Drivers of the consumer acceptability of sweet potato poundo produced from different steaming temperatures and times

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Abstract
This study aimed to evaluate the drivers of the consumer acceptability of sweet potato poundo (SPP). The SPP was produced using different steaming temperatures and times (80℃: 5mins, 84 ℃: 9 mins, 90 ℃: 7.5 mins, and 104 ℃: 7.5 mins), and then analyzed for biophysical and textural attributes and consumer acceptability in three locations (Safari, Malete and Asomu) of Kwara State. The principal component analysis shows that the 90 °C: 7.50 min SPP was in the same quadrant with the water absorption capacity, zinc content, sensory hardness and mouldability, instrumental hardness and gumminess, and the consumer acceptability of the dough in all the locations. Also, the consumer acceptability of the SPP was negatively correlated ($p<0.05$) with the carbohydrate ($r=-0.88$) and amylose ($r=-0.94$) contents, and the sensory stickiness ($r=-0.95$) of the cooked dough, while a positive correlation was observed with the water absorption capacity of the SPP ($r=0.97$), and the sensory hardness ($r=1.00$) and mouldability ($r=0.76$), as well as the instrumental hardness ($r=0.89$) and gumminess ($r=0.84$) of the cooked dough. Thus, the drivers of the consumer acceptability of the 90 °C: 7.50 min SPP may be the sensory hardness and mouldability, and the instrumental hardness and gumminess, which might have been influenced by the positive contribution of the water absorption capacity of the SPP.

Keywords: Sweet potato poundo, cooked dough, biophysical and textural attributes, consumer acceptability

Introduction

Sweet potato has become a research focus due to its versatility and adaptability to variation in climatic conditions. Its versatility ranges from cooking, roasting, sparri production, confectionaries, flour, crisps, animal feed, starch, sweet potato beer, and sweet potato beverages to pounding (Egeonu, 2004). However, pounding sweet potatoes using mortar and pestle just like yam is strenuous and time-consuming in areas where it is consumed as staples, hence, the production of sweet potato poundo. The sweet potato poundo (SPP) being a new product, therefore needs textural profiling of the cooked dough, which may assist in the evaluation of the consumer acceptability of the product in addition to the biophysical attributes. Therefore, this study is aimed at evaluating the drivers of the consumer acceptability of sweet potato poundo produced at different steaming temperatures and times.

Materials and Methods

The sweet potato tubers were bought from a local market in Ilorin and processed into SPP using the worst (104 °C: 7.50 min), medium (80 °C: 5 min), and best (90 °C: 7.50 min) steaming temperatures and time obtained from the sensory analysis, as well as the optimum temperature (84 °C) and time (9 min) obtained from the optimization result reported by Salimon (2020). The functional, pasting, and chemical composition of the SPP were analyzed using standard methods. The SPP (250 g) was cooked in boiling water (100 ml) by stirring to make a glutinous cooked dough (Salimon, 2020). The well-coded cooked dough samples were kept in a warmer before the sensory and instrumental texture profiling. The instrumental texture profiling was done using a texture analyzer interfaced with an IBM computer, and the sensory texture profiling was done using a well-structured questionnaire with 15 trained panelists (Awoyale et al., 2021). The consumer acceptability of the dough was carried out in three locations (Safari, Malete, and Asomu) using a well-structured questionnaire with

50 respondents in each location (Awoyale et al., 2021). The principal component analysis (PCA) of the data was done using XLSTAT free version.

