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Characterization of Himalayan Rice Genotypes on PPV and FRA Guidelines

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A B S T R A C T

Genotypes of rice collected from various parts of foot hills of Himalayan region (31.1048 °N; 77.1734 °E) mainly Himachal Pradesh were assessed for morphological markers such as leaf linked characters. A significant amount of genetic variation was displayed for most of the traits examined. All genotypes has green coleoptile colour except Kaludhan which was purple in nature. Among the 8 genotypes which having anthocyanin colouration for leaf, 4 genotypes have anthocyanin on tip only, marginal distribution for 3 genotype and uniform spread for Kaludhan. The short leaf blade was found in VL-221(26.06 cm) and the longest in HPR-2699 (56.86 cm). In the genotypes collected, HPR-2143 (17.80mm) has the highest leaf width, which was significant superior over all other genotypes. Whereas RP-2421 (9.90 mm) genotype was found to be the lowest followed by HPR-2746 (11 mm). These characters can be used for identification of off types at the time of field inspection. Genetic diversity among some of these cultivars indicating that the cultivars can effectively contribute to the gene pool of rice cultivars.

Introduction

Rice is an important cereal crop of Himachal Pradesh next only to maize during *kharif* season. Rice accounts for 0.78 m ha of area and 1.32 m ton of production on total food grain basis and 22.2% of area and 18.8% of production on *kharif* season crops basis in the State. Kangra and Mandi districts alone account for 71.2 percent of area and 69.7 percent of production. There is great diversity of agro-climatic conditions under which rice is cultivated and its cultivation extends from foot-hills (350 m) to high hills (up to 2300 m). In the high hills of Himachal Pradesh commonly cultivated traditional rice varieties are Jatoo, Matali, Laldhan, Deval, Chohatoo and Sukara dhan etc. People in the high hills prefer rice, which cooks sticky. In Kullu valley and high hills of Shimla and Sirmor districts, these landraces have very specific climatic adoptability. Red rice (red pericarp) is still being grown because of local preferences and fetch premium price (Rana *et al.*, 2000). Classification of genotype on the basis of their morphological traits related to plant anatomy, which final added valve in crop production. These activities are performed at different

stages of the global process including seed production and scientific research for improvement of crops. The earliest attempt was made for detailed classification of rice varieties based on agronomical and physiological characters by Kikkawa (1921) and Based on leaf sheath colour and then on grain dimension (graham 1913).

Materials and Methods

The field experiment was conducted at Rice and Wheat research Centre, CSKHPKV, Malan. Which is situated at an elevation of 950 MSL (N 32^{o} 07', E76^{o} 23') coming under sub-humid mid-hill condition. The annual rainfall is 1800±512 mm. The field experiment was laid out in a randomized block design with 3 replication involving thirty varieties (Table 1) with spacing 20 X 15 cm. along with application of recommended dose nutrients complex (90: 40: 40 N:P:K kg/ha). To study the plant morphological traits, each genotype were observed for stable and distinguishable characters related to leaf structure as recommended by Plant Varieties and Formers Rights Authority (PPV&FRA) guidelines (Anon., 2001) and various traits where recorded at different plant growth stages (Table 2).

Results and Discussion

Broadly the leaf characters can be taken for categorizing are intensity of green colour of leaf, Pubescence of leaf blade, flag leaf blade attitude, ligule shape, leaf blade length, intensity of green colour of leaf, density of pubescence on lemma (Table 2). For on the intensity of green colour of leaf, 5 had light green, 13 with medium and 10 genotypes with dark green leaves Monika *et al.,* (2007) also clustered nineteen genotype of paddy based on intensity of green colour of leaf. It was absent in all the cultivars of his study. Similar type of work was carried out by Anita Lakshmi (2002), Nethra (2003), Rimpi *et al.*, (2008), Mageshwaran (2010) and Sarika *et al.*, (2011).

