African Journal of Food Science and Technology (ISSN: 2141-5455) Vol. 3(7) pp. 155-159, September 2012
Available Online http://www.interesjournals.org/AJFST

Full Length Research Paper

Cooking time and sensory evaluation of selected Dolichos (Lablab purpureus) genotypes

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Accepted 17 July, 2012

Cooking time and sensory characteristics greatly influence production and consumption of Lablab bean genotypes. This study was undertaken so as to determine cookability of 13 selected lablab genotypes and their sensory characteristics. The genotypes were cooked in a random manner on gas burner at the Food Science Laboratory (KARI-Kakamega). On-farm sensory evaluation was adopted, involving farmers from Meru area who are familiar with the bean. There were significant differences among genotypes in terms of cooking time and sensory attributes at P <0.01. Genotypes 11723 and Njoro recorded low means for cooking time of 70.5 and 93.5 minutes while Lamu and 11736 recorded high means of 197.5 and 172.0 minutes respectively. Evaluation panelists preferred genotypes 11741, 11719 and Mwingi for their good sensory traits. Evidence of genotypic differences in cooking time and consumer preference among selected genotypes indicate that there is an opportunity for breeding to improve on farmers' collections for shorter cooking time and better sensory attributes.

Keywords: Dolichos lablab (Lablab purpureus), cooking time, organoleptic traits.

INTRODUCTION

Cookability and organoleptic qualities of beans are important attributes affecting preference, selection and acceptance of bean varieties developed by breeders. It refers to a condition where beans achieve a degree of tenderness during cooking acceptable to consumers (David et al., 2004). According to Coelho et al., (2009), prolonged cooking has been listed as one of the major factors responsible for under utilization of beans in many diets. Fast cooking varieties are preferred to hard-to-cook varieties to save on energy. Prolonged cooking has a negative impact on beans; reducing their nutritive value especially vitamins and certain amino acids (Urga et al., 2009; Bressani, 2008).

Lablab production and consumption is constrained by anti nutritive factors in some genotypes which impart bitter taste (Gupta, 1992). They have to be cooked for a protracted time in several changes of water to reduce the bitterness resulting in loss of nutrients and taste (Wanjekeche et al., 2003). Therefore, breeding for fast cooking varieties will in effect cut down on fuel costs, reduce nutrient losses and consequently facilitate conservation of natural resources. Diversity in Kenyan Lablab populations has been reported to be low (Kimani et al., 2012; Kamau et al., 2011). The reflection of differences in cooking time and sensory characteristics would help in further classification.

Apart from cooking time, sensory characteristics such as appearance, texture and taste contribute to consumers' choice for a particular bean variety (Mkanda, 2007; Sanzi and Attienza, 1999). Lablab grain finds poor market and low acceptance by farmers and consumers because of its poor cooking qualities. It is a challenge to incorporate sensory traits in breeding programmes as breeding for new bean varieties has mainly focused on agronomic attributes such as yield, maturity rate and

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Table 1. Selected gene bank and farmer grown Lablab genotypes and their characteristics

Entry	Accession no.	Code	Seed colour
1	11723	GBK	Black
2	13086	GBK	Black
3	11719	GBK	Light brown
4	Lamu	FMR	Brown
5	12158	GBK	Brown
6	11736	GBK	Brown
7	Mwingi	FMr	Brown
8	Njoro	FMR	Black
9	Machakos	FMR	Dirty brown
10	13083	GBK	Black
11	11741	GBK	Light brown
12	Mbeere 1	FMR	Brown
13	Mbeere 2	FMR	brown

Key: GBK= genebank; FMR=farmer

resistance to diseases (Scott and Maiden, 1998), and nutritional content (Graham and Ranalli, 1997). For Lablab, the main criteria used has based on adaptability Kenya to ascertain their cooking qualities. Therefore, the objective of this study was to evaluate cooking time and organoleptic properties of thirteen Lablab genotypes. Genotypes identified as fast cooking and of good sensory traits have a potential to be used in breeding and crop improvement programmes.

MATERIALS AND METHODS

Genotypes consisted of freshly harvested (less than one month old) lablab grains collected from farmers in dolichos growing regions of Kenya blended with novel accessions from Muguga genebank-Kenya (Table 1). They were selected based on adaptability, yield and ability to withstand pests and other diseases.

