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The potential for using trained taste panels for screening sweetpotato cultivars: Experiences from Tanzania

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Abstract

The criteria considered by Tanzanian urban consumers in the selection of sweetpotato varieties for fresh consumption include starchiness/flouriness, taste, fibre content, cooking quality and appearance. Most of these criteria cannot be measured in quantitative terms. It was therefore necessary to assess the potential of using trained taste panels on-station for assessment of new varieties. A panel of 10 staff members was trained at the Agricultural Research Institute Ukiriguru in May, 1998. This panel assessed the sensory characteristics of 12 varieties and was able to statistically distinguish the varieties for eleven out of twelve sensory characteristics. Following this, a study was carried out at three locations in the Lake Zone of Tanzania to compare the preferences of local consumers with the panel assessment. For each location, 5-6 common varieties were selected from the markets. These were ranked for preference by 100 consumers, and then assessed by the on-station panel. After the first year of trials sensory profiles produced by the on-station panels indicate that the most popular varieties in each of the three locations had very similar profiles. This suggests that on-station trained taste panels could be a valuable technique for varietal assessment.

Key words: Consumers, preference, sensory characteristics, sensory profiles, sweetpotato, Tanzania

Résumé

Des critères utilisés par des consomateurs urbains Tanzaniens dans la selection de patate douce pour la consommation comprennent entre autres l'aspect féculent, le goût, le contenu en fibre, qualité de cuisson et l'apparence. Cependant tous ces critères ne peuvent pas etre mesurés en terme de quantité. Il était alors nécessaire d'évaluer le potentiel d'utiliser un jury sensoriel formé en station en vue d'une évaluation des nouvelles variétés. Un jury de 10 membres du personnel a été entrainé au mois de mai 1998 à l'institut de recherche agricole d'Ikirihuru. Ce jury a évalué les caractéristiques sensorielles de 12 variétés et il a été possible de distinguer statistiquement les variétés pour 11 sur 12 caratéristiques considérées. Ainsi une étude a été conduite dans de 3 régions de la zone du lac Tanganyika pour comparer des préferences des consommateurs locaux avec des évaluations du jury. Pour chaque région, 5-6 variétés communes ont été sélectionnées aux marchés. Ells ont été classifiées pour leur préference par 100 consommateurs et puis évaluées par le jury de la station. Après une année d'essais sensoriels, des profiles de produits développés par le jury a montré que les variétés les plus populaires dans chacune région des 3 zones avaient des profiles très similaires. Ces résults ont montré que le jury formé au niveau de la station de recherche pourrait constituer une technique valable pour des évaluations variétales.

Mots clés: Consommateurs, préference, caractéristique sensorielle, profiles sensoriels, Tanzanie

Introduction

Many of the sweetpotato varieties presently grown in Tanzania are low yielding compared to average yields around the world (Kapinga *et al.*, 1995). Consumer preferences are known to differ greatly between different countries. For example, in North America low dry matter varieties are preferred, while in East Africa these are not acceptable. This, together with pressure due to virus infestation, means that direct import of germplasm from different regions is rarely successful. Nevertheless, there is enormous diversity of sweetpotato germplasm in East Africa, and therefore great potential for rapid improvements in varietal characteristics through breeding within the region.

The Tanzanian National Root and Tuber Crops Programme has an active sweetpotato breeding programme. Several promising varieties have been released, and many more new varieties are expected over the next few years.

Obviously, the success of any newly released variety will depend not only on production characteristics, but also on its acceptability to consumers in terms of both sensory and utilisation characteristics. In recognition of this, survey work has been conducted to identify the selection criteria considered important by both farmers and urban consumers (Kapinga *et al.*, 1995; Kapinga *et al.*, 1997a; Kapinga *et al.*, 1997b). The reports are fairly consistent. Both consumers and traders considered that high dry matter content (also expressed as starchy, or floury) and good taste were the most important criteria. This was followed by cooking quality (referring to the time needed for cooking) and the colour of the flesh and skin. Other criteria mentioned were low fibre content, good storability after purchase and root size.

