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Full Length Research Paper

Sensory evaluation: The last hurdle in varietal development of yams (*Dioscorea rotundata*, poir) in Ghana

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In variety development, sensory evaluation is not only the most important hurdle after all the necessary agronomic characteristics have been developed but also a major determinant of acceptability of the variety, as well as a major determinant in the subsequent adoption and use of the variety. Eight yam genotypes out of thirty-six genotypes evaluated for yield, pest and disease tolerance and stability over a three year period, plus 3 farmers' checks were assessed on parameters such as enzymatic oxidation, colour attractiveness, aroma, taste, texture and overall acceptability in relation to farmers' checks (Dente, Brass and Dorban). Gender differences existed in the degree of perception of texture and taste of yams. KUP__2000/001 was the overall best genotype with respect to general acceptability in all agroecologies followed by TDr_89/02665, 2000/001, TDr__ 89/02660, TDr__95/19177, Dente, Brass, Dorban, TDr__95/01932, TDr__95/01544 and TDr__98/02877 in that order. The results of this study indicated that accessions KUP_2000/001, TDr_89/02665 and 2000/001 were the most preferred accessions with respect to sensory evaluation. After clearing this all important hurdle of sensory evaluation, genotypes KUP_2000/001, TDr_89/02665 and 2000/001 were release as varieties CRIPona, MankrongPona and CRIKukrupa respectively in 2005.

Key words: Dioscorea, Enzymatic oxidation, farmer participatory breeding, Ghana, yams.

INTRODUCTION

Yam (*Dioscorea* spp), constitutes a cheap source of carbohydrate in the diets of millions of people worldwide and in tropical West Africa it provides some 18 metric tonnes of food for people in the yam zones. Yam also constitutes 53% of total root and tuber consumption in West Africa (Gebremeskel and Oyewole, 1987). Yam, therefore, is not only an important stable crop in West Africa but also an important cash crop. It contributes 12% of dietary energy supply and of the major agricultural food items traded in 2002, yams were the most important crop with the net trade (export-import) of 13000 Mt followed by cassava and its products, plantain and maize and its products with 2500, 0 and -12500 Mt respectively (FAO, 2004). The importance of yams therefore to the Ghanaian economy cannot be over-emphasized.

In Ghana, yam is an important staple food, consumed largely in the semi-urban and urban centers in the country. Apart from being the choicest food for festive occasions, it has also become a common street or fast food in most urban areas (Degras, 1993). It is nutritionally better than cassava with respect to the amount of edible protein produce per ha per day (FAO, 1990). It also contains sufficient vitamin C (8 – 10 mg/100 g) to be important in nutrition where they are consumed in large quantities. Yam again is superior to cassava as a source of protein hence the displacement of yam by cassava may increase the incidence of Kwashiorkor (Purseglove, 1972). It is prepared for consumption in a variety of ways including boiled slices, pounded yam (fufu), fried yam, roasted yam, yam flour, yam pottage, instant yam flakes. There are however strong individual and local preferences based on cultural factors for different species and different food preparations (Otoo et al., 2001), necessitating farmer participatory sensory evaluation of yams in Ghana.

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In Ghana, however, there has not been any formal release of any yam cultivar until this study. Farmers grow what they perceive to be "good", selecting against "bad" genotypes that are often neglected, resulting in erosion of the genetic base of the crop. In developing a new variety, it is therefore imperative to consider farmer's preferences especially at harvesting when the culinary characteristics are being assessed. Developers of products not only need to know the degree of overall liking, but also what consumers like and dislike about a product and how these attributes might be changed to increase acceptability (Popper et al., 2003). Farmers' involvement in planning and evaluation of genotypes has also been known to enhance adoption and diffusion of technologies (Mekbib, 1997; Baidu-Forson, 1997).

