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Agro-morphological characterization of indigenous germplasm accessions of rice (*Oryza sativa* L.)

Madhuri Singh, Prerna Chouhan and Prabharani Chaudhari

Abstract
Fifty indigenous rice germplasm were evaluated to estimate the Agro-morphological characterization of indigenous germplasm accessions of rice (*Oryza sativa* L.) in yield and yield contributing characters at Research cum Instructional Farm, Genetics and Plant Breeding Department, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, during *Kharif* 2018. Varietal characterization is to establish the distinctiveness between the germplasm and also to establish their unique germplasm line detection .In the current study, morphological traits were recorded *viz.*, Coleoptile colour, basal leaf sheath colour, leaf intensity of green colour, leaf sheath intensity of anthocyanin coloration, culm attitude, lemma anthocyanin coloration of area below apex, stem thickness, lemma and palea colour and panicle length of main axis value observed highest differences between accessions. Hence characterization of germplasm accessions creates uniqueness between rice genotypes. In breeding programme, not only used for suitable base donors, although in current time it is useful for preserving the unique rice.

Keywords: Rice, indigenous germplasm, unique, agro-morphological characterization

Introduction
Rice (*Oryza sativa* L.) belonging to family Poaceae is one of the world's most important food crops. It is grown in 115 countries in different parts of the world and provides staple food to more than half of the world's population. India has largest area under rice in the world and ranks second in production next to China. The cultivated rice of Asia is supposed to have originated in the South and/ or South East Asia. India forms a major part of this region thus, it is traditionally rich in the diversity of rice including the wild progenitors of cultivated rice (Singh *et al*., 2001) [6].

Being signatory to the General Agreement on Trade and Tariffs (GAAT), Government of India has enacted its Sui generis system, Protection of Plant Varieties and Farmers' Right Act (PPV&FRA), 2001 for providing protection to plant varieties based on Distinctiveness, Uniformity and Stability (DUS) test, apart from novelty. Therefore, the characterization of a variety is a prerequisite and identification of plant varieties of common knowledge is essential for the protection of new plant varieties and determining varietal purity. Agro-Morphological characterization should eventually lead to a system of recording and storing useful data that can be readily retrieved and made available to others and help in planning breeding programmes.

In any breeding program characterization of rice germplasm increases its utility. While the most predictable approach agro-morphological traits is applied to determine the relationships between genotypes (Bajracharya *et al*., 2006) [2], The studying of existing genetic diversity and its distribution in crop species is essential for conservation of germplasm and selection of parents with diverse genetic background, hence making crop improvement more effective (Teklu *et al*., 2006) [8]. A major purpose of varietal characterization is to establish the distinctiveness between the germplasm and also to establish their unique detection profiles on the basis of grouping individuality prescribed by Distinctness Uniformity Stability (DUS) guidelines.

Material and Methods
The recent research study was conducted at Research cum Instructional farm, College of Agriculture, Indira Gandhi Agricultural University, Raipur, Chhattisgarh during *Kharif*, 2018. Fifty germplasm accessions were characterized using 52 different agro-morphological traits based on DUS. Rice germplasm accessions used in this study are listed in the table.

The plant materials raised bed nursery were sown on last week of june 2018. In randomized block design twenty days seedlings were transplanted into the field with two replications. The experimental materials were transplanted in 2 replications and individual replication consisted of 50 genotypes. Each entry was transferred in two rows where row to row spacing was 20 cm and plant to plant spacing was 15 cm. Check varieties were randomized within block.

Table 1: List of 43 germplasm accessions of rice along with 7 checks used in the present study

