Some physico-chemical and sensory properties of Roselle (Hibiscus sabdariffa) calyx jam under storage

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Abstract
The pH, titratable acidity, total solid and the sensory properties of roselle calyx jam under storage were monitored. The jams were prepared using 70:30, 60:40, 50:50 and 40:60 ratios of roselle calyx and sugar respectively. The jams were packaged in white, transparent plastic containers and stored under ambient conditions (34±2°C and 60-65% relative humidity) for 8 weeks. The pH of all samples decreased during storage, the TTA increased and the total solid remained stable. Generally, all the jam samples remained acceptable all through the period of storage. The acceptability of roselle jam increased with increasing sugar content.

Keywords: Roselle calyx; sugar; jam; storage; sensory evaluation

1.0 Introduction
Roselle (Hibiscus sabdariffa) is a herbaceous plant and a member of the family Malvaceae. It originated in the Sudan [1]. It has edible calyces which can be eaten fresh as vegetables or dried and processed into other edible forms like beverage and jam [2]. The calyces are also used as thickener and flavouring in soups. Ibrahim et al. [3] reported that water extraction of roselle calyces showed that it is rich in beta-carotene and ascorbic acid. It is used for the treatment of hypertension and urinary tract infection. It is also used in treating liver disease, atherosclerosis, cancer, diabetes and other body metabolism disorders.

The term jam refers to product derived from boiling fruit juice with or without the fruit pieces in the presence of acid, sugar and pectin [4]. A good jam has soft even consistency without distinct pieces of fruit, a bright colour, a good fruit flavour and semi-gelled texture that is easy to spread but has no free liquid. A jam typically contains both the juice and flesh of fruit or vegetables.

Iwe and Ocheme [2] produced acceptable jam from roselle calyces using different sugar concentrations. The objective of this study was to determine the keeping quality of roselle calyx jam produced using different ratios of roselle calyx and sugar.

2.0 Materials and Methods
The roselle calyx and granulated sugar used in this study were obtained from Kure Ultra Modern Market Minna, Nigeria.

2.1 Processing of Roselle jam
Roselle jam from dry calyces was prepared using the method of jam preparation described by [5]. The roselle calyces were sorted, washed and boiled until they were soft. The soft calyces were then blended using a high speed blender for 15 minutes to obtain a smooth slurry. The blended calyx slurry was mixed with granulated table sugar in different ratios of 70:30, 60:40, 50:50 and 40:60. The calyx:sugar mixture was then boiled until with the addition of 1% potash until it gelled to yield the jams. The jams were then packaged in white, transparent plastic containers and stored under ambient conditions (34±2°C and 60-65% relative humidity) for 8 weeks.

2.2 Sensory and physico-chemical analyses
The samples were subjected to sensory evaluation on a weekly basis using a 15-member semi trained panel. The panel rated the samples on a 9-point hedonic scale [6] with 1 = extremely disliked, 5 = neither liked nor disliked and 9 = extremely liked .The sensory attributes evaluated were colour, aroma, texture and taste. The pH, total titratable acid and total solid contents of the samples were also measured weekly [7]. The data obtained were subjected to analysis of variance [8].

3.0 Results and Discussion

3.1 pH, TTA and total solid of jam samples
The pH, TTA and total solid of the jam samples during storage are shown in figures 1, 2 and 3 respectively. Although the jam sample with the highest roselle calyx ratio recorded lower pH values compared with the others, there was no significant difference (p>0.05) between the pH of the samples throughout the storage period. The pH values of the samples were quite low and similar to values reported by [2]. The highest value was 2.98 for the 40:60 fresh sample while the lowest value was 1.66 for the 60:40 sample in the 8th week of storage. The pH values all decreased with time. The low pH values, though capable of serving to extend the shelf stability of the roselle jam, may limit its acceptance and consumption because it may taste very sour. The TTA values of roselle jam samples did not differ significantly (p>0.05) between the samples throughout the storage period. The values ranged between 1.35-2.25 %. The total solid content of 70:30 jam was significantly (p<0.05) higher than that of 40:60 jam throughout the period of storage. This might suggest that the calyces contributed more to the solid content than sugar. Overall, the total solid content of all jam samples remained stable and there were no significant differences between the initial and final total solid of all the samples. This may be due to the absence of microbial activity as a result of the low pH.
3.2 Sensory properties of jam samples
The sensory scores for colour, aroma, texture and taste of roselle calyx jam samples during storage are shown in figures 4, 5, 6 and 7 respectively. The 40:60 jam was consistently rated highest in terms of colour, aroma and taste. This will suggest that increasing sugar content caused the jam to be more acceptable. The higher sugar content must have caused it to be sweeter than the other samples. Iwe and Ocheme [2] reported the same trend. The sensory properties of the samples were fairly stable during storage. This may be related to the stable solid content which in turn may be due to the absence of microbial activity as a result of the low pH of the samples.
Figure 4: Mean scores of colour of roselle calyx jams during storage

Figure 5: Mean scores of aroma of roselle calyx jams during storage

Figure 6: Mean scores of texture of roselle calyx jams during storage
4.0 Conclusion
This study has shown that roselle calyx jam is stable under storage: probably due to its high acidity (low pH). In as much as this is an advantage with respect to keeping quality, it may be a disadvantage in terms of acceptance and consumption even though sensory ratings showed that the jams were acceptable. A comparative analysis of roselle jam and conventional jams is therefore necessary in order to ascertain the acceptability of roselle calyx jam.

References