Many of the criteria mentioned above are very complex. Many are subjective, and therefore very difficult or impossible to measure by analytical means. Direct consumer testing of new varieties is very expensive

and time consuming, since a large number of consumers (usually at least 100) is required for reliable results. Trained taste panels can be used to produce sensory profiles of varieties. The study presented here was carried out in order to investigate whether such panels could be used as a means of screening new varieties for consumer acceptability. The procedure aimed at identification of a sensory profile that accurately represented the preferences of consumers. One key question is how consistent consumer preferences are across the country, and therefore whether one consistently preferred profile exists.

Materials and methods

To obtain freshly cooked sweetpotatoes, the roots were peeled and cut into roughly equal sized portions (3-5 cm). The portions were placed in plastic bags with holes and boiled until the texture, assessed by a fork, was considered ready for eating.

For the initial assessment of 12 cultivars, the trained taste panel consisted of 10 staff from ARI Ukiriguru. The panel size was reduced to 8 for the subsequent studies.

During initial discussions, the panel agreed on 12 attributes to describe the sensory characteristics (Table 1). In subsequent taste tests each panel member scored for each of these 12 characteristics by placing a mark on a 10.5 cm line. For each tasting each panellist was presented with between 4 and 6 samples at random. Sessions were repeated until each cultivar was assessed two times by each panellist. The two assessments were averaged for subsequent analyses.

The taste panel methodology was first developed and tested using a trial of 12 contrasting varieties. Following this a study was carried out using local varieties at three locations in Lake Zone to obtain "preferred" profiles. In each of three districts chosen for consumer tests (Mwanza, Meatu and Misungwi) cooked samples of 5-6 locally available varieties were assessed and ranked by 100 individual consumers. Samples of the same varieties were then assessed and profiled by the trained taste panel.

Dry matter contents were measured by drying for 48 hours at 80°C in a fan assisted oven. For analysis of sugar content of cooked roots, samples were preserved in 80% ethanol for transport to the Natural Resources Institute, UK. The samples were then dried, extracted in cold water and analysed using high performance liquid chromatography.

Results and discussion

Development of profiles for 12 varieties

Table 1 lists the attributes selected by the trained panel to describe fresh cooked sweetpotato. Many of the attributes were of a very subjective nature, notably *acceptability*, *appearance* and *taste*

A great range in profiles was obtained for the 12 varieties initially assessed in terms of these attributes, as illustrated by the "spider diagrams" in Figure 1. Analysis of variance indicates that the panel was able to distinguish between the varieties for all attributes except Fibre. This indicates a consistency between panel members even for the very subjective criteria. The inability to distinguish between the varieties for Fibre may be a consequence of the fact that all varieties tested were considered low in Fibre by the panel.

The composition of storage roots of the varieties profiled was analysed in terms of dry matter content and sugar content. The attribute described by starch, refers to the texture of the root, and is sometimes described as Mealiness or Flouriness. Although a complex attribute, it is thought to be related to the dry matter of the roots. Figure 2 shows the Starch score obtained by the panel for each variety plotted against the measured dry matter content from one variety, Kagole, which has an exceptionally low Starch score, there was a significant relationship ($P<0.01$) between the two parameters.

Sugar, or sweetness, of the roots is considered an important taste attribute. This can also be a complex characteristic, not necessarily related directly to sugar content. The sugar content of roots increases during cooking, as the process promotes the breakdown of starch. Figure 3 shows the sugar score obtained by the panel plotted against the actual sugar content of cooked roots as obtained using high performance liquid chromatography (HPLC) analysis. There is a significant ($P<0.05$) correlation between the two parameters.

The consistency of the panel's scores with compositional analysis is an indicator of the validity of the assessments.

Table 1. Attributes used by trained panel to assess varieties, and the level of significance for discrimination between the 12 cultivars.

Sensory attribute	Significance of discrimination between 12 cultivars as determined by trained panel
Acceptability	***
Appearance	***
External Colour	***
Internal Colour	**
Taste	***
Sugar	***
Starch	***
Texture	***
Stickiness	**
Chewiness	***
Fibre	n.s.
Odour	***

n = 12

n.s. not significant. ** , *** significant at probability levels 0.01 and 0.001, respectively.