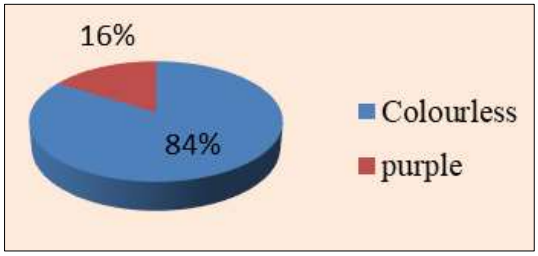
S. No.	Accession No.	Accession Name	S. No.	Accession No.	Accession Name
1	CGR:176	Karanga	26	DT-30	Paveetra
2	CGR:1987	Lalbanko	27	DT-31	Krishnanjana
3	CGR:1991	Rajbanko	28	CGR:1064	Kujjii
4	CGR:2748	Nagpuri gurmatiya	29	-	Karangi
5	CGR:355	Ramshri	30	CGR:1464	Sendur singha
6	CGR:1021	Karela	31	-	Gathuwan
7	CGR:1134	Lal dhan	32	CGR:618	Bhejari
8	CGR:1319	Parra	33	CGR:14591	Laycha
9	CGR:2493	Davar	34	CGR:1225	Maharaji
10	CGR:3345	Khutbuti	35	-	Saraiphool
11	CGR:7364	Kalimuch	36	CGR:725	Danwar
12	CGR:9455	Sathaka	37	-	Baisoor
13	CGR:8682	Nagkeshar	38	CGR:4514	Resari
14	CGR:9457	Sathi	39	-	Suldhan
15	CGR:10039	Aalcha	40	CGR:17202	Soth
16	CGR:11244	Bora	41	CGR:1041	Karhani
17	CGR:13487	Hundar	42	CGR:3891	Mehardhan
18	CGR:17011	Sathaka	43	CGR:13060	Chepti gurmatiya
19	CGR:1440	Korma	44	-	IR 64
20	CGR: 22	Barhasal	45	-	C.G. Zinc rice-1
21	-	R-RKM-1	46	-	Swarna
22	CGR:2842	Kalajeera	47	-	MTU 1010
23	CGR:18864	Jauphool	48	-	C.G. Zinc rice-2
24	CGR:9789	Tilkasturi	49	-	Chaptimathyala
25	CGR:15998	Parwatkala	50	-	Madhuraj dhan-55

Results and Discussion

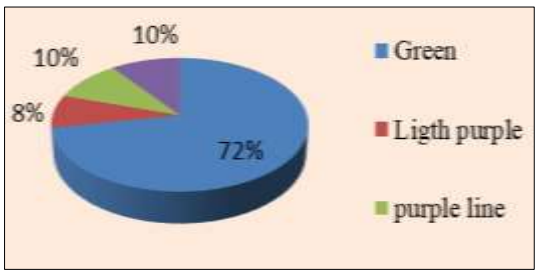
Several varieties can be recognized through its observed morphological characters. These characters can be monogenic and polygenic. The constant morphological characters can be utilized as dependable morphological characters for recognition of a variety from others. Such analytic traits should equally present in the population and transferred in another generation then only the traits is supposed to be constant and to differentiate that varieties this traits can be utilized as morphological marker. Therefore, the great importance for current and future agronomic and genetic improvement of rice crop is systematic study and characterization of germplasm.

These observations were recorded on fifty rice genotypes all descriptors exhibited markable variation in their division and total variations inside them. The records of agro-morphological characterization in accessions are listed. Distribution of frequency distribution and percentage value of agro-morphological traits of fifty germplasm accessions are listed in Table. In the current study, between the morphological characters was recorded Coleoptile colour, basal leaf sheath colour, leaf intensity of green colour, leaf sheath intensity of anthocyanin coloration, culm attitude, lemma anthocyanin coloration of area below apex, stem thickness, lemma and palea colour and panicle length of main axis value observed highest differences between accessions.

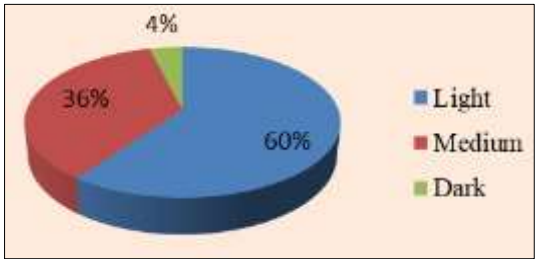
Thus, from primitive types to evolved ones the majority of the genotypes have undergone changes but some possess still primitive traits. Hence, for development of varieties these genotypes should be effectively preserved to be used with distinct traits, novel genes and transfer of some resistance, at higher yield production viable identification at different levels.



