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RESEARCH ARTICLE

DISTRIBUTION OF MORPHOLOGICAL AND CHEMICAL KEY DIAGNOSTIC CHARACTERS IN THE COLLECTION OF SCENTED RICE.

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Abstract

Most of the characters taken for categorization based on key are again depend on environmental and biotic and abiotic stress and also influenced by the practices followed by the farmers. But based on the external morphology and pigmentation on the seed, plant and their reactions to various chemicals the genotypes can be grouped. the scented rice genotypes which are collected from the different places of northern Karnataka are grouped and studied the distribution based on the Protection of Plant Varieties and Farmers Right (Act , 2007). Estimates of physico-chemical quality parameters supplemented with organoleptic attributes were observed to be adequate to provide confirmatory unscrupulous identification of basmati rice. These landraces can be popularized among the farmers and can be used as donor in varietal development programme.

INTRODUCTION

Asia is considered as 'Rice bowl' of the world, as more than 90 per cent of the rice is produced and consumed in Asia, a region with high population density. It is one of the very few crop species endowed with rich genetic diversity which account over 100,000 landraces and improved cultivars and makes it one of the most researched crops with the wealth of scientific literature on all its aspects.

With the introduction of high yielding varieties, the land races that include aromatic quality types were moving out of cultivation. Therefore, these varieties have to be collected and evaluated for their exploitable genetic variability and to be conserved. Further, management of the indigenous aromatic rice genetic resources by way of characterisation and documentation helps in protection of these unique bio resources in accordance with the provision laid out in PPV and FR Act (Anon., 2007) to meet the Conservation of Biological Diversity.

Material and methods

The field experiment was conducted at the Agriculture Research Station (ARS) Mugad Farm of the University of Agricultural Sciences, Dharwad, Karnataka during *kharif* season of 2010-11for the varieties which were collected from the farmers field of northern Karnataka as scented rice genotypes. And the observations were taken on these genotypes. Some of the seed and plant morphological traits have been used as key characters to identify the rice genotypes. Similarly combination of phenol, modified phenol and KOH tests could also be used to identify some of the genotypes. System of characterization and descriptors were used for studying the considerable variability among the genotypes studied. Generally, genetic diversity is assessed for morphoagronomic traits. These

traits are of great value as phenotypic markers because of their omnipresence and easy availability. However, the approach has the limitation in terms of resources and time required for field evaluation of a large number of accessions (Dhillon *et al*. 2004).

Results and discussion

Various morphological and agronomical characters exhibited large variation to moderate variability was observed for no coleoptile colour (63.4%), no anthocynin colouration on leaf (68.3), erect type attitude (51.2%), no anthocynin colouration of area below apex (65.9%), no anthocynin colouration of apex (65.9%), very short type (91 cm) length of stem (56.1%), medium (11-20), number of panicles per plant (68.3%), yellowish colour tipped lemma (43.9%), straw type of lemma and palea colour (53.7%), very short type length of longest own (50.0%), partly exerted type of panicle (53.7%), straw type colour of lemma (63.4%), white type of dehusked seed colour category (48.8%), few (<10) number of tillers per plant (51.2%) type, medium (<30) type of Spad meter reading 51.2 per cent of genotypes, plant height in medium category (30-40 cm) and 48.8 per cent genotypes were grouped to medium (20-25 g), 1000 seed weight category.

Most of the genotypes had auricles (90.2%), ligules (95.1%), split types ligule (87.8%), white type colour of ligule (95.1%), short (<30 cm) type of blade length (78.0%), narrow (<1 cm) type of width of blade (2.7%). Thin (<4 mm) type of stem (92.7%), with no colour of Anthocynin colouration of nodes and internodes (80.5% each). In the panicle length of main axis maximum genotypes were grouped to long type (26.30 cm) category, yellowish white type of awn colour (68.8%), 73 per cent of genotypes had secondary branching. Good variability was observed for stigma colour with 65.9 per cent genotypes having white stigma colour and 19.5 per cent genotypes had yellow type for anther colour 82.9 per cent of genotypes had yellow type of anther.