Consumer tests on local varieties in Mwanza, Meatu and Misungwi

The sweetpotato varieties available at the three sites chosen for consumer tests were not the same. Table 2 shows the varieties used and also their ranking by the consumers. In all cases the ranking was statistically significant as shown by rank sum analysis.

All the varieties were then assessed by the trained panel and profiles created. For all locations a large range in profiles was obtained. However, the most popular varieties had a very similar profile in the three locations (Figure 4). This enabled us to produce a profile of a generalised variety that would be expect to be popular in all of the locations assessed (Figure 4d). Comparison of this profile with those shown in Figure 1 allows predictions for which varieties will be most acceptable to consumers. For example the three cultivars SP/93/23, SP/93/34 and SP/93/2 were close to the preferred profile, while Kagole was very different. Further work needs to be done to confirm these findings.

Conclusion

The most popular varieties in the three locations had similar sensory profiles implying that a trained panel can give an accurate assessment of the sensory attributes of sweetpotato varieties. However, these three locations were all in one zone of Tanzania and it is not clear from this study whether the preferences of consumers remain consistent over the different regions of the country.

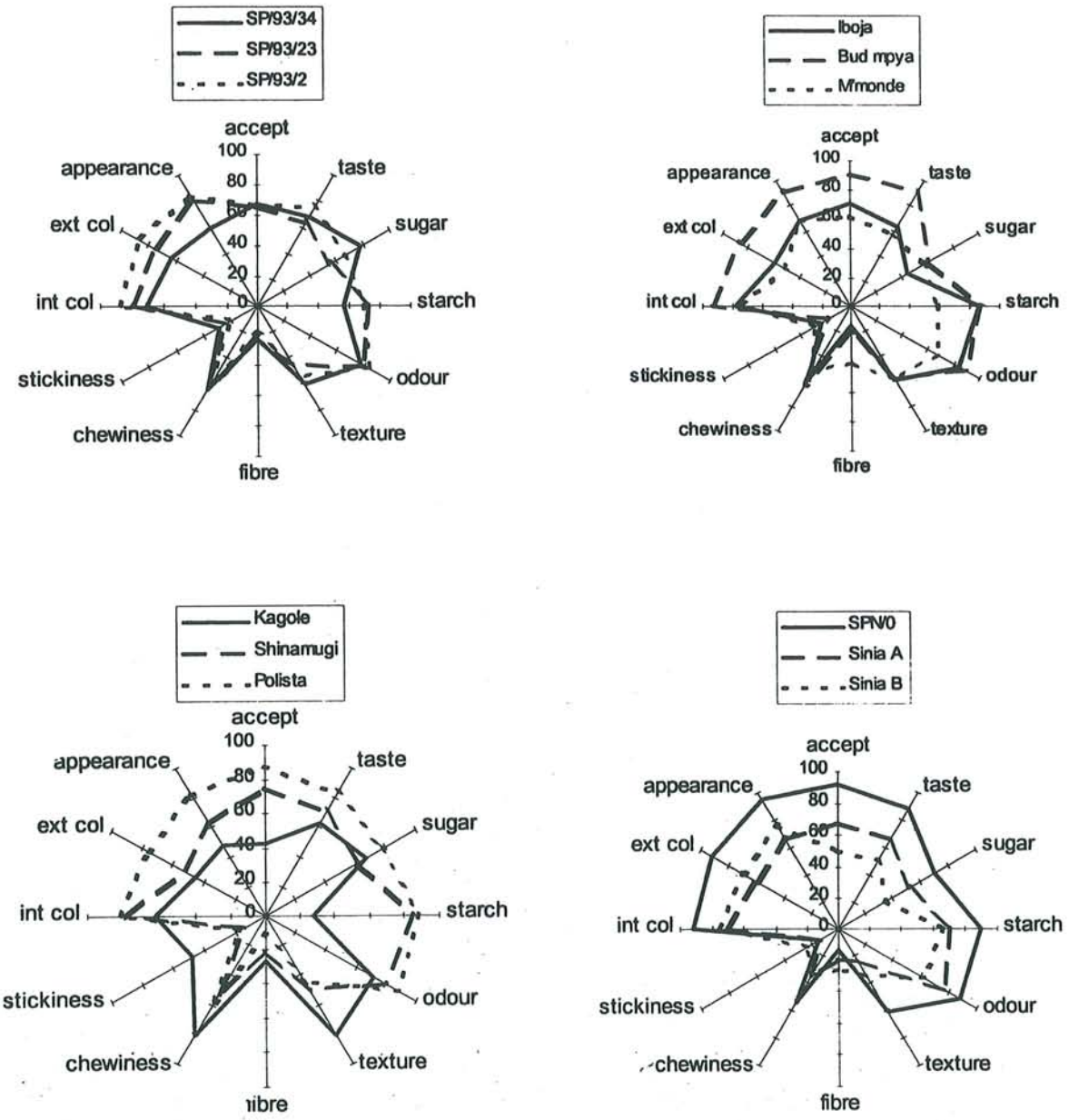

Fig. 1. Sensory profiles created by the trained taste panel for twelve sweetpotato varieties.

Table 2. Ranking of local varieties at three locations in the Lake Zone, Tanzania.

Ranking	Location of consumer study		
	Mwanza	Meatu	Misungwi
Most preferred	Polista	SPN/0	Ngikuru
	Sinia B	Ngosha	SPN/0
	SPN/0	Polista	Polista
	Mzondwa	Serena	Toniki
		Sinia B	Sinia B
Least preferred	Bilagala	Ipembe	Nguruka

The square symbol indicates the data for Kagole.

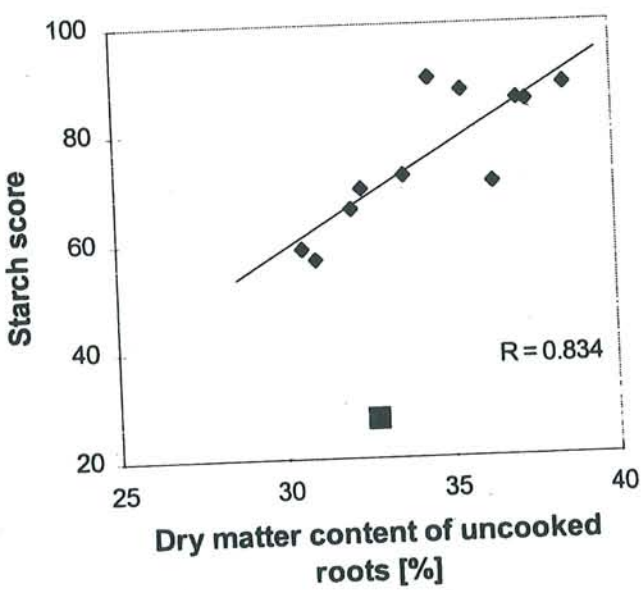

Fig. 2. The relationship between Starch score given by the panel and dry matter content of roots of a range of sweetpotato varieties. The square symbol indicates the data for Kagole.

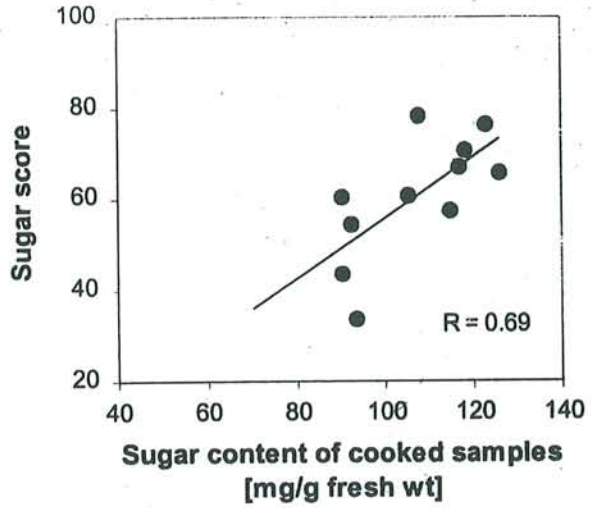

Fig. 3. The relationship between Sugar score given by the panel and sugar content of cooked roots for a range of sweetpotato varieties.

