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Sensory Characteristics of Sweet Variety Cassava (*Mannihot esculenta*) Chips

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Abstract

Cassava (*Manihot esculenta*) was introduced in Ethiopia around 1960's. currently the plant is being distributed throughout the country as a tool to tackle food insecurity. However, the distribution is not supported by proved food preparation techniques for optimal processing to increase nutrient density and eliminate toxin. Purpose of the Study: The aim of this study was to develop the cassava chips and compared sensory acceptance with potato chips and improved nutritional quality of cassava-based foods. Sweet variety cassava was used in this study. Processing techniques such as washing, peeling, slicing, frying and draining were used to increase nutritional value and diversity of cassava-based foods. Results: In this study the chips produced from potato was found to be the best in sensory acceptance criterion while chips produced from sweet variety cassava was best in the crispness quality. Conclusion: In general, sensorial accepted chips can be produced from both sweet variety cassava and potato.

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Keywords

Chips, Cassava, Crispness, Sensory Analysis, frying, potato.

Introduction

Cassava was believed to be carried to Africa by Portuguese traders from America and spread rapidly. Now-a-day, it is a staple food in many of western and central Africa and is found throughout the humid tropics (Monica *et al.*, 2018). Today, it is grown over 90 countries. Cassava is valued over other roots and tubers for its outstanding ecological adaptation, low labor requirements, ease of cultivation, pest resistance and high productivity. It is therefore, usually considered as an important famine reserve crop in countries with un-reliable rainfall (Oyedeji *et al.*, 2017). Farmer use cassava for food, cash and livestock feed (CGIAR, 2015). This plant is famous for the presence of free and bound cyanogenic glycosides, linamarin and lotustralin which are converted to hydrogen cyanide (HCN) in the presence of linamerase, a naturally occurring enzyme in cassava (Piñeros-Hernandez *et al.*, 2017). The amount of cyanide in the cassava is variety dependent. All plant parts contained cyanogenic glycosides with the levels having the biggest concentration. In the roots, the peels have a higher concentration than interior (Atlaw, 2018). Techniques like boiling, grinding, drying, fermentation and frying are used to neutralize the cyanide (Onyenwoke and Simonyan, 2014). In Ethiopia this crop is cultivated in southern and south western regions for decades as an alternative food insecurity crops (Parmar *et al.*, 2018). However, in Ethiopia, processing techniques, storage experience and modes of consumption are not yet customized unlike other cassava producing and consuming countries. The crop has been used in south western of Ethiopia mainly to tackle seasonal food shortage (Haile *et al.*, 2017). Currently,

some cassava varieties are being promoted in food insecure northern areas of Ethiopia.

However, the distribution of the cultivars is not supported with proven food preparation techniques to increase nutrient density and cyanogenic-free cassava based foods without affecting consumers taste (Chemeda *et al.*, 2018). In Ethiopia, cassava based processed foods are not well-known. They consumed by simply boiling and sometimes by mixing its flour with other crops flour to make Injera and bread. Hence, this study is tried to diversify cassava based foods such as cassava chips.

The main objectives of this study to develop sweet cassava chips and compare sensory characteristics with potato chips and to diversify cassava based foods.

Materials and Methods

Study area

The study was conducted at Hawassa University, Food Science and Post-harvest Technology Laboratory, 272 Km from Addis Ababa to south direction.

Sample collection and preparation

Cassava (sweet variety) and potato was used in the study. Sweet cassava variety of 10 kg was brought from Hawassa Agricultural Research Center, Addis Ababa, Ethiopia. Potato (10 kg) was purchased from the open market of Hawassa town. Both raw materials followed the same procedure of chips preparation. The roots and tubers (Cassava and Potato) were washed to remove the majority of dirt coming from the field. The roots and tubers were then peeled with stainless steel knives and kept immersed in the water until the moment of frying, then, cut into 2 mm × 2 mm diameter using slicer. These slices were blanched for 15 min at 90°C.

Then, the slices were drained and fried in an electric fryer by using cooking palm oil. One liter of cooking palm oil was used in each frying vat of approximately 20 slices per operation. The frying time was from 10-12 min. The salt was then added while frying. 2l of cooking oil was used. After frying the slices were drained by using aluminum mesh and kept cooled. Then, the chips were packed in plastic and stored in cool and dry area. Chips developing were based on Maskan (2000) and chips preparation method as cited by Jia *et al.*, (2019).

Sensory analysis

Developed cassava and potato chips were evaluated for its sensory acceptability and preference by using 20 semi-trained Melkassa agricultural research center researcher and consumer participants. Five point hedonic scale rated from 1 (dislike very much), 2 (Dislike), 3 (Neither like nor dislike), 4 (Like), and 5 (Like very much) for evaluating the degree of liking and disliking were employed (Amany *et al.*, 2016). The parameters tested were Color, Flavor, Taste, Crispness and Overall acceptance.

