Yield trial and sensory evaluation of sweetpotato cultivars in Highland Papua and West Papua Indonesia

P. Saraswati[1], A. Soplanit[2], A. T. Syahputra[3], L. Kossay[3], N. Muid[3], E. Ginting[4] and G. Lyons[5*]

[1]Faculty of Agriculture Papua State University Manokwari, West Papua; [2]Assessment Institute for Agricultural Technology, Papua; [3]International Potato Center, Bogor; [4]Research Institute for Legume and Tuber Crops, Malang, [5]University of Adelaide, South Australia.

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Abstract

With the aim of improving income and nutrition of indigenous highland people in Papua and West Papua provinces of Indonesia, trials involving introduced and local sweetpotato (*Ipomoea batatas* L.) cultivars were conducted in the Baliem Valley and Arfak Mountains (Minyambouw), Indonesia. Tuber yield and other agronomic traits, chemical content and sensory traits for 17 introduced and three local sweetpotato cultivars were evaluated. Total tuber yield varied from 7.4 to 20.8 Mg ha^{-1} in the Baliem Valley and from 1.9 to 14.4 Mg ha^{-1} in Minyambouw. The introduced cultivars produced higher yields than the local cultivars in both regions. Cultivar Papua Pattipi produced the highest yield in the Baliem Valley, while Sawentar produced the highest yield in Minyambouw. Cultivars varied in dry matter, protein, and beta-carotene. Worembai was best for tuber flesh colour, taste, texture and sweetness in the Baliem Valley, while Helaleke and Papua Salosa scored highest for all sensory traits in Minyambouw. Introduced sweetpotato cultivars adapted well to both areas. In order to reduce malnutrition and increase income, it is important to grow several sweetpotato cultivars in each food garden, including high yielding cultivars and those with specific nutritional traits, such as high protein, pro-vitamin A and anthocyanins.

Keywords: Sweetpotato, *Ipomoea batatas* (L.), Adaptation, Tuber yield, Sensory evaluation.

Introduction

Sweetpotato is an important staple food crop in the eastern part of Indonesia, particularly on the island of Papua. It is the main source of carbohydrate intake for the highlanders of Papua, where it accounts for around 95 % of the diet (Ruinard, 1969; Schneider et al., 1993). Sweetpotato and pigs are an integral part of the social and cultural system of indigenous communities.

In Minyambouw, sweetpotato is usually grown along with other root crops and vegetables without any agronomic input in the mixed cropping system. On the Baliem Valley floor it is cultivated, in both monoculture and mixed cropping systems, in mounds on large, raised beds with a developed drainage system (Peters, 2001), and is grown all year round in both regions.

Intensive research efforts to enhance production and consumption have been undertaken in recent decades with the aim to explore the potential of sweetpotato as a nutritious food for humans and animals (Woolfe, 1992; Yamakawa and Yoshimoto, 2002). Sweetpotato tubers are an excellent source of energy, vitamins A (in orange tuber flesh cultivars), B and C, potassium, phosphorus, calcium and magnesium (Hill, 1984; Woolfe, 1992). Sweetpotato can produce more edible energy per

*Author for correspondences: Phone (08) 83136533; Email<graham.lyons@adelaide.edu.au>.

hectare per day than other food crops in the tropics (Woolfe, 1992). Orange-fleshed varieties provide beta-carotene, which acts as a precursor of vitamin A (Ofori et al., 2009), while purple-fleshed sweetpotatoes are rich in anthocyanin and have high antioxidant activity (Lila, 2004; Kano et al., 2005). Young sweetpotato leaves are rich in polyphenols, protein, vitamins and minerals and are used as a green vegetable (Islam et al., 2002; Johnson and Pace, 2010). Protein content of sweetpotato leaf ranges from 25.5-29.8 % (An et al., 2003), which is higher than the protein of sweetpotato tubers, which ranges between 1.4 and 9.4% (Oboh et al., 1989).

