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Influence of Edible Coating from Sesame and Moringa Seed Oil on Nutritional Properties of Cassava

Olasope T.D., Ayanda I.S., Yusuf K.A., Olaleye O.O. and Aina O.B.

Nigerian Stored Product Research Institute, Km 3, Asa-Dam Road, P.M.B. 1489, Ilorin Kwara State,

Correspondence: kayodeyusuf14@gmail.com, 08037289055.

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ABSTRACT: *Cassava roots are perishable commodities that cannot be stored for a very long period of time after harvest in ordinary conditions. During storage, the quality may be very different from utilization quality. Thus, this experimental lot was designed to investigate the influence of the oil coating on the nutritional quality of fresh cassava tubers under ambient storage conditions. Three different treatments comprising of root crops (Untreated), root crop coated with sesame oil (1: 1 water/oil), root crop coated with moringa oil (1:1 water/ oil). The sample coated with sesame seed oil showed a more favourable result. Moisture ranges from 67.60-74.52% for both treatment, titratable acidity ranged from 0.15-0.33%, ash content value ranged from 0.91-1.61% and crude fibre ranged from 0.91-2.05% for both treatments. The obtained results indicated that the treatment with oil (sesame and moringa) under storage showed a significant ($p<0.05$) difference in the nutritional quality value of the stored cassava roots. It also plays a role in prolonging the shelf life of the cassava and delaying rotting.*

KEYWORDS: Moringa Oleifera, Sesamum Indicum, Cassava, Edible Coating

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INTRODUCTION

Many plants have been known to contain active secondary metabolites such as phenolic compounds found in essential oils with established potent insecticidal and antimicrobial activities, which indeed has formed the basis for their applications in some pharmaceuticals, alternative medicines and natural therapies (Bakkali *et al*, 2008). Plant seeds have been used since ancient times as sources of vegetable oil (Ochigbo and Paiko, 2011). Examples of some plant seeds which have been conventionally exploited commercially for this purpose include soya beans, cottonseed, groundnut, palm seed and sunflower seeds (Ochigbo and Paiko, 2011) Sesame (*Sesamum indicum*) is a very old cultivated crop and has antioxidant and health-promoting activities. Sesame was reported by Shahidi *et al.*, (2015) to be rich in various bioactive compounds including phytosterols, tocopherols and lignans such as sesamin, sesamolin and sesaminol, which are acknowledged to play a significant role in providing stability against oxidation of oil and contribute to the antioxidative activity. The sesame seed oil has been used as therapeutic oil for thousands of years and enjoyed by humans since the dawn of civilization (Ganesh and Thangavelu, 2012). *Moringa oleifera* oil is clear, sweet and odourless oil that is rich in antioxidants and is similar to olive oil in terms of its nutritional profile (Drew, 2014). Bukar *et al.*, (2010) reported that some phytochemical substances such as polypeptide found in Moringa seed extracts (oil) act directly on microorganisms and result in growth inhibition through disrupting cell membrane synthesis or synthesis of essential enzymes. Root and tuber crops are versatile staples and can be used to address food and nutrition security for millions of people, as they produce more food per unit area of land. Cassava is a cheap but nutritionally rich staple food that contributes protein, vitamin A, zinc, and iron to the dietary demands of the region’s fast-growing towns and cities. Another advantage of this crop is that it is largely traded locally and nationally, as opposed to internationally. As such, it contributes to a more stable food system and predictable source of income. The major challenges facing this root and tuber crop is spoilage and rotting. Several methods that have been used to store cassava roots includes storing in moist sawdust, trenched and refrigerator all show a reduction in moisture loss as reported by Olaleye, (2013). However, Akingbala *et al*.,(1989) and Olaleye, (2013) reported that cassava food utilization properties change long before physical deterioration is observed in stored roots. Thus, this study is designed to monitor the changes that may occur in the quality attributes of stored cassava roots treated with the extracts of selected plants

MATERIAL AND METHODS

HARVESTING OF FRESH CASSAVA ROOTS

The stems of the cassava plant TMS 419 were cut off, leaving only a short part above ground three weeks prior to harvesting to aid storability as recommended by Rickard and Coursey, (1981). Harvesting was done while the soil was wet after a fairly heavy rain to minimize the damage that could occur during lifting. Harvesting of the roots was done with part of the stem (2 – 5cm) still attached to prevent the rapid spread of decay into the root, as rotting usually starts from the neck (i.e. the point of attachment of the root to the parent plant).