Farmer participatory breeding has been identified as a novel approach in developing and recommending new varieties to farmers as opposed to conventional breeding. This approach does not only hasten the variety development process (3 - 5 years compared to 7 - 10 years of conventional breeding) but also incorporates stakeholder's view and preference at the very onset of the process. In both instances, one prerequisite for varietal development is consumer preference which is also an important criterion used by farmers for choosing yam varieties to cultivate. The process of variety development involves identification and selection of promising accessions which may take several years of multilocational evaluation and selection and conclude with successful sensory evaluation of the varieties. The sensory evaluation is not only the most important hurdle after all the necessary agronomic characteristics have been developed but also, a major determinant of acceptability of the variety, as well as a major determinant in the subsequent adoption and use of the variety.

Sensory evaluation is a scientific discipline which encompasses all of the senses and used to evoke measure, analyze and interpret reactions to the characteristics of foods and materials as they are perceived by the senses (FAO, 2000). It involves the measurement and evaluation of sensory properties of food and other materials. Boiled yam, for instance, is considered an important all-time (breakfast, lunch or dinner) food product made by peeling the yam, slicing and boiling the pieces in water until the cores are soft (Otegbayo et al., 2005). In Ghana especially in the southern part (coastal savannah, forest and forest-savannah transition) where the main yam consumption pattern is boil and eat, culinary characteristics of the tuber is more important than yield in selecting yam genotypes by farmers, (Otoo et al., 2001).

The objective of this study therefore was to assess the culinary characteristics of boiled yam of eight promising genotypes as perceived by consumers including farmers and to facilitate the release of yam varieties in Ghana.

METHODOLOGY

Location and test materials

A total of 36 yam genotypes evaluated over 3 year period on-station with farmer participation, were earmarked and evaluated on-farm under farmer-managed conditions in 44 villages using Augmented RCB design with 2 checks in 2002. The best eight genotypes in terms of yield potential, pest and disease tolerance and culinary characteristics were selected and further evaluated in 3 agroecologies (forest – Ejisu District; coastal savannah-Bodwease District and forest-savannah transition – Wenchi District) in 6 villages per ecology in 2003. Village was used as a replication and 2 farmers were selected per village and hence each farmer constituted an experimental unit. The genotypes were of two kinds: local landraces (KUP__2000/001, 2002/001, *Dente*, *Dorban*, *Brass*) and improved genotypes (TDr__89/02665, TDr__89/02660, TDr__95/19177, TDr__95/18544, TDr__95/01932 and TDr__98/02877). However *Dente*, *Brass* and *Dorban* were used as farmers' checks at Ejisu, Bodwease and Wenchi, respectively.

Sample preparation

Twelve farmers were trained in each location to evaluate the genotypes. Two tubers each of the genotype were selected from harvested tubers, washed, peeled and cut into chunks of approximately similar sizes (10 x 5 cm). The head and tail regions were discarded. Optimum cooking time was assessed by placing a sample each in pre-heated (boiled) water and checking at intervals to detect changes in texture. Ten chunks of each sample were placed in boiling water and first checked after 10 min of boiling and thereafter at 5 min interval to determine optimum cooking time of each genotype. The optimum cooking time was taken to be the approximate time within which samples were cooked right through the middle. This was determined by piercing through with a fork (Adu-Kwarteng et al., 2001).

Food quality assessment

Consumers describe their subjective impressions either in qualitative tests e.g. focus group discussing or in quantitative tests (Lundgren, 1981). A hedonic scale of 1 - 5, where 1 = like very much and 5 = dislike very much, was therefore used for descriptive purposes, to assess colour attractiveness, texture, aroma, taste description and perception, after-taste and general acceptance. The intensity of taste and after-taste, were measured on a scale of 1 - 5 where 1 = very sweet and 5 = bitter, texture was scored on a scale of 1 - 4 where 1 = very mealy and 4 = waxy; aroma on a scale of 1 - 5 where, 1 = very high and 5 = none; colour on a scale of 1 - 5 where 1 = white and 5 = purple and general acceptability on a scale of 1 - 4, where 1 = very good and 5 = very bad. Data was also collected on enzymatic oxidation (time for browning of cut surface) 1 - 3; 1 = < 1 min, 2 = 1 - 2 min and 3 > 2 min (Asiedu et al., 1998). The genotypes were ranked for individual attributes and general acceptability. The mean rank for each genotype was calculated. The percentage of farmers giving a particular ranking to an attribute of a genotype was also calculated. Data was analyzed by the multiplicative term of mixed model procedure (Smith et al.,

Table 1. Mean Squares Values of mixed model analysis of culinary characteristics of yam genotypes.

