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Effect of pre-treatments and dehydration on quality and shelf-life of okra (*Abelmoschus esculentus*) slices

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Abstract
The present investigation was carried out during the period January 2022 to March 2022 in the Vegetable Science Laboratory, College of Horticulture, Rajendranagar, Hyderabad to standardize the best pre-treatment and dehydration method for product development of okra, study the physico-chemical characteristics of the dehydrated okra product. The ten integrated treatments of blanching and treating with preservative chemicals and different dehydration methods viz., sun drying and cabinet drying were arranged in a completely randomized design with factorial concept (FCRD) with three replications for the storage period of 60 days. Results revealed maximum rehydration ratio, crude fibre, ascorbic acid, mucilage and total sugars were recorded in the dehydrated okra treated in T_3 (Blanching at 60 °C + dipping in 0.1% KMS solution + Cabinet Drying) and could be stored significantly for a period of 60 days at ambient conditions without much loss of nutritional qualities of the product.

Keywords: Okra, blanching, preservatives, dehydration, storage, quality attributes

Introduction

Okra (*Abelmoschus esculentus* L.) also known as Lady's finger is an important vegetable crop and belongs to family Malvaceae. It is considered to be native of tropical and sub-tropical Africa and widely cultivated in South America, West Indies and India. It is major vegetable being cultivated throughout India particularly in states of Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh, Karnataka, Assam, Maharashtra and Gujarat (NHB, 2019). It is an excellent source of Iodine and is useful for the treatment of goitre. Fruits are also dried or frozen for using in off-season. Dried fruit contains 13-22 percent edible oil and 20-24 percent protein. It has been reported that 100 g of fresh okra pod contains 89.6 percent moisture, 103 mg of potassium, 90 mg of calcium, 43 mg of magnesium, 56 mg of phosphorus, 18 mg of vitamin C and metals such as iron and aluminium. Carbohydrates are mainly present in the form of mucilage (Kumar *et al*., 2000) [14].

Okra is highly perishable because of its high moisture content and respiratory activities; thus, it is necessary to preserve the commodity. The traditional method for preserving okra involves slicing and sun drying of the fruits until they become brittle (Kolawole and Bukola, 2008) [12].

During the peak production season, there is glut in the market and the prices crash beyond expectation, causing financial losses to the growers. The shelf life of okra fruit is dependent on ambient temperature. In loosely filled baskets, it can be stored for 2 to 3 days at the most. Keeping in view low prices and low shelf life, processing technology should be developed for preservation and increasing shelf life. Processing can change foods into new or more usable forms and make them more convenient to prepare. Several process technologies have been employed on industrial scale to preserve fruits and vegetables, the major ones being canning, freezing and drying (Rani *et al*., 2021) [20]. Okra cannot be produced in winter in Telangana, yield is less. Hence, this method can make the vegetable available in winter.

Many studies have reported on the influence of drying condition of vegetable product. However, effect of drying techniques on nutritional quality of dehydrated products has been given little attention. The main aim of this work was to study the effect of various drying methods viz. sun drying and oven drying with varying temperature on nutritional quality of dehydrated okra during storage. Pre-treatments like blanching and dipping the vegetables in chemicals reduce the drying time and yield a good quality dried product.

Materials and Methods

The experiment was carried out at Vegetable Science Laboratory, College of Horticulture, Rajendranagar, Hyderabad, Telangana during the period January 2022 to March 2022. The experiment was laid out in completely randomized design with factorial concept (FCRD) with three replications and ten treatments. Treatments consisted of T_1 - Sun drying, T_2 - Cabinet drying, T_3 - Blanching at 60 ℃ + dipping in 0.1% KMS solution + Cabinet Drying, T_4 - Blanching at 60 ℃ + dipping in 0.1% KOH solution + Cabinet Drying, T_5 - Blanching at 70 ℃ + dipping in 0.1% KMS solution + Cabinet Drying, T_6 - Blanching at 70 ℃ + dipping in 0.1% KOH solution + Cabinet Drying, T_7 - Blanching at 60 ℃ + dipping in 0.1% KMS solution + Sun Drying, T_8 - Blanching at 60 ℃ + dipping in 0.1% KOH solution + Sun Drying, T_9 - Blanching at 70 ℃ + dipping in 0.1% KMS solution + Sun Drying, T_{10}-Blanching at 70 ℃ + dipping in 0.1% KOH solution + Sun Drying.

