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EFFECTS OF GAMMA RADIATION AND STORAGE ON COOKED PINE SEED (*ARAUCARIA ANGUSTIFOLIA*)

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ABSTRACT

The *Araucaria angustifolia*, is knowed as the "Pinheiro-do-Parana" Brazilian pine, Pine, Pine Tree Monkey, emerges as the main representative of the Rain Forest, also known as Araucaria Forest, part of the Atlantic Forest biome (Decree Law 750/1993). Despite being appreciated nutritious food, the gear has been widely used in Brazilian cook as other seeds, and its consumption in the more usual way roasted or boiled, however, certain foods have been developed, such as flour, pine seeds, artisan produced only due to poor commercial expression. Because of this, the aim of this work was to study the effect of storage under vacuum and gamma radiation on samples cooked pinion. Pine seeds after cooking were stored in vacuum packaging and polypropylene irradiated with 0 (control), 0.5, 1.0 and 3.0 kGy. Later they were stored at a temperature of 6º C. Analyzes were performed to characterize physical (weight, temperature, percentage of losses) and proximate composition (Humidity, fat, protein, ash and weight loss) of *A. angustifolia* (Bert.) pine seed after three months of storage. The results indicated that there was no significant difference between treatments at protein parameter. About the other parameters there was an increase humidity and decrease with ash and fat with the treatments.

INTRODUCTION

In small forest fragments of Araucaria *Araucaria angustifolia*, scattered throughout the South in South America, germinates an alternative for the conservation of one of the most typical scenarios and threatened the country in just over 100 years, the exploitative and disorderly nearly took the Araucaria the disappearance of the sovereign kind of unmistakable beauty, whose life - threatened by the court, the expansion of agriculture, livestock and commercial forests of pine (*Pinus elliottii*) is directly linked to the survival of many species of animals [1].

The pine seed is the seed of the pine, called *A. angustifolia*, also known as the Parana pine, originally from southern Brazil, which has an important role in power since the early indigenous people living in the South Brazilian Plateau. A pine tree yields an average of 300

cones, which give about 5 bags of 50 kilos of pine seed. Since this is a regional product, is often used during the fall and winter in the preparation of typical dishes from southern Brazil. The seed of Araucaria, the pine seed, has excellent nutritional value, consisting mainly of starch which provides a high-energy (2 kcal/g). Contain significant amounts of protein, minerals and vitamins complex B, is present in this seed lot, with about 4700 mg/100 g, although little recognized and publicized [2], [3].

The pine seed provides food for many animal species, especially rodents and birds, is also frequent in the fall and winter menu item in thousands of homes, mainly in South and Southeast of Brazil [3].

The pulp is the edible part, very tough when raw, and tenderer when cooked, made up mainly of starch. The seed is eaten, usually cooked in water, but is also used as flour in regional dishes. Pine seed flour, produced only by hand due to poor commercial expression, allows the making of scones, cakes and breads. In regions where there are still common pines is the preparation of pine seeds cooked in vinegar brine and pickled [3].

This work aimed to characterize the chemical composition of vacuum cooked pine seed.

MATERIAL AND METHODS

2.1. Material

The pine seeds were obtained in the horticultural trade in the city of Piracicaba and taken to the Laboratory of Radiobiology and Environment at CENA/USP. Were washed in running water, cooked in an autoclave per 15 to 20 minutes then were dried in plastic colander. After drying they were packed in plastic vacuum (Heat sealer).

2.2. Treatments

After assembly of the packaging were irradiated in a source of Cobalt-60, Gammacell-220 under a dose rate of 0.725 kGy /hour, with doses of 0 (control), 0.5, 1.0 and 1.5 kGy (temperature of irradiation was of the 25ºC) and stored in a refrigerator at a temperature of 5°C.

2.3. Methods

2.3.1. Physiochemical analysis

2.3.1.1. Humidity

The method used was the AOAC [4]. Be determined by weight loss. Was performed in weighing 1g porcelain crucible and heated at 105°C for one night. After this procedure the crucible was cooled in a desiccator to room temperature and weighed on an analytical balance.

2.3.1.2. Ash

The method used was the AOAC [4]. Be determined by weight loss. Was performed in weighing 1g porcelain crucible and heated in an oven by increasing the temperature up to 550 °C for 4 hours, After this procedure the crucible was removed from the flask placed in a desiccator until room temperature crucibles were weighed more ashes to expressing the result as a percentage.

2.3.1.3. Protein

The protein content was determined by AOAC [4].

2.3.1.4. Fat

Fat was determined by extraction with methanol and chloroform, according to the method described by [5].

2.3.1.5. Fresh weight loss

Was determined by the difference in percentage (%) between the initial and end of each repetition, through an electronic precision scale.

