



Effect of Some Preservatives on the Peroxide Value and Carbohydrate Content of Dry Melon Seeds

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ABSTRACT

The present study sought to evaluate the effect of some chemical preservatives (sodium chloride, ascorbic acid, citric acid, sodium benzoate) concentration on the peroxide value and carbohydrate content of processed melon seeds. Graded amount of the preservatives (0.15, 0.25, 0.5, 0.75 g) were added respectively to the equal weight (75g) of the processed melon seeds and a control that had no preservative. The peroxide value and carbohydrate contents of the processed and treated melon seeds were determined on a weekly basis, for four weeks. Data collected from the study shows increase in the peroxide value of sample treated with sodium chloride compared to the control while there is a decrease in the peroxide values of sample treated with ascorbic acid, citric acid and sodium benzoate. This result did not show sodium chloride as an effective agent in preventing rancidity. The carbohydrate content of each group was found to decrease as the week progressed compared to control. It may therefore be concluded that sodium chloride, ascorbic acid, citric acid and sodium benzoate are not effective agent in stabilizing the carbohydrate content in processed melon seeds.

Keywords: Melon seeds; Chemical preservative; Peroxide value; Rancidity; Carbohydrate

INTRODUCTION

Melon seeds which are locally called egusi also known as *Citrilluscologyntsis* is the biological ancestors of the watermelon now found all over the world but originated from West Africa. It is cultivated in the tropical countries particularly in West Africa, especially Nigeria for the food in the seeds and as a crop inter planted with maize, cassava, and yam [1]. Melon seeds (*Citrilluscologyntsis*) have both nutritional and cosmetic importance. They are rich in oil and protein, although none of this oil has been used on an industrial scale; many are used as cooking oils in some Africa and Middle Eastern countries [2].

Carbohydrates are aldehydes or ketone compounds with multiple hydroxyl groups. They are molecules that contain oxygen, hydrogen and carbon atoms. They are important compounds for storing and transporting energy in most organisms including plants and animals and are major structural elements in many organisms e.g. cellulose in plants. Carbohydrates are classified into three: monosaccharide, disaccharide and polysaccharide. They have a general formula $C_nH_{2n}O_n$ [3].

Rancidity is a term used to refer to the deterioration in fat and fatty foods. This deterioration is a result of oxidation. Oxidation of fats results in the replacement of oxygen for hydrogen ion in the fatty acid molecule. Rancidity brings about unpleasant odour in food. Unsaturated fats are more susceptible to oxidation than saturated fats. Factors that accelerate fats oxidation include trace metals, salt, light, bacteria and moulds. Fats oxidation can be retarded by the use of antioxidants [4].

Ascorbic acid is an antioxidant with a board group of compounds that destroy single oxygen molecules also called free radicals thereby protecting against oxidative damage.

Sodium benzoate is widely used as food preservative, it is the sodium salt of benzoic acid. It is by reacting sodium hydroxide with benzoic acid. Citric acid is naturally occurring acid which is found in large quantities in fruits notably citrus fruits such as oranges, lemon and certain berries. It is widely used in the food industries as a preservative by increasing acidity. The low pH conditions produced prevent bacterial and fungal growth, therefore prolonging the life of the food or drink [5]. Salts preservative ability was a foundation of civilization. It eliminated dependency on the seasonal availability of food and allowed travel over long distances and for vital food additive. Its preservative properties in food have been found in the chlorine atom present in it. Chlorine atom has anti-microbial properties which kills germs but salt as a preservative agent has negative effect on food because it makes the food taste harsh and can raise the blood pressure [6].

MATERIALS AND METHODS

Chemicals

Chloroform, methanol, distilled water, Nessler's reagent, acetic acid, potassium iodine (KI) powder, potassium iodide solution, sodium thiosulphate, starch solution, solvent mixture (consisting of glacial acetic and chloroform a ratio of 2:1) All are product of Evans Medical PLC, Nigeria.