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Storage of fresh cassava roots

The uprooted fresh cassava roots were gently cleaned by using a soft brush (hairbrush) to remove dirt and soil. They were then treated with the oils and neatly arranged on a platform in the laboratory. (Preliminary tests were carried out using 25 %, 50%, 75 % and 100 % oils. 50 % oils were found to be more effective as a coating material) The treated roots and control were stored until deterioration set in. The treated roots were kept on a clean table in a well-aerated room at ambient temperature. Meanwhile, samples were taken at 0, 3 days, 6 days, 9 days, 12 days, 15 days, 18 days and 21 days for assessment of selected quality parameters on the stored roots. Fresh cassava was chosen for this test because it is more prone to spoilage than the other root crops.

Determination of Physico-chemical properties.

The pH, Total Titratable Acidity**,** Moisture, Ash, Crude fibre, was determined using AOAC, (2012)

RESULTS AND DISCUSSION

A reduction in the moisture content value of both the untreated (control), (74.85-65.40%) and treated (74.85-67.60 %,) for moringa seed oil while (74.85-67.82%) for sesame seed oil. Stored cassava roots were observed up to day 12 and 18 respectively as can be seen in Table 1. An increase in moisture content value (67.38-74.44%) of untreated cassava roots were recorded from day 15 to 21. Also, an increase in moisture content value from 67.60-72.70% was recorded between day 18 and day 21 for cassava roots treated with moringa seed oil. The moisture content between the control sample and the treated samples were significantly different ($p<0.05$) from each other. The rate of loss of moisture in the control sample was higher than in the treated samples. This might be as a result of the coating with the oils which create a barrier that reduced the rate of moisture loss.

Table 1: Moisture content (%) of cassava roots during storage

DAYS	CONTROL	Cassava treated with moringa seed oil	Cassava treated with sesame seed oil
0	74.85±0.00	74.85±0.00	74.85±0.00
3	72.99^{a}±0.15	74.35^{b}±0.29	74.52^{b}±0.14
6	72.37^{a}±0.04	73.14^{b}±0.21	73.88^{c}±0.17
9	70.53^{a}±0.72	70.50^{a} ±0.31	72.72^{b}±0.56
12	65.40^{a}±0.31	70.47^{b}±0.09	71.32^{c}±0.15
15	67.38^{a}±0.37	68.51^{b}±0.29	70.44^{c}±0.26
18	71.60^{c}±0.23	67.60^{a}±0.30	69.20^{b}±0.42
21	74.44^{c}±0.32	72.70^{b}±0.15	67.82^{a}±0.18

Values = mean triplicate readings. Values with the same letter on the same row are not significantly ($p<0.05$) different.

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From Table 2, the ash content values ranged from 0.91 – 1.31 %, 0.91- 1.59 % and 0.91-1.61 % for the control, and cassava treated with moringa and sesame seed oil respectively. The ash content values were not significantly ($p<0.05$) different from each other except on days 6 and 9 when the treated crops were significantly different from the control. The ash content values increased up to the 6th day then a decrease in value was observed up to the 15th and 18th day for treated and control samples respectively, before the values later increased to the 21st day. The increase and decrease in value could be a result of the biochemical reaction taking place in the cassava root.

Table 2: Ash content (%) of cassava roots during storage

DAYS	CONTROL	Cassava treated with moringa seed oil	Cassava treated with sesame seed oil
0	0.91±0.00	0.91±0.00	0.91±0.00
3	0.95^{a}±0.02	0.95^{a}±0.01	0.96^{a}±0.01
6	1.31^{a}±0.03	1.59^{b}±0.04	1.61^{b}±0.01
9	1.27^{c}±0.01	1.13^{a}±0.03	1.21^{b}±0.01
12	1.28^{a}±0.01	1.10^{a}±0.09	1.16^{a}±0.05
15	1.04^{a}±0.06	0.98^{a}±0.07	1.04^{a}±0.04
18	1.01^{a}±0.00	1.04^{a}±0.06	1.06^{a}±0.03
21	1.05^{a}±0.03	1.08^{a}±0.05	1.13^{a}±0.03

Values = mean triplicate readings. Values with the same letter on the same row are not significantly ($p<0.05$) different.