Source	Df	EO	TD	TP	Texture	Flavour	CA	After-taste	GA
Agroecology (A)	2	0.24	0.29	0.30	0.13	0.05	0.11	1.58**	0.06
Gender (G)	1	0.24	0.85	0.76	0.73**	0.07	0.01	0.01	0.42
A*G	2	0.23	0.22	0.19	0.16	1.67**	0.02	0.69**	0.09
Genotype (Ge)	10	31.23**	77.15**	88.23*	46.15**	32.8**	11.11**	12.42**	70.4**
C*A	14	0.22	0.20	0.19	0.08	0.16	0.05	0.39**	0.27*
C*Ge	10	0.13	0.25	0.26	0.62**	0.15	0.01	0.09	0.26*
C*A*Ge	14	0.18	0.20	0.21	0.02	0.03	0.33	0.50**	0.30**
Error	930	0.11	0.14	0.12	0.10	0.09	0.12	0.09	0.12
Total	983	-	-	-	-	-	-	-	-
Mean	-	1.44	2.32	2.11	2.10	2.00	1.40	1.40	2.40
CV	-	23.4	16.4	12.3	15.06	15.40	23.95	20.79	14.50
R^2	-	0.76	0.87	0.78	0.85	0.81	0.54	0.66	0.89

EO, TD, TP, CA and GA are enzymatic oxidation, taste description, taste perception, colour attractiveness and general acceptability, respectively.

Table 2. Mean scores of enzymatic oxidation assessment of 8 yam genotypes in 3 agroecologies in 2 years.

Clone	Fumesua	Wenchi	Bodwease	Mean
TDr__95/1932	1.0	1.6	1.5	1.3
TDr__89/2660	3.0	3.0	3.0	3.0
TDr__89/02665	3.0	3.0	3.0	3.0
TDr__98/02877	1.9	1.9	1.9	1.9
TDr__95/18544	3.0	3.0	3.0	3.0
TDr__95/19177	3.0	3.0	3.0	3.0
2002/001	3.0	3.0	3.0	3.0
Brass	.	.	3.0	3.0
Dente	3.0	.	.	3.0
Dorban	.	3.0	.	3.0
KUP__2000/001	3.0	3.0	3.0	3.0
Grand Mean	2.6	2.7	2.7	2.7
SE	0.06			0.03

2003). Agroecology was considered a random variable and genotype and gender were fixed variables.

RESULTS

The results of the "multiplicative term mixed model procedure" of descriptive analysis of sensory evaluation of yam genotypes in Ghana. (Table 1), showed that generally, the agroecology had no effect ($P > 0.01$) on the culinary characteristics studied. Highly significant ($P < 0.01$) clonal differences were observed in taste description and perception, texture, flavour, colour, after-taste and general acceptability.

Enzymatic oxidation appearance and colour attractiveness

Results from colour assessment ranged from liked very much (1.0) to liked (2.0) (Table 3). All the genotypes evaluated had white tuber flesh colour except KUP__2000/001 which was yellowish in colour and TDr_89/02665 which had yellowish tint. However, results from colour attractiveness analysis indicate that, all genotypes had attractive tuber colour and their appearance was acceptable to farmers.

Of all the genotypes studied only TDr__98/02877 and TDr__95/1932 had significantly ($P < 0.01$) rapid browning after cutting the tuber surface (Table 2).

Texture, taste, flavour and after-taste and general acceptability

Texture

Results from the textural analysis of the boiled yam (Table 4) showed that the texture of the genotypes

Table 3. Mean scores of colour attractiveness of 8 yam genotypes in 3 agroecologies in 2 years.