Sample Preparation and Treatment

Melon seeds (dehulled) were bought from Agenebode market in Edo State and processed by using a home blender. 75 g each of the processed melon was put into 5 different containers. Graded amount of the preservatives (0.15, 0.25, 0.5, 0.75) g were added to each container except the first that served as control. From these content samples were taken on a weekly basis for determination of peroxide values and carbohydrate contents.

Extraction of Lipids

Melon seeds lipids was extracted with chloroform-methanol (1:2 v/v) mixture as described by Bligh and Dyer [7]. 90 ml chloroform and methanol mixture was added to 20 g of grinded dry melon seeds and allowed to settle. The supernatant was decanted and the residue re-extracted with 100 ml of the solvent mixture. The pooled supernatants were diluted with 125 ml of chloroform and distilled water to form two phase solvent system. The phases were separated with a 500 ml glass separating funnel. The lower chloroform phase containing the lipid was recovered using 5 ml syringe. It was put in a boiling tube with anti-bumping agent in it. Evaporation was done on a hot water bath. After evaporation it was allowed to attain room temperature before it was weighed.

Assays for Peroxide Value

1 g of the oil was weighed into a 200 ml conical flask then 25 ml of 2:1 v/v glacial acetic acid + chloroform solvent were added. 1 ml of potassium iodide was then added and the mixture was left in the dark for 1 minute. 30 ml of water was added and the mixture titrated with 0.002 N sodium thiosulphate using 5 ml starch indicator.

$$P_v(\text{mmol/kg}) = \frac{0.5 \times (\text{ml. Thiosulphate} \times \text{Normality})}{\text{weight of oil}}$$

Carbohydrate Determination

The carbohydrate content was determined by a calorimetric method (phenol-sulfuric acid method). A clear aqueous solution of the sample to be analysed is placed in a test tube and then phenol and sulfuric acid was added. The solution turns a yellow-orange colour as a result of the interaction between the carbohydrate and the phenol. The absorbance was read at 420 nm which is proportional to the carbohydrate concentration.

Statistical Analysis

All analysis was run in triplicates. The mean value and standard deviation were calculated using the Microsoft Excel Software (Microsoft Corporation, Redmond, WA).

RESULTS AND DISCUSSION

Food is no doubt the most basic necessity for one to effectively function in his own ecosystem. It is a substance that often composed of carbohydrates, lipids, protein, vitamins and water are eaten or drunk by animals or humans for nutrition [8].

From Table 1, it is obvious that increase in the concentration of sodium chloride (NaCl) in the dry melon seed will cause an increase in the peroxide value as observed in the four week period of experiment as compared to the

control. The reason for these increases in the peroxide value in the sample may be due to the presence of Sodium Chloride as this agent is known to increase oxidation since it can readily donate its valence electron.

From Table 2, it is obvious that as the week progressed there is a decrease in the peroxide values of the treated melon seeds compared to the control. The reason for this decrease in the peroxide values in the treated melon seed may be due to the presence of ascorbic acid, as this antioxidant is known to decrease rancidity by reducing the level of free radicals present in the sample.

From Tables 3 and 4, the peroxide value of the treat melon seeds also decrease as the week progressed compared to the control. This decrease may be due to the presence of citric acid which produces low pH condition preventing bacterial and fungal growth, therefore, prolonging the shelf life of the melon seeds. The decrease in the peroxide value of melon seed treated with sodium benzoate may also be due to the fact that there may be other microbes that may be ineffective at the concentration of sodium benzoate used in the experiment. Therefore, inhibiting the growth and survival of microorganisms caused the food spoilage.

From Tables 3-8 the carbohydrate content in the samples are observed to reduce over time, in spite of the fact that sodium chloride, ascorbic acid, citric acid and sodium benzoate has been ascribed a good preservative [9]. The reason for this significant reduction in carbohydrate content in the sample may be due to the fact that there may be other microbes that maybe very effective at the concentration of the preservatives used in the experiment.