Awn is a filiform extension of the keel of the lemma. Farmers prefer awnless variety seed because awns are objectionable in threshing and milling. In the present collection, most of the genotypes (61.0%) were awn less. High variability was observed for intensity of anthocynin coloration of leaf sheath, colour of auricles, attitude of flag leaf, density of pubescence of lemma, colour of tip of lemma, distribution of awns, secondary branching leaf senescence, seed colour and plot yield, days to 50 per cent flowering. Similar findings were also obtained Sharma *et al*. (2004) and Sangeeta Das and Amitava Ghosh (2010) in rice genotype collections.

Along with morphological, the distribution pattern for chemical tests also responded well to the characterizing the scented rice genotypes moderate variable was seen with light brown colour for phenol test in 53.7 per cent genotypes, modified phenol test and KOH tests showed least variability with most of the genotypes gave no change in colour. Similarly, NaOH and KI test also showed moderate variabalities among the genotypes and it was found most of genotypes with light yellow colour for NaOH and brown colour for KI test. Response for added chemicals to GA_3 and 2,4-D was also moderately varied, where in most of aromatic genotypes showed high response to growth promoter GA_3 (46.3%) and least response to growth suppression to 2,4-D (65.9% genotypes). With the consumer point of view paddy were length, kernel length, cooked kernel length, elongation ratio, gelatinizing temperature, gel consistency, amylase concentration and aroma are important characteristics. From farmers point of view more panicle length weight is preferred while hulling percentage, milling percentage and hulling recovery is preferred by trader. In his study nine lines of small and medium grained aromatic rice were evaluated for their physical and quality characteristics. This can be utilized for the development of keys for identification of genotypes based on different combinations. This study the genotypes showed variation for seed, seedling and plant morphological traits and for few biochemical tests, which were helpful in grouping of genotypes, and not for identifying individual genotypes. Therefore, it is very much essential to develop suitable techniques for establishing stable diagnostic traits. It requires developing and standardizing a biographic characteristic descriptor for identification as especially for seed industry based on combination of morphological, chemical and electrophoresis banding pattern.

Table 1. Distribution of morphological and chemical characters in the collection of scented rice genotypes

Sl. No.	Character	States	Note	Number of genotypes	Percentage Frequency
1	Coleoptile colour	Light pink	1	13	31.7
		Green	2	2	4.9
		Colourless	3	26	63.4
2	Leaf: Intensity of	Light	1	18	43.9

	green colour	Medium	2	13	31.7
		Dark	3	10	24.4
3	Leaf: Anthocyanin Colouration	Absent	1	28	68.3
		Present	9	13	31.7
4	Leaf: Distribution of anthocyanin Colouration	Absent	1	28	68.3
		On tips only	2	6	14.6
		On margins only	3	5	12.2
		In blotches only	4	0	0.0
		Uniform	5	2	4.9
5	Leaf Sheath: Anthocyanin colouration	Absent	1	17	41.5
		Present	9	24	58.5
6	Leaf sheath: Intensity of anthocyanin colouration	Absent	1	16	39.0
		Very weak	2	8	19.5
		Weak	3	6	14.6
		Medium	4	8	19.5
		Strong	5	1	2.4
		Very strong	6	2	4.9
7	Leaf: Auricles	Absent	1	4	9.8
		Present	9	37	90.2
8	Leaf: Anthocyanin colouration of auricles	Colourless	1	31	75.6
		Light purple	2	6	14.6
		Purple	3	0	0.0
		Absent	4	4	9.8
9	Leaf: Ligule	Absent	1	2	4.9
		Present	9	39	95.1
10	Leaf: Shape of ligule	Truncate	1	0	0.0
		Acute	2	5	12.2
		Split	3	36	87.8
11	Leaf: Colour of ligule	White	1	39	95.1
		Light purple	2	2	4.9
		Purple	3	0	0.0
12	Leaf: Length of blade	Short (< 30 cm)	1	32	78.0
		Medium (30-45 cm)	2	9	22.0
		Long (> 45 cm)	3	0	0.0
13	Leaf: Width of blade	Narrow (< 1 cm)	1	38	92.7
		Medium (1-2 CM)	2	3	7.3
		Broad (>2 cm)	3	0	0.0
14	Culm: attitude	Erect	1	21	51.2
		Semi-erect	2	10	24.4
		Open	3	6	14.6
		Spreading	4	4	9.8
15	Flag leaf: Attitude of blade (Early observation)	Erect	1	16	39.0
		Semi-erect	3	13	31.7
		Horizontal	5	8	19.5
		Drooping	7	4	9.8

Contd table 1..