Clone	Fumesua	Wenchi	Bodwease	Mean
TDr__95/01932	1.8	1.7	1.5	1.7
TDr__89/02660	1.8	1.5	1.7	1.7
TDr__89/02665	1.0	1.0	1.3	1.1
TDr__98/02877	2.0	2.0	2.0	2.0
TDr__95/18544	1.8	1.9	1.7	1.8
TDr__95/19177	1.3	1.3	1.6	1.4
2002/001	1.0	1.0	1.0	1.0
Brass	.	.	1.5	1.5
Dente	1.1	.	.	1.1
Dorban	.	1.5	.	1.5
KUP__2000/001	1.0	1.0	1.0	1.0
Mean	1.4	1.4	1.5	1.4
SE	0.06			0.03

Table 4. Mean scores of texture of 8 yam genotypes in 3 agroecologies in 2 years.

Clone	Fumesua		Wenchi		Bodwease		Mean	
	Men	Women	Men	Women	Men	Women	Men	Women
TDr__95/01932	2.1	2.9	2.0	2.9	2.0	2.8	2.0	2.9
TDr__89/02660	1.2	2.4	2.0	2.2	1.4	2.2	1.5	2.3
TDr__89/02665	1.1	2.1	1.2	2.0	1.2	2.0	1.2	2.0
TDr__98/02877	2.2	3.0	2.0	3.0	2.1	3.0	2.1	3.0
TDr__95/18544	2,2	2.9	2.1	2.9	1.9	2.8	2.0	2.9
TDr__95/19177	1.3	2.3	1.4	2.3	1.9	2.4	1.5	2.3
2002/001	1.2	1.0	1.1	1.0	1.2	1.0	1.2	1.0
Brass	.	.	.	.	1.2	1.8	1.2	1.8
Dente	1.1	1.5	.	.	.	.	1.1	1.5
Dorban	.	.	1.2	1.7		.	1.2	1.7
KUP__2000/001	1.0	1.0	1.1	1.0	1.1	1.0	1.1	1.0
Mean	1.4	2.1	1.6	2.1	2.1	2.1	1.7	2.1
SE	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

ranged from very mealy (1.0) to soggy (3.0), with a mean of 2.1 (mealy). Generally, KUP__2000/001 and 2002/001 were very mealy followed in that order by Dente, Dorban, Brass, TDr__89/02665, TDr__89/02660, TDr__95/19177, TDr__95/18544, TDr__95/01932 and TDr__98/02877. All the local landraces (KUP__2000/001, 2002/001, Dente, Dorban, Brass) were comparatively mealy compared to the improved genotypes (TDr__89/02665, TDr__89/02660, TDr__95/19177, TDr__95/18544, TDr__95/01932 and TDr__98/02877), with KUP__2000/001, Dente and 2002/001 being very mealy than the rest of the genotypes.

Gender differences in texture were in the degree of appreciation of the “feel” of the genotypes. Women generally were very critical in their rankings. In Fumesua, for instance all the genotypes ranked very mealy by men (TDr__89/02665 and check) except KUP__2000/001 and 2000/001 were ranked by women as mealy (Table 4). Similar trends were observed at other locations or villages.

Aroma of the studied genotypes ranged from 1.0 (Very high = KUP__2000/001) to 2.9 (low = TDr__95/01932 and TDr__95/18544) (Table 5). KUP__2000/001 had very high aroma followed in order by 2002/001, TDr__89/02665, Dorban, TDr__98/02877, TDr__89/02660, TDr__95/19177, Brass, TDr__95/01932.

All the improved genotypes (TDr__95/18544, TDr__95/01932 and TDr__98/02877) except TDr__89/02665, TDr__89/02660, TDr__95/19177 had less sweet after-taste than local landraces (KUP__2000/001, 2002/001, *Dente*, *Dorban*, *Brass*) (Table 6).

Table 5. Mean scores of aroma of 8 yam genotypes in 6 locations in 2 years.

