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Effect of packaging methods and storage conditions on quality characteristics of osmotic dehydrated coconut

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Abstract

Objective of this study was to evaluate the effect of packaging methods and storage conditions on quality of osmotic dehydrated coconut. The samples T₁ and T₂ stored at room temperature had higher free fatty acid content than the samples stored at refrigerated condition. The free fatty acid content of T₁ before storage was 0.404 which had increased to 0.564 (C₁P₁), 0.538 (C₁P₂), 0.496 (C₂P₁) and 0.489 (C₂P₂) per cent of oleic acid. The peroxide value of control sample was changed from 4.52 to 8.34 (C₁P₁), 7.46 (C₁P₂), 6.77 (C₂P₁) and 6.21 (C₂P₂) mEq/kg at the end of storage. The initial peroxide values of T₁ and T₂ were 4.45 and 4.38 mEq/kg. The corresponding values at the end of storage were 5.79 (C₁P₁), 5.32 (C₁P₂), 5.13 (C₂P₁) and 4.95 (C₂P₂) for T₁, 5.19 (C₁P₁), 5.07 (C₁P₂), 4.92 (C₂P₁) and 4.89 (C₂P₂) mEq/kg for T₂.

Keywords: Coconut, vacuum, dehydration, refrigeration, storage

Introduction

Dehydrated coconut is the edible, dried-out shredded coconut meat prepared from fresh kernel of fully matured coconut. In the bakery and confectionery industry desiccated coconut is a favoured ingredient^[5]. Food dehydration is one of the most challenging unit operations in food processing. During the osmotic dehydration, water flows from the product into the osmotic solution, while osmotic solutes are transferred from the solution into the product. It is an effective technique to reduce the water content in processed product to improve sensory, functional, nutritional properties and reduce or inhibit microbial growth. Compared to the other preservation treatments, osmotic dehydration shows significant advantages such as environmentally acceptability, energy efficiency, providing stable and quality products^[12]. The shelf-life of dehydrated products depends on many deleterious reactions, which in turn depend on the specific nature of food materials, storage condition and nature of packaging method. The undesirable changes that occur are due to off flavours, browning and loss of pigments and nutrients. The factors mainly responsible for deteriorations are moisture, storage temperature and period, oxygen and light^[16]. In the industrialized world less than 2% of food spoils between production and consumption, whereas in developing countries, 30-50% of all food is wasted, largely due to inadequate packaging^[9]. Packaging of dried product enhancing the shelf life of product and act as barrier against air borne contamination or loss and gain in moisture thus ensuring the retention of all the desirable quality of product during storage. Processed foods can be preserved for extended periods by a combination of aseptic packaging to exclude microbes and oxygen as well as to maintain a moderate temperature. During storage, one or more food characteristics can reach an undesirable state and consequently the consumer may reject the product or the product can be detrimental to the health of the consumer^[17]. Therefore, a study was undertaken to reveal the effect of packaging methods and storage temperature on quality characteristics on osmotic dehydrated coconuts.

Methods and materials

Processing of osmotic dehydrated coconut

The steps involved in the processing of osmotic dehydrated coconut are preparation of coconut, preparation of sugar solution, osmosis, dehydration, packaging and storage.

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The selected coconuts were broken into two halves and scraped by using a stainless steel scraper. The scraped uniform size coconut was steam blanched for 10 min. Sugar solution containing 10 and 20° brix were prepared. The coconut scrapings and sugar solution were taken in the ratio of 1:2. The blanched coconut scrapings were soaked individually in sugar solutions. To preserve the colour and to prevent the spoilage of coconut samples 250 ppm of SO₂ was added to the soak solution and kept for 24 hours. After osmosis, the solution was drained out from the coconut scrapings and dried separately in the mechanical dryer at 60° C for 4 to 5 hours (up to 4.0% moisture). Each dried sample was cooled immediately.

Packaging and storage

The dehydrated coconut samples were packed in food grade polyethylene bags (300-gauge thickness) under with and without vacuum condition. The packed samples are kept at room and refrigeration temperature to study the storage quality. The changes in the quality characteristics were analysed once in 30 days during the storage period (6 months).

