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Full Length Research Paper

Analysis of preference attributes for spider plant genotypes in Kenya: Implications for breeders and farmers

Kenneth Mutoro

Department of Horticulture and Food Security, Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62000 – 00200, Nairobi, Kenya.

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The supply of spider plant (*Cleome gynandra*) as one of the African leafy vegetables in Kenya is low and this is attributed to inadequate supply of genotypes preferred by both farmers and consumers. This study was carried out to evaluate preference attributes and genotypes of spider plant for both farmer and consumer production and utilization respectively. A survey was conducted in Kiambu county, Kenya on 113 respondents distributed as follows:- 32 farmers, 37 traders and 45 consumers. Both primary and secondary data were utilized. Primary data was collected through a structured questionnaire and analyzed with the aid of SPSS version 16.0 computer software. Hedonic scale of 1-9 was used in ranking preferences. Results indicated that appearance, colour, aroma and/or taste and medicinal properties influence consumer choices of vegetable lines.

Keywords: African leafy vegetables, *Cleome gynandra,* manure, cultivars.

INTRODUCTION

The demand for *Spider plant (cleome gynandra)* is high due to its nutritional and health benefits. It contains numerous vitamins, minerals and bioactive phytochemical compounds for nutritional and health benefits. A study by Kebwaro (2012) indicated that spider plant is among the African leafy vegetables (ALVs) whose consumption has grown steadily in Kenya. Farmers prefer to grow tall spider plant varieties with many leaves and petioles. Being a vegetable, spider plant has positive correlation between height and yield. The higher yield means that the households are more food secure and can sell the surplus to generate income. Harvesting stage is critical because growers may have to compromise between quality and quantity of vegetables harvested depending on the market. Kebwaro (2012) documented that the sixth week from planting was the most opportune time to harvest in order to derive maximum benefit of antioxidant capacity of spider plant. However, harvesting entire crop at this point may have undesirable economic implications due to lower yields.

Surveys that were conducted within East Africa relate low AIV consumption to limited information on recipe preparation (Habwe *et al.,* 2010). For the recipes, consumers prefer spider plant and other AIVs added milk or combined with other vegetable species such as amaranth and black night shade. The plain spider plant is relatively bitter-tasting and thus, not so attractive to the majority of people. However, there is a small number of consumers who prefer eating them as such. Accordingly, a number of studies has been undertaken to determine nutritional content of various AIVs and their formulated indigenous vegetable recipes (Kebwaro, 2012. Habwe *et*

Corresponding author E-mail: kenmutoro@yahoo.com

al., (2010) documented that Africa is endowed with AIVs that are extremely rich in micronutrients.

The health and economic benefits of spider plant have been explored extensively in the recent past (Ojiewo *et al.*, 2010). However, low production levels exacerbated by inadequate supply of high yielding consumer preferred genotypes have hindered its utilization. Limited access by farmers to improved spider plant varieties is a major cause of low fresh leaf yields for this crop. Yields are being improved through selection of genotypes of spider plant, which has intensified in the recent past (Onim and Mwaniki, 2008; Masinde, 2011), since commercial varieties have shortfalls such as yield, nutrient, and geographical diversity. Limited access to quality seed and shortage of suitable cultivars has been key cause of low spider plant productivity (Kebwaro, 2012). Despite these efforts, assessment of consumer preference attributes in various spider plant varieties is key to informing decisions of both breeders and farmers. Consumers are rational in decision making and hence expected to select those genotypes that offer them with maximum utility. Lack of consumer preference analysis in spider plant genotypes could be a factor hindering its production and utilization. Consequently, there is a knowledge gap on farmer and consumer preference attributes in spider plant cultivars. The current study assessed the preference attributes of spider plant cultivars such as aroma, appearance, texture, medicinal at the various stages of the value chain. The findings will be beneficial to breeders, farmers and traders in the value chain.

MATERIALS AND METHODS

The study was conducted in Ruiru sub-county situated in Central Province, Kenya, between March-June 2011 and April-July 2012; its geographical coordinates are latitude1° 9' 0" S, and longitude 36° 58' 0" E. The area is classified under sub-tropical highland climate, by Köppen climate classification system, receives average annual rainfall of 1,025 mm. Temperature range is 10-26°C with altitude of 1,795 m above sea level. The soils are typically red on undulating topography. Main human activities include coffee farming, dairy, and horticulture (MoA, 2008).

Surveys

Three kinds of surveys were carried out: two for farmers at Ruiru; two retail traders at Githunguri and Kahawa West, and, one for consumers in the same locality preference for aroma, appearance, texture and medicinal.

Growers' survey

Spider plant farmers from Kiambu County, who were purposely selected with help of the local District Agricultural Officer, were invited to the experimental site in Ruiru to evaluate the spider plant lines at harvesting stage. A total of thirty-two farmers participated. All the eighty-one subplots were discreetly coded and labelled to conceal identity of the varieties in order to minimize bias. The farmers filled in a simple questionnaire requiring them to indicate their overall varietal preference.