Clone	Fumesua	Wenchi	Bodwease	Mean
TDr__95/01932	2.9	2.9	2.9	2.9
TDr__89/02660	2.0	2.0	2.1	2.0
TDr__89/02665	1.9	1.9	1.9	1.9
TDr__98/02877	2.0	2.0	2.0	2.0
TDr__95/18544	2.9	2.9	2.9	2.9
TDr__95/19177	2.0	1.9	2.3	2.1
2002/001	1.1	1.5	1.0	1.2
Brass	.	.	2.4	2.4
Dente	1.3	.	.	1.3
Dorban	.	2.0	.	2.0
KUP__2000/001	1.0	1.0	1.0	1.0
Grand Mean	1.9	2.0	2.1	2.0
SE	0.05			0.03

Table 6. Mean scores of after-taste of 8 yam genotypes in 6 locations in 2 years.

Clone	Fumesua	Wenchi	Bodwease	Mean
TDr__95/01932	1.9	1.8	1.9	1.9
TDr__89/02660	1.3	1.3	1.0	1.2
TDr__89/02665	1.5	1.4	1.3	1.4
TDr__98/02877	2.0	2.0	2.0	2.0
TDr__95/18544	1.9	1.8	1.8	1.9
TDr__95/19177	1.4	1.4	1.0	1.3
2002/001	1.0	1.0	1.0	1.0
Brass	.	.	1.0	1.0
Dente	1.0	.	.	1.0
Dorban	.	1.0	.	1.0
KUP__2000/001	1.0	1.0	1.0	1.0
Grand Mean	1.5	1.4	1.3	1.3
SE	0.05	0.03	0.04	0.04

Table 7. Mean scores of taste perception[λ] assessment of 8 yam genotypes in 3 agroecologies in 2 years.

Clone	Fumesua		Wenchi		Bodwease		Mean	
	Men	Women	Men	Women	Men	Women	Men	Women
TDr__95/01932	3.0	4.0	3.6	4.2	3.2	4.0	3.3	4.1
TDr__89/02660	1.6	2.4	2.2	2.7	1.7	2.9	1.8	2.7
TDr__89/02665	1.1	2.1	1.2	2.0	1.2	2.0	1.2	2.0
TDr__98/02877	2.4	3.2	2.4	3.3	2.4	3.4	2.4	3.3
TDr__95/18544	2.9	3.6	2.9	3.6	3.2	3.9	3.0	3.7
TDr__95/19177	1.5	2.5	1.5	2.6	2.1	2.5	1.7	2.5
2002/001	1.3	1.8	1.3	1.8	1.3	1.8	1.3	1.8
Brass	.	.	.	.	2.2	3.0	2.2	3.0
Dente	1.9	2.2	.	.	.	.	1.9	2.2
Dorban	.	.	1.8	2.4		.	1.8	2.4
KUP__2000/001	1.0	1.0	1.1	1.0	1.1	1.0	1.1	1.0
Mean	1.9	2.1	2	2.1	2.1	2.7	2	2.1
SE	0.05		0.03		0.04		0.04	

[λ]Taste description was significant correlated (r = 1.0) to taste perception hence concentrated on Taste Perception.

Table 8. Mean scores of general acceptability of 8 yam genotypes in 6 locations in 2 years.

Clone	Fumesua	Wenchi	Bodwease	Mean
TDr__95/01932	3.8	3.7	3.7	3.7
TDr__89/02660	2.1	2.2	2.3	2.2
TDr__89/02665	1.5	1.2	1.2	1.3
TDr__98/02877	3.0	3.1	3.1	3.1
TDr__95/18544	3.8	3.7	3.6	3.7
TDr__95/19177	2.0	2.2	2.3	2.1
2002/001	2.0	2.0	2.0	2.0
Brass	.	.	2.3	2.3
Dente	2.0	.	.	2.0
Dorban	.	2.5	.	2.5
KUP__2000/001	1.0	1.0	1.0	1.0
Grand Mean	2.4	2.4	2.4	2.4
SE	0.06			0.03

Table 9. Percentage of farmers selecting yam genotypes and ranking of preference in 3 agroecologies in Ghana.