Chemical analysis of osmotic dehydrated coconut

Moisture content was determined by weight loss of 5 g sample after heating at 110°C for 2 hours^[1]. Free fat acid value was expressed as mg of potassium hydroxide required to neutralize free fatty acids of 100 g sample. Peroxide value was determined by titration against thiosulphate in the presence of potassium iodide^[11]. Sugar content in the samples was determined by using Lane- Eynon method^[1].

Microbial load

The microbial load of osmotic dehydrated coconut samples were enumerated by serial dilution method. The samples were serially diluted. Dilution of 10⁻², 10⁻³ and 10⁻⁶ were taken for all the analysis. One ml of the serial dilutions of the samples were taken in the petri dishes and appropriate media was added for the specific organism. The plates were incubated at

room temperature for 48 h for bacteria, 3 days for fungi and actinomycetes and the colonies were counted^[2].

Statistical analysis

The analysis of variance of the data obtained was done by using Completely Randomized Design (CRD). Critical differences were worked out at 5% probability level and presented^[8].

Result and discussion

Chemical changes of the osmotic dehydrated coconut during storage

Moisture

The changes noticed in the moisture content of the dehydrated coconut stored in different storage conditions are given in table 1. A gradual increase in the moisture contents of the samples were noted in both the storage conditions irrespective of treatment and packaging material. The control sample had slightly higher moisture content before and after storage than T₁ and T₂. The initial moisture content of control (4.22%) had changed to 5.98 (P₁) and 5.50 (P₂) in C₁ and 5.27 (P₁) and 5.10 (P₂) per cent in C₂. The T₁ and T₂ samples showed slight variation in their moisture content throughout the study period in both the storage conditions. The final moisture content of T₁ had changed from 4.18 to 5.44 (P₁) and 5.17 (P₂) and 5.19 (P₁) and 4.98 (P₂) per cent stored at C₁ and C₂ respectively at the end of the storage period (180 days). The dehydrated coconut treated with 20°Bx sugar syrup contained the final moisture content as 5.49, 5.30, 5.28 and 5.04 per cent in T₂C₁P₁, T₂C₁P₂, T₂C₂P₁ and T₂C₂P₂ respectively.

A significant difference in the moisture content of the dehydrated coconut samples was noted between the treatments, storage conditions, packaging methods and storage period.

Vennila and Pappiah (1998)^[15] found that the stored osmotically dehydrated coconut showed an increase in the moisture content between 0 and 90 days of storage. Similar increase in the moisture content was observed in the control as well as in the treated samples.

Table 1: Changes in the moisture (%) content of osmotic dehydrated coconut during storage

Storage period (days)	Control (T ₀)				Treatments							
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		10° Brix (T ₁)				20° Brix (T ₂)			
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)	
	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂
0	4.22	4.22	4.22	4.22	4.18	4.18	4.18	4.18	4.14	4.14	4.14	4.14
30	4.41	4.35	4.27	4.25	4.28	4.23	4.23	4.22	4.25	4.22	4.20	4.19
60	4.74	4.51	4.34	4.29	4.50	4.36	4.40	4.34	4.46	4.39	4.38	4.36
90	4.93	4.73	4.61	4.40	4.71	4.50	4.63	4.48	4.70	4.55	4.65	4.50
120	5.15	4.87	4.85	4.73	4.95	4.76	4.81	4.72	4.98	4.84	4.84	4.79
150	5.40	4.99	5.12	4.91	5.18	4.92	4.97	4.85	5.25	4.96	5.01	4.92
180	5.98	5.50	5.27	5.10	5.44	5.17	5.19	4.98	5.49	5.30	5.28	5.04

P₁- Polyethylene bag without vacuum and P₂- Polyethylene bag with vacuum

Source	CD (0.05)	Source	CD (0.05)
Treatment (T)	0.00212**	CS	0.00639**
Storage condition (C)	0.00262**	PS	0.00639**
Packaging method (P)	0.00262**	TCP	0.00512**
Storage periods (S)	0.00401**	TCS	0.01121**
TC	0.00438**	TPS	0.01121**
PS	0.00438**	CPS	0.00836**
TS	0.00742**	TCPS	0.01236**
CP	0.00342**		