Two research projects under the auspices of the Australian Centre for International Agricultural Research (ACIAR) have aimed to improve the livelihood of indigenous highland people of Papua and West Papua by increasing income and nutritional status through improving sweetpotato quality and production and pig management. The first project (2000-2008) was implemented in the Baliem Valley and the second was extended to a highland area (Minyambouw) of West Papua Province. A baseline survey conducted prior to the research reported that the average family in the Arfak mountain region has just one child under 15 years, and there are few people over 45 years old. These conditions are similar to those in the Baliem Valley, where a similar survey was conducted in the first phase of the ACIAR project (S. Mahalaya, pers. comm., 2011). The most widely grown and preferred sweetpotato in these areas are white or cream-fleshed cultivars, without beta-carotene and anthocyanin. Inadequate nutrients in the diet, in particular protein and those minerals and vitamins associated with protein (iron, zinc, selenium, vitamin A), is likely to be a major factor in the poor health indices observed in these areas.

Even though sweetpotato is the major staple food, most of the local sweetpotato clones are low yielding, with average yield of 5-10 Mg ha^{-1} in the Baliem Valley (Peters, 2001) and 5 Mg ha^{-1} in Minyambouw (Syahputra et al., pers. comm. 2009). Introduction and selection of advanced sweetpotato cultivars for human food and pig feed may provide higher yields, protein and starch content and improve nutrition. Field trials are needed to assess the adaptability of improved cultivars, including Pattipi, Salosa and Sawentar, to local conditions. The adaptation trials of sweetpotato cultivars for human food and pig feed in the current study were conducted at highland sites in Papua and West Papua in 2010, with the aim to compare tuber yield, dry matter content, nutrient content and sensory traits (including taste, texture and sweetness). Improved sweetpotato production, especially when combined with suitable agroforestry programs, has a strong potential to improve food security in South-East Asia (Kumar, 2006).

Materials and Methods

Study sites

The study was conducted in collaboration with local farmers in two highland sites, the Baliem Valley in Papua Province and Minyambouw in West Papua Province. All sweetpotato cultivars were grown in farmers' gardens. Climate and soil conditions of both sites are presented in Table 1.

The amount of rainfall in the Baliem Valley between the first and third months after planting was an average of 271 mm/month, but declined from the fourth month until harvest time to an average of 50 mm of rainfall/month. The rainfall in Minyambouw was around a mean 260 mm/month (range 143-401 mm/month) during the trial period.

Sweetpotato cultivars

Twenty sweetpotato cultivars with important characteristics, such as high yield, short maturity, superior nutrition and high dry matter were collected from research institutions and both local highland sites (Table 2).

Table 1. Climate and soil conditions in the Baliem Valley and Minyambouw.

	Baliem Valley	Minyambouw
Latitude	138°30'-139°40' E; 3°45'-4°20'S	133°52'-133°54' E and 01°06'-01°08'
Altitude	1500-2000 m	1650-1750 m
Annual rainfall	1907 mm	2283 mm
Relative humidity	80%	75-85 %
Minimum temperature	15 °C	-
Maximum temperature	26 °C	-
Average temperature	19.3 °C	-
Solar radiation	1.38 kJ/cm[1] [2]	-
Daily sunlight duration	3.98 hours/day[1]	-
Soil pH (H_2O)	5.0-6.0	5.4- 6.3
Soil type	sandy clay loam to silty clay with block structure	sandy clay loam to clay loam
Soil P (Bray method)	7 µg/g (low)	6 µg/g (low)
Soil N total (Kjeldahl method)	0.12-0.24 % (low to medium)	0.48 % (medium)
Soil C (Calorimetric method)	2-2.75 % (low to medium)	2.39 % (medium)
Soil K (Colwell method)	Low[2]	Low[3]

Source: [1] Peters, 2001; [2] Schroo, 1963 in Soenarto and Rumawas, 1997; [3] Unipa, 2011, unpublished data.

