Effect of Antioxidants on the Shelf Life of Cashew Kernels

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Abstract

Cashew kernels have high nutritive value. Upon exposure to air kernels turn rancid and their nutritive value decreases. From this study it is concluded that chemical treatment using antioxidants reduced oxidative rancidity but failed to prevent deterioration in organoleptic characteristics and decrease in protein and carbohydrate content of stored kernels.

Introduction

The change that a lipid undergoes leading to an undesirable flavour and odour is called rancidity (1). Cashew kernels on exposure to air undergoes oxidative rancidity. Here, fats react with oxygen producing products with undesirable characteristics. Also, nutritive value of such spoiled kernels show a decrease (2).

The role of chemicals in food preservation has been recognised for a very long time now. Many chemicals protect flavour, texture and storage stability of food stuffs (2). Antioxidants used to preserve food materials containing fats. They function as free radical accepters, terminating the oxidation of all at the initial steps. Synergism has been noticed in the case of antioxidants where the combined effect of two or more antioxidants produces an effect greater than a single one alone (2).

Materials and methods

Commercially available plain cashew kernels sealed in CO2 filled packets were used as sample. Different antioxidant compositions as detailed in Table - 1 were used to treat the kernels by three methods.

1. Wet treatment in which the antioxidants were dissolved in water and kernels dipped in it for 5 minutes and spread on a filterpaper for drying.

2. Dry treatment in which the antioxidants were mixed on percentage by weight basis of cashew kernels and mixed with them and

3. Wet followed by dry treatment in which kernels dipped in solution were dried in over at 53°C for 40 minutes.

Treated kernels as well as control (untreated) kernels were stored at 80% humidity. After 20 days oil was extracted using Soxhlet apparatus and oxidative rancidity measured by determining iodine value and peroxide value. Protein and carbohydrate contents of defatted seed meals were determined by Lowry *et al* (3) and anthrone/Sulphuric acid method respectively.

Moisture content of the treated kernels was determined and computed using the equation :

$$\% \text{ of moisture content} = \frac{\text{Initial weight - Final weight}}{\text{initial weight}} \times 100$$

Results and discussion

1. *Effect on orgnoleptic characteristics*

The antioxidant treatments tested falled to prevent

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deterioration of organoleptic characteristics of stored kernels. Generally all the treatments resulted in unfavourable characteristics like browning, mold growth etc. (Table - 2). Browning may be attributed to the ability of antioxidants to undergo discolouration (4). Water soaked appearance was due to the hygroscopic nature of antioxidants and moisture absorption of raw kernels. The difference in treatment response can be attributed in the water content absorbed by treatment kernels (Table - 3). Water content was found to Increase in the order wet-followed - by-dry, dry and wet treatments. In all the treatments high concentration of antioxidants resulted in increased deterioration as the moisture content is higher due to their hygroscopic nature.

2. *Antioxidants are not effective in preventing decrease in protein and carbohydrate content of stored cashew kernels :*

The study shows that under high humidity kernels show a decrease in protein and carbohhydrate contents (Table - 4). Use of antioxidants could not prevent this. In fact as their concentration is increased the decrease in these components is more.

3. *The proportion, concentration and mode of application of antioxidants influenced rancidification :*

The rancidification was maximum, as evident from iodine value, in wet treatment with maximum concentration of citric acid and ascorbic acid. It was minimum in wet followed by dry treatment with low concentration of citric acid and ascorble acid (Table 4).

High concentration of antioxidants were undesirable as they promoted mold growth leading, to hydrolytic rancidification.

Thus it may be concluded from this study that antioxidant treatments reduced oxidative rancidification but could not prevent deterioration in organoleptic characteristics and nutritive value.

Table - 1

Treatment method	Percentage composition			
	Citric acid	Ascorbic acid	Propyl gallate	Code
Wet	5	5	-	W-1
	10	10	-	W-2
	10	5	-	W-3
Dry	5	5	-	D-1
	10	10	-	D-2
	10	5	-	D-3
	-	-	5	D-4
Wet Followed by dry	5	5	-	W/D-1
	10	10	-	W/D-2
	10	5	-	W/D-3

Table - 2 Organoleptic characteristics of kernels subjected to antioxidant treatments : A wet treatment : B Dry treatment : C. wet followed by dry treatment.

Treatment code		Time in days	Organoleptic characteristics		
			Browning	Rubber like texture	Mold growth
A	W-1	2	+	+	-
		10	++	+	+
		14	+++	+	+++
	W-2	2	+	+	-
		8	++	+	+
		14	+++	+	+++
	W-3	1	-	+	-
		2	+	+	-
		10	++	+	+
		14	+++	+	+++
B	D-1	2	-	+	-
		4	+	+	-
		16	+++	+	+
	D-2	3	+	+	-
		12	++	+	+
		16	+++	+	+++
	D-3	2	-	+	-
		4	+	+	-
		14	++	+	+
		16	+++	+	+++
	D-4	2	+	+	-
		14	++	+	-
		17	++	+	+
C	W/D-1	2	+	+	-
		5	++	+	-
		18	+++	+	+
	W/D-2	2	+	+	-
		3	++	+	-
		17	+++	+	+
	W/D-3	2	-	+	-
		5	+	+	-
		18	+++	+	+
	Control	4	+	+	-
		17	++	+	-
		24	++	+	+
		30	+++	+	++

(-Nil. +mild, ++ Moderate, +++ Maximum)

Table - 3 Estimation of moisture content of antioxidant treated kernels

Treatment	Moisture content (%)
Control	9.54
W-1	11.8
W-2	11.31
W-3	11.22
D-1	10.03
D-2	10.96
D-3	10.45
W/D-1	9.89
W/D-2	10.28
W/D-3	9.7

Table - 4 Effect of antioxidant treatment on rancidification of cashew kernels, protein content and carbohydrate content.

Treatment code	Protein (mg)/g kernel	Carbohydrate (mg)/g kernel	Iodine value	Peroxide valaue
Control	107	84.24	78.51	-
W-1	91.5	73	81.53	-
W-2	70	68.75	76.34	-
W-3	86	71.25	81.08	-
D-1	101.5	78	81.5	-
D-2	85	71.5	79.74	-
D-3	91.5	74.5	81.02	-
D-4	75.25	67.75	77.4	-
W/F-1	115.5	82.25	84.09	-
W/D-2	97.5	76	78.19	-
W/D-3	105	79.75	78.73	-

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