All genotypes has green coleoptile colour (Fig. 1) except Kaludhan which was purple in nature. The sheath colour for Basel leaf (Fig. 2 and 3) was observed, 25 genotypes are found in having green colour, 2 are light purple and 3 are purple for leaf sheath colour. Similar work was carried out by Monika *et al.*, 2007 by grouping all 19 varieties into green basel leaf colour. Among the 8 genotypes which having anthocyanin colouration for leaf (Fig. 4), 4 genotypes have anthocyanin on tip only, marginal distribution for 3 genotype and uniform spread for Kaludhan. With respect to the presence or absence of pubescence on blade surface of leaf varied among the genotypes. Jhinidhan didn't have pubescence on the leaf sheath and very strong in HPR-2682. Mangeshwaran (2010) also grouped 10 genotypes based on this pubescence character. Auricles are present in all genotypes. Among these HPR-2711 and Jhinidhan having purple anthocyanin colouration for auricle. Monika *et al.*, (2017) also grouped 19 varieties on this character basis.

In all genotypes, color (Fig. 5) and ligule are present.HPR-2748, Kalijhini-1; Kalijhini-2 has anthocyanin colouration for collar (Fig. 6 and 7). Ten genotypes were acute for ligule shape and others are split in nature. According to Bora *et al.*, (2018) among 19 varieties, 11 are split in shape for ligule for which DUS characterization was done. The short leaf blade was found in VL-221 (26.06 cm) and the longest in HPR-2699 (56.86 cm). In the genotype collected HPR-2143 (17.80mm) has the highest leaf width, which was significant superior over all other genotypes. Whereas RP-2421 (9.90 mm) genotype was found to be the lowest followed by HPR-2746 (11 mm). Rosita (1975) suggested that length and width of blade were quite useful traits in varietal identification.