Retail market survey

Two market surveys were conducted separately in Kahawa West and Githunguri open-air grocery markets in the suburbs of Nairobi County. A total of thirty-seven customers were involved in the survey. Both studies were done in the afternoon between 2.00 p.m. to 6.00 p.m. The arrangement was such that in one of the fresh leaf harvests, the shoots were bundled according to colour of the lines. Once on the retail market, the bundles were displayed in four separate groups of green stem-green petiole (GS-GP), green stem-purple petiole (GS-GP), purple stem-green petiole (PS-GP) and purple stem-purple petiole (PS-PP), which is the control. By observing and interviewing customer selection criteria, data was collected and filled out in a simple form.

Survey for recipes

A survey was done at the Food Science Department laboratory in JKUAT to establish consumer preference for three spider plant dishes made from three different recipes. The dishes were made of mixture of five spider plant genotypes grown at JKUAT. They were MLSF17, UGSF14, UGSF36, UGSF 9 and control. A panel of forty-five untrained consumers was invited to taste and fill a simple questionnaire. Ranking was based on hedonic scale of 1-9 whereby tendency towards 9 represented a stronger liking, and vice versa.

The vegetable was carefully prepared by removing hardy stems and petioles and washed. It was then boiled all at once in a larger pan for 15 minutes. The boiled vegetable dish was then divided equally and put into three different bowls for cooking for each of the three recipes. All the three recipes were fried normally and separately on gas cooker, using ordinary vegetable cooking fat with onions and tomatoes before adding the respective ingredients. The recipes were: 1) plain spider plant; 2) spider plant plus peanut and amaranth, and, 3) spider plant plus fresh milk. In the second recipe, 100g of dried, roast peanuts were ground into fine powder using mortar and pestle, before cooking, while amaranth was added at the frying stage. Once cooked, the dishes were put in three different food flasks to keep warm over the entire duration of tasting. The test was conducted from 10.00 a.m. to 12.00 p.m. evaluating the aroma, texture, medicinal and other important traits.

Data analysis

Descriptive statistics were used to analyze data with the aid of SPSS computer software.

Table 4.1. Farmer preference for height and No. of leaves across different genotypes.

Genotype	UGSF14	IP3	MLSF17	Control	UGSF12	UGSF 36	MLSF3	UGSF9	UGSF25
Height	12.7	11.1	12.7	12.7	12.7	9.5	9.5	11.1	8.3
No. of leaves	13.3	13.3	11.7	11.7	11.7	11.7	10	8.3	8.6
General pr.	12.9	12.1	12.1	12.1	12.1	10.6	9.7	9.6	8.6

RESULTS AND DISCUSSION

Preference for spider plant attributes

Farmer preference for height and number of leaves across different genotypes

Assessment of farmer preference for the various attributes of spider plant genotypes was carried out by the aid of descriptive statistics and recorded in percentage terms. Based on the results, UGSF14, MLSF17, control and UGSF12 were highly preferred by farmers due to their tallness trait. The least preferred genotype was UGSF 25 due to its dwarf trait (table 4.1). This finding connotes that farmers prefer tall genotypes to short ones. Accordingly, genotypes with more leaves were highly preferred than those with fewer leaves. UGSF14 and MLSF17 were ranked as having a greater number of leaves per stem (table 4.1). UGSF9 had the least number of leaves per stem according to the ranking by farmers. General preference analysis indicated that UGSF14 was the most liked genotype of spider plant by farmers while UGSF25 was the least preferred genotype.

Consumer preference for recipes

The study evaluated the type of recipes that possessed the attribute value. Consumers scored the recipes based on the appearance on a five point likert scale relating to aroma, texture, medicinal based on the previous experience. The result indicated that a combination of spider plant and fresh milk had the best appearance compared to plain spider plant recipe but was least in aroma (table 4.2). Recipes with amaranth and ground peanut produced the best aroma, texture and were generally preferred compared to all other recipes (table 4.2). Plain recipe was the least preferred in all the attributes that were evaluated.

Buyer preference for attributes

The current study assessed reasons for preference to the physical attributes of the stem and petiole. Findings showed that genotypes with purple colour on stem and petiole were more preferred due to their general appearance and high flavour/aroma (table 4.3). Genotypes with green stem and purple petiole were preferred due to the fact that they have more medicinal value compared to the other genotypes. Finally, spider plant genotypes which were green in colour for both stem and petiole were highly preferred even though none of the attributes under study was distinguishable (table 4.3).

Consumers preference at the market varied among the varieties based on stem and petiole colours. They were guided by appearance, aroma and medicinal properties. Even though the specific attributes varied with the varieties, the overall results were not significant at 5% level. Under typical grocery market scenario, the spider plant varieties are generally sold as mixed (varieties), and issue pure lines was thus, not significant. The score was made from hedonic scale of 1-9, whereby 1 was extreme dislike while 9 was extreme like (Table 4.2).

