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Studies on organoleptic evaluation of banana genotypes

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Abstract
Sensory quality is a composite of product characteristics that impart value to the buyer and consumer. Consumers prefer fruits that look good, firm and offer good flavour and nutritive value. Producers and handlers are first concerned with appearance and textural quality along with long post harvest life. Present study was undertaken at ICAR-AICRP on Fruits, KRC. College of Horticulture, Arabhavi to study the organoleptic qualities of banana genotypes during 2018-19. Five diploid (AA & AB) and Eleven triploid (AAA) banana genotypes were used for the evaluation. The analyzed results for overall acceptability were in higher preference level in Kadali (8.18) which was on par with Pisang Lillin (7.02) while minimum was noticed in Namarai (6.26) among AA group. In AB group, significantly maximum values were observed in Ney Poovan (9.00) which was on par with Mitli (8.71) while, minimum value was noticed in Kodappanilla (4.99).

Keywords: banana, organoleptic, diploid, triploid and acceptability

Introduction
Banana (*Musa* spp.) is one of the most widely cultivated fruits in tropical countries, being the world's second leading fruit, in terms of production. Bananas are grown in at least 107 countries. Although the wild species have fruits with numerous large, hard seeds, virtually all culinary bananas have seedless fruits. Bananas are classified either as dessert bananas (meaning they are yellow and fully ripe when eaten) or as green cooking bananas. Almost all export bananas are of the dessert types; however, only about 10-15 per cent of all production is for export. *Musa* species attained a position of central importance within Pacific societies: the plant is a source of food, beverages, fermentable sugars, medicines, flavorings, cooked foods, silage, fragrance, rope, cordage, garlands, shelter, clothing, smoking material, and numerous ceremonial and religious uses. Although mostly consumed locally in the Pacific region, the fruit enjoys a significant worldwide export market. They are cultivated primarily for their fruit, and to a lesser extent for the production of fibre and as ornamental plants.

Bananas come in a variety of sizes and colors when ripe, including yellow, purple and red. Most production for local sale is of green cooking bananas and plantains, as ripe dessert bananas are easily damaged while being transported to market. Banana is a good source of vitamin A, fair source of vitamin C and B_2 (riboflavin). The fruits are also rich source of minerals like magnesium, sodium, potassium, phosphorus and fair source of calcium and iron. Each 100 g of fruit contains 70 per cent water, 27 per cent carbohydrates, 0.5 per cent crude fiber, 0.3 per cent fat, 1.2 per cent protein, 80 ppm calcium, 29 ppm Phosphorus, 6 ppm iron, 2.44 ppm carotene, 0.8 ppm riboflavin, 7 mg ascorbic acid and 104 calories of energy. Ripe bananas is one of the most easily digested foods and widely used in the nutrition of infants and of people suffering from various intestinal disorders. Because of the low lipid and high energy value, bananas are recommended for obese and geriatric patients (Perrier. 2011) [15].

Although banana is an important fruits of the sub tropics but considerable literature dealing with reducing of post-harvest losses and biochemical changes after application of different treatments during storage is very limited under Indian conditions. In popular culture and commerce, "banana" usually refers to soft, sweet "dessert" bananas. The bananas from a group of cultivars with firmer, starchier fruit are called plantains. Bananas may also be cut and dried and eaten as a type of chip. Dried bananas are also ground into banana flour. A harvested banana or plantain fruit undergoes three physiological developmental stages, which include pre-climacteric or 'green life' stage, the climacteric and ripening stage and the eat-ripe and senescence stage (Robinson, 1996) [17]. Banana fruits have been one of the favorite fruits in India. For preserving a firm pulp texture, good color and flavor and also to avoid from contusion, bananas are cut at a mature-green stage and exported to consumer countries.

To predict quality factors of banana fruits, Finney *et al.*, (1967) [5] measured changing in firmness of banana fruits during the ripening treatment by means of a sonic technique. Ripening is a process, which increases the quality of the fruit, and it is part of the same process, which is accelerating the product towards post-market senescence (Ferris, 1991) [4]. This study aimed at assessing the organoleptic traits and sensorial acceptance, as well as the intention to purchase banana fruits from improved genotypes and commercial cultivars.

Materials and Methods

Sufficient number of bunches were tagged at the fruit set stage at ICAR-AICRP on Fruits Arabhavi field during 2018-19. Diploid banana genotypes like, Anaikomban (AA), Cultivar Rose (AA), Kadali (AA), Namarai (AA), Pisang Lillin (AA), Aktoman (AB), Kodappailla (AB), Kunnan (AB), Mitli (AB), Ney Poovan (AB) and triploid banana genotypes like, Dwarf Cavendish (AAA), Gandevi Selection (AAA), Grand Naine (AAA), Karivazhai (AAA), KBS-8 (AAA), Manoranjitham (AAA), Red Banana (AAA), Red Banana (green) (AAA), Robusta (AAA), Thella Chakkarakeli (AAA) and Yangambi KM-5 (AAA) were used for evaluation. The tagged bunches were harvested with a curved knife when fingers were fully developed and when the fingers started to change their colour from dark green to light green and brought to the laboratory. Good and healthier bunches were selected, in that bunch, middle hand from the top and bottom rows was taken and kept in the laboratory for natural ripening and ripened fingers were used for the organoleptic study. One genotype was considered as a treatment and each treatment and was replicated thrice. The experiment was carried out in a Completely Randomized Design.