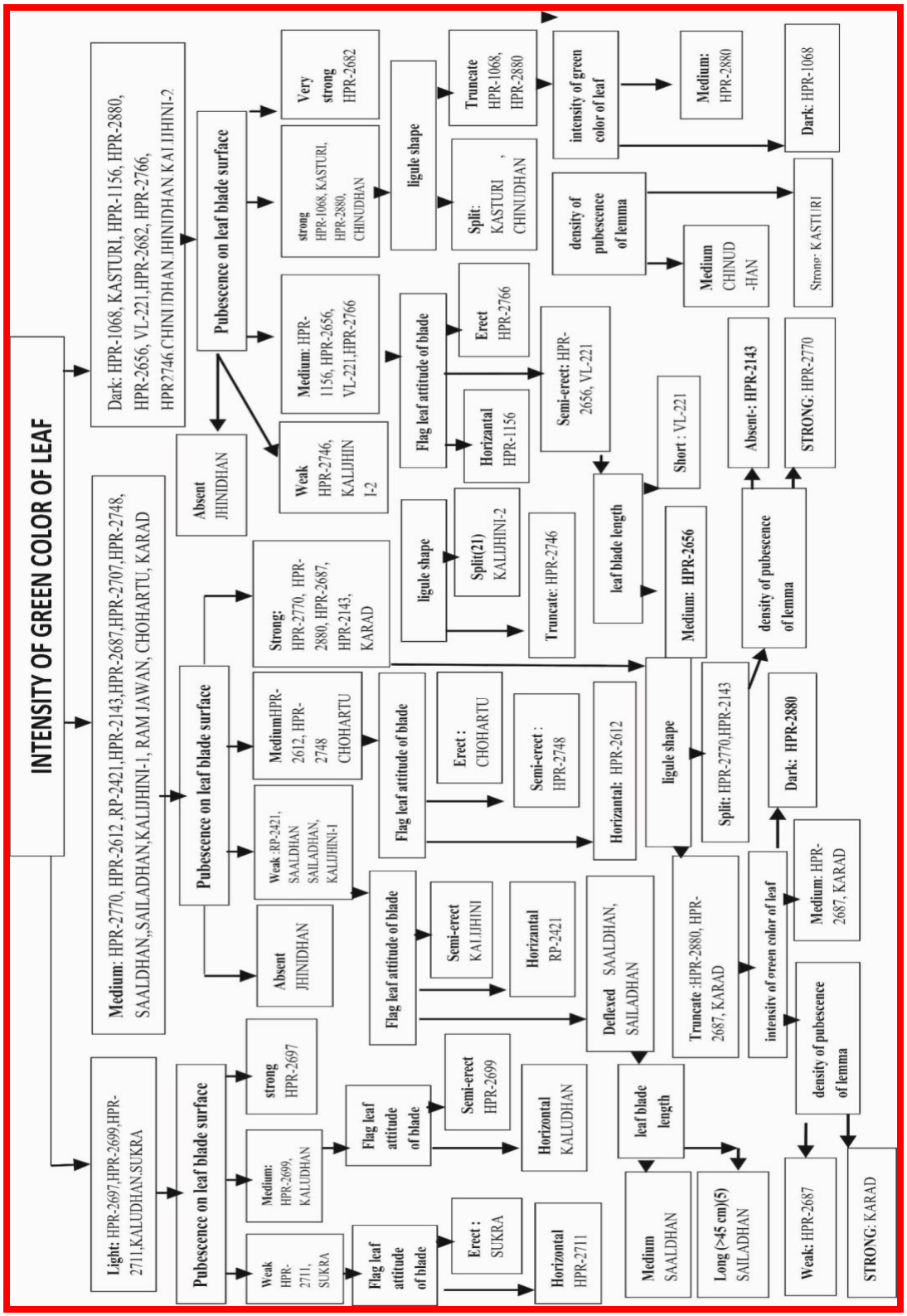
Table.1 Rice cultivars and their source

Sr. No.	Varieties	Source	Year of release	Source/Pedigree
1.	HPR-1068	CSKHPKV, Palampur	2005	IR 53455Nag- 11-1-12-1-3 IR 42015-83-3-22 × IR 9758-K2
2.	HPR-2720 (Palam Lal Dhan-1)	Do	2013	Pure line selection from IC455333
3.	HPR-2612(Palam Basmati-1)	Do	2013	Sarai/T23 × IR 66295-36-2
4.	KASTURI	Do	1994	Basmati 370 × CRR 88-17-1-5
5.	HPR-1156	Do		IR 32429122-3-1-2 × IR 31868-64-2-33-3
6.	HPR-2880(Him Palam Dhan-2)	Do	2016	HPU2216 × Tetap
7.	HPR-2656(Him Palam Dhan-1)	Do	2016	RP2421 × Tetap
8.	RP-2421	Do	1994	IR36 × Kanthawar
9.	VL-221	Do	1994	IR-2053-521-1-1-1 × CH-1039
10.	HPR-2143	Do	2005	HPR 9020-22-2-1-1-1 Phul Patas × HUP 741
11.	HPR-2682	Do	Improved lines	Him dhan-1 × IR-53915
12.	HPR-2687	Do	do	VL Dhan-221 × RP2421 ×× IR53925
13.	HPR-2697	Do	do	957 × RP-2421
14.	HPR-2699	Do	do	RP-2421 × VL dhan-221
15.	HPR-2707	Do	do	VL dhan-221 × JD-3
16.	HPR-2711	Do	do	TS-29 × HPV-2216
17.	HPR-2766	Do	do	HIM-1 × IR-53915
18.	HPR-2748	Do	do	Hessan Serai × T23 ×IR66295
19.	HPR-2746	Do	do	Hessan Serai ×T23 ××IR66295-36-2
20.	Chinudhan	Jandrangal	Landraces	Villege-Jandrangal
21.	Jhinidhan	Timber	do	Pritam Chand. Dadh-Timber
22.	Saaldhan	Bir	do	Bachtan Singh Villege-Bir
23.	Sailadhan	Keor	do	Surjadevi. Villege-Keor
24.	Kaludhan	Pangal	do	Pratap Singh-Pangal
25.	Kalijhini-1	Jadrangal	do	Villege-Jadrangal
26.	Kalijhini-2	Indragal	do	Shyam Lal-Indragal
27.	Ramjawandhan	Nagarota	do	Bagawan –Nagarota
28.	Sukara	Bhatiyala	do	Bhatiyat- Chamba
29.	Chohartu	Rohru	do	Rohru, Shimla
30.	Karad	Dadryada	do	Chamba