Total sugar

The total sugar content of control was lesser than the treated samples throughout the study period (table 2). The sample treated with 20°Bx had maintained higher concentration of total sugar than the sample treated with 10°Bx between 0 and 180 days. A gradual reduction in the total sugar content was noted in all the samples irrespective of packaging material and storage conditions. Initially T₀, T₁ and T₂ contained 8.00, 10.58 and 11.93 per cent of total sugar, respectively. At the end of the storage, the control had 5.03-6.40, 8.17-9.68 for T₁

and 9.95-11.17 g of total sugar per 100 g for T₂ stored in C₁ and C₂.

The statistical analysis of the data revealed a significant difference in the total sugar content of dehydrated coconut among various treatments, storage conditions, packaging methods and storage period.

Vennila and Pappiah (1998) [15] stated that the total sugar content of control and treated coconut pieces had reduced from 8.35 to 5.70 and from 10.88 to 10.05 per cent respectively after 90 days of storage. The reduction noted in the total sugar content of the control resembled similar to the values reported by Vennila and Pappiah (1998) [15].

Table 2: Changes in the total sugar (%) content of osmotic dehydrated coconut during storage

Storage period (days)	Control (T ₀)				Treatments							
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		10° Brix (T ₁)				20° Brix (T ₂)			
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)	
	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂
0	8.00	8.00	8.00	8.00	10.58	10.58	10.58	10.58	11.93	11.93	11.93	11.93
30	7.71	7.84	7.92	7.94	10.24	10.39	10.42	10.45	11.51	11.74	11.78	11.81
60	7.35	7.38	7.80	7.85	10.08	10.20	10.38	10.38	11.20	11.45	11.62	11.75
90	6.29	6.46	7.13	7.46	9.65	9.91	10.17	10.21	10.96	11.13	11.54	11.66
120	5.95	6.04	6.84	7.02	9.14	9.53	9.93	9.98	10.40	10.83	11.40	11.58
150	5.57	5.68	6.19	6.78	8.50	9.17	9.84	9.85	10.17	10.45	11.29	11.35
180	5.03	5.27	5.98	6.40	8.17	8.69	9.56	9.68	9.95	10.04	11.08	11.17

P₁- Polyethylene bag without vacuum and P₂- Polyethylene bag with vacuum

Source	CD (0.05)	Source	CD (0.05)
Treatment (T)	0.02016**	CS	0.04354**
Storage condition (C)	0.01646**	PS	0.04354**
Packaging method (P)	0.01646**	TCP	0.04031**
Storage periods (S)	0.03079**	TCS	0.07543**
TC	0.02850**	TPS	0.07542**
PS	0.02850**	CPS	0.06158NS
TS	0.05333**	TCPS	0.10665**
CP	0.02327**		

Reducing sugar

The conversion of total sugar into simple sugar might have increased the reducing sugar content of stored dehydrated coconut (table 3). As the storage period increases, the reducing sugar content had also increased in all the samples irrespective of packaging material and storage condition. Similar to total sugar content, the control sample exhibited

lesser reducing sugar content throughout the study period than T₁ and T₂. The samples T₁ and T₂ stored in the refrigeration contained more or less equal levels of reducing sugar at the end of the storage whereas the same samples at room temperature showed variation between themselves. Initially T₀, T₁ and T₂ had 4.40, 7.05 and 7.88 per cent of reducing sugar respectively. The corresponding values at the end of storage for control ranged between 7.14 and 6.17, 10.15 and 9.51 for T₁ and 10.44 and 9.59 per cent of reducing sugar for T₂ stored in both the storage conditions and packed in P₁ and P₂.

The significant difference in the reducing sugar content of dehydrated coconut was observed between treatments, storage conditions, packaging methods and storage period.