Sample preparation

Good quality okra fruits of variety Arka Anamika were procured from PG Research Station, Horticulture Department, GKVK, Bengaluru. The selected okra fruits were washed thoroughly using clean and safe water to remove the contaminants *viz*. dirt, sand and dust. The okra fruits were steam blanched in hot water bath at temperatures of 60 ℃, and 70 ℃ for 5 minutes and dipped into 0.1% Potassium meta-bi-sulphite (KMS) and 0.1% potassium hydroxide (KOH) solutions for 3 min respective to treatments. The okra fruits were cut into 1 cm long slices uniformly with the help of a sharp stainless-steel knife. The slices were dehydrated by two different methods: i.e., Sun drying and Cabinet drying. Pre-treated fresh okra slices were sun dried for 6-7 hours for 3 to 4 days and dried in cabinet dryer for 7-8 hours till it dried completely until final moisture content of 8-10% at 55 °C temperature.

The dried slices of okra were packed in 200-gauge polythene zipper bags and stored under ambient conditions (22 ℃ to 35 ℃) for a period of two months and samples were drawn periodically at 0, 15, 30, 45 and 60 days for physical, biochemical and sensory analysis at an interval of 15 days.

Statistical analysis of data is done by using ANOVA on all experimental groups with three replications each. A factorial experimental design (with CRD Concept) was adopted for statistical analysis of data of experiments related to storage studies by following the procedure as described by Panse and Sukhatme (1963) [18].

Results and Discussion

Physico-chemical composition of fresh okra fruits

The physical properties of fresh okra had thickness of okra slice (10 mm), width of okra slice (15 mm), volume of okra slice (1766.25 mm^3) and moisture 89% and chemical properties had crude fibre 35.04%, ascorbic acid 21.10 mg/100g, mucilage 0.72%, total sugars 61.50% and titratable acidity 1.04%.

Changes in physico-chemical parameters during storage

The dehydrated okra slices were stored at ambient conditions and analysed for physico-chemical composition to assess the effect of pre-treatments and dehydration on the product quality for 60 days at 15 days intervals and data regarding the effect and the result of experiment were presented in Table 1 to 3.

Table 1: Effect of pre-treatments and dehydration on shrinkage (%), moisture (%) and rehydration ratio of dehydrated okra slices