Organoleptic evaluation of fresh banana fruits was carried out by a semi- trained panel of 15 judges consisting of teachers and post graduate students of Kittur Rani Channamma Horticulture, Arabhavi. The fruit characters like colour and appearance, texture, taste, flavor, and overall acceptability of banana fruits were evaluated on a nine point hedonic scale using score card mentioned below (Ranganna, 2009) [16].

Hedonic scale	Colour and appearance	Texture	Taste and flavour	Overall acceptability
Like extremely	9	9	9	9
Like very much	8	8	8	8
Like moderately	7	7	7	7
Like slightly	6	6	6	6
Neither like or dislike	5	5	5	5
Dislike slightly	4	4	4	4
Dislike moderately	3	3	3	3
Dislike very much	2	2	2	2
Dislike extremely	1	1	1	1

Statistical analysis

The data recorded on the organoleptic characteristics were subjected to statistical analysis in completely randomized block design. Analysis done using Web Agri. Stat. Package 2 developed by ICAR research complex, Goa. Examination of the data was determined in accordance with Panse and Sukhatme (1985) [14].

Results and Discussion

Organoleptic evaluation of products is a chief means for determining the consumer acceptability. Human element plays a significant role in assessment of sensory quality of a product. From the consumers point of view, the flavour, colour and organoleptic taste of fruit juice is very important because it determines the marketability of squash. Organoleptic quality like colour, mouth feel, flavour and taste of fruit products generally reduces with the increase in storage period (Sensory quality is a composite of product characteristics that impart value to the buyer and consumer. Consumers prefer fruits that look good, firm and offer good flavour and nutritive value. Producers and handlers are first concerned with appearance and textural quality along with long post harvest life (Kader, 2012) [9].

Colour and appearance

Among AA group (Table 1), significantly Kadali (8.50) has recorded maximum values for colour and appearance which was on par with Namarai (6.80) while minimum score was noticed in cv. Rose (6.00). Significantly Ney Poovan (8.99) has recorded highest values for colour and appearance which was on par with Mitli (8.25) and Kunnan (7.50) while minimum score was observed in Kodappanilla (6.90) among AB group. Non significant differences were observed among AAA group (Table 2). Various studies have revealed the influence of fertilizers on the colour of fruits. Increased use of nitrogen fertilizers led to quality of fruits in terms of colour and keeping quality (Murthy *et al*., 2011) [12].

Flavour

Significantly higher values (Table 1) were observed in Kadali (7.89) and Pisang Lillin (7.89) which was on par with Cultivar rose (6.98) while minimum score was noticed in Namarai (5.26) for flavour among AA group. Among AB group, Ney Poovan (9.00) and Mitli (9.00) has recorded maximum values for flavour while minimum was recorded in Kodappanilla (4.26). Among AAA group (Table 2), significantly higher values were observed in Red banana (8.64) which was on par with Manoranjitham (7.42), Red banana green (7.41), Grand Naine (7.14) and Robusta (7.00) while minimum values were noticed in Karivazhai (4.37). This might be due to presence of more total soluble solids more reducing sugar and less acidity usually *acuminata* groups are superior in taste. These results are in line with Nowakuda and Tushemereirwe (2004) [13].

Kader (2008) [8] has observed that the influence of cultural practice on precursors of esters that determine the ultimate level of volatile esters in fresh fruits which in turn affect flavour. Flavour is the combined impression perceived *via* the chemical stimuli from a product in to the mouth. The consumer acceptance of fruits most often relies up on the inherent flavour and textural quality of the product. The flavour of fruits improves during ripening and the different volatile compounds which contributes flavour in banana are Isomyl acetate, 2-pentanol acetate, 2- methyl-1-propanol, 3-methyl-1-butanol banana (Jordan *et al*., 2001) [7].

Taste

Among AA group (Table 1), Kadali (8.00) has recorded higher values for taste which was on par with Pisang Lillin (7.50) and cv. Rose (7.15) while minimum value was noticed in Namarai (6.84). In AB group, significantly higher values for taste was noticed in Ney Poovan (9.00) which was on par with Mitli (8.57) which was followed by Kunnan (7.98) while, minimum value was noticed in Kodappailla (4.15). Significantly maximum (Table 2) values for taste were noticed in Red banana (9.00) which was on par with Manoranjitham (8.94), Red banana green (8.61), Grand Naine (8.61) and Robusta (7.54) while minimum value was recorded

in Yangambi KM-5 (6.31) among AAA group. Sreedevi (2013) [19] reported that organically cultivated banana varieties had significantly higher value for taste as compared to conventionally cultivated banana varieties. Taste is a balance between sugar and acid contents in banana. Malic, citric, tartaric and citric acids are the major acids in banana. The decrease in acidity reduction improves taste (Dadzie and Orchard, 1996) [3].

