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Effect of Aloe Vera on Proximate Composition of Mango (Mangifera indica L.)

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Abstract: *Proximate composition of mango (mangifera india L.) were evaluated. The study objectives were to determine the effect of Aloe vera with citric acid on the nutritional content of mango. Samples were analysed using standard procedures for moisture content, crude ash, total carbohydrate and protein. The result shows that there were significant differences in mango fruit throughout the storage period of 0, 6, 12, 18 and 24 days. The result shows a significant difference in moisture content, ash content, total carbohydrate and protein. At room temperature aloe vera gel with citric acid concentration significantly increase the shelf-life of mango fruit and moisture content at 60%concentration has more effective value than 40%, 20% and 0% respectively. Aloe vera gel with citric acid can be used for coating at room temperature for storage of mango fruit in maintaining quality and hence reduce post-harvest losses.*

Keyword: *Aloe vera gel; Chemical composition; Nutritional analysis*

Introduction

Mango (*Magniera indica* L.) is the most economically important fruit of the Anacardiacea family (Tharantha *et al*, 2006). World trade in mangoes has been increasing over the years, both exports from Nigeria and local consumption. The World market continues to become more price-competitive in spite of post-harvest challenges such as losses caused by disease (HCDA, 2011). Mango is one of the most popular fruits all over the world as it has an attractive colour, delicious taste and excellent nutritional properties.

However, mango fruits are climacteric and ripen rapidly after harvest, this limits their storage, handling and transport potential (Lalel *et al*. 2003). In Nigeria, Most of the fruit produced are consumed as fresh fruit, although Nigeria occupies the 9th position among the ten leading mango

fruit experts (FAOSTAT, 2007). Mango fruit is very perishable in nature and consideration of postharvest quality, defects occurred during and after harvest. Hence, mango fruit is susceptible to post-harvest damages, pest and disease attacks and considerable yield loss occurs during harvesting, transportation, handling and storage conditions Therefore, scientists are working toward prolonging the shelf life of the fruit by slowing down the ripening process while maintaining quality and flavour (Ochiki, *et al.* 2014).

Fruit coating after harvesting is becoming popular in this respect. However, possible health-risk associated with residue of the coating material like fungicides are reducing the scope of coatings (Ochiki et. al., 2014). Edible coating have no residue associated risk and are possible alternative option The use of aloe vera gel has drawn interest in the food industry (Arowora et al., 2013). Aloe vera base edible coating have been shown to prevent loss of moisture and firmness, control respiration rate and development and maturation, delay oxidation browning, and reduce microorganism proliferation in fruit such as sweet cherry, table grapes and nectarines (Valverde *et al.,* 205; Martinez-Romero *et al.,* 2005; Ahmed *et al*. 2009).

Post-harvest major defects on mango fruit is commonly found among producers handle especially in the study area (Maiduguri) due to weather condition, poor harvesting of fruit and handling by producers. Therefore, this study was conducted with the objective to determine the effect of aloe vera on proximate content of mango fruit.

MATERIALS AND METHODS

Study Area

The study was conducted in the laboratory of Department of Agricultural and Bio-environmental Engineering on the nutritional analysis conducted at the Department of Science Laboratory Technology of Ramat Polytechnic, Maiduguri, Borno State.

The study was conducted during the mango fruiting season from March to May. Mango samples were harvested in Maduganari within the Maiduguri Metropolitan Council of Borno State. The mangoes were harvested fresh from matured trees in the orchard. Variety of Keitt mango were harvested which is 3km away from Ramat Polytechnic, Maiduguri.

Sample Collection

Mangos were collected from the tree by climbing the tree using scissors to harvest. The mango fruits were transported to the Department of Agricultural and Bio-environmental Laboratory for analysis in Ramat Polytechnic, Maiduguri, Borno State.

Treatment and Experimental Design

The treatment consist of a one factor which is the use of aloe vera on storage of mango at percentage of 20, 40, 60 and control. A completely randomized design was used and replicated three (3) times.

Sample Preparation for Laboratory Analysis

Freshly harvested aloe vera leaves were first washed with water and then distilled water. The lower base, the tapering point of the leave top and the soft sharp spine located along the leave margin were first removed using a knife. Then the knife was used to extract the get by scrapping. The gel was blended to form a homogenous solution which was later filtered using a fine sieve of 300μm. The crude was pasteurized at 70oC for 45 mins and 5g of citric acid was added to regulate pH at 4. The mango fruits were dip for 10 min at various percentage of 24%, 40%, 60% and control (0%) then stored at room temperature.

Proximate Analysis

The proximate analysis of the samples for moisture content, ash, fibre, fat, protein and carbohydrate were carried out on the mango fruit using the standard by AOAC, 2002). The data collected was subjected to Analysis of variance (ANOVA).

RESULT AND DISCUSSION

Moisture Content

The effect of different levels of Aloe vera gel with citric acid on moisture content significantly affected the moisture content of mango fruit, 0% has the highest rate of moisture content (80.715) followed by 20%, 40% and 60% aloe vera of 78.044, 73.814 and 72.4 respectively In the variation of storage period and level of concentration indicate increase in moisture in 0% of untreated fruit and gradual decrease in 20%, 40% and 60% aloe vera gel with citric acid, the increase in untreated (0%) might be as a result of senescence. The decrease in moisture content during storage was also reported by Sharmin *et al*. (2015). The decrease of moisture content was probably due to transpiration and evaporation loss and also due to starch hydrolysis.