Evaluation of cooking time

The genotypes were evaluated for cooking time at Kenya Agricultural Research Institute (KARI) food laboratory-Kakamega. Saucepans (“sufuria”) used in this experiment were uniform in size (holding 1.5 litres) made of stainless steel with tight fitting lids. Cooking gas was used to ensure continuous heat of same intensity. Fifty grains for each genotype were cleaned to remove damaged or split beans, specks of dirt or other contaminants. Cooking was done in accordance to Gisslen’s (2007) protocol with few modifications in terms of quantities of water and grains used as described below.

as a forage crop not as a grain legume (Kinyua et al., 2007; Adebisi and Bosch, 2004). Very limited research has been conducted on Lablab genotypes grown in

One litre of tap water was put on each saucepan and allowed to boil. The grains were immersed in the water on onset of boiling and timing started. During the cooking process, samples remained covered with water and it was added intermittently as its level dropped until the grains were cooked to acceptable tenderness. Tenderness was determined using method of Njoku and Ofuya (1989), that involved pressing the beans in between fingers until no hard material was found. Time required to obtain such a consistently cooked product was recorded as cooking time. It was calculated from initiation of cooking to time taken to soften (80%) of the grains. Four samples were cooked at a time on different saucepans.

Sensory Analysis

This was evaluated as a farm cooking experiment that was conducted in Meru region, Kenya because of the popularity of the crop in the region. Tasting panel comprised of ten farmers (8 women and 2 men) familiar with the bean. Females formed majority of the panelists because they are frequently involved in food preparation and are therefore likely to make a more reliable and conclusive evaluation than their male counterparts (Kigel, 1999).

Characteristics assessed included appearance, texture, taste and overall acceptability. Two hundred grains (40 grams) from each accession were cleaned and then placed on a saucepan to which water was added to

Table 2. Means for cooking time and hedonic scores for selected Lablab genotypes

Entry	Accession No.	Cooking Time (Minutes)	Appearance	Taste	Texture	Overall Acceptability
1	11723	70.5a	3.5de	3.7d	3.6def	3.7cde
2	13086	140.5gh	3.1bcd	3.1bcd	3.1bcd	3.2abcde
3	11719	126.5efg	3.2cd	3.4cd	3.7def	4.1de
4	Lamu	197.5j	2.2abc	3.8de	3.6def	3.5bcde
5	12158	100.5bc	2.9abcd	2.7ab	3.5def	2.8abc
6	11736	172.0j	2.8abcd	3.4cd	3.4def	3.2abcde
7	Mwingi	102.5bc	4.6f	3.9e	4.0f	4.2de
8	Njoro	93.5 b	2.7abcd	2.8abc	2.9abcd	2.9abc
9	Machakos	110.0cd	2.7abcd	2.2a	2.4abc	2.5ab
10	13083	134.0fg	2.0a	2.6abc	2.2ab	2.6abc
11	11741	151.5i	4.2ef	4.6e	4.0f	4.3e
12	Mbeere 1	121.0def	2.2abc	2.3ab	3.3cde	3.1abcd
13	Mbeere 2	114.5cde	2.1ab	2.2a	2.1a	2.1a
G. M		125.7	2.94	3.13	3.24	3.23
S.E		6.68	1.03	0.88	0.96	1.13
SED		8.49	0.46	0.39	0.43	0.51
CV%		5.30	35.3	28.0	29.5	34.8

NB. Means followed by the same letter are not significantly different, according to DMRT at 5% probability level

cover the beans. They were boiled to acceptable tenderness using firewood. Tenderness was determined using method developed by Njoku and Ofuya (1989). After cooking, the beans were removed from the fire and allowed to cool. Each sample with coding blinded from the panelists, was served on ten plates for evaluation by each of the panelists, using a five point hedonic scale depending on intensity of sensation perceived. Appearance was rated using sight while texture was felt with hands. Texture and taste were evaluated in the mouth. Overall acceptability was sum total of all these parameters. To ensure independent ratings, the panelists were seated away from each other to avoid any distraction. They tasted the entire samples, one at a time rinsing their mouths with tap water in between the tasting to prevent carry over effect.

Experimental design and Data analysis

For determination of cooking time, the samples were cooked at random with two replications. Organoleptic experiment was also laid in CRD where the samples were presented to the panel at random. Data generated was subjected to statistical analysis using Genstat discovery 10th edition (2007) version. Means were separated using Duncan's Multiple Range Test (DMRT) of same software.

RESULTS

The genotypes showed varied cooking times and the analysis of variance (ANOVA) revealed highly significant differences across genotypes at ($P< 0.001$) (Table2). There were significant differences for organoleptic traits, including overall acceptability at $P<0.01$ level of probability. Organoleptic means were significant across genotypes revealing the existence of variation in sensory attributes among test genotypes (Table 2).

Cooking time among genotypes ranged between 70-197 minutes. Comparatively, gene bank accessions took relatively longer time to cook than farmers' collections. However, the shortest cooking time of 70 minutes was observed in 11723; a genebank accession. The darkest seeded genotypes took longer time to cook as compared to light brown to white seeds. With regard to appearance, 13083 was rated lowest. All dark genotypes obtained fairly low scores for appearance >3. However, there was a deviation from the expected where some brown genotypes; Mbeere 1 and Mbeere 2 were rated poorly and given low scores for appearance. Genotypes 11741, Mwingi, and 11719 received the highest overall acceptance scores in that order. They were ranked highly in all parameters evaluated (Table 2). On the other hand, Mbeere 2 was least preferred because of its poor sensory qualities. It was consistently ranked least in nearly all traits evaluated

Ample variability was detected for cooking time and sensory attributes among studied genotypes. Five genotypes; 11741, 11719, 11723, Mwingi and Njoro were identified for outstanding cooking quality characteristics.