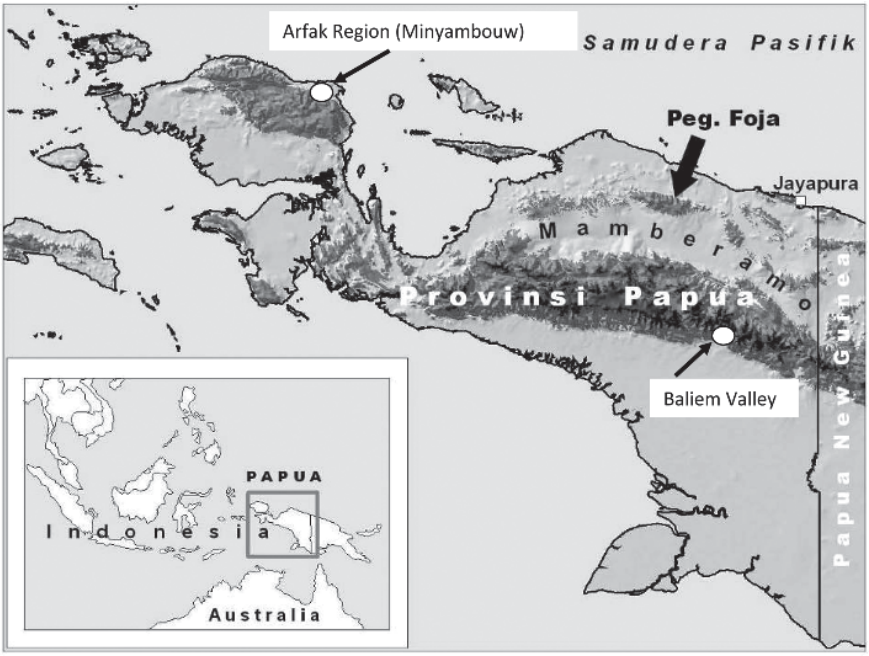

Figure 1. Map of Papua showing the areas where the sweetpotato trials were conducted

Experimental design

The field trials were arranged in a randomised complete block design (RCBD) with three replications at each site. The size of each plot was 3 m x 3 m. Spacing between mounds was 1 m. There were nine mounds, each planted with two sweetpotato tip cuttings (25-30 cm length). Each mound was 40 cm high and 100 cm in diameter. Weeding was conducted at two, three and five months after planting. Sweetpotato cuttings were planted in March 2010 and harvested seven months

Table 2. Origin and tuber morphological characteristics of 20 sweetpotato cultivars.

No	Cultivar/clone	Origin	Skin colour	Flesh colour
1	Cangkuang	Balitkabi[1]	Dark red	Light yellow
2	Sawentar	Balitkabi	Red	Yellow
3	Sukuh	Balitkabi	Yellow	Light orange
4	Sari	Balitkabi	Red	Dark yellow
5	Papua Salosa	Balitkabi	Yellow	Yellow with orange spots
6	Papua Pattipi	Balitkabi	Light yellow	Light yellow
7	BB-20413-13	CIP[2]	Light yellow	White
8	BB-00105-10	CIP	Orange	Dark orange
9	Ayamurasaki	CIP	Dark red	Purple
10	UnguFiriangge[3]	CIPUnipa	Dark redDark red	Dark purpleLight yellow
11	Airani-3	PPUS[4]	Yellow/Cream	Light yellow
12	Miencon	PPUS	Light red (slightly pink)	Light orange
13	Worembai	PPUS	Red	Pale yellow
14	Dosak-1	PPUS	Dark red purplish	Slightly dark purple
15	Dosak-2	PPUS	Yellow slightly cream	Light yellow, purple spots
16	Numfor- 5	PPUS	Light yellow, red spot	Pale yellow
17	Nabire	PPUS	Red	White
18	Musan	B. Valley[5]	Light red	Pale yellow
19	Helaleke	B. Valley	Red	Light yellow
20	Bramwamrum	Minyambouw[6]	Dark red	Light yellow

[1] Balitkabi (Root Crops and Legumes Research Centre, Malang), [2] CIP (International Potato Center, Bogor), [3] Instead of cultivar Firiangge which was tested in Minyambouw, cultivar Ungu was used in the Baliem Valley, as Firiangge did not grow there. [4]PPUS (Root Crop and Sago Research Centre, Manokwari), [5] Local Baliem Valley cultivars, [6] Local Minyambouw cultivar.

after planting in the Baliem Valley, and nine months after planting in Minyambouw, following consultation with local farmers. Plant leaf samples were collected four months after planting from each site and selected minerals analysed using inductively coupled plasma optical emission spectrometry (ICP-OES) to determine nutrient content.

Total tuber yield and dry matter content were determined after harvesting the tubers. Nutrient contents of samples were determined using the AOAC (1990) method. Protein was analysed by the micro-Kjeldahl procedure. Protein concentration was calculated using the following formula : N (%) = (ml HCl – ml blank) x N x 14.007 x 100. Protein (% dry weight) = % N x conversion factor (6.25). Fat content was analysed using the Soxhlet method. Carbohydrate comprised the remainder of the sample. Beta-carotene was analysed using the HPLC method described by Rodriguez-Amaya and Kimura (2004).