SL. No.	Character	States	Note	Number of genotypes	percentage Frequency
16	Spikelet: Density of pubescence of lemma	Absent	1	3	7.3
		Weak	3	11	26.8
		Medium	5	19	46.3
		Strong	7	8	19.5
		Very strong	9	0	0.0
17	Lemma: Anthocyanin colouration of keel	Absent	1	31	75.6
		Weak	3	0	0.0
		Medium	5	4	9.8
		Strong	7	2	4.9
		Very strong	9	4	9.8
18	Lemma: Anthocyanin colouration of area below apex	Absent	1	27	65.9
		Weak	3	4	9.8
		Medium	5	2	4.9
		Strong	7	4	9.8
		Very strong	9	4	9.8
19	Lemma: Anthocyanin colouration of apex	Absent	1	27	65.9
		Weak	3	5	12.2
		Medium	5	2	4.9
		Strong	7	2	4.9
		Very strong	9	5	12.2
20	Spikelet: Colour of stigma	Purple	1	4	9.8
		White	2	27	65.9
		Light green	3	4	9.8
		Yellow	4	8	19.5
		Light purple	5	2	4.9
21	Colour of anther	White	1	7	17.1
		Light green	2	0	0.0
		Yellow	3	34	82.9
		Light purple	4	0	0.0
		Purple	5	0	0.0
22	Stem: Thickness	Thin (<4.00 mm)	3	38	92.7
		Medium (4.00-5.50 mm)	5	3	7.3
		Thick (>5.50 mm)	7	0	0.0
23	Stem: Length (excluding panicle)	Very short (< 90 cm)	1	23	56.1
		Short (91-110cm)	3	18	43.9
		Medium (111-130 cm)	5	0	0.0
		Long(131-l50 cm)	7	0	0.0
24	Stern: Anthocyanin colouration of nodes	Absent	1	33	80.5
		Present	9	8	19.5
25	Stem: Intensity of anthocyanin coloration of nodes	Weak	3	33	80.5
		Medium	5	7	17.1
		Strong	7	1	2.4
26	Stern: Anthocyanin colouration of internodes	Absent	1	33	80.5
		Present	9	8	19.5
27	Panicle: Length of main axis	Very short (< 16 cm)	1	0	0.0
		Short (17-20 cm)	3	0	0.0
		Medium (21-25 cm)	5	2	4.9
		Long (26-30 cm)	7	39	95.1
		Very long (> 30 cm)	9	0	0.0