DISCUSSION

Comparatively, gene bank accessions took relatively longer time to cook than farmers' collections. This could be explained by the fact that farmers prefer varieties that cook fast to save on energy bearing in mind that farmers' genotypes came from regions where dolichos is a popular food. However, 11723; a gene bank accession cooked the fastest, indicating that preferred diversity like short cooking time can also be accessed in non cultivated materials. A possible explanation for this genotype not being popular among farmers could be attributed to its relatively poor sensory qualities (from organoleptic results) compared to other genotypes, which was rated low.

Variation in cooking time may be caused by several factors such as energy source, type of water, genetics of selection, size and age of beans among others. Since most factors (heat supply, water type, age and size of beans) were kept constant during the experimentation, the lengthy cooking time observed in some genotypes could be attributed to their genetic make up, as earlier suggested by Bitjoka (2008) and Price and Dawn (2004).

The long cooking time of most dark seeded selections could be attributed to high anti-nutritive levels in their seed coats. Maass and Usongo (2007) and Pengelly and Maass (2001) related lablab seed colour to anti nutritive levels, and found dark seeded types to contain high amounts of these substances than white seeded genotypes. A large amount of energy is thus required to eliminate these compounds resulting in prolonged cooking. In the present study, dark genotypes recorded slightly higher cooking times agreeing with reports by Adebayo, (2006) and Fasoyiro at al., (2005) who found black seeded pigeon pea and mucuna varieties to cook for a longer time. Thus, the high values obtained for black genotypes in this study are not surprising. Seemingly, anti nutritional factors may be responsible for the bitter taste in black genotypes as could be envisaged from the organoleptic results, where black genotypes received low scores for taste attribute. However, anti nutritional factors were not evaluated and their determination in these genotypes needs further investigation.

Sensory panelists had clear preferences for certain genotypes. A major finding from the panelists was that, quality traits of appearance, texture and taste greatly affect consumers' choice for Lablab genotypes. With regard to appearance, 13083 was rated lowest and this could be attributed to its colour. In pulses, white, cream and brown genotypes are preferred to dark types because the latter may contain relatively high amounts of anti nutritional factors giving them a bitter taste. All dark genotypes obtained fairly low scores for appearance. As a pulse crop, white and cream genotypes are preferred to black seeded types (Pengelly and Maass, 2001). This explains why 13083, a black genotype received the lowest mean score of 2.0 for appearance. However, there was a deviation from the expected where some brown genotypes; Mbeere 1 and Mbeere 2 were rated poorly and given low scores for appearance. This disagrees with several investigators that found black genotypes to be less preferred compared to other colour genotypes (Maass et al., 2005; Wszelaki et al., 2005). A possible explanation for this observation would be influence of taste. Machakos, Mbeere 2, and Mbeere1 were given lowest scores in that order for this trait. Coincidentally, they were of same colour (brown) and happen to be farmers' material from other regions different from that of the panelists. This could be an indication that either the farmers are growing them because of desirable agronomic attributes such as growth habit, yield and adaptation or texture, colour or taste preferences are region specific. This is a clear indication that, genotypes currently grown by farmers need to be improved and novel accessions from gene-bank would be a good source of germplasm.

In the present study, genotypes 11741, Mwingi, and 11719 received the highest overall acceptance scores in that order. This observation could be accredited to their good organoleptic qualities including appearance, texture and taste. They were ranked highly in all parameters evaluated. On the other hand, Mbeere 2 was least preferred because of its poor sensory qualities. It was consistently ranked least in nearly all traits evaluated. A major finding from the panelists was that, quality traits of appearance, texture and taste greatly affect consumers' choice for lablab genotypes

It would therefore be expected for white or cream genotypes to be among popular genotypes grown by farmers because of their good cooking qualities contrary to farmers' choice, where black genotypes have dominated. Pengelly and Maass, (2001) found white and cream genotypes to be susceptible to most pests and had reduced longevity during storage, thus limiting their use in small holder agriculture.

Determination of cooking time was quite subjective though it gave meaningful results. The study therefore recommends use of a Matson cooker which is more scientific. Exploring other ways of reducing cooking time such as soaking and proper storage conditions will be a worth while endeavour.

ACKNOWLEDGEMENTS

We are grateful to Kirk House Trust of the United Kingdom, for providing funds to support this study. Special thanks go to Dr. Brigitte Maass for her valuable comments and Meru farmers' for their participation.

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