Evaluation of sensory traits was conducted by semi-trained consumer panels comprising farmers, teachers and housewives at both sites. Tuber samples of the 20 sweetpotato cultivars were placed in labelled plastic bags, and steamed for 30 minutes. The cooked samples were served to panellists randomly and evaluated for colour acceptability, taste, texture, fibrosity, sweetness level, performance and general acceptability. The responses of the panellists were recorded on a five-point hedonic scale. The panellists rinsed their mouth with plain water after tasting each sample. The agronomic data collected from the sites were analysed by standard ANOVA using GenStat version 14 at a 95% confidence interval, while sensory characteristics were analysed descriptively.

Results and Discussion

Tuber yield and dry matter content

Sweetpotato cultivars varied significantly in tuber yield and dry matter content ($P < 0.05$). Average tuber yield was higher in the Baliem Valley (average of 12.1 Mg ha^{-1}) than in Minyambouw (average of 9.6 Mg ha^{-1}) (Fig. 2). Yield of sweetpotato cultivars in the Baliem Valley ranged from 7.4 Mg ha^{-1} to 20.8 Mg ha^{-1}, with the highest yielding (20.8 Mg ha^{-1}) being the introduced cultivar Papua Pattipi. Other relatively high yielding cultivars (with more than 12 Mg ha^{-1}) were Musan (a local Baliem Valley cultivar), Papua Salosa, Sawentar, Dosak-2, BB-20413.13, Ungu, Cangkuang, Helaleke (local) and Numfor-5.

Tuber yield varied according with the location. In Minyambouw, the average tuber yield was highest in cultivar Sawentar, which produced 14.4 Mg ha^{-1}. Other relatively high yielding cultivars (10.1-13.9 Mg ha^{-1}) were Airani-3, Numfor-5, Miencon, BB-20413-13, Worembai, Helaleke, Papua Pattipi, Dosak-1 and Papua Salosa. The local Minyambouw cultivar (Bramwamrum) produced 7.5 Mg ha^{-1}. Firiangge and Ayamurasaki produced the lowest yields, 4 Mg ha^{-1} and 1.9 Mg ha^{-1}, respectively.

Bramwamrum produced the highest dry matter content in the Baliem Valley (36.5%) and in Minyambouw (39.6%), while the lowest dry matter was recorded from cultivar BB-00105.1 in both sites: 20.4% in the Baliem Valley and 18.3% in Minyambouw. Figure 2 shows that most cultivars yielded lower dry matter content in Minyambouw than in the Baliem Valley, except for the local Bramwamrum cultivar, which contained greater dry matter when it was planted in Minyambouw than in the Baliem Valley.

Tuber yield varied according to both cultivar and location. Several introduced cultivars produced higher yields than the local cultivars in both sites. The Baliem Valley and Minyambouw differ in

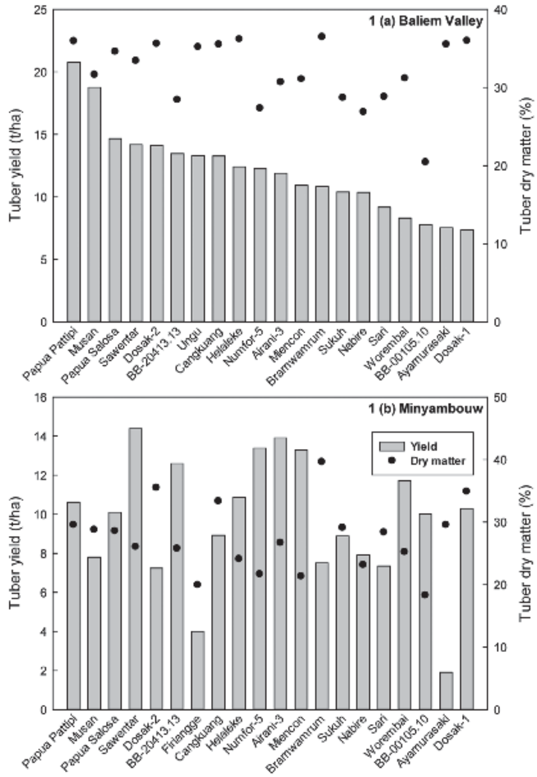

Figure 2. Yield and dry matter content of tubers collected from (a) the Baliem Valley and (b) Mintambouw sites. Note that the y axis scales vary.
Baliem Valley: yield CV%: 18.3, LSD (0.05): 3.7; dry matter CV%: 9.3, LSD: 4.9
Minyambouw: yield CV%: 30.3, LSD: 4.8; dry matter CV%: 5.4, LSD: 2.5.