Treatments (T)	Shrinkage (%)						Moisture (%)						Rehydration ratio					
	0th day	15th day	30th day	45th day	60th day	Mean T	0th day	15th day	30th day	45th day	60th day	Mean T	0th day	15th day	30th day	45th day	60th day	Mean T
T1	84.08	83.87	83.54	83.22	83.07	83.56	9.66	9.69	9.73	9.77	9.80	9.73	7.98	7.88	7.88	7.82	7.77	7.87
T2	73.21	73.34	72.59	72.32	72.06	72.70	8.84	8.88	8.92	8.95	8.99	8.92	10.58	10.5	10.50	10.45	10.42	10.49
T3	69.46	69.21	69.03	68.82	68.63	69.03	7.86	7.87	7.92	7.93	7.99	7.91	11.92	11.86	11.87	11.83	11.81	11.86
T4	71.69	71.47	71.21	70.88	70.78	71.20	7.42	7.43	7.45	7.48	7.51	7.46	10.67	10.60	10.60	10.57	10.53	10.59
T5	69.22	68.81	68.81	68.53	68.45	68.76	7.58	7.61	7.64	7.67	7.70	7.64	9.27	9.21	9.21	9.17	9.14	9.20
T6	74.69	74.51	74.32	74.13	73.95	74.32	7.60	7.63	7.67	7.70	7.74	7.67	9.17	9.11	9.11	9.07	9.04	9.10
T7	82.24	81.99	81.87	81.62	81.49	81.84	8.87	8.88	8.94	8.95	8.98	8.93	8.59	8.54	8.54	8.51	8.48	8.53
T8	83.69	83.49	83.28	83.07	82.88	83.28	7.62	7.65	7.67	7.70	7.74	7.68	7.69	7.63	7.63	7.60	7.58	7.63
T9	77.56	77.21	77.14	76.98	76.80	77.14	8.87	8.89	8.92	8.96	8.99	8.93	8.89	8.83	8.83	8.79	8.76	8.82
T10	77.19	76.92	76.70	76.42	76.25	76.70	8.87	8.91	8.96	8.98	9.02	8.95	8.44	8.38	8.38	8.35	8.31	8.37
Mean S	76.30	76.08	75.85	75.60	75.44		8.32	8.35	8.38	8.41	8.45		9.32	9.25	9.26	9.22	9.18	
	T		S		T×S		T		S		T×S		T		S		T×S	
S.E(m) ±	0.54		0.38		1.20		0.04		0.03		0.09		0.02		0.01		0.05	
CD at 5%	1.51		NS		NS		0.12		0.08		0.26		0.06		0.04		NS	

T_1 -Sun drying	T_6 -Blanching at 70 ℃ + dipping in 0.1% KOH solution + Cabinet Drying
T_2 -Cabinet drying	T_7- Blanching at 60 ℃ + dipping in 0.1% KMS solution + Sun Drying
T_3 -Blanching at 60 ℃ + dipping in 0.1% KMS solution + Cabinet Drying	T_8- Blanching at 60 ℃ + dipping in 0.1% KOH solution + Sun Drying
T_4 -Blanching at 60 ℃ + dipping in 0.1% KOH solution + Cabinet Drying	T_9- Blanching at 70 ℃ + dipping in 0.1% KMS solution + Sun Drying
T_5 -Blanching at 70 ℃ + dipping in 0.1% KMS solution + Cabinet Drying	T_{10}-Blanching at 70 ℃ + dipping in 0.1% KOH solution + Sun Drying

Table 2: Effect of pre-treatments and dehydration on titratable acidity (%), total soluble solids (ºbrix) and total sugars (%) of dehydrated okra slices

Treatments (T)	Titratable acidity (%)						Total soluble solids (ºbrix)						Total sugars (%)					
	0th day	15th day	30th day	45th day	60th day	Mean T	0th day	15th day	30th day	45th day	60th day	Mean T	0th day	15th day	30th day	45th day	60th day	Mean T
T1	0.61	0.59	0.56	0.53	0.50	0.56	38.30	36.60	34.90	34.40	33.83	35.61	16.60	16.73	16.86	16.98	17.11	16.86
T2	0.42	0.38	0.34	0.30	0.26	0.34	32.60	30.80	29.10	28.67	27.90	29.81	19.64	19.83	20.02	20.20	20.39	20.02
T3	0.71	0.69	0.66	0.63	0.60	0.66	44.57	43.00	41.50	40.97	40.43	42.09	28.80	29.03	29.26	29.48	29.71	29.26
T4	0.63	0.60	0.57	0.54	0.51	0.57	42.30	40.77	39.20	38.67	38.17	39.82	26.49	26.70	26.92	27.14	27.33	26.92
T5	0.62	0.59	0.56	0.54	0.50	0.56	42.53	40.93	39.37	38.83	38.27	39.99	26.51	26.73	26.95	27.16	27.38	26.95
T6	0.60	0.57	0.54	0.50	0.47	0.54	40.33	38.73	37.13	36.53	36.03	37.75	25.42	25.62	25.81	26.04	26.20	25.82
T7	0.82	0.80	0.78	0.76	0.74	0.78	48.70	47.23	45.73	45.23	44.73	46.32	21.58	21.79	21.98	22.17	22.37	21.98
T8	0.69	0.67	0.64	0.62	0.59	0.64	47.30	45.80	44.30	43.80	43.30	44.90	21.24	21.43	21.62	21.81	21.99	21.62
T9	0.66	0.64	0.62	0.60	0.57	0.62	47.50	46.00	44.50	44.00	43.53	45.11	20.87	21.09	21.28	21.50	21.69	21.29
T10	0.63	0.60	0.58	0.55	0.52	0.58	46.40	44.90	43.40	42.90	42.40	44.00	19.67	19.84	20.04	20.24	20.41	20.04
Mean S	0.64	0.61	0.58	0.56	0.53		43.05	41.47	39.91	39.40	38.86		22.68	22.88	23.07	23.27	23.46	
	T		S		T×S		T		S		T×S		T		S		T×S	
S.E(m) ±	0.01		0.01		0.03		0.11		0.08		0.25		0.02		0.02		0.05	
CD at 5%	0.03		0.02		NS		0.32		0.22		NS		0.06		0.05		0.14	

