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EFFECT OF IRRADIATION ON THE pH FOR 11 COMMERCIAL SALAD DRESSINGS NEAR EXPIRATION DATE

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ABSTRACT

The demand for salad dressings has evolved significantly in recent years and has become a frequent option in the meal. The pH values for salad dressings are low, precisely because they are emulsions acidified by adding ingredients, such as, acetic acid and / or citric acid and preservatives like benzoic acid and / or sorbic those provide an environment unfavorable to the growth of many microorganisms. However, the deterioration of such products occur as a result of growth of lactobacilli, bacilli, yeasts, once damaged, can present loss of taste and dark spots on the surface as an indication of yeast colony formation. Whereas, the positive effects of gamma irradiation on food, such as improved safety and stability of food products on shelves, the pH is a key factor for assessing not only the conservation, but also to the quality. The aim of this study was to reassess the effects of radiation on the pH of 9 varieties of commercial salad dressing after 6 months of storage, near the expiration of samples validity. The samples were acquired on the market of Sao Paulo and subjected to low doses of radiation at irradiator Multipurpose IPEN / CNEN-SP. The irradiated samples were compared to control. Statistical analyzes were performed using the program Graph Pad 5 and adopting a significance level of 5% ($p < 0.05$).

1. INTRODUCTION

The consumption of salad dressings in Brazil only in 2009, increased by 14.3% according to Nielsen data (market research company worldwide). In 2011, this volume in supermarkets grew 4.3%, an increase of 2723 tonnes in 2010 to 2839 tonnes in 2011 [1].
The demand for salads and salad dressings has evolved significantly in recent years due to the consumption of healthier and more practical foods for consumption [2].
Given the growing economic importance of food production emulsified as salad dressings, it takes a broad knowledge of their physicochemical properties. [3].
The physico-chemical properties and the emulsion stability are determined by the type and concentration of various ingredients used for the homogenization of these and the condition of the process employed for their preparation [4].
The health surveillance agency ANVISA [5] through RDC No. 12 regulates the microbiological standards for foods such as salad dressings. However, it is well known that manipulation may be a problem for cross-contamination and recontamination.
Due to the commercial importance of food in the form of emulsions, ensuring the safety of these have been studied for possible contamination or spoilage bacteria and pathogens that may be present, for example, raw vegetables or spices [6; 7].
Although the pH of salad dressing minimizes the presence of pathogens, the industry does not

renounce the use of preservatives to ensure safety of these. The demand for healthy foods without additives and preservatives, or the best combination of these preservatives to be controlled microbial load, extended shelf life and kept the physicochemical properties have been more than the scope of scientific research, but the goal for Industry [8; 9]. Because of the positive effects of gamma radiation sterilization in preventive, improvement of the security and stability of food products on shelves, its use in food reaches a wide diversity in research areas [10]. In recent years, they have been shown the benefits of irradiation in different fields of application, such as: control of insect infestation, delayed fruit ripening, reduction of microbial load, inhibiting sprouting in bulbs and tubers among others.

Given the positive aspects of the process of gamma irradiation on food compared to some commercial post-production processes, such as microfiltration and heat treatment that may lead to low productivity, destruction of nutrients and undesirable changes in sensory quality and microbiological for cross-contamination during the reconditioning is important to check the chemical safety and acceptability of these [11].

The aim of this study was to determine the pH of 11 commercial salad dressings ready for consumption treated with medium doses of gamma radiation, after a period of 6 months of storage, when the samples were near the maximum expiration date in order to observe the Stability samples.

2. MATERIALS AND METHODS

2.1. Materials

It was used nine national varieties of salad dressings according Table 1. These were purchased in the national market in São Paulo and sent to the IPEN / CNEN-SP. The selection of dressings was based according to popularity, therefore to the greater availability and low value of these on the market.

TABLE 1 – Types of salad dressings used in analyses.

Code	Salad Dressing	Manufacturer
D1	Homemade	Hellmann's
D2	Honey and Mustard	Liza
D3	Yogurt	Liza
D4	Parmesan	Hellmann's
D5	Italian	Hellmann's
D6	Oriental	Taeq
D7	Italian	Master Food
D8	Sicilian lemon with sesame	Taeq
D9	Honey and Mustard light	Taeq
D10	Lemon	Liza
D11	Italian light	Taeq

2.2. Treatment: Irradiation

The salad dressings were irradiated in the Multipurpose Gamma Source (IPEN / CNEN-SP, Sao Paulo - Brazil) and were divided in three groups (treatments): Control (C), 3 kGy dose and 5 kGy dose. Amber Perspex Batch 3042 S 603-651nm dosimeters were uses for the measurement of radiation dose.