climate, topography and soil type. Sweetpotato leaves from the Baliem Valley had higher boron, potassium and sulphur concentration for the same cultivar than those from Minyambouw (data not shown). This may have contributed to the higher tuber yield and higher dry matter content of the tested sweetpotato cultivars in the Baliem Valley.

The yield of tubers grown in the Baliem Valley in the present study was 28% lower than that in the previous trial of the ACIAR phase I project (Jusuf et al., 2007; Soplanit et al., 2005). This can be attributed to the dry conditions due to La Niña that occurred in the Baliem Valley from the time of tuber bulking until harvest. However, most of the cultivars were well adapted to the local environment, as shown by production of more than 10 Mg ha^{-1}, which is higher than the mean national sweetpotato yield of 10 Mg ha^{-1} (International Potato Center, 1998) and that recorded for the Baliem Valley of 5-10 Mg ha^{-1} (Peters, 2001).

Sweetpotato normally yields 5 Mg ha^{-1} in Minyambouw (Syahputra et al., pers. comm., 2009). In this area, it is traditionally cultivated without any soil tillage. Application of appropriate methods of cultivation, such as mounding and optimal plant spacing increased yield in this trial. Yield of the local cultivar Bramwamrum increased from the usual level of 5 Mg ha^{-1} to 7 Mg ha^{-1}. Mounding allows more oxygen circulation and improved drainage for tuber development, and facilitates harvesting (Sillitoe, 1998).

Local varieties normally take nine to ten months to mature in high altitude areas. However, the introduced cultivars in this study matured earlier, taking just six months from planting to harvest in the Baliem Valley. These early maturing cultivars offer an opportunity for faster recovery of sweetpotato yield after drought, which periodically occurs in the Baliem Valley. Some introduced cultivars in the Minyambouw trial, namely Papua Pattipi, Papua Salosa, Cangkuang and Sawentar, were also visually observed to be ready for harvest at seven months after planting. This could be important for food security.

Nutrient Analysis

Tuber nutrient content varied significantly among the 20 sweetpotato cultivars (Table 3). Protein content was highest in cultivars Ungu, Ayamurasaki, Papua Salosa and Numfor-5, which contained 4.6%, 4.5%, 4.5% and 4.4%, respectively. The local Minyambouw cultivar (Bramwamrum), which had the highest dry matter content, also had the greatest starch content of 37.2%, followed by Papua Salosa (35.4%), and Papua Pattipi (35.3%). The orange tuber flesh cultivar BB-00105.10, which had the lowest dry matter content, also had the lowest starch content (16.7%). The fat content of all cultivars was low, varying from 0.1 to 0.8%; Sawentar had the highest fat content (0.8%). Cultivar Nabire had the highest ash content (2.5%), followed by Helaleke (1.4%), Dosak-2 (1.3%) and Dosak 1 (1.3%).

Nutrients of the 20 sweetpotato cultivars were analyzed using tubers harvested from the Baliem Valley trial (Table 3). The Minyambouw data were not included due to a faulty analytical instrument. Differences in yield and nutrient concentrations are attributed to genotype-environment interaction. Papua Pattipi had higher iron, zinc, manganese, copper and calcium, but lower potassium and

Table 3. Mean nutrient contents of sweetpotato cultivars grown in the Baliem Valley. Data for the highest five and lowest one for protein are shown of the 20 sweetpotato cultivars grown.

Sample	Protein (%)	Carbohydrate (%)	Fat (%)	Ash (%)
Ungu/Firiangge	4.55	26.47	1.07	1.07
Ayamurasaki	4.54	30.37	0.97	0.97
Papua Salosa	4.52	35.37	0.67	0.67
Numfor-5	4.35	27.89	0.57	0.57
Worembai	3.91	31.85	1.08	1.08
Sari	1.20	20.59	0.32	0.32
Mean	3.09	28.68	0.93	0.93
CV(%)	3.4	0.90	2.50	2.50
LSD (P=0.05)	0.22**	0.52**	0.05**	0.05**

Mean, CV and LSD for all 20 cultivars grown.

phosphorus in tubers than Bramwamrum grown at the same site (data not shown). The lower potassium and phosphorus in Papua Pattipi are attributed to the dilution of the minerals by the formation of heavier tubers.