Table.2 Description of qualitative characters based on DUS and PPVFRA guidelines

S. No.	Growth Stage	Characters	Category or types	No of genotypes
1.	VS	Coleoptile: colour	1. Colourless 2. Green 3. Purple	0 29 1
2.	VS	Basal leaf: sheath colour	1. Green 2. Light purple 3.Purple lines	25 2 3
3.	VG	Leaf: intensity of green colour	3. Light 5. Medium 7. Dark	4 12 16
4.	VG	Leaf: anthocyanin colour	1. Absent 9. Present	22 8
5.	VG	Leaf: distribution of anthocyanin colour	1. On tips only 2. On margins only 3. On blotches only 4. Uniform	4 3 0 1
6.	VG	Leaf sheath: anthocyanin colour	1. Absent 9. Present	20 10
7.	VG	Leaf sheath: intensity of anthocyanin colour	1. Very weak 3. Weak 5. Medium 7. Strong 9. Very strong	2 2 0 6
8.	VS	Leaf: pubescence of blade surface	1. Absent 3. Weak 5. Medium 7. Strong 9. Very strong	1 8 10 10 1
9.	VS	Leaf: auricles	1. Absent 9. Present	0 30
10	VS	Leaf: anthocyanin colour of auricles	1. Colourless 2. Light purple 3. Purple	26 2 2
11.	VS	Leaf: collar	1. Absent 9. Present	0 30
12.	VS	Leaf: anthocyanin colour of collar	1. Absent 9. Present	27 3
13.	VS	Leaf: ligule	1. Absent 9. Present	0 30
14.	VS	Leaf: shape of ligule	1. Truncate 2. Acute 3. Split	0 9 21
15.	VS	Leaf: colour of ligule	1. White 2. Light purple 3. Purple	24 4 2
16.	MS	Leaf: length of blade	3. Short (<30 cm) 5. Med (30-45 cm) 7. Long (>45 cm)	1 25 4
17.	MS	Leaf: width of Blade	3. Narrow (<1 cm) 5. Medium (1-2 cm) 7. Broad (>2 cm)	1 29 0
18.	VG	Flag leaf: attitude of blade (early observation)	1. Erect 3. Semi-erect 5. Horizontal 7. Drooping	20 9 1 0

Fig.1 Schematic diagram for cultivar identification of rice varieties on the Basis of seed characters



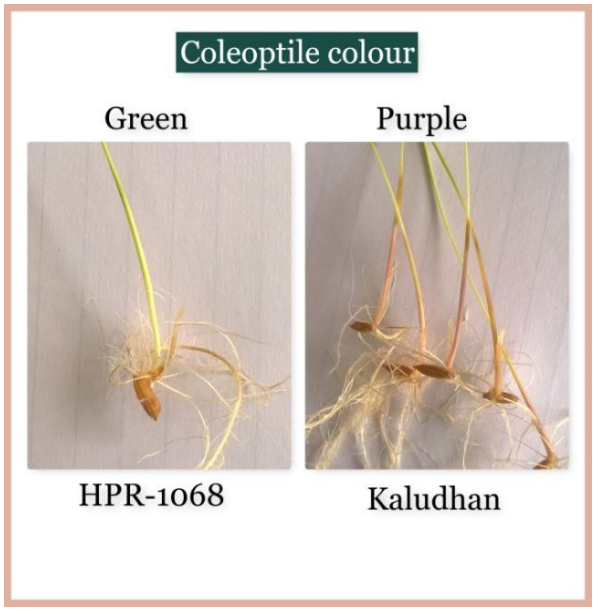


Fig.1 Characterization of rice varieties on the basis of coleoptile colour

Fig.2 Characterization of rice varieties on the basis of basal leaf sheath colour