Texture

Significantly Kadali (8.32) has recorded maximum values for texture which was on par with Cultivar Rose (7.00) and Pisang Lillin (6.69) while minimum value was noticed in Anaikomban (6.01) among AA group. In AB group, significantly higher (Table 1) values were recorded in Ney Poovan (9.00) and Mitli (9.00) while minimum was noticed in Kodappanilla (4.65). Non-significant differences were noticed among AAA group for texture (Table 2). Texture means the sensory manifestation of the structure or inner make up of a food product. Fruit texture is influenced by environmental, cultural, physiological and genetic factors (Sams, 1999) [18]. Decrease in flesh texture has been reported due to excessive fertilization in many fruit crops (Blampied *et al*., 1998) [2]. High fertilization levels impaired the early solubilization of polyuronides resulting in the accumulation of low molecular weight water soluble polyuronides, which ultimately causes inferior texture of fruits (Jia *et al.*, 2006) [6].

Overall acceptability

The analyzed results for all the attributes were in higher preference level for variety Kadali (8.18) which was on par with Pisang Lillin (7.02) while minimum was noticed in Namarai (6.26) among AA group. In AB group, significantly maximum values were observed in Ney Poovan (9.00) which was on par with Mitli (8.71) while, minimum vale was noticed in Kodappanilla (4.99) for overall acceptability. Non-significant (Table 2) differences were observed between genotypes for overall acceptability in AAA group. It can be concluded that the panelists preferred the external appearance rather than internal quality of the banana varieties. This effect has previously been found by Karamura and Karamura (1995) [10]. The increase in moisture content during ripening will improve the taste and aroma of the fruits (Appiah *et al*., 2011) [1]. During ripening, carbohydrates are hydrolyzed into sugars (Kays, 1991) [6]. A study on a comparative quality analysis of banana (var. Palayankodan) by Sreedevi and Suma (2015) [20] found that, sensory parameters were found to be better in organically cultivated varieties.

Table 1: Organoleptic evaluation of diploid banana genotypes

SL. NO.	Genotypes	Colour and appearance	Flavour	Taste	Texture	Overall acceptability
	AA Group					
1	Anaikomban	6.25	6.00	7.00	6.01	6.32
2	Cultivar Rose	6.00	6.98	7.15	7.00	6.78
3	Kadali	8.50	7.89	8.00	8.32	8.18
4	Namarai	6.80	5.26	6.84	6.12	6.26
5	Pisang Lillin	6.00	7.89	7.50	6.69	7.02
	Mean	6.71	6.80	7.30	6.69	6.88
	S.Em±	0.49	0.49	0.54	0.58	0.42
	C.D. 1%	2.06	2.04	1.98	1.98	1.73
	C.V.	9.55	9.14	9.79	8.58	6.12
	AB Group					
1	Aktoman	7.10	4.89	6.31	5.21	5.88
2	Kodappanilla	6.90	4.26	4.15	4.65	4.99
3	Kunnan	7.50	7.98	7.98	7.10	7.64
4	Mitli	8.25	9.00	8.57	9.00	8.71
5	Ney Poovan	8.99	9.00	9.00	9.00	9.00
	Mean	7.89	7.32	7.58	7.03	7.45
	S.Em±	0.46	0.45	0.38	0.40	0.46
	C.D. 1%	1.92	1.88	1.59	1.69	1.93
	C.V.	5.58	6.48	3.45	5.39	6.58

Table 2: Organoleptic evaluation of triploid banana genotypes

SL. NO.	Genotypes	Colour and appearance	Flavour	Taste	Texture	Overall acceptability
	AAA Group					
1	Dwarf Cavendish	8.25	6.31	6.89	7.21	7.17
2	Gandevi Selection	8.00	6.00	7.10	7.50	7.15
3	Grand Naine	8.50	7.14	8.61	8.05	8.08
4	Karivazhai	6.34	4.37	6.35	6.98	6.01
5	KBS-8	8.23	6.21	7.15	7.89	7.37
6	Manoranjitham	8.00	7.42	8.94	8.68	8.26
7	Red Banana	8.62	8.64	9.00	8.95	8.85
8	Red Banana (green)	7.00	7.41	8.64	8.17	7.81
9	Robusta	8.00	7.00	7.54	7.63	7.54
10	Thella Chakkarakeli	7.00	6.35	7.31	8.63	7.32
11	Yangambi KM-5	6.34	4.87	6.31	6.98	6.13
	Mean	7.66	6.52	7.64	7.88	7.43
	S.Em±	0.61	0.66	0.71	0.67	0.81
	C.D. 1%	NS	2.64	2.15	NS	NS
	C.V.	3.81	7.60	6.17	3.97	9.10

Conclusion

In the present study, overall acceptability can be considered as a summary of sensory evaluation. The analyzed results for all the attributes were in higher preference level in Kadali and Pisang Lillin among AA group. In AB group, overall acceptability was good in Ney Poovan and Mitli.

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