The fibre content of the samples is shown in Table 3. It ranged from 1.12 to 2.05 %, 0.81 to 2.05% and 0.89 to 2.05% for the control, moringa and sesame seed oil-treated samples respectively. It was observed that as the storage period progressed, the crude fibre decreased up to the 18th day for the control and the treated samples, after which an increase in value was observed. The increase and decrease in the crude fibre content might be a result of biochemical processes and the breaking down of root tissue by microorganisms present on the root.

Table 3: Crude fibre content (%) of cassava roots during storage

DAYS	CONTROL	Cassava treated with moringa seed oil	Cassava treated with sesame seed oil
0	2.05±0.00	2.05±0.00	2.05±0.00
3	1.44^{a}±0.11	1.41^{a}±0.11	1.41^{a}±0.04
6	1.43^{b}±0.03	1.04^{a}±0.03	1.06^{a}±0.01
9	1.35^{b}±0.02	0.99^{a}±0.05	1.06^{a}±0.02
12	1.19^{b}±0.02	0.94^{a}±0.03	0.99^{a}±0.02
15	1.12^{c}±0.01	0.85^{a}±0.04	0.96^{b}±0.01
18	1.18^{c}±0.04	0.81^{a}±0.01	0.89^{b}±0.01
21	1.22^{c}±0.01	0.91^{a}±0.01	1.03^{b}±0.02

Values = mean triplicate readings. Values with the same letter on the same row are not significantly ($p<0.05$) different.

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The pH values shown in Table 4 of the stored cassava roots ranged from 6.69 to 6.82, 6.60 to 6.92 and 6.60 to 6.90 for the control, moringa and sesame seed oil-treated samples respectively. They all fall within the range of cassava pH (4.5 to 7.0). The treated samples (with moringa and sesame seed oils) have the least pH of 6.60 and moringa seed oil-treated cassava has the highest value of 6.92. This indicated that the cassava roots were mildly acidic. There was a significant

($p<0.05$) difference among the PH values of the control and the treated samples.

Table 4: pH of cassava roots during storage

DAYS	CONTROL	Cassava treated with moringa seed oil	Cassava treated with sesame seed oil
0	6.72±0.00	6.72±0.00	6.72±0.00
3	6.79^{a}±0.00	6.80^{a}±0.00	6.79^{a}±0.01
6	6.81^{a}±0.00	6.92^{c}±0.00	6.90^{b}±0.00
9	6.80^{a}±0.00	6.83^{b}±0.00	6.83^{b}±0.00
12	6.70^{b}±0.00	6.62^{a}±0.00	6.63^{a}±0.00
15	6.69^{b}±0.01	6.60^{a}±0.00	6.60^{a}±0.00
18	6.79^{c}±0.00	6.63^{b}±0.00	6.61^{a}±0.00
21	6.82^{c}±0.00	6.69^{b}±0.01	6.65^{a}±0.00

Values = mean triplicate readings. Values with the same letter on the same row are not significantly (p<0.05) different

There was a significant ($p<0.05$) difference among total titratable acidity values of the control and the treated cassava samples shown in Table 5. The titratable acid of the treated cassava sample was higher than the control sample, except for cassava treated with sesame seed oil at day 3. The total titratable acid measures the amount of acid present in a sample. The higher it is the better; for it helps to inhibit the growth of microorganisms (Olaleye, 2013).