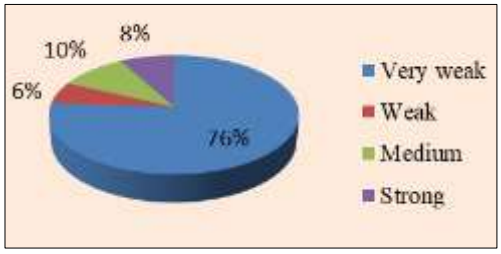
Coleoptile colour



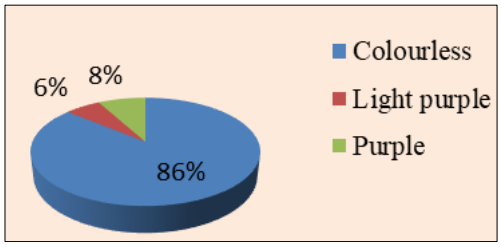
Basal leaf: sheath colour



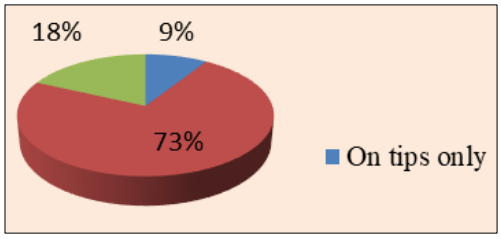
Leaf:intensity of green colour



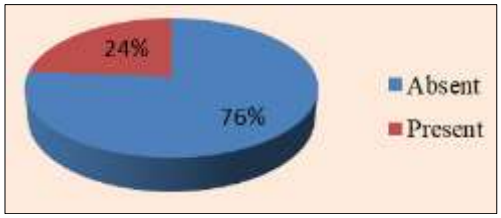
Leaf sheath:intensity of anthocyanin colouration



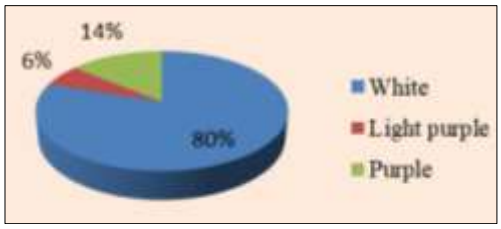
Leaf:anthocyanin colouration of auricles



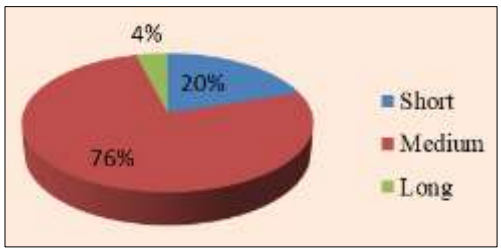
Leaf distribution of anthocyanin colouration



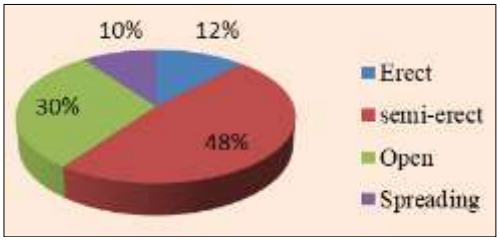
Leaf sheath: anthocyanin colouration



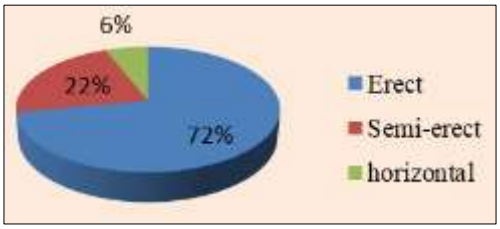
Leaf:colour of ligule



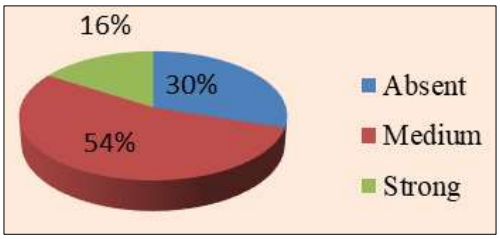
Leaf:length of blade



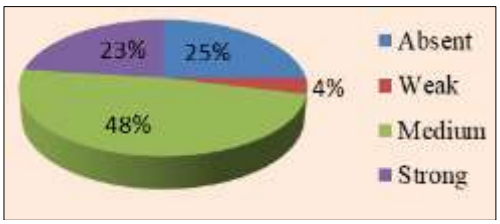
Culm:attitude



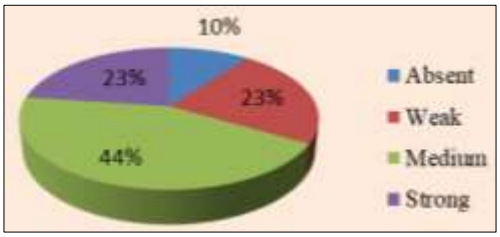
Flag leaf of blade(early observation)



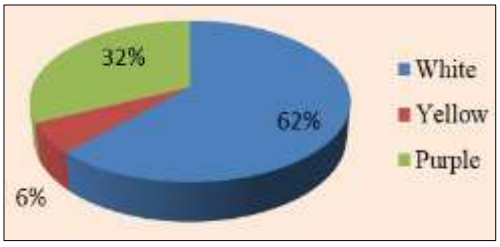
Lemma:anthocyanin colouration of keel



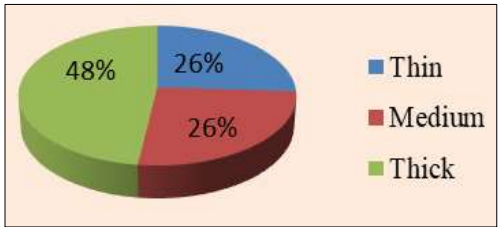
Lemma:anthocyanin colouration of area below apex