Improved nutritional content of sweetpotato tubers can reduce malnutrition and improve food security in the developing world. It was interesting that two of the purple-fleshed cultivars contained the highest protein of all the cultivars: Ungu (4.6%) and Ayamurasaki (4.5%), followed by two yellow-fleshed cultivars, Papua Salosa (4.5%) and Numfor-5 (4.4%). The lowest protein was in the cultivars Bramwamrum (1.6%) and Sari (1.2%). The protein content of sweetpotato in other studies included a 0.5-5% range in Papua New Guinea (Bradbury et al., 1984).

Beta-carotene was analysed in selected sweetpotato cultivars that represented the yellow and orange tuber flesh colour. The cultivar with deep orange tuber flesh colour (BB-00105-10) had the highest beta-carotene level (226 µg g^{-1} dry weight). The pale orange or yellow-fleshed cultivars contained much lower amounts of beta-carotene (average of 20 µg g^{-1}) (Table 4). Beauregard, an orange-fleshed cultivar which is common in developed countries was reported to have 215µg g^{-1} dry weight of beta-carotene (Ofori et al., 2009). The intensity of the sweetpotato's orange flesh colour is directly related to its beta-carotene content, and some dark orange cultivars contain similar levels to carrots (Woolfe, 1992; Takahata et al.,1993). Cultivar BB-00105.10 could therefore play an important role in reducing vitamin A deficiency.

Sensory analysis

The local panellists' preferences differed between the two regions. In the Baliem Valley, Worembai scored the highest mean value (4.5) for all sensory attributes (Table 5). In this area, the purple-fleshed cultivars Ayamurasaki, Dosak-1 and Ungu were among the five cultivars scored by the local people

Table 4. Beta-carotene levels of orange- and yellow-fleshed tuber sweetpotato cultivars.

Cultivar	Flesh colour	Beta-carotene (µg/g DW)
BB-00105-190	Dark orange	226
Sukuh	Pale orange	40
Papua Salosa	Yellow/orange spots	35
Miencon	Pale orange/cream	12
Sawentar	Yellow	10
Sari	Yellow	5
Nabire	White	0

as having the best taste. However, BB-00105.10, which is the only cultivar with dark orange flesh colour, and which contained the highest beta-carotene level, was less preferred by the panellists, scoring 3.7 due to poor texture and high water content. Consumers in the Baliem Valley also considered Bramwamrum, Ayamurasaki, Ungu, Dosak-1, Papua Pattipi, Sawentar, Papua Salosa, Cangkuang and Helaleke to have desirable sensory traits, with scores between 4.2 and 3.8 (Table 5).

On the other hand, Helaleke and Papua Salosa were the most preferred cultivars by Minyambouw's panellists, both scoring 4.9, followed by Sukuh, Sawentar, Dosak-2, Sari and Cangkuang, scoring between 4.7 and 4.3 (Table 6). A number of cultivars (Firiangge, Miencon, Dosak-1, BB-20413-13 and BB-00105.10) received low scores (between 2.6 and 2.9) in Minyambouw.

Most of the tested cultivars were found to have acceptable tuber flesh colour, except for Musan in both sites. Musan was the least preferred cultivar for human consumption with low scores in all sensory characters, due to poor texture and high fibre. This cultivar produced a high yield in the Baliem Valley but the overall sensory characters showed that it was not regarded as fit for staple consumption by local people. It is usually fed to their domestic animals, particularly pigs.

Panellists from both areas considered that high dry matter content (also expressed as starchy) and good

Table 5. Sensory scores for steam cooked tubers of sweetpotato cultivars in the Baliem Valley, using a hedonic scale[1]. Data included from the six highest-scoring cultivars and the lowest cultivar for acceptability and taste of the 20 tested.