T_1 -Sun drying	T_6 -Blanching at 70 ℃ + dipping in 0.1% KOH solution + Cabinet Drying
T_2 -Cabinet drying	T_7- Blanching at 60 ℃ + dipping in 0.1% KMS solution + Sun Drying
T_3 -Blanching at 60 ℃ + dipping in 0.1% KMS solution + Cabinet Drying	T_8- Blanching at 60 ℃ + dipping in 0.1% KOH solution + Sun Drying
T_4 -Blanching at 60 ℃ + dipping in 0.1% KOH solution + Cabinet Drying	T_9- Blanching at 70 ℃ + dipping in 0.1% KMS solution + Sun Drying
T_5 -Blanching at 70 ℃ + dipping in 0.1% KMS solution + Cabinet Drying	T_{10}-Blanching at 70 ℃ + dipping in 0.1% KOH solution + Sun Drying

Table 3: Effect of pre-treatments and dehydration on ascorbic acid (mg/100g), mucilage (%) and crude fibre (%) of dehydrated okra slices

Treatments (T)	ascorbic acid (mg/100g)						Mucilage (%)						Crude fibre (%)					
	0th day	15th day	30th day	45th day	60th day	Mean T	0th day	15th day	30th day	45th day	60th day	Mean T	0th day	15th day	30th day	45th day	60th day	Mean T
T1	11.51	10.70	10.22	9.29	8.58	10.06	5.82	5.09	4.25	3.48	2.68	4.26	15.04	14.88	14.69	14.52	14.34	14.69
T2	13.75	13.04	12.42	11.75	11.07	12.41	5.42	4.66	3.89	3.13	2.36	3.89	15.25	15.10	14.95	14.80	14.65	14.95
T3	14.90	14.44	13.87	13.46	12.98	13.93	6.30	5.63	4.98	4.32	3.66	4.98	18.26	18.14	18.01	17.89	17.53	17.97
T4	13.93	13.26	12.86	12.33	11.75	12.83	5.97	5.27	4.54	3.80	3.11	4.54	18.13	18.01	17.88	17.77	17.63	17.88
T5	14.34	13.95	13.40	12.86	12.36	13.38	6.13	5.42	4.71	4.00	3.29	4.71	17.86	17.63	17.58	17.43	17.29	17.56
T6	13.78	13.37	12.70	12.16	11.59	12.72	5.39	4.65	3.91	3.15	2.43	3.91	17.55	17.40	17.25	17.10	16.95	17.25
T7	12.63	12.04	11.61	10.87	10.59	11.55	4.84	4.03	3.34	2.57	1.81	3.32	16.96	16.81	16.66	16.50	16.36	16.66
T8	12.34	11.77	11.13	10.53	9.91	11.14	4.67	3.90	3.13	2.36	1.58	3.13	16.75	16.60	16.44	16.28	16.12	16.44
T9	12.37	11.78	11.19	10.60	10.01	11.19	4.63	3.87	3.11	2.35	1.59	3.11	16.81	16.64	16.46	16.29	16.11	16.46
T10	12.29	11.55	10.85	10.16	9.43	10.86	4.35	3.57	2.8	2.02	1.24	2.80	16.58	16.41	16.23	16.06	15.88	16.23
Mean S	13.18	12.59	12.02	11.40	10.83		5.35	4.61	3.87	3.12	2.37		16.92	16.76	16.61	16.46	16.29	
	T		S		T×S		T		S		T×S		T		S		T×S	
S.E(m) ±	0.04		0.03		0.08		0.03		0.02		0.07		0.03		0.02		0.06	
CD at 5%	0.10		0.07		0.23		0.09		0.06		NS		0.08		0.06		NS	