Clone	Taste	Texture	CA	Aroma	After-taste	OA						
	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
TDr95/01932	58.3	9	74.8	9	60.2	9	60.4	9	86.2	2	36.3	9
TDr89/02660	89.8	2	90.4	2	75.6	2	80.4	2	86.2	2	66.4	4
TDr89/02665	89.8	2	90.4	2	75.6	2	80.4	2	86.2	2	86.8	2
TDr98/02877	40.1	11	54.3	11	60.2	9	60.4	9	86.2	2	29.8	11
TDr95/18544	48.2	10	67.5	10	60.2	9	60.4	9	68.4	11	32.3	10
TDr95/19177	84.7	5	90.4	2	75.6	2	80.4	2	86.2	2	57.9	5
2002/001	89.8	2	90.4	2	75.6	2	80.4	2	86.2	2	75.4	3
Brass	70.4	7	90.4	2	75.6	2	80.4	2	86.2	2	40.2	7
Dente	78.4	6	90.4	2	75.6	2	80.4	2	86.2	2	46.8	6
Dorban	66.2	8	80.8	8	75.6	2	80.4	2	86.2	2	39.4	8
KUP2000/001	100	1	100	1	100	1	100	1	100	1	100	1

CA- Colour attractiveness and OA- Overall acceptability.

Taste

The perception of taste ranged from 1.0 (Very sweet = KUP__2000/001) to 3.4 (bland = TDr__ 95/18544). KUP__2000/001 was the most tasty genotype followed in order by 2002/001 and TDr__89/02665, Dente, Dorban, TDr__95/19177, TDr__89/02660, Brass, TDr__98/02877, TDr__95/01932 and TDr__95/18544 (Figure 7). Gender difference exists with respect to perception of taste. For instance, at Fumesua, only KUP__2000/001 had a rating of 'very sweet' for both men and women, while genotypes such as TDr__89/02665 and 2000/001 which were ranked 'very sweet' by men but and just 'sweet' by women.

KUP__2000/001 which was ranked first in terms of texture, taste, aroma, colour attractiveness and after-taste was the best genotype (Table 8) and the most preferred genotype by farmers (Table 9). Similarly, genotypes 2000(2)/001 and TDr__89/02665 which were ranked second only to KUP__2000/001 in terms of taste, texture, colour attractiveness, aroma, after-taste, were generally accepted by farmers in that order of preference.

DISCUSSION

In varietal development, sensory evaluation is essential since gastronomic preferences differ from individual to individual and from place to place. Hence the non-significant difference ($p < 0.01$) observed in sensory evaluations with respect to agroecology from this study indicates that consumer preference for yams is universal in the study area. This was expected since the study was conducted in the Forest-Savannah Transition, Forest and Coastal Savannah agroecologies in the country where the most preferred form of yam consumption is boil-and-eat. Yams in Ghana generally have very narrow range of utilization. Unlike Nigeria and other French-speaking West Africa countries where yam is processed into flour and 'amala', in Ghana yam consumption is mainly boil-and-eat in most part of the Forest-Savannah Transition, Forest and Coastal Savannah agroecologies in the country and some degree of pounding in the Guinea Sudan agroecology. Yam consumption as flour and 'amala' for instance, is completely non-existent in Ghana.

The sensory attributes of taste, appearance, colour

and texture are key determinants of food acceptability (Lawless and Heymann, 1998; FAO, 2000). Appearance which is significantly impacted by colour is one of the first attributes used by consumers in evaluating food quality (FAO, 2000). Colour may also be influenced by naturally occurring pigments such as chlorophylls, carotenoids and anthocyanins in food, or by pigments resulting from both enzymatic and non-enzymatic reactions (FAO, 2000). All the genotypes studied had white tuber flesh colour except KUP_2000/001 which had yellowish tuber flesh and TDr_89/02665 white with yellowish tint tuber flesh colour, which were the most preferred genotypes.