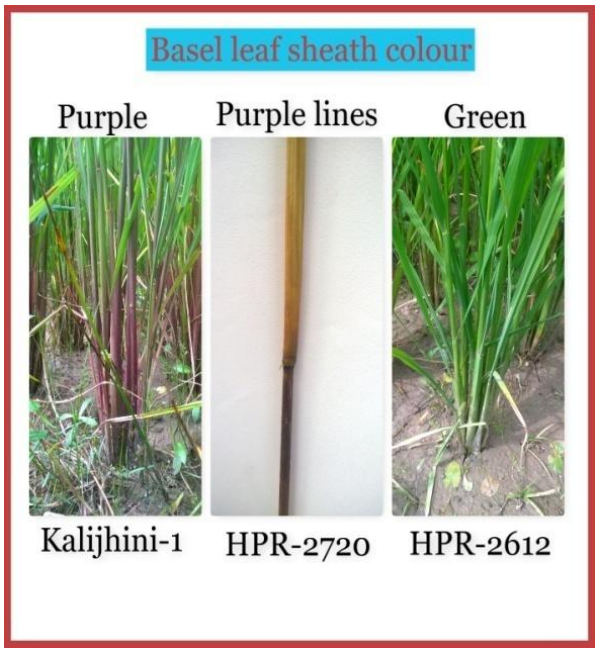


Fig.3 Characterization of rice varieties on the basis of basal leaf sheath anthocyanin colouration

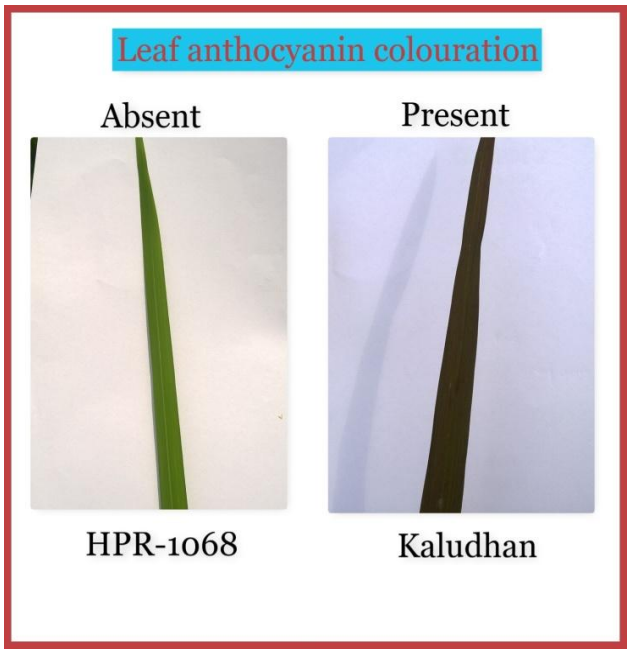


Fig.4 Categorization of paddy varieties on the basis of leaf anthocyanin colour

Fig.5 Characterization of rice varieties on the basis of presence leaf auricles

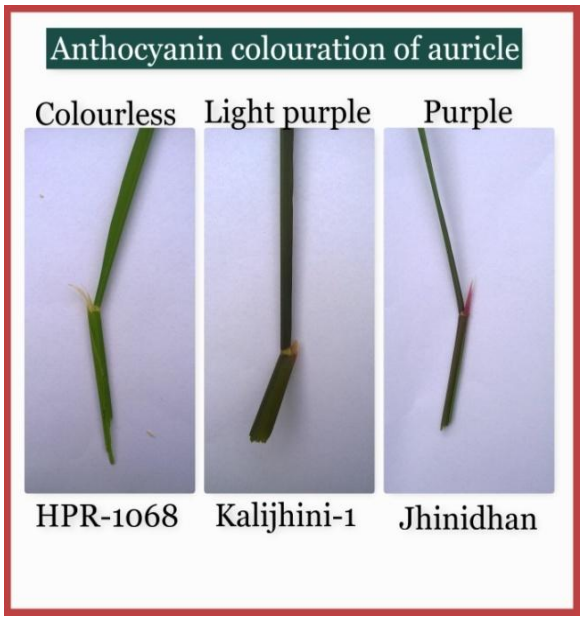


Fig.6 Characterization of rice varieties on the basis of basal of anthocyanin colouration of auricles