Table1: Interaction effect of different levels of Aloe vera on storage period

	Aloe vera %			
Storage time	0%	20%	0%	60%
0 day	78.1^{d}	78.3^{d}	75.0^{h}	75.7^{g}
6 day	78.3^{d}	76.8^{ef}	76.6^{ef}	74.3^{hi}
12 day	78.6^{d}	76.9^{e}	76.1^{fg}	73.9^{i}
18 day	831^{b}	79.4^{c}	71.6^{j}	70.0^{k}
24 day	85.3^{a}	78.6^{d}	69.5^{k}	67.9^{l}
Significant	*	*	*	*
SE±0.05		0.3474		

Protein Content

Aloe vera solution significantly (P>0.05) affected the protein content of mango. At 60% concentration, protein content was retained more (3.6013) followed by 40% and 20% of 3.52 and 3.44 respectively while untreated mango (0%) lost more protein. There was a significant difference observed in the variation of storage period and Aloe vera gel in protein content. The

result indicates a higher decrease in uncoated (0%) mango throughout the storage period but better protein content was maintained in the different levels of aloe vera with citric acid and was much better at 60% in 24 days. According to Pamela et al. (2016), protein from pant source have lower quality but their combination with many other of protein such as animal protein is an adequate nutrient value

Table 2: Interaction effect of different levels of Aloe vera on storage period

	Aloe vera %			
Storage time	0%	20%	0%	60%
0 day	3.60^{a-d}	3.54^{d-g}	3.63^{g-c}	3.53^{d-c}
6 day	3.47^{gh}	3.55^{d-f}	3.52^{e-g}	3.64^{ab}
12 day	3.38^{ij}	3.50^{f-h}	3.52^{e-g}	3.58^{b-e}
18 day	3.35^{j}	3.20^{k}	3.52^{e-g}	3.56^{c-f}
24 day	3.02^{l}		3.43^{hi}	3.67^{dg}
Significant	*	*	*	*
SE±0.05		0.0352		

Crude Carbohydrate

Significant difference was observed on carbohydrate content in different level of Aloe vera gel in Mango, 60% has the highest rate of carbohydrate (26.073) followed by 40% and 20% with 25.601 and 25.4 respectively while the untreated (0%) was less with 24.7. In Table 4, the interaction between the storage period and Aloe Vera concentration was significantly observed with decrease in carbohydrate content throughout the storage period but higher in uncoated mango (0%), which might be due to fruit maturity condition, the result is in agreement with the findings of Okello *et al.,* (2018) who reported that total carbohydrate in fruit depend on the type of fruit.

Table 3: Interaction effect of different levels of Aloe vera on storage period

	Aloe vera %			
Storage time	0%	20%	0%	60%
0 day	26.1^{h}	25.3^{h}	26.3^{ab}	26.0c-^{e}
6 day	26.1^{c}	25.8^{ef}	26.3^{a}	25.8^{ef}
12 day	25.7^{f}	25.6^{fg}	26.0^{cd}	25.3^{gh}
18 day	24.2^{i}	25.4^{h}	25.8^{ef}	25.3^{h}
24 day	21.3^{i}	25.2^{h}	25.4^{h}	25.7^{g}
Significant	*	*	*	*
SE±0.05		0.1173		

Ash Content

Aloe vera gel with citric acid significantly (P<0.05) affected the level of ash content of mango fruit. At 60% ash content of 1.0227 was retained followed by 40% (1.008) and 20% (0.9812) respectively and was less in untreated (0.95).

The interaction effect between the storage period and the level of concentration shows a decrease in untreated mango fruit compared to the different levels of concentration of aloe vera gel with citric acid. Better ash content was maintained at 40% and 20% but much better at 60% in 24 days. The total ash content of most fresh food rarely is greater than 5% higher ash content presents a high concentration of minerals that catalysed metabolic processes and improve growth and development. The higher the total ash content, the lower the energy value reported by De Caluwe *et al*. (2010) and Okello *et al*., (2018).

Table 4: Interaction effect of different levels of Aloe vera on storage period

	Aloe vera %			
Storage time	0%	20%	0%	60%
0 day	1.01^{b-f}	1.00^{c-g}	1.01^{b-g}	1.01^{b-g}
6 day	1.02^{b-e}	1.03+	1.07^{a}	1.01^{b-g}
12 day	0.97^{gh}	1.03^{b-d}	0.99^{b}	1.04^{e-g}
18 day	0.43^{i}	1.00^{d-g}	1.02^{b-e}	0.99^{f-g}
24 day	0.83^{k}	0.92^{ij}	0.92^{d}	0.95^{hi}
Significant	*	*	*	*
SE±0.05		0.0158		

Conclusion

The application of coating using naturally available resources like the aloe era could easily be integrated into the current handling system of fruit and would provide additional shelf-life benefits to the fruit. Compared to the uncoated mango, all coated fruit significantly (P>0.05) delayed changes in the ripening parameter such as carbohydrate, protein ash and percentage moisture content values. In addition, the aloe vera treatment combined with citric acid (60%) led to recluses with better freshness without browsing symptoms throughout the period. To effectively extend the shelf-life of postharvest fruit, aloe vera-based coating is a relatively convenient and safe measure and is totally harmless. Dipping fruit into aloe vera extract combined with citric acid reduced respiration and enzymatic activities responsible for the quality decay of mango fruit.

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