour, cooking oil, and animal feeding [3].

Both national and international market of peach palm products are growing [4] and some countries are expanding its production in order to matches this continuous development (notably Brazil and Costa Rica) [5].

The edible portion of the palm is divided in three parts: basal or caulinar (heart), apical and central or foliaceous (cream or thole). The commerce of palm privileges the central part of the peach palm, selling heart and thole as by-products [6].

Heart of palm is gaining ground especially in the gourmet market. Fresh, dried or canned hearts-of-palm has been used for salads preparation, soups, roasted chips and fillings. It represents a great source of dietary fiber and a moderate source of magnesium and iron [4,7,8].

Even though many food conservation processing has been applied to ensure a safe food supply, microbial contamination is still a concern, even in advanced countries. There are plenty of food processing tools available to provide additional protection. One very promising treatment constitutes food irradiation, which is a processing of delivering ionizing radiation to foods to extend shelf life, inhibit sprouting and ripening and enhance food safety by reducing pathogenic microorganisms [9,10].

Food irradiation has been shown to be an effective tool to eliminate certain food borne-pathogens from food. Safety and efficiency of food irradiation has been approved by several authorities (FDA, USDA, WHO, FAO) and scientific societies based on extensive research [11,12].

The aim of this work was to evaluate the effect of gamma radiation processing to reduce microbiological contamination of peach palm *in natura.*

2. MATERIAL AND METHODS

2.1 Samples

Samples from peach palm (*Bactris gasipaes Kunth*) were provided by "Floresta Indústria e Comércio Ltda." located in the Ribeira Valley, Juquiá, São Paulo/SP – Brazil. Palm samples were divided in three parts (basal, apical and central), wrapped in PVC plastic film and stored in cold chamber around 8^{o}C.

2.2 Irradiation

Irradiation was carried out at room temperature at Instituto de Pesquisas Energéticas e Nucleares (IPEN-CNEN/SP) located in São Paulo, Brazil. A multipurpose ^{60}Co irradiator was used, with dose rate of 5 kGy/h. Gammachrome YR dosimeters (lot 64 - 530mm) were used for radiation dose measurement. Applied doses were 1 kGy and 1.5 kGy and after irradiation the samples were stored in cold chamber (around 8ºC).

2.3 Microbiological Analysis - mesophilic aerobic microorganisms count [13].

Samples were divided in 3 parts: basal, apical and central. Portions of 25g were stirred vigorously with 225mL of sterile peptone saline diluent (Merck) 0.1% for 1 minute at normal speed in stomacher (Seward) and serially diluted with the same diluent. From each dilution prepared, 1mL was transferred to a sterile Petri dish and added 15mL of plate count agar (Difco), previously melted and cooled to 47^{o}C (±2ºC). After homogenization and solidification of agar, plates were incubated upside down at 30ºC (± 1ºC) for 48h. The results were expressed in colony-forming units per gram (CFU/g).

3. RESULTS AND DISCUSSION

Mesophilic aerobic microorganisms are a well known indicator of the hygienic status of food products. Although in the Brazilian Resolution RDC n.12 of the National Sanitary Control Agency [14] it is not established microbiological patterns to mesophilic aerobic microorganisms in peach palm *in natura*, its knowledge is an useful tool to evaluate the hygienic status of foodstuffs. *In natura* peach palm analyzed in this study, non-treated by irradiation, showed mesophilic bacterial populations around 10^3.

According to [15], perishable goods, a high mesophilic count could indicate that there was an abuse during storage with regard to time/temperature binomial. It is worth mentioning that most of the pathogenic bacteria, including *Salmonella* and *Escherichia coli*, are mesophiles, thus high mesophilic populations indicate there were propitious conditions during processing/storage to its proliferation. Radiation treatment had a positive effect in reducing these microorganisms count, at least one log cycle reduction were achieved after radiation processing (Table 1).

Table 1. Mesophilic aerobic counts (mean CFU/g) obtained from *in natura* peach palm irradiated at different doses and storage time.

Samples	Storage Time (Days)	Mesophilic aerobic count (CFU/g)		
		Control	1kGy	1.5kGy
Basal part	01	6.7×10^3	4.9×10^2	3.3×10^2
	07	7.1×10^3	5.1×10^2	4.5×10^2
	14	7.1×10^3	5.7×10^2	4.7×10^2
	21	7.7×10^3	6.4×10^2	4.8×10^2
	28	8.2×10^3	6.8×10^2	5.3×10^2
Apical part	01	5.2×10^3	1.2×10^1	1.2×10^1
	07	5.9×10^3	1.5×10^1	1.4×10^1
	14	6.4×10^3	1.9×10^1	1.5×10^1
	21	6.5×10^3	2.2×10^1	1.5×10^1
	28	7.3×10^3	2.7×10^1	1.9×10^1
Central part	01	3.3×10^3	0.8×10^1	0.2×10^1
	07	4.5×10^3	1.4×10^1	0.4×10^1
	14	4.8×10^3	1.5×10^1	0.7×10^1
	21	5.7×10^3	1.9×10^1	1.2×10^1
	28	6.2×10^3	2.3×10^1	1.5×10^1

Applied radiation doses (1.0 and 1.5kGy) promoted a similar effect on bacterial populations. Regardless of the radiation dose applied, counts were nearly at the same level. It was also realized that during storage (up to 28 days) under refrigeration, mesophilic aerobic counts slightly increase, both in non-irradiated samples as well as in irradiated samples. Though all the parts of peach palm analyzed showed similar mesophilic counts, it was markedly noticed that the basal part of peach palm showed a higher mesophilic count in comparison to the other two. A probably reason of this would be that the basal part is the most external part and in such way is easily susceptible to exterior microbiological contamination and/or manipulation failures (Figures 1, 2, 3).