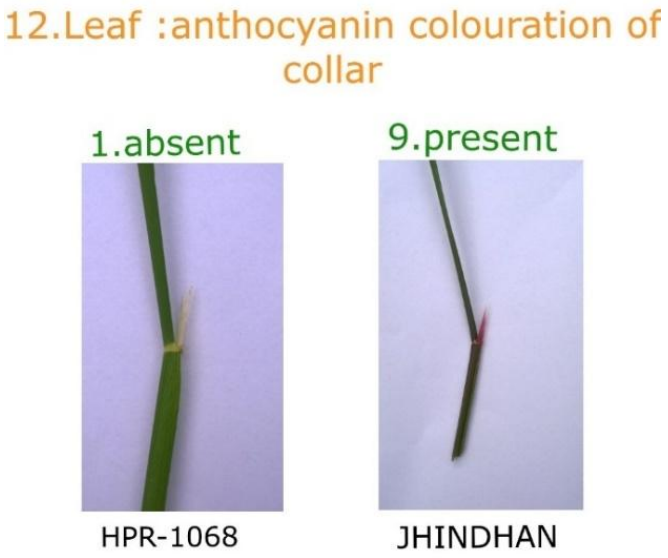


Fig.7 Characterization of rice varieties on the basis of anthocyanin colouration of collar

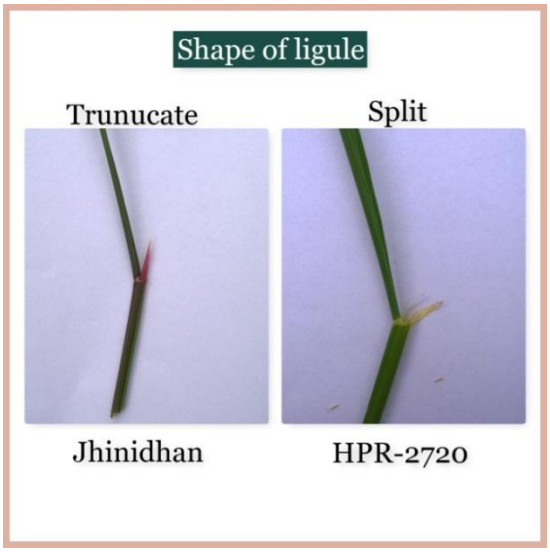


Plate.8 Characterization rice varieties on the basis of basal shape of ligule

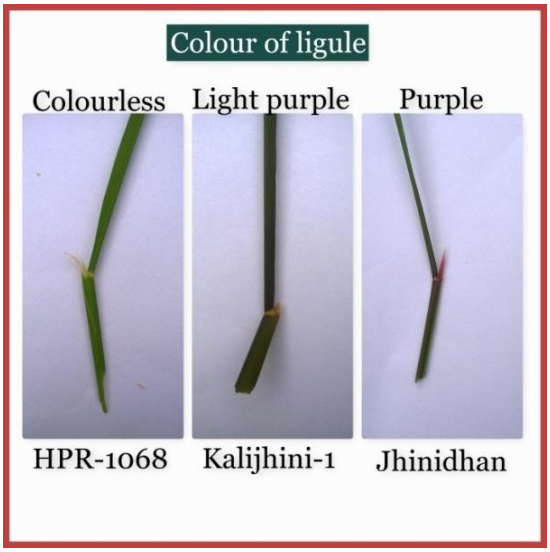


Plate.9 Characterization of rice varieties on the basis of presence colour of ligule