Results and Discussion

Table 1 shows the correlation loading of the biophysical traits of the SPP and the textural attributes and consumer acceptability of the cooked dough. The result depicts that the principal component 1 (PC1) was positively correlated with the SPP bulk density (r=0.94), water absorption capacity (r=0.97), least gelation concentration (r=0.91), peak viscosity (r=0.96), setback viscosity (r=0.91), pasting temperature (r=0.96), zinc (r=1.00), iron (r=0.93), the cooked dough sensory stretchability (r=0.96), hardness (r=1.00) and mouldability (0.76), and the instrumental hardness (r=0.89) and gumminess (r=0.84), but negatively correlated with the SPP swelling power (r=-0.76), carbohydrate content (r=-0.88), amylose content (r=-0.94), and the cooked dough sensory stickiness (r=-0.95) and instrumental mouldability (r=-0.64). The consumer acceptability of the cooked dough was also positively correlated with principal component 1 (PC1) in all the locations (r=0.95). The PCA biplot, as shown in Figure 1, allowed us to separate the SPP samples based on the biophysical and textural attributes and the consumer acceptability of the cooked dough. The result showed a data variance of about 95.43%, with PC1 contributing 79.73% and PC2 15.70%. The 104 ^{o}C: 7.50 min SPP was in the same quadrant with the least gelation concentration, bulk density, peak viscosity, setback viscosity, pasting temperature, iron content and the sensory stretchability of the cooked dough. Similarly, the 90 ^{o}C: 7.50 min SPP was in the same quadrant with the water absorption capacity, zinc content, the cooked dough sensory hardness and mouldability, the instrumental hardness and gumminess, and the consumer acceptability in Safari, Malete and Asomu. The 84 ^{o}C: 9 min SPP was in the same quadrant with the swelling power and the cooked dough instrumental mouldability. Also, the 80 ^{o}C: 5 min SPP was in the same quadrant as the carbohydrate and amylose contents, and the cooked dough sensory stickiness and instrumental adhesiveness (Figure 1). Figure 1 also shows that the consumer acceptability of the cooked dough was negatively correlated ($p<0.05$) with the carbohydrate (r=-0.88) and amylose (r=-0.94) contents of the SPP, and the sensory stickiness (r=-0.95) of the cooked dough, but a positive correlation with the water absorption capacity of the SPP (r=0.97), and the sensory hardness (r=1.00) and mouldability (r=0.76), and the instrumental hardness (r=0.89) and gumminess (r=0.84) of the cooked dough. Therefore, the consumer preference for the poundo produced from the steaming temperature of 90 ^{o}C and steaming time of 7.50 min for all the locations may be attributed to the sensory hardness and mouldability, and the instrumental hardness and gumminess, which might have been influenced by the positive contribution of the water absorption capacity of the poundo.

Conclusion

Since, the consumer acceptability of the SPP was negatively correlated with the carbohydrate and amylose contents, the sensory stickiness of the cooked dough, and positively correlated with the water absorption capacity of the SPP, the sensory hardness and mouldability, and the instrumental hardness and gumminess of the cooked dough. Therefore, the drivers of the consumer acceptability of the 90 ^{o}C: 7.50 min SPP may be the sensory hardness and mouldability, and the instrumental hardness and gumminess, which might have been influenced by the positive contribution of the water absorption capacity of the SPP.

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Table 1. Correlation loading of the biophysical traits of the instant sweet potato flour, and the textural attributes and consumer acceptability of the cooked dough

Attributes	F1	F2	F3
Bulk density	0.94	0.33	-0.11
Water absorption capacity	0.97	-0.23	0.00
Swelling power	-0.76	-0.65	0.06
Least gelation concentration	0.91	0.37	-0.16
Peak viscosity	0.97	0.22	-0.11
Setback viscosity	0.91	0.34	-0.22
Pasting temperature	0.96	0.24	-0.12
Carbohydrate content	-0.88	0.33	0.34
Amylose content	-0.94	0.20	0.29
Zinc content	1.00	-0.02	0.04
Iron content	0.93	0.31	-0.22
Sensory stretchability	0.96	0.14	0.23
Sensory hardness	1.00	-0.08	0.02
Sensory stickiness	-0.95	0.09	-0.31
Sensory mouldability	0.76	-0.64	0.05
Instrumental hardness	0.89	-0.35	0.29
Instrumental adhesiveness	-0.11	0.87	0.47
Instrumental mouldability	-0.64	-0.76	-0.12
Instrumental gumminess	0.84	-0.46	0.30
Safari consumer acceptability	0.98	-0.19	0.04
Asomu consumer acceptability	0.94	-0.20	0.27
Malete consumer acceptability	0.96	-0.27	0.07