Table 5: Total titratable acid (TTA) % of cassava roots during storage

DAYS	CONTROL	Cassava treated with moringa seed oil	Cassava treated with sesame seed oil
0	0.020±0.00	0.020±0.00	0.020±0.00
3	0.027^{b}±0.00	0.033^{c}±0.00	0.020^{a}±0.00
6	0.017^{a}±0.00	0.017^{a}±0.00	0.019^{a}±0.00
9	0.014^{a}±0.00	0.016^{c}±0.00	0.016^{ab}±0.00
12	0.015^{a}±0.00	0.019^{b}±0.00	0.019^{b}±0.00
15	0.017^{a}±0.00	0.020^{b}±0.00	0.021^{b}±0.00
18	0.013^{a}±0.00	0.015^{b}±0.00	0.017^{c}±0.00
21	0.014^{a}±0.00	0.016^{a}±0.00	0.019^{b}±0.00

Values = mean triplicate readings. Values with the same letter on the same row are not significantly (p<0.05) different

As can be seen in the figures (a and b) below, the treated cassava roots (moringa and sesame seed oils) still maintain their freshness, the internal part, the mesoderm maintain its freshness and whiteness, while that of the control showed serious signs of rot, mesoderm rot, turning brownish and sign of vascular streaking by day 15. However, on day 18, on the treated cassava samples, black streaking and softening of tissue was observed. This might be a result of the

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physiological and microbiological activities going on in the tissue of the cassava roots. It results in the breakdown of the tissue components and increases in the moisture content and other contents observed. At times, it is worthy of note that storage quality may be very different from utilization quality. Akingbala *et al.*, (1989) reported that cassava food utilization properties change long before physical deterioration is observed in stored roots.

Fig. 3.1 Control cassava roots on the 15th day

Fig. 3.2 Treated cassava roots on the 15th day.

a. Moringa seed oil-treated **b. Sesame seed oil-treated**

Figure 3.3: Treated cassava roots on day 18. Black streaking and softening of tissue observed

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CONCLUSION

Storage quality of cassava roots may be very different from utilization quality. This study has shown that cassava food utilization properties gradually change before physical deterioration is observed in stored roots. Also, root and tuber crops such as cassava are subjected to deterioration, if not properly handled, preserved and stored. This study has indicated the possibility of using moringa and sesame seed oil as a tool to prolong the shelf life of cassava and delay rotting.

REFERENCE

Bakkali, F., Averbeck, S., Averbeck, D.,&Idaomar, M. (2008): Biological effects of essential oils. A review. Food Chemical Toxicology,46,446–475.

Ochigbo, S.S.&Paiko, Y.B. (2011): Effects of Solvent Blending on the Characteristics of Oils Extracted from the Seeds of *Chrysophyllum albidium*. International Journal of Science and Nature. IJSN, 2, 352-358.

Shahidi, F., Chandrika, M. Pathirana L.,& Dana.S. (2006): Antioxidant activity of white and black sesame seeds and their hull fractions. Wall Food Chemistry, 99,478-483.

Ganesh, S.K. &Thangavelu, S. (2012): Genetic divergence in Sesame (*Sesamum indicum L.*) Madras Agricultural Journal,82, 263-265.

Drew, C. (2014): The Green Herb That Flushes Toxins and Fights Cancer with No Known Side Effects. FitlifeTv.

Bukar, A., Uba, A.,& Oyeyi, I. (2010): Antimicrobial profile of Moringa Oleifera Lam.

Extracts against some foodborne microorganisms. Bayero Journal of Pure and Applied Sciences,3, 43-48.Olaleye, O.O. (2013): Effects of storage on the quality attribute of cassava roots products: M. Tech thesis, Ladoke Akintola University of Technology, Ogbomoso.

Akingbala, J.O., Osunsami A.T. & Oguntimein G.B., (1989): Effect of storage on starch content and modification of cassava. Starch/Stärke, 41,54-57.

Rickard J.E., &Coursey D.G., (1981): Cassava Storage. Tropical. Science. 23,1.

AOAC. (2012): Association of Analytical Chemists. Official Methods of Analysis International.17thedition.Gaithersburg, Md, USA, Association Of Analytical Communities,2012.

Article DOI: 10.52589/AJAFS-PS7EEXJK
DOI URL: https://doi.org/10.52589/AJAFS-PS7EEXJK