2.3. pH

The pH was Measured using a potentiometer (Micronal brand - model B274) from the Laboratory of Food Irradiation - CTR / IPEN-SP.
The electrometric processes was chosen in this study. The pH was carried out at 25°C in triplicate for each salad dressing. For each measured was used 50 ml of dressing. It was mixed and placed in a beak subsequently; the electrode and the thermometer from potentiometer were placed in the samples under magnetic stirring to obtain the values [12, 13].

2.4. Statistical Analysis

The results were statistically analyzed by analysis of variance One-Dimensional Analysis of Variance (One-Way-ANOVA) followed by Tukey test. All statistical analysis was performed using the program Graph Pad Prism 5 and adopting a significance level of 5 % ($p < 0.05$), expressed as the mean results ± standard deviation.

3. RESULTS

TABLE 2 – Averages of pH at commercial salad dressings, irradiated and control, after six months of storage, near expiration date of validity.

Dressings	Control	3 kGy	5 kGy
D1	3,48 ± 0,01 [a]	3,55 ± 0,01 [b]	3,50 ± 0,01 [c]
D2	3,20 ± 0,01 [a]	3,21 ± 0,01 [a]	3,17 ± 0,01 [b]
D3	3,12 ± 0,01 [a]	3,11 ± 0,01 [a]	3,14 ± 0,01 [b]
D4	3,42 ± 0,01 [a]	3,42 ± 0,01 [a]	3,42 ± 0,01 [a]
D5	3,67 ± 0,01 [a]	3,67 ± 0,01 [a]	3,67 ± 0,01 [a]
D6	4,29 ± 0,01 [a]	4,29 ± 0,01 [a]	4,30 ± 0,06 [a]
D7	3,73 ± 0,27 [a]	3,71 ± 0,25 [a]	3,71 ± 0,24 [a]
D8	3,73 ± 0,01 [a]	3,71 ± 0,01 [a]	3,71 ± 0,01 [a]
D9	4,02 ± 0,01 [a]	4,06 ± 0,01 [b]	3,95 ± 0,01 [c]
D10	3,23 ± 0,01 [a]	3,22 ± 0,01 [a]	3,23 ± 0,01 [a]
D11	3,55 ± 0,01 [a]	3,55 ± 0,01 [a]	3,55 ± 0,01 [a]

a, b,c, Averages followed by the same letter (Line) do not differ by Tukey test at 5% level of significance.

4. DISCUSSION

The pH values of the different salad dressings are shown in Table 2. All commercial salad dressings, after six months of storage presented the pH value between 3.11 and 4.30.
All treatments of these 11 commercial salad dressings studied near its manufacturing date showed similar pH value and no significant difference in pH as compared to control (data not shown).
The samples values of pH measurements to 3 kGy and 5 kGy treatment reassessed after a storage period of approximately six months also did not show a significant difference compared to control except dressings D1 and D9 for all treatments and D2 and sauces D3 in a dose of 5 kGy (TAB 2).
Despite this difference is found necessary to emphasize that misalignments are unable to change the profile acid, characteristic of this class of products.
Most pH values (D1, D4, D6, D8, D9 and D10) increased slightly after the storage period compared to the values found in the tested samples near the date of manufacture. Unlike the sauces D1 and D4 that demonstrated a small decrease in their pH measurements after being stored.
However, any change in pH before or after storage, should not be attributed to the irradiation process, but mainly as a result of some chemical change in a particular characteristic ingredient of the composition of each type of sauce.
Although the composition of sauces is known the label of commercial products ready for consumption as the dressings evaluated, does not reveal the proportion of each ingredient in the formulation. This lack of information difficult to identify exactly what the ingredient that may have caused the variation in the measurements of pH, since the formulations contain the same ingredients as the base.
However, the value range of pH measurements of the 11 treatments commercial salad dressings studied was unaffected even after being stored. This result is consistent with the pH range given by Beuchat et al. (2006) [7].
Thus, it is possible that the irradiation process can positively contribute to the prolongation of shelf life of such products as food sauce ready for consumption, since the stability of acidity is important as an indicator of the conservation of dressings, as a decomposition process or by hydrolysis, oxidation or fermentation, usually alters the concentration of hydrogen ions [12].

5. CONCLUSIONS

Most dressings did not differ significantly when submitted to irradiation. The gamma radiation treatment did not alter the pH range characteristic of salad dressings. For this reason, results of this study suggest that the use of gamma processing may be the treated for preservation in the industry which the negative effects of heat treatment would be discarded.

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