T_1 -Sun drying	T_6 -Blanching at 70 ℃ + dipping in 0.1% KOH solution + Cabinet Drying
T_2 -Cabinet drying	T_7- Blanching at 60 ℃ + dipping in 0.1% KMS solution + Sun Drying
T_3 -Blanching at 60 ℃ + dipping in 0.1% KMS solution + Cabinet Drying	T_8- Blanching at 60 ℃ + dipping in 0.1% KOH solution + Sun Drying
T_4 -Blanching at 60 ℃ + dipping in 0.1% KOH solution + Cabinet Drying	T_9- Blanching at 70 ℃ + dipping in 0.1% KMS solution + Sun Drying
T_5 -Blanching at 70 ℃ + dipping in 0.1% KMS solution + Cabinet Drying	T_{10}-Blanching at 70 ℃ + dipping in 0.1% KOH solution + Sun Drying

Shrinkage (%), Moisture (%) and Rehydration ratio

The data pertaining to shrinkage, moisture and rehydration ratio of dehydrated okra slices treated with different preservatives and dehydration methods was presented in the Table 1.

The shrinkage in dehydrated okra slices recorded highest in T_1 (Sun Drying) treatment followed by T_8 (83.28%) (Blanching at 60 ℃ + dipping in 0.1% KOH solution + Sun Drying). Shrinkage decreased gradually during storage period from 0th day to 60th day. Least shrinkage observed in KMS treated okra slices due to heat and moist resistance by KMS during dehydration. Shrinkage is correlated to moisture content of the sample. decrease in the moisture content increases the shrinkage of the okra slices. Abasi *et al.* (2009) [1] on effect of time and temperature on moisture content, shrinkage, and rehydration of dried onion and Nahimana *et al.* (2011) [16] in study of radial shrinkage and volume of carrot reported similar results obtained in the present experiment.

Moisture content of dehydrated okra slices recorded the lowest moisture (7.46%) in T_4 (Blanching at 60 ℃ + dipping in 0.1% KOH solution + Cabinet Drying) treatment followed by T_5 (7.64%) (Blanching at 70 °C + dipping in 0.1% KMS solution + Cabinet Drying). The moisture content of the dehydrated okra slices increased gradually over the storage period from 0 to 60th day. The moisture content of blanched okra samples increased slightly possibly due to absorption of water during blanching (Inyang and Ike, 1998) [10]. Increase in moisture content of dehydrated vegetables products during storage has also been reported by Fagbohum and Faleye (2012) [7] in sun dried okra and Kalasker *et al*. (2012) [11] in dehydrated fenugreek leaves during 90 days of storage. Sra *et al.* (2014) [25] also reported similar results in dehydrated carrot during six months of storage.