The osmotically dehydrated coconut pieces showed an increasing trend in the reducing sugar content from 6.59 to 9.51 per cent after 90 days of storage (Vennila and Pappiah, 1998) [15]. Similar observations were noticed in the present investigation too.

Table 3: Changes in the reducing sugar (%) content of osmotic dehydrated coconut during storage

Storage period (days)	Control (T ₀)				Treatments							
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		10° Brix (T ₁)				20° Brix (T ₂)			
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)	
	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂
0	4.40	4.40	4.40	4.40	7.05	7.05	7.05	7.05	7.88	7.88	7.88	7.88
30	4.53	4.62	4.54	4.57	7.46	7.40	7.27	7.25	8.21	8.14	8.05	8.05
60	4.98	4.84	4.94	4.90	7.87	7.81	7.66	7.64	8.79	8.70	8.41	8.37
90	5.27	5.33	5.22	5.18	8.19	8.05	8.01	7.93	9.04	8.92	8.79	8.60
120	6.10	5.72	5.45	5.42	8.90	8.64	8.73	8.51	9.63	9.54	8.93	8.85
150	6.93	6.05	5.69	5.55	9.38	9.01	9.06	9.05	9.96	9.89	9.24	9.14
180	7.14	6.27	6.28	6.17	10.15	9.76	9.68	9.51	10.44	10.35	9.70	9.59

P₁- Polyethylene bag without vacuum and P₂- Polyethylene bag with vacuum

Source	CD (0.05)	Source	CD (0.05)
Treatment (T)	0.01136**	CS	0.02455**
Storage condition (C)	0.00928**	PS	0.02455**
Packaging method (P)	0.00928**	TCP	0.02273**
Storage periods (S)	0.01736**	TCS	0.04252**
TC	0.01607**	TPS	0.04252**
PS	0.01607**	CPS	0.03472**
TS	0.03007**	TCPS	0.06013**
CP	0.01312**		

Free fatty acid

The free fatty acid content of T₁ and T₂ was found to be lesser than the control. The control samples showed a drastic change in their free fatty acid content at the end of the storage in both the storage conditions (table 4). The final free fatty acid values noted were 1.186 (P₁) and 1.141 (P₂) in C₁ and 0.905 (P₁) and 0.862 (P₂) per cent of oleic acid in T₀. The samples T₁ and T₂ stored at room temperature had slightly higher free fatty acid than the samples stored at refrigerated condition. Similar condition was also observed between packaging materials in T₁ and T₂. The free fatty acid content of T₁ before storage was 0.404 which had increased to 0.564 (C₁P₁), 0.538 (C₁P₂), 0.496 (C₂P₁) and 0.489 (C₂P₂) per cent of oleic acid. The T₂ samples stored in C₁ and C₂ had changed from 0.394 to 0.523 and 0.498 and 0.482 and 0.478 per cent of oleic acid packed in P₁ and P₂ respectively.

The statistical analysis showed that a significant difference in the free fatty acid content of the dehydrated coconut was seen between treatments, storage conditions, packaging methods and storage period.

Vennila and Pappiah (1998) [15] reported that the osmotically dehydrated control coconut pieces had higher free fatty acid (1.08% of oleic acid) content than the treated one (0.56% of oleic acid) after storing for 90 days. Similar situations were noted in the present study.

The fresh treated coconut grating stored for six months at ambient condition had increased the free fatty acid content from 0.26 to 1.56 per cent of oleic acid (Jayaraman *et al.*, 1998) [4]. The test sample selected for the study also exhibited an increase in the free fatty acid during storage.