Table 1: Effect of sodium chloride on peroxide value (mmol/kg) of melon seeds

Duration	Control	0.15 g	0.25 g	0.5 g	0.75 g
Week 1	0.47	2.68	3.38	3.7	3.75
Week 2	0.56	2.89	3.67	3.91	3.84
Week 3	1.8	3.22	3.52	3.96	3.93
Week 4	1.92	3.24	3.82	4.05	4.07

Table 2: Effect of ascorbic acid on the peroxide value (mmol/kg) of melon seeds

Duration	Control	0.15 g	0.25 g	0.5 g	0.75 g
Week 1	0.47	3.2	3.16	2.98	2.89
Week 2	0.56	3	2.85	2.85	2.73
Week 3	1.8	2.8	2.62	2.7	2.66
Week 4	1.92	2.64	2.6	2.6	2.52

Table 3: Effort of citric acid on the peroxide value (mmol/kg) of melon seeds

Duration	Control	0.15g	0.25g	0.5g	0.75g
Week 1	0.47	3.8	2.56	2.34	2.2
Week 2	0.56	2.74	2.49	2.32	2.16
Week 3	1.8	2.6	2.34	2.29	2.08
Week 4	1.92	2.52	2.28	2.14	1.85

Table 4: Effect of Sodium benzoate on the peroxide value (mmol/kg) of melon seeds

Duration	Control	0.15 g	0.25 g	0.5 g	0.75 g
Week 1	0.47	3.72	3.66	3.58	3.56
Week 2	0.56	3.7	3.62	3.54	3.5
Week 3	1.8	3.55	3.58	3.50	3.44
Week 4	1.92	3.4	3.27	3.38	3.29

Table 5: Effect of sodium chloride on the carbohydrate content of melon seeds

Duration	Control	0.15 g	0.25 g	0.5 g	0.75 g
Week 1	0.78	0.85	0.81	0.77	0.72
Week 2	0.74	0.82	0.78	0.73	0.65
Week 3	0.66	0.79	0.72	0.67	0.54
Week 4	0.6	0.74	0.68	0.61	0.5

Table 6: Effect of ascorbic acid on the carbohydrate content of melon seeds

Duration	Control	0.15 g	0.25 g	0.5 g	0.75 g
Week 1	0.78	0.74	0.71	0.67	0.69
Week 2	0.74	0.69	0.63	0.58	0.66
Week 3	0.66	0.66	0.61	0.52	0.57
Week 4	0.6	0.57	0.58	0.46	0.42

Table 7: Effect of citric acid on the carbohydrate content of melon seeds

Duration	Control	0.15 g	0.25 g	0.5 g	0.75 g
Week 1	0.78	0.75	0.74	0.79	0.75
Week 2	0.74	0.67	0.7	0.66	0.69
Week 3	0.66	0.65	0.69	0.56	0.65
Week4	0.6	0.61	0.63	0.52	0.55

Table 8: Effect of sodium benzoate on the carbohydrate content of melon seeds

Duration	Control	0.15 g	0.25 g	0.5 g	0.75 g
Week 1	0.78	0.76	0.78	0.75	0.77
Week 2	0.74	0.69	0.73	0.7	0.61
Week 3	0.66	0.63	0.7	0.66	0.59
Week 4	0.6	0.61	0.68	0.62	0.56

CONCLUSION

It can be concluded that an increase in sodium chloride concentration tends to increase the peroxide value of dry melon seeds, while citric acid, ascorbic acid and sodium benzoate were able to offer some retardation in the spoilage process of the treated melon seeds with time by reducing the rate of rancidity. However, the carbohydrate content of each treated group was found to decrease as the week progress compared to the control. This result did not show sodium chloride, ascorbic acid, citric acid and sodium benzoate as effective agent in stabilizing the carbohydrate content in processed melon seeds.

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