Rehydration ratio of dehydrated okra slices revealed that T_3 (Blanching at 60 °C + dipping in 0.1% KMS solution + Cabinet Drying) recorded the highest Rehydration ratio (11.86) followed by T_4 (10.60) (Blanching at 60 °C + dipping in 0.1% KOH solution + Cabinet Drying). The Rehydration ratio of the dehydrated okra slices decreased gradually over the storage period from 0 to 60th day. T_3 is good as decrease in rehydration ratio from 0th to 60th day is only 0.92%, while in T_1(Sun drying) rehydration ratio reduced 2.63% from 0th day to 60th day of storage. As the storage period increases the rehydration ratio decreases significantly irrespective of dehydration method. Weier and Stocking (1949) [28] reported that the loss of rehydration is due to changes in macromolecular components, including cellulose, pectin, hemicellulose and protein, which were adversely affected during pre-treatment, dehydration and storage. Similar results were also reported by Manimegalai and Ramah (1998) [15] in dehydrated bitter gourd rings and Balasubramanium *et al*. (2011) [4] in dehydrated okra.

Titratable acidity (%)

The data pertaining to titratable acidity of dehydrated okra slices treated with different preservatives and dehydration methods was presented in table 2 which revealed that T_7 (Blanching at 60 °C + dipping in 0.1% KMS solution + Sun Drying) recorded the highest titratable acidity (0.78%) followed by T_3 (0.66%) (Blanching at 60 °C + dipping in 0.1% KMS solution + Cabinet Drying). The titratable acidity of the dehydrated okra slices decreased gradually over the storage period from 0 to 60th day.

The titratable acidity was higher in case of KMS treated samples as compared to potassium hydroxide treated and untreated samples. During storage, there was a noticeable decline in the titratable acidity. This might be due to biochemical interactions resulting in binding of acid with the other components with the passage of time or may be due to the leaching loss of acids in to water during blanching and sulphitation

Total soluble solids (ºbrix)

The data pertaining to TSS of dehydrated okra slices treated with different preservatives and dehydration methods was presented in table 2 which revealed that T_7 (Blanching at 60 °C + dipping in 0.1% KMS solution + Sun Drying) recorded the highest TSS (46.32 ºbrix) followed by T_8 (44.90 ºbrix) (Blanching at 60 °C + dipping in 0.1% KOH solution + Sun Drying). The TSS of the dehydrated okra slices decreased gradually over the storage period from 0 to 60th day

Better retention of TSS in sulphitation might be due to reduced leaching losses of total soluble solids than other pretreatments. The decrease in moisture content with increasing temperature is accompanied by an increased percentage of TSS since it is the major component of dry matter. This result is supported by Abe-Inge *et al*. (2018) [2] who observed an increased TSS with increasing temperature (50 to 60 then up to 70 °C). During storage the moisture increases so TSS content decreased gradually and observation reported by Rani *et al.* (2021) [20] in dehydration of okra found similar results

Total sugars (%)

The data pertaining to total sugars of dehydrated okra slices treated with different preservatives and dehydration methods was presented in table 2 which revealed significant difference among the treatments and storage period while there was no significant difference between interactions.

Among the different treatments, T_3 (Blanching at 60 °C + dipping in 0.1% KMS solution + Cabinet Drying) recorded the highest total sugars (29.26%) followed by T_5 (26.95%) (Blanching at 70 °C + dipping in 0.1% KMS solution + Cabinet Drying). The total sugars of the dehydrated okra slices increased gradually over the storage period from 0 to 60th day

This reduction in total sugar content during storage period indicates the possibility of their participation in biochemical and browning reactions. KMS pre-treated okra slices were found to undergo less browning as compared to control and potassium hydroxide pre-treated slices. similar findings were obtained by Raj *et al.* (2006) [19] in dehydrated onion rings and Sojak *et al.* (2014) [24] in the analysis of quality parameters of giant pumpkin (*Cucurbita maxima*) dehydrated using several technologies.