Table 4: Changes in the free fatty acid (% of oleic acid) content of osmotic dehydrated coconut during storage

Storage period (days)	Control (T ₀)				Treatments							
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		10° Brix (T ₁)				20° Brix (T ₂)			
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)	
	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂
0	0.410	0.410	0.410	0.410	0.404	0.404	0.404	0.404	0.394	0.394	0.394	0.394
30	0.524	0.517	0.425	0.422	0.421	0.418	0.418	0.414	0.411	0.410	0.404	0.404
60	0.741	0.735	0.534	0.506	0.459	0.437	0.428	0.428	0.428	0.422	0.416	0.413
90	0.879	0.869	0.592	0.588	0.478	0.464	0.441	0.436	0.450	0.447	0.429	0.420
120	0.983	0.950	0.641	0.630	0.497	0.480	0.473	0.464	0.476	0.465	0.452	0.438
150	1.114	1.107	0.796	0.746	0.529	0.503	0.485	0.470	0.492	0.480	0.464	0.457
180	1.186	1.141	0.905	0.862	0.564	0.538	0.496	0.489	0.523	0.498	0.482	0.478

P₁- Polyethylene bag without vacuum and P₂- Polyethylene bag with vacuum

Source	CD (0.05)	Source	CD (0.05)
Treatment (T)	0.00119**	CS	0.00258**
Storage condition (C)	0.00097**	PS	0.00258**
Packaging method (P)	0.00097**	TCP	0.00239**
Storage periods (S)	0.00182**	TCS	0.00447**
TC	0.00169**	TPS	0.00447**
PS	0.00169**	CPS	0.00365**
TS	0.00316**	TCPS	0.00632**
CP	0.00138**		

Peroxide value

The data collected on the peroxide value of the treated dehydrated coconut samples is given in table 5. Similar to free fatty acid, the peroxide value also increased as the storage period increases. The increase of peroxide value was found to be lesser in the samples stored at refrigerated condition than at room temperature. The control sample exhibited a drastic increase in its peroxide value at the end of the storage than T₁

and T₂. A slight variation in the peroxide value was observed between treatment and packaging material. The peroxide value of control sample was changed from 4.52 to 8.34 (C₁P₁), 7.46 (C₁P₂), 6.77 (C₂P₁) and 6.21 (C₂P₂) mEq/kg at the end of storage. The initial peroxide values of T₁ and T₂ were 4.45 and 4.38 mEq/kg. The corresponding values at the end of storage were 5.79 (C₁P₁), 5.32 (C₁P₂), 5.13 (C₂P₁) and 4.95 (C₂P₂) for T₁, 5.19 (C₁P₁), 5.07 (C₁P₂), 4.92 (C₂P₁) and 4.89 (C₂P₂) mEq/kg for T₂.

A significant difference in the peroxide value of the dehydrated coconut samples was observed between treatments, storage conditions, packaging method and storage period.

Jayaraman *et al.* (1998) [4] reported that the treated preserved fresh coconut gratings showed an increase in the peroxide value from 3.1 to 15.5 mEq/kg after six months of storage. In the present investigation increase in the peroxide value was observed in the stored dehydrated coconut whereas the values obtained were found to be lesser than the value given by Jayaraman *et al.* (1998) [4].

Table 5: Changes in the peroxide value (mEq/kg) of osmotic dehydrated coconut during storage

Storage period (days)	Control (T ₀)				Treatments							
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		10° Brix (T ₁)				20° Brix (T ₂)			
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)	
	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂
0	4.52	4.52	4.52	4.52	4.45	4.45	4.45	4.45	4.38	4.38	4.38	4.38
30	4.73	4.64	4.64	4.60	4.52	4.50	4.50	4.49	4.45	4.43	4.42	4.42
60	5.54	5.15	4.81	4.78	4.84	4.69	4.61	4.58	4.59	4.51	4.49	4.48
90	5.90	5.43	5.14	4.94	5.03	4.88	4.76	4.70	4.73	4.68	4.57	4.53
120	6.31	5.90	5.80	5.19	5.28	5.02	4.84	4.79	4.92	4.77	4.71	4.68
150	7.15	6.59	6.02	5.65	5.46	5.19	4.98	4.86	5.08	4.86	4.85	4.77
180	8.34	7.46	6.77	6.21	5.79	5.32	5.13	4.95	5.19	5.07	4.92	4.89