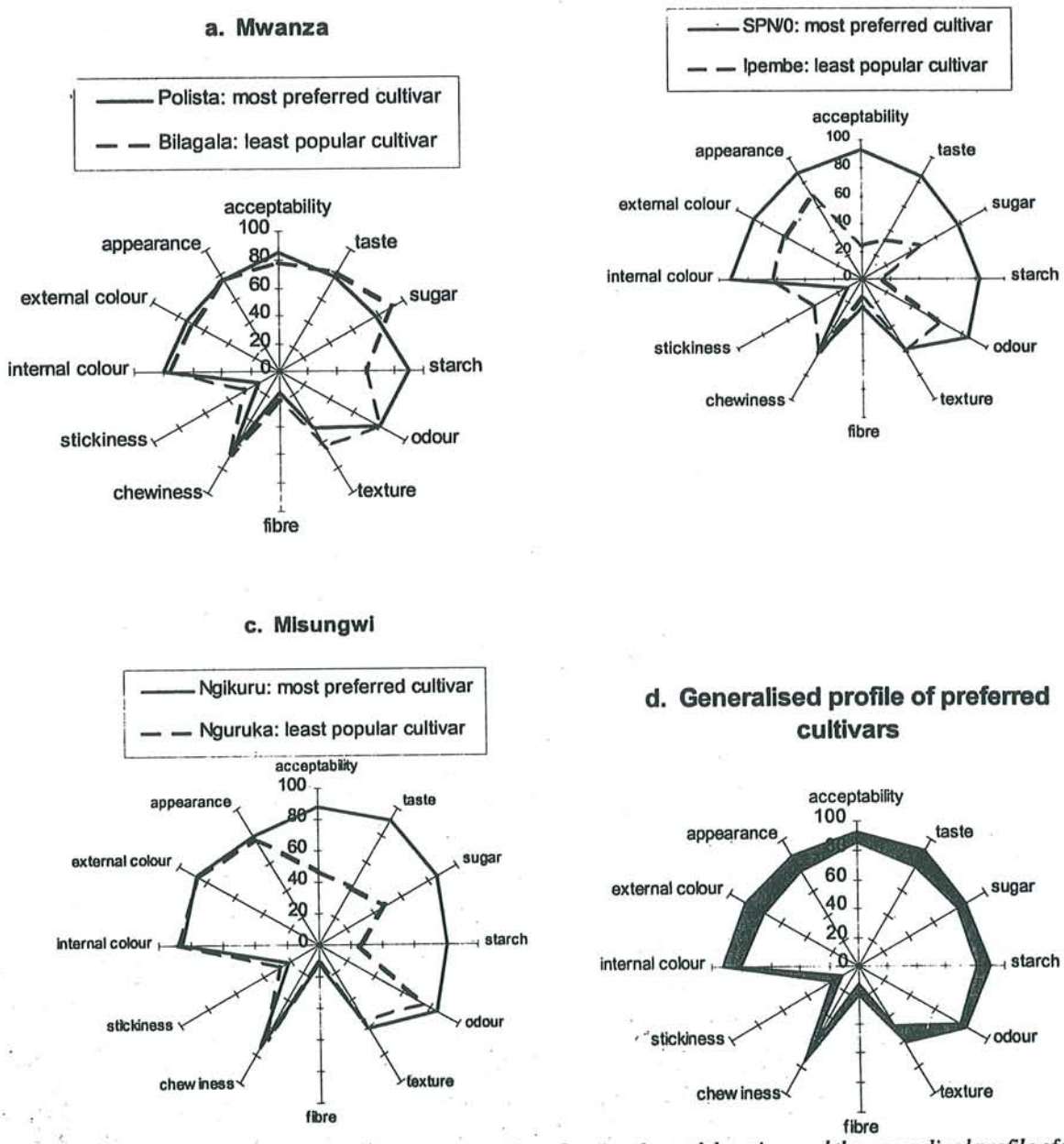

Fig. 4. Sensory profiles of the most preferred and least preferred variety for each location, and the generalised profile of preferred varieties.

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