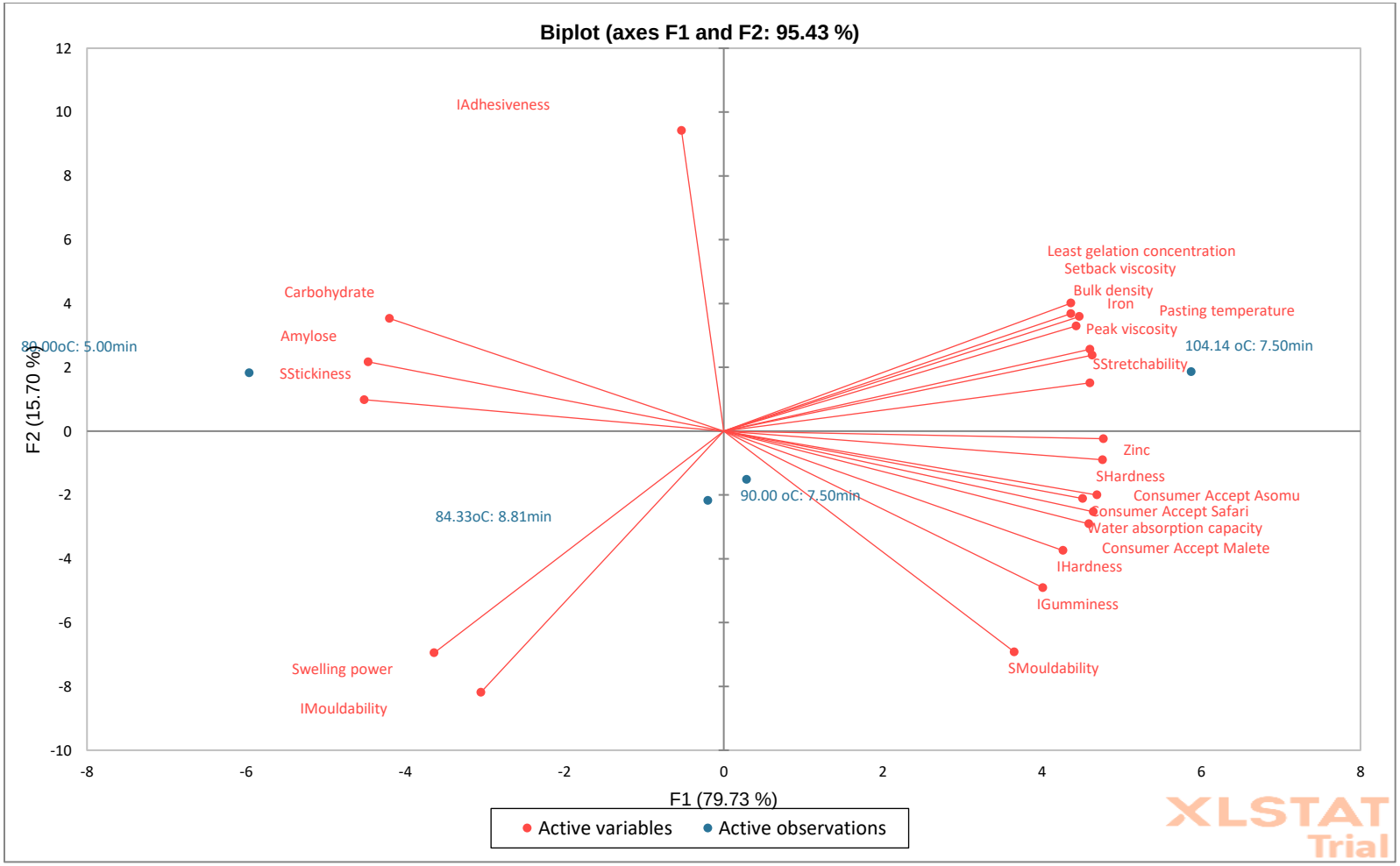


Figure 1. Principal component biplot of the biophysical traits of the instant sweet potato flour, and the textural attributes and consumer acceptability of the cooked dough produced from different steaming temperatures and times.

SStretchability-Sensory stretchability, SHardness-Sensory hardness, SStickiness-Sensory stickiness, SMouldability-Sensory mouldability, IHradness-Instrumental hardness, IAdhasiveness-Instrumental adhesiveness, IMouldability-Instrumental mouldability, IGumminess-Instrumental gumminess