P₁- Polyethylene bag without vacuum and P₂- Polyethylene bag with vacuum

Source	CD (0.05)	Source	CD (0.05)
Treatment (T)	0.00566**	CS	0.01222**
Storage condition (C)	0.00468**	PS	0.01222**
Packaging method (P)	0.00462**	TCP	0.01132**
Storage periods (S)	0.00864**	TCS	0.02117**
TC	0.00800**	TPS	0.02117**
PS	0.00800**	CPS	0.01728**
TS	0.01497**	TCPS	0.02994**
CP	0.00653**		

Microbial changes in the osmotic dehydrated coconut during storage

As the storage period progresses an increase in the microbial load was also noted (Table 6). The bacterial count of the samples was found to be more during storage when compared to fungi and actinomycetes. The control sample had higher microbial population than T₁ and T₂ stored in both the conditions. Initially the control sample had 7.0 x 10⁶/g of bacteria, which had increased to 29.0, and 21.0 x 10⁶/g in C₁ and 11.0 and 10.0 x 10⁶/g in C₂ packed in P₁ and P₂ respectively. The samples T₁ and T₂ initially had 4.0 and 3.0 x

10⁶/g of bacteria which showed an increase of 6.0 and 5.0 x 10⁶/g (T₁) and 6.0 and 5.0 x 10⁶/g (T₂) in C₁ and 5.0 and 5.0 x 10⁶/g (T₁) and 4.0 and 3.0 x 10⁶/g (T₂) in C₂ at the end of the storage. The control sample initially had 4.0 x 10²/g of fungi, which had increased to 11.0, and 8.0 x 10²/g in C₁ and 5.0 and 5.0 x 10²/g in C₂ packed in P₁ and P₂ respectively after 180 days. The samples T₁ and T₂ did not show any increase in the fungal population during the study period stored in both the storage conditions. The actinomycetes level of control was 6.0 x 10³/g, which had increased to 13.0, and 10.0 x 10³/g in C₁ and 9.0 and 7.0 x 10³/g in C₂ packed in P₁ and P₂ respectively after 180 days. Initially the samples T₁ and T₂ had 2.0 and 1.0 x 10³/g of actinomycetes respectively which had increased to 4.0 and 3.0 x 10³/g (T₁) and 3.0 and 2.0 x 10³/g (T₂) during the study period.

Vennila (2003) reported that the microbial population of the control and treated dehydrated coconut sample had increased during the study period (90 days). The initial bacterial level of control was noted as 128.0 x 10⁶/g and 4.0 x 10³/g for fungi and 4.0 x 10³/g for actinomycetes which had increased to 152.0 x 10⁶/g, 6.0 x 10³/g and 8.0 x 10³/g respectively. In the present study the increase in the microbial population was lesser than the levels reported by Vennila (2003) [14].

Table 6: Microbial changes in the osmotic dehydrated coconut during storage

Particulars	Control (T ₀)				10° Brix (T ₁)				20° Brix (T ₂)			
	Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)		Room Temperature (C ₁)		Refrigerated Temperature (C ₂)	
	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂
Bacteria (x 10⁶/g)												
Initial	7.0	7.0	7.0	7.0	4.0	4.0	3.0	3.0	4.0	4.0	3.0	3.0
Final	29.0	21.0	11.0	10.0	6.0	5.0	6.0	5.0	5.0	5.0	4.0	3.0
Fungi (x 10²/g)												
Initial	4.0	4.0	4.0	4.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Final	11.0	8.0	5.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Actinomycetes (x10³/g)												
Initial	6.0	6.0	6.0	6.0	2.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0
Final	13.0	10.0	9.0	7.0	4.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0

P₁- Polyethylene bag without vacuum and P₂- Polyethylene bag with vacuum

Conclusion

Vacuum packaging and refrigeration storage of osmotic dehydrated coconut prevent the oxidation of fat present in the coconut during storage. So, it reduces the formation of free fatty acid and peroxide value of the osmotic dehydrated coconut. It helps in the prevention of rancidity of the products. Vacuum packaging and refrigeration storage hinder the growth of aerobic, thermophilic and mesophilic microorganisms present in the products. So, shelf life of the dehydrated coconut can be extended by vacuum packaging and refrigeration storage.

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