Cultivar	Colour acceptability	Taste	Texture	Fibre	Sweetness level	Appearance	General acceptability	Mean
Bramwamrum	4.1	5.0	4.0	3.8	3.6	3.9	5.0	4.2
Worembai	4.7	4.7	4.7	4.0	4.1	4.0	5.0	4.5
Ayamurasaki	4.1	4.5	4.0	3.9	3.3	4.0	5.0	4.1
Dosak-1	4.2	4.3	3.6	3.7	3.8	4.1	5.0	4.1
Ungu	4.3	4.2	3.9	4.0	3.2	4.2	5.0	4.1
Papua Salosa	4.3	4.1	3.3	4.0	3.7	3.8	5.0	4.0
Musan	2.8	2.6	2.3	2.2	3.2	2.9	2.0	2.6

[1]Five-point hedonic scale from 1 = dislike to 5 = extremely like.

Table 6. Sensory scores for steam-cooked tubers of sweetpotato cultivars in Minyambouw using a hedonic scale[1]. Data included from the six highest-scoring cultivars and the lowest cultivar for acceptability and taste of the 20 tested.

Cultivar	Colour acceptability	Taste	Texture	Fibre	Sweetness level	Appearance	General acceptability	Mean
Helaleke	4	5	5	5	5	5	5	4.9
Papua Salosa	4	5	5	5	5	5	5	4.9
Sukuh	4	5	4	5	5	5	5	4.7
Sawentar	4	5	5	4	5	5	5	4.7
Dosak-2	3	5	5	4	5	4	5	4.4
Sari	3	5	3	5	5	5	5	4.4
Dosak-1	4	1	1	5	1	4	3	2.7

[1]Five-point hedonic scale from 1 = dislike to 5 = extremely like.

taste were the most important criteria. Dry matter content depends on cultivar, location, climate, daylength, pathogens and cultivation practices (Woolfe, 1992). For example, high humidity as a result of heavy rainfall during the trial in Minyambouw reduced tuber dryness. According to Rahman et al. (2003), genotypes with high starch content have lower tuber water content when harvested in the dry season. A sensory test of sweetpotato in Kenya also showed an adult preference for sweetpotato cultivars with dry matter greater than 27% (Hagenimana et al, 2001). The average dry matter content in this trial was 31.9 % in the Baliem Valley and 27.5 % in Minyambouw, which is in broad agreement with the mean of 30% reported by Ekayanake and Collins (2004).

Some cultivars, including the purple-fleshed Ayamurasaki, Dosak-1 and Ungu, were favoured by panellists in both regions. These are known to contain high antioxidant activity due mainly to their high level of anthocyanins (Teow et al., 2007), and this, combined with their high protein levels (see above) may be valuable in improving nutrition and reducing the risk of infectious diseases. Tuber conformity was varied: Ayamurasaki had the best tuber shape, size and homogeneity in the Baliem Valley, while Numfor-5 was best in Minyambouw. The best suggestion for reducing malnutrition may be that people are encouraged to plant and consume several sweetpotato cultivars with strong nutritional and agronomic traits.

Most of the introduced sweetpotato cultivars adapted well in the Baliem Valley and Minyambouw, as shown by their higher yield, particularly Pattipi, Salosa and Sawentar. Pattipi produced the highest tuber yield in the Baliem Valley, while

Sawentar produced the highest yield in Minyambouw. Bramwamrum, Helaleke, Dosak-1, Papua Pattipi, Dosak-2, Cangkuang and Ayamurasaki had higher dry matter content than other cultivars at both sites. A number of cultivars offered superior nutrient traits. Ungu, Ayamurasaki and Dosak-1, which have purple flesh colour, and also Salosa and Numfor-5, which have yellow flesh colour, had a higher protein level, while BB-00105.10, the only orange fleshed sweetpotato trialled contained the highest beta-carotene, as expected. The highest carbohydrate content was produced by the local Minyambouw cultivar (Bramwamrum), which was related to its high dry matter content.

Introduced cultivars were perceived to have the best sensory traits. Worembai was considered to have the best taste by the people of the Baliem Valley, whereas Arfak people favoured Helaleke. On the other hand, Musan, which is popular for pig diet in the Baliem Valley, was found to be fibrous and more subject to cracking than the other cultivars. It had the poorest taste according to the people of both areas.

The highland people of Papua and West Papua are recommended to grow several sweetpotato cultivars in their gardens, including high yielding forms for their daily consumption, pig feed and income, as well as cultivars that provide particular nutritional advantages.

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