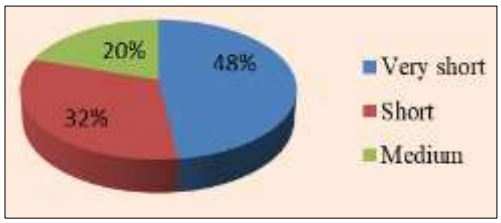
Lemma:anthocyanin colouration of apex



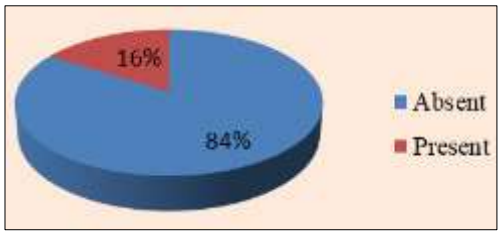
Spikelet:colour of stigma



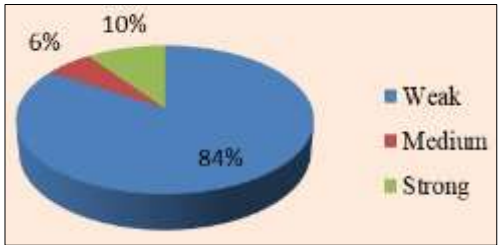
stem: thickness



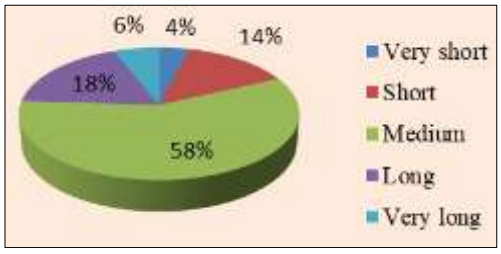
Stem:length(excluding panicle excluding floating rice)



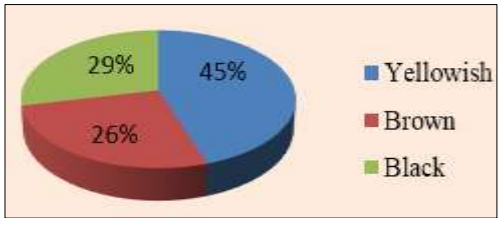
stem:anthocyanin colouration of nodes



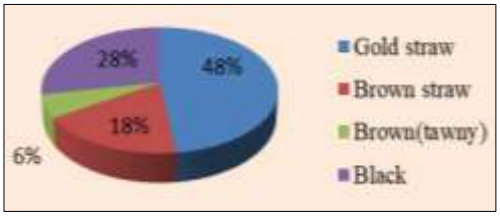
Stem:intensity of anthocyanin colouration of nodes



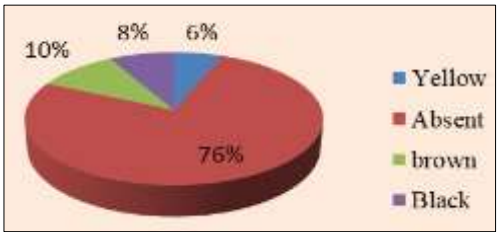
Panicle:length of main axis



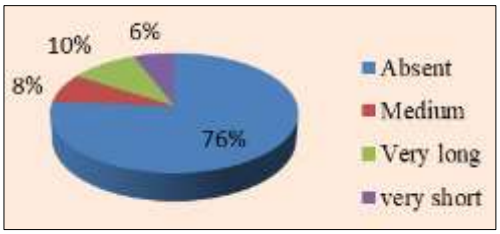
Spikelet:colour of tip of lemma



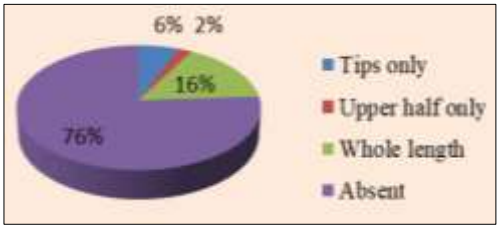
Lemma and palea:colour



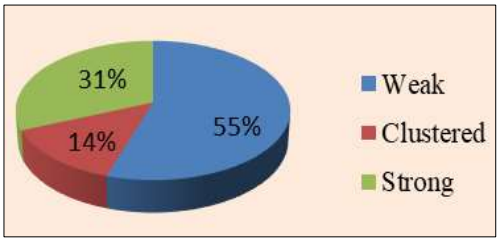
Panicle:colour of awns(late observation)