Ascorbic acid (mg/100g)

The data pertaining to Ascorbic acid of dehydrated okra slices treated with different preservatives and dehydration methods was presented in table 3 which revealed that T_3 (Blanching at 60 °C + dipping in 0.1% KMS solution + Cabinet Drying) recorded the highest ascorbic acid (13.93 mg) followed by T_5 (13.38 mg) (Blanching at 70 °C + dipping in 0.1% KMS solution + Cabinet Drying). The Ascorbic acid of the dehydrated okra slices decreased gradually over the storage period from 0 to 60th day.

Among the interactions between treatments and storage period highest ascorbic acid (14.90 mg) was found in okra slices treated with T_3 (Blanching at 60 °C + dipping in 0.1% KMS solution + Cabinet Drying) on 0th day of storage while lowest ascorbic acid (10.06 mg) was found in okra slices treated with T_1(Sun Drying) on 60th day of storage.

Bhonsale and Arya (2010) [5] observed highest loss of vitamin C during sun drying as compared to other two drying methods which might be due to the sensitivity of vitamin C to atmospheric conditions like oxygen, light, and temperature. The maximum retention of ascorbic acid in oven dried samples might be due to the use of controlled temperature for short time. The results also showed that sulphite treated samples retained maximum ascorbic acid due to the fact that the sulphitation prevents oxidation of ascorbic acid. Results of the present study are in agreement with the findings of Eze and Akubor (2012) [6] in effect of drying methods and storage on the physico chemical properties of okra and Sun *et al*. (2020) [27] in effects of different pre-treatment methods on the drying characteristics and quality of potatoes.

Mucilage (%)

The data pertaining to Mucilage of dehydrated okra slices treated with different preservatives and dehydration methods was presented in table 3 which revealed that T_3 (Blanching at 60 ℃ + dipping in 0.1% KMS solution + Cabinet Drying) recorded the highest mucilage (4.98%) followed by T_5 (4.71%) (Blanching at 70 ℃ + dipping in 0.1% KMS solution + Cabinet Drying). The Mucilage of the dehydrated okra slices decreased gradually over the storage period from 0 to 60th day.

Mucilage further deteriorated upon dehydration during storage. Woolfe *et al*. (1978) had earlier stated that mucilage solutions are not stable to heat and lose much of their viscosity when heated. They concluded that depolymerization of the polysaccharides would occur above 90 °C and at high pH and this would account for loss of viscosity. Inyang *et al*. (1998) [10] studies on effect of blanching, dehydration method and temperature on the ascorbic acid, colour, sliminess and other constituents of okra fruit and reported similar readings which justifies the present study.

Crude fibre (%)

The data pertaining to crude fibre of dehydrated okra slices treated with different preservatives and dehydration methods was presented in table 3 which revealed that T_3 (Blanching at 60 ℃ + dipping in 0.1% KMS solution + Cabinet Drying) recorded the highest crude fibre (17.97%) followed by T_4 (17.88%) (Blanching at 60 ℃ + dipping in 0.1% KOH solution + Cabinet Drying).

The crude fibre of the dehydrated okra slices decreased gradually over the storage period from 0 to 60th day. These findings are in agreement with findings of Rani *et al*. (2021) [20] who reported similar decrease in the fibre content of dehydrated okra. The reduction suggested that the microorganisms utilized these nutrients for their successful establishment, cellular growth and reproduction (Amadioha, 1998) [3]. Almost similar findings were also reported by Fagbohun and Faleye (2012) [7] in sun dried okra.

Conclusion

Based on the results of the study the following conclusions could be drawn. At the end of storage period minimum volume and maximum rehydration ratio, crude fibre, ascorbic acid, mucilage and total sugars were recorded in the dehydrated okra treated in T_3 (Blanching at 60 ℃ + dipping in 0.1% KMS solution + Cabinet Drying) during storage. Good quality and acceptable dehydrated okra could be obtained by treating in T_3 (Blanching at 60 ℃ + dipping in 0.1% KMS solution + Cabinet Drying) and could be stored significantly for a period of 60 days at ambient conditions without much loss of nutritional qualities of the product.

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