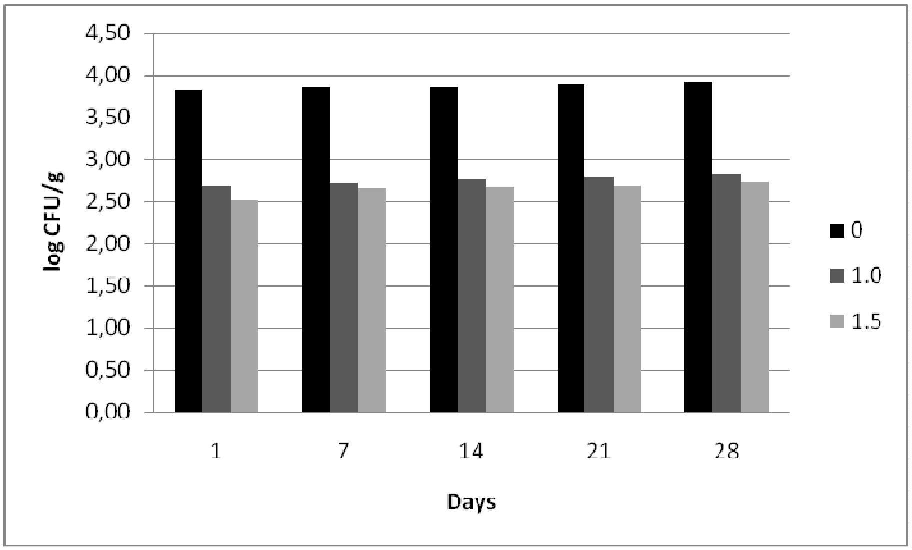

Fig. 1 – Mesophilic count (mean log UFC/g) in peach palm *in natura* irradiated (basal).

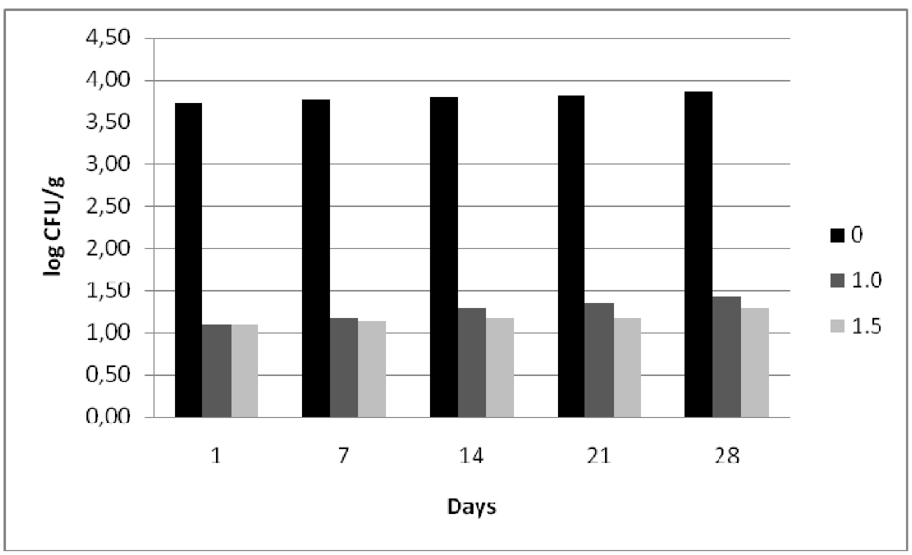

Fig.2 - Mesophilic count (mean log UFC/g) in peach palm *in natura* irradiated (apical).

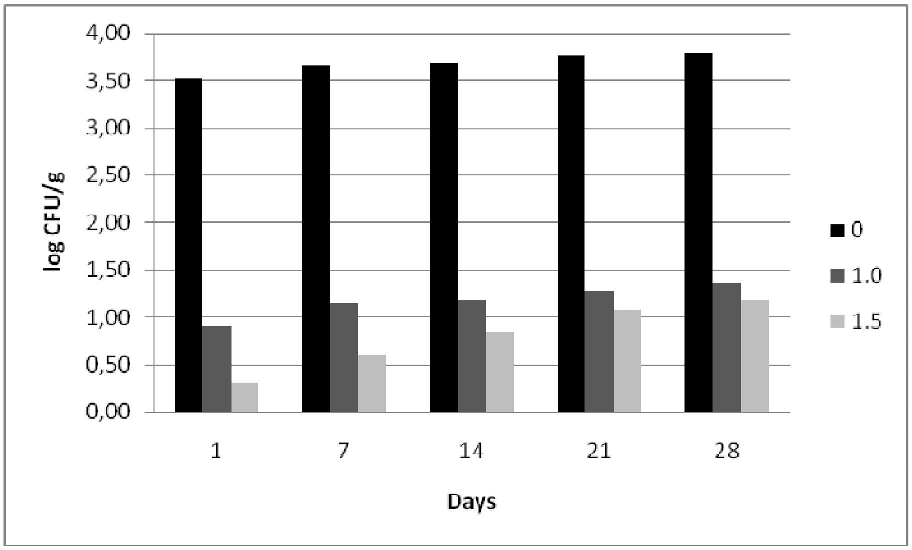

Fig.3 - Mesophilic count (mean log UFC/g) in peach palm *in natura* irradiated (central).

4. CONCLUSION

Microbiological analysis of peach palm *in natura* showed that radiation treatment would be an effective tool to enhance its food safety and increase its shelf life during transportation and storage.

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