Statistical analysis

The results were subjected to Analysis of Variance (ANOVA) technique by using Completely Randomized Design (CRD) method and all pair wise comparison tests were used for mean comparisons whereas Duncan's Multiple Range test (SPSS version 21.0 for Windows, SPSS Inc., Illinois, USA) was carried out to determine level of significance within means at ($p \leq 0.05$).

Results and Discussion

From the result, the chips prepared from potato are significantly different from that produced from cassava in terms of taste and overall acceptance. The reason behind is that the hard texture of cassava made difficulty in production of chips. Due to this hard texture the salt does not penetrate inside, it is left only on interior part and made the chips inferior in quality. As sited by Jia *et al.*, (2019) and Maskan (2000) stated that the chips Produced from potato have higher quality than other root and tuber. This is due to the light peel and soft texture of potato. This soft texture can be easily peeled and soften when blanched and allowed the salt to enter inside the pulp and made uniform taste to the chips. The present study also showed that the chips produced from potato are more liked. So, salt used in this study is enough to penetrate into potato and gave good taste.

Both cassava and potato chips have gotten the same acceptability regarding crispness. The color of cassava chips is deep dark brown which is not good color of chips.

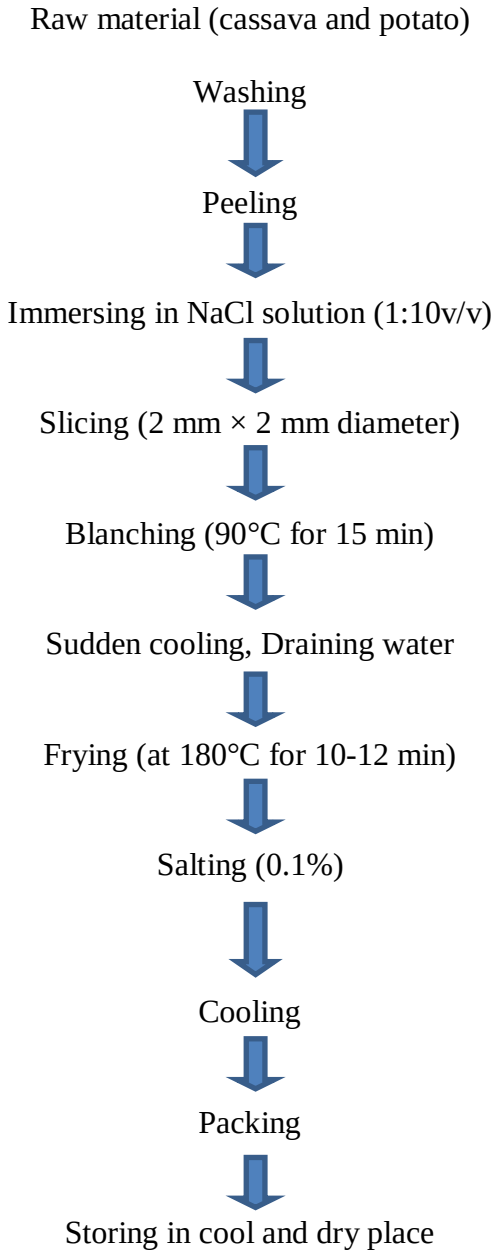
Table 1 Sensory characteristics of potato and cassava chips

No	Treatments	Sensory attributes				
		Color	Flavor	Taste	Crispness	Overall acceptance
1	Potato	4.20±0.6^{a}	4.20± 0.63^{ab}	4.20±0.7^{a}	4.20±0.63^{b}	4.5 ± 0.53^{a}
2	Cassava	3.50±0.8^{b}	3.80±0.97^{ab}	3.50±1.2^{b}	4.2±1.23^{b}	3.7±1.25^{b}

Where Treatment1=potato chips and Treatment2= cassava chips

Data presented are means ±SD, N=4. Means with the different letters in the same column are significantly different ($p<0.05$).

Fig.1 Chips processing



A potato chip has gotten better color acceptability by panelists due to its light golden yellow. Color of potato chips is described as one of the most significant quality factors determining their acceptance (Tuta and Palazoglu, 2017). In the case of flavor both products (potato and cassava chips) are equally liked by the panelists. This is due to the effects of frying oil. The taste of potato chip is preferred than that of cassava chips. This is also due to ratio of concentration of salt to the slices. It is difficult to penetrate the combined effects of taste and color.

Recommendations

Based on this experiment cassava can be used as alternative crops to potato for production of chips. Even though cassava chips have the acceptability as potato chips in terms of flavor and crispness, this study showed that potato is better than cassava in terms of color, taste and texture. Generally, the chips produced from potato have gotten overall acceptability than cassava chips by the panelists. But, the present result could be recommend the study it is better if they perform the research on cassava chips by modifying the ratio of salt to slices concentration and thickness of slices, because cassava is the crop that can be found throughout the year, drought resistant, high yield and cheap to produce.

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