Contd table 1

Sl. No.	Character	States	Note	Number of genotypes	percentage Frequency
28	Flag leaf: Attitude of blade (Late observation)	Erect	1	16	39.0
		Semi-erect	3	18	43.9
		Horizontal	5	7	17.1
		Deflexed	7	0	0.0
29	Panicle: Curvature of main axis	Straight	1	5	12.2
		Semi-straight	3	8	19.5
		Deflexed	5	15	36.6
		Dropping	7	13	31.7
30	Panicle: Number per plant	Few(<11)	3	13	31.7
		Medium (11-20)	5	28	68.3
		Many (> 20)	7	0	0.0
31	Spikelet: Colour of tip of lemma	White	1	13	31.7
		Yellowish	2	18	43.9
		Brown	3	2	4.9
		Red	4	1	2.4
		Purple	5	6	14.6
		Black	6	1	2.4
32	Lemma and palea: Colour	Straw	1	22	53.7
		Gold	2	7	17.1
		Brown	3	5	12.2
		Purple	4	2	4.9
		Black	6	5	12.2
33	Panicle: Awns	Absent	1	25	61.0
		Present	9	16	39.0
34	Panicle: Colour of awns	Yellowish white	1	11	68.8
		Brown	2	2	12.5
		Light red	3	1	6.3
		Purple	4	1	6.3
35	Panicle: Length of longest awn	Very short	1	8	50.0
		Short	3	2	12.5
		Medium	5	3	18.8
		Long	7	3	18.8
36	Panicle: Distribution of awns	Tip only	1	4	25.0
		Upper half only	3	5	31.3
		Whole length	5	7	43.8
37	Panicle: Presence of secondary branching	Absent	1	9	22.0
		Present	9	32	78.0
38	Panicle: Secondary Branching	Weak	1	16	39.0
		Strong	2	11	26.8
		Clustered	3	5	12.2
		Absent	4	9	22.0
39	Panicle: Exertion	Partly exerted	3	22	53.7
		Mostly exerted	5	16	39.0
		Well exerted	7	3	7.3
40	Leaf: Senescence	Early	3	12	29.3
		Medium	5	13	31.7
		Late	7	16	39.0
41	Sterile lemma:	Straw	1	26	63.4

	Colour	Gold	2	9	22.0
		Red	3	1	2.4
		Purple	4	5	12.2
42	Aroma	Slight smell	1	15	36.6
		Medium smell	2	12	29.3
		Strong smell	3	14	34.1

Contd table 1..

S. No.	Character	States	Note	Number of genotypes	percentage Frequency
43	Seed colour	Pale yellow	1	9	22.0
		Yellow	2	11	26.8
		Yellowish brown	3	12	29.3
		Brownish yellow	4	5	12.2
		Very pale brown	5	4	9.8
44	Dehusked seed colour	White	1	20	48.8
		Light brown	2	10	24.4
		Variegated brown	3	5	12.2
		Light red	5	3	7.3
		Light green	10	3	7.3
45	Number of tillers per plant	Few(<10)	3	21	51.2
		Medium (10-15)	5	17	41.5
		Many (> 15)	7	3	7.3
46	Days to 50%flowering	Less days (<80)	3	8	19.5
		Medium days (80-100)	5	19	46.3
		Many days (>100)	7	14	34.1
47	Plot yield (kg)	Less(<0.5)	3	12	29.3
		Medium (0.5-1)	5	18	43.9
		Good (> 1)	7	11	26.8
48	Spad meter reading	less(<30)	3	3	7.3
		Medium (30-40)	5	27	65.9
		Good (> 40)	7	11	26.8
49	Plant height (average) (cm)	Short (<30 cm)	3	8	19.5
		Medium (30-40 cm)	5	21	51.2
		Long (>40 cm)	7	12	29.3
50	Panicle weight of 5 plants in kgs	Less(<0.03)	3	17	41.5
		Medium (0.03-0.04)	5	12	29.3
		More (>0.05)	7	12	29.3
51	1000 seed weight (g)	Less < 20 g	3	12	29.3
		Medium : 20-25 g	5	20	48.8
		More :>25 g	7	9	22.0
52	Phenol test	No colour change	0	13	31.7
		Light brown	1	22	53.7
		Dark brown	3	6	14.6
53	Modified Phenol test	No colour change	0	10	24.4
		Light brown	1	9	22.0
		Brown	2	9	22.0
		Dark brown	3	9	22.0
		Black	4	4	9.8
54	KOH test	No colour change	0	8	19.5
		Light yellow	1	14	34.1
		Dark yellow	2	13	31.7

		Reddish brown	3	6	14.6
55	NaOH test	No colour change	0	3	7.3
		Light yellow	1	24	58.5
		Yellow	2	14	34.1
56	KI test	Brown	0	25	61.0
		Bluish brown	1	16	39.0
57	GA3	Low response	1	13	31.7
		Medium response	2	9	22.0
		High response	3	19	46.3
58	2-4 D	Highly affected	1	2	4.9
		Moderately affected	2	12	29.3
		Least affected	3	27	65.9

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