Was assessed weight loss. The packs were heavy in the first and 6-9 (months) storage. It was estimated then the difference in weight loss of trays to check for possible differences in weight loss between treatments.

After 3 months of storage the samples were lyophilized for the following analysis: moisture, ash, protein, ether extract.

2.4. 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 ($p \leq 0.05$), with use of the SAS program [6].

RESULTS AND DISCUSSION

3.1. Physiochemical analysis

Variations in humidity, ash, protein and fat obtained for precooked pine seed and irradiated are shown in Table 1.

Table 1. Means of pine seed humidity, ash, protein and fat.

DOSES	Humidity (% db)	Ash (% db)	Protein (g/100g)	Fat (g/100g)
0 (controle)	91.96[1b]	6.17[a]	7.00[a]	2.43[a]
0.5kGy	93.21[a]	5.29[ba]	8.87[a]	2.28[a]
1.0kGy	93.27[a]	4.29[b]	7.99[a]	2.12[ab]
3.0kGy	92.98[ab]	5.42[ba]	8.05[a]	1.52[b]

[1] Media
[2] Medias with different word(s) in the vertical they differ significantly at the level of 5%.

1.1.1. Humidity

The according with Table 1, we can observe that the humidity increased statistically significantly with increasing the dose.
The values obtained for cooked pine seed differ of [7, 8] and [9], who report values close to 50% for this parameter.

1.1.2. Ash

In Table 1 we can observe that there was a decrease in the value of the ashes with increasing dose although a slight increase in the level of treatment at a dose of 3.0 kGy.

The samples ash (% db) were higher than those reported by [10] of 0.04%, and those found by [11] and [8] which were around 0.4%, but close to the values reported by [9] that found that values around 3.25%.

1.1.3. Protein

About protein tenor there was no statistical difference between treatments indicating that the doses used did not influence this parameter.

The values obtained for cooked pine seed protein was far superior to those obtained by [7] and [12] who found values close to 2.31g/100g and 3.00g/100 samples respectively.

1.1.4. Fat

By the values given for fat, we can be seen that there was a reduction of the content according to the increase in dosage.

Nevertheless, only the values of higher doses are agree with the values obtained by [7] and [12] who found values around 1.3g/100g sample for lipids. The values obtained by [8], were far below, lying around 0.3g/100g sample, and the need to degrease the samples, to remain content to their analysis.

3.1.5. Weight fresh loss

By the Figure 1 we can observe that all samples lost a little weight fresh along time proportionally. It was expected because packs are not perfectible impermeable.

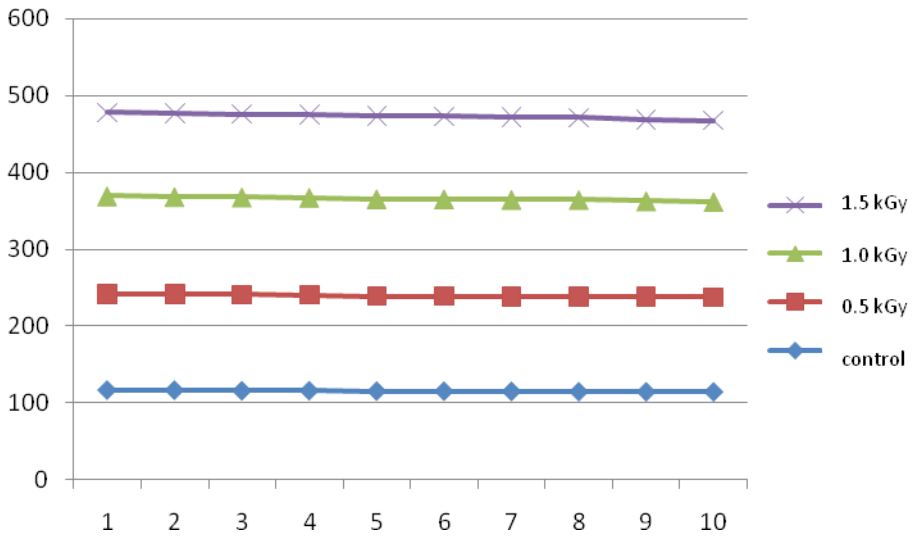

Figure 1 – Grafic apointed the fresh weight loss per a period of 9 months

Are agree with results of [7],[8] and [9] that obtained in their works that over time the seeds lose humidity.

In her work [8] determines that the loss of moisture in pine seed is due to structural feature of the starch in the seed, which lacks the ability to retain water for long periods.

4. CONCLUSION

The results indicated that there was no significant difference between treatments at protein parameter. About the other parameters there was an increase humidity and decrease with ash and fat with the treatments.

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