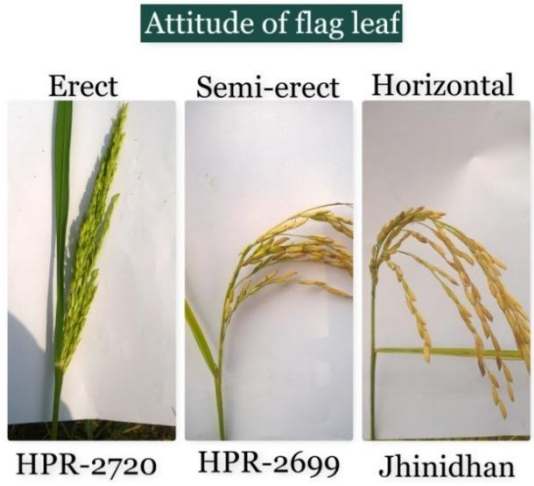


Plate.10 Characterization of rice varieties on the basis of attitude of blade

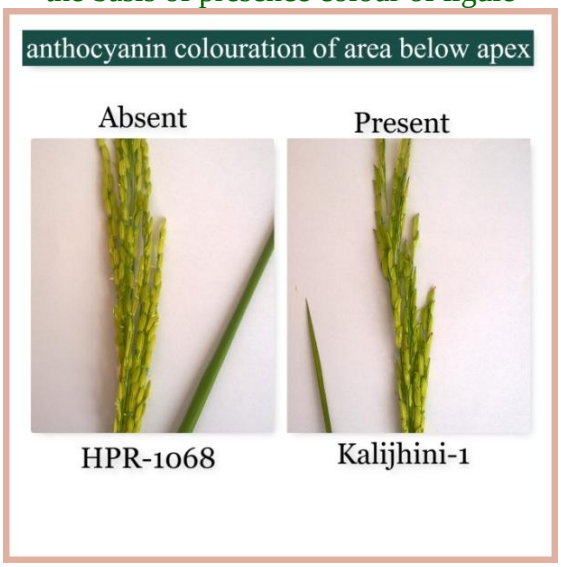


Plate.11 Characterization of rice varieties on the basis of anthocyanin colouration of area below apex

Monika *et al.*, (2007) also grouped nineteen rice varieties based on length and width of the blade and suggested that high heritability and genetic advance (GA) was found with references to these characters. Attitude of blade were observed both at early (Beginning of a thesis) and later stage (ripening) of crop growth but later stage observation is best for characterization of genotypes. At later stage observation, Except RP-2421 and VL-221 (semi-erect), all are erect in nature.

On the basis of results, It can be concluded that morphological DUS description can be effectively used for identification, documentation and grouping of varieties along with their use in registration and unambiguous identification in the field.

References

Anitalakshmi V. Characterization and identification of cultivars based on

morphological and biochemical markers in rice (Oryza sativa L.). M.Sc. (Agri.) Thesis submitted to the Univ. Agric. Sci., Bangalore, Karnataka (India). 2002.

Anonymous. 2008. Centre for monitoring Indian Economy, Mumbai.

Bora R, Deka SD and Sen P. Identification of rice varieties of Assam, based on grain characters and reaction to certain chemical tests. *Seed Res*, 2008, 36(1): 51- 55.

Graham RJD. Preliminary note of the classification of rice in the central provinces. Meni. Dept. Agric. *India Botanical Survey*, 1913, 6, 209-229.

Kikkawa S. On the classification of cultivated rice. *Journal of College of Agriculture, Tokyo*, 1913, 3, 1-108.

Mageshwaran S. 2010. Evaluation of Morphological, chemical and biochemical methods for cultivar identification in rice (*Oryza sativa* L.) M.Sc. (Agri) Thesis, Tamil Nadu Agric. Univ., Coimbatore, Tamilnadu (India).

Monika A, Joshi A, Navaraj K, Sharma RC, Singh P and Bharaj TS. Varietal characterization of rice (*Oryza sativa* L.) based on morphological descriptors. *Seed Res*, 2007, 35(2), 188-193.

Nethra N. 2003. Studies on varietal characterization based on morphological, biochemical and molecular markers in rice. M.Sc. (Agri) Thesis, Univ. Agric. Sci., Bangalore, Karnataka (India).

Rana RB, Chaudhary P, Gaudhan D, Khatiwada SP, Sthapit BR and Subedi A. 2000. *In situ* crop conservation: findings of agro-ecological, crop diversity and socio-economic baseline survey of Kachorwa eco-site, Bara, Nepal. NARC and LI-BIRD, Nepal/IPGRI, Rome, Italy NP Working Paper No. 1/2000

Rimpi Bora, Sharmia Dutta Deka and Abrata Sen. Characterization of local rice varieties of Assam using morphological markers, *Seed Res*, 2008, 36(2), 218-227.

Sarika Mathur, Asif Shaikh, N., Renuka, Kantilal Wakte, Narendra Jawali, Ratnakar Thengane and Altafhusain Nadaf. Characterisation of aromatic rice (*Oryza sativa* L.) germplasm and correlation between their agronomic and quality traits. *Euphytica*, 2011, 179, 237–246.

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