Enzymatic browning is one of the most important colour reactions that affect fruits, vegetables and seafoods (FAO, 2000). Similarly, in yam, browning of peeled tuber makes it unappealing to consumers. Browning can also adversely affect flavour and nutritional value. The absence of browning from peeled tubers is therefore very critical for maintaining economic value of the crop. Genotypes TDr_98/02877 and TDr_95/1932 were the least preferred genotypes and this may be attributed to their rapid browning on cutting the tuber surface, making them unappealing to consumers.

In boiled yam, mealiness, waxiness, sogginess, stickiness and hardness are the important textural classes (Otegbayo et al., 2005). Texture is an important index of quality in many food products (Wilkinson et al., 2001). It is a multidimensional attribute and a collective attribute that encompasses the structural and mechanical properties of a food and its sensory perception in the hand and in the mouth (Bourne, 2002). Mealiness is thus the ease of disintegration of the boiled yam while waxiness is the extent to which the yam remains intact and does not disintegrate easily when pressed with fingers or in the mouth, (Otegbayo et al., 2005). The texture of foods is the combination of the perception of vision, hearing, somesthesis and kinesthesis (Wilkinson et al., 2000). Differences in texture result in different chewing time, moistening and sizes of particle after mastication (Hoebler et al., 2000). Texture is also important for flavour release and perception (FAO, 2000). Solid foods that are chewed need longer time than drinks that are consumed almost immediately and spend only seconds in the mouth. The forming of a thin film in the oral cavity is important for perception of flavour (Harrison, 1998; Klahorst, 1997). Mealiness therefore is an important textural characteristic influencing many food forms of yams especially in a boil-and-eat yam food culture. This might have influenced consumer preferences accounting for some of the predominance of certain cultivars in some region, in addition to agro-climatological impacts on the growing attributes of the species (Opara, 1999). White- fleshed yams, for instance, have firm texture (mainly *D. rotundata*) are the most popular in West Africa, while in the South Pacific, *D. alata* cultivars (water yam, white purplish with loose watery texture) are most common (Opara, 1999). From this study, all the genotypes evaluated were mealy and hence acceptable to farmer/consumers with respect to mealinesss. The relatively high degree of association of women with the preparation of food items than men might have accounted for the observed gender differences in taste and texture appreciation of the yam genotypes.

Aroma is also one of the key determinants of the palatability of food and means the overall impression of taste, texture and mouthfeel (Donini et al., 2003). Genotypes KUP_2000/001, TDr_89/02665 and 2000/001 were tops in that order of preference by farmers and consumers. This might also have contributed positively for overall acceptability of these genotypes. Similar preference was expreesed for taste of the genotypes. The perception of taste is the result of many sensations: smelling, tasting, texture, sound, temperature, appearance, chemical pain; as well as cognitive factors such as knowledge and expectation (FAO, 2000). Women seem to have critical perception of such attributes accounting for observed gender differences.

Conclusions

Agroecology had no significant effect on yam preferences of farmers in Ghana ($p > 0.1$). Gender differences exist in degree of appreciation of intensity of sensory attributes such as texture and taste. Taste description was positively correlated ($R = 1.0$) to taste perception and could substitute each other in sensory evaluation of yam. Taste, texture, colour attractiveness, aroma and after-taste are important determinants of overall acceptability of yam by farmers.

KUP___2000/001 was the most preferred genotype due to its superiority in taste, texture, aroma and after-taste followed in order_by TDr__89/02665, 2000/001, TDr__89/02660, TDr__95/19177, Dente, Brass, Dorban, TDr__95/01932, TDr__98/18544 and TDr__98/02877. Local landraces of yams were mealier than the improved genotypes.

Genotypes KUP_2000/001, 2000/001 and TDr_89/02665 have therefore been formally released as new varieties in Ghana as CRI_Pona, CRI_Kukrupa and Mankrong_Pona, respectively.

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