The recipe 2 was the most preferred, but was insignificantly different from recipe 3 due to higher score value. This could be due to effect of amaranth on making taste milder and improved aroma from roast peanuts, similar to the effect of milk. These findings are consistent with the study by Abukutsa (2007) among three communities in western Kenya. AIVs are normally mixed with other vegetables such as basil, nightshade or cowpeas for improved palatability and nutrition composition. Plain recipe 1 was least preferred due to low visual appeal, low nutritional and relative bitter taste. Vegetables deliver health benefits in addition to fulfilling physiological nutritional needs (Hasler, 1998), especially when ingredients such as milk are included (Abukutsa, 2007). In concurrent study, Kebwaro (2012) documented MLSF17 and UGSF14 accessions to have superior nutritional and phytochemical compositions.

CONCLUSION AND RECOMMENDATIONS

Most consumers in Kenya are becoming aware of their dietary needs and more are selective. Appearance, colour, aroma and/or taste and medicinal properties influence consumer choices of vegetable lines. Food colour is an indicator of available phytochemicals present e.g. carotenoid, lycopene and anthocyanin. For instance, the highest yielding genotypes were not necessarily the ones most preferred by neither the growers nor the consumers, nor will it be nutritionally endowed variety. Consequently, informed compromise must therefore be reached in order to make invaluable and sound recommendations. The wider crop and human factors should be considered.

In conclusion, the study recommends adoption of genotypes MLSF17, UGSF14, Control, UGSF9 and UGSF36 for adoption by farmers considering their outstanding agronomic performance. However, it is recommended to undertake phytochemical analysis for each genotype and effect of high nitrogen stress on plant

Table 4.2. Consumer preference for Recipes across different attributes.

Recipe	Attribute (% score)			
	Appearance	**Aroma**	**Texture**	**General preference**
Plain	20	31	27	26
Amaranth + ground peanut	35	38	40	38
Fresh milk	45	31	33	36

Table 4.3. Buyer preference for the attributes of spider plant genotypes.

Genotype (Stem - petiole)	Reasons for preference (% score)				
	Appearance	Flavour/aroma	Medicinal	None	Overall score (%)
Green – green	26	25	19	9	28
Green-purple	21	23	28	4	23
Purple-green	23	19	21	5	24
Purple-purple	30	26	18	7	25

toxin accumulation. Also, trained panellists should be involved in the sensory test to verify whether there is a significance difference among consumers.
The study found that both growers and consumers have preference for certain spider plant genotypes over others.

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REFERENCES

Abukutsa-Onyango, M. (2007). The diversity of cultivated African leafy vegetables in three communities in western Kenya. *Afr J of Food Agri, Nutr and Development,* **7** 3

Alva AK, Paramasivam S, Fares A, Delgado JA, Mattos D Sajwan K (2008). Nitrogen and Irrigation Management Practices to Improve Nitrogen Uptake Efficiency and Minimize Leaching Losses. Journal of Crop Improvement. Vol. 15 issue 2. Pages 369-420

Blom-Zandstra, M *(2008). Nitrate accumulation in vegetables and its relationship to quality. Annals of Applied Biology. 115 3*

Herman M (2011). Inorganic fertilizer vs. cattle manure as nitrogen sources for maize *(Zea mays L.)* in Kakamega, Kenya. JUROS vol 2 (22).

Kebwaro, D.O., Onyango, C.A., Sila, D.N., Masinde, P.W., Nyaberi, M. N. and Mutoro, K.W. (2012). Influence of nitrogen application on total phenolics and flavonoids during growth of five selected accessions of spider plant (Cleome gynandra L.). Jomo Kenyatta University of Agriculture and Technology online repository.

Macer D (1973). Strawberry growing complete. Pg. 82-86 164 WJ Holman Ltd, Dawlish. UK

Masinde WP, Agong GS (2011). Plant growth and leaf N of spiderplant under varying nitrogen supply Afr. J. Hort. Sci. (December 2011) 5:36-49.

Masinde WP, Agong GS (2011). Plant growth and leaf N of spiderplant under varying nitrogen supply Afr. J. Hort. Sci. (December 2011) 5:36-49.

Ojiewo C, Tenkouano A, Oluoch M, Yang R (2010). The role of AVRDC (The World Vegetable Centre) in vegetable value chains. Afr, J. Hort. Sci. **3**: pp 1-23

Onim M, Mwaniki P (2008). Cataloguing and evaluation of available community/farmers-based seed enterprises on African Indigenous Vegetables (AIVs) in four ECA countries. Lagrotech consultants. Kisumu.

Wambani H, Nyambati EM, Kamidi M (2008). Evaluation of legumes as components of integrated soil nutrient management for kale production. Afr. J. Hort. Sci. 1 (2008) pp 91-9

WHO/FAO (2012) Report of the Joint Expert Committee on Food Additives (JECFA) of the Food and Agriculture Organization of the UN/WHO and the European Commission's Scientific Committee on Food

Mauyo LW, Anjichi VE, Wambugu GW, Omunyini ME (2008). Effect of nitrogen fertilizer levels on fresh leaf yield of spider plant (*Gynandropsis gynandra*) in Western Kenya. Scientific Research and Essay 3 (6) 240-244.