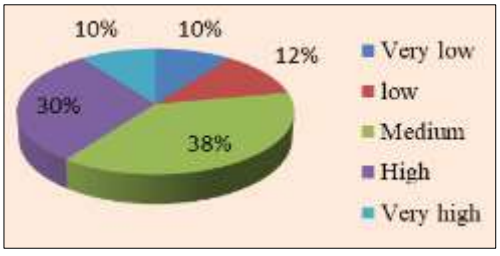
Panicle:length of longest awn



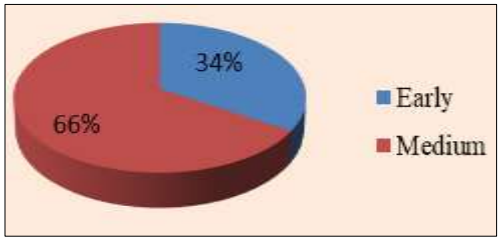
Panicle:distributions of awns



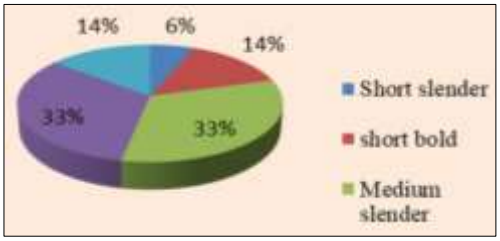
Panicle:secondary branching



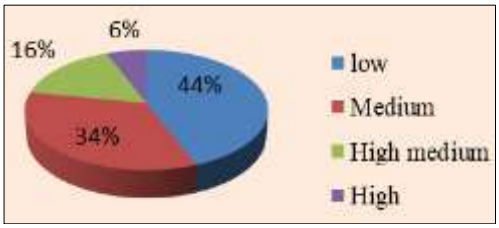
Grain:weight of 1000 fully developed grains



Time maturity(days)



Decorticated grain:shape



Geletinization temperature through alkali spreading value

Table 2: Frequency distribution and percentage value of agro-morphological and quality characters

S. No.	Characters	Category	Number	Frequency %
1	Coleoptile colour	Colourless	42	84
		Purple	8	16
2	Basal leaf: sheath colour	Green	36	72
		Light purple	4	8
		Purple line	5	10
		Uniform purple	5	10
3	Leaf: intensity of green colour	Light	30	60
		Medium	18	36
		Dark	2	4
4	Leaf: anthocyanin colouration	Present	10	20
		Absent	40	80
5	Leaf sheath: anthocyanin Colouration	Absent	38	76
		Present	12	24
6	Leaf sheath: intensity of anthocyanin colouration	Very weak	38	76
		Weak	3	6
		Medium	5	10
		Strong	4	8
7	Leaf: Pubescence of blade Surface	Weak	8	16
		Medium	28	56
		Strong	8	16
		Very strong	6	12
8	Leaf: auricles	Present	50	100
9	Leaf: anthocyanin colouration of auricles	Colourless	43	86
		Light purple	3	6
		Purple	4	8
10	Leaf: collar	Present	50	100
11	Leaf: anthocyanin colouration of collar	Present	7	14
		Absent	43	86
12	Leaf: ligule	Present	50	100
13	Leaf: shape of ligule	Split	50	100
14	Leaf: colour of ligule	White	40	80
		Light purple	3	6
		Purple	7	14
15	Culm: attitude	Erect	6	12
		Semi-erect	24	48
		Open	15	30
		Spreading	5	10
16	Flag leaf: of blade (early observation	Erect	36	72
		Semi-erect	11	22
		Horizontal	3	6
17	Spikelet: density of pubescence of lemma	Weak	8	16
		Medium	7	14
		Strong	35	70
18	Male sterility	Absent	50	100
19	Lemma: anthocyanin colouration of keel	Absent	15	30
		Medium	27	54

		Strong	8	16
20	Lemma: anthocyanin colouration of area below apex	Absent	13	26
		Weak	2	4
		Medium	25	50
		Strong	12	24
21	Lemma: anthocyanin colouration of apex	Absent	5	10
		Weak	11	22
		Medium	21	42
		Strong	11	22
22	Spikelet: colour of stigma	White	31	62
		Yellow	3	6
		Purple	16	32
23	Stem: anthocyanin colouration of nodes	Absent	42	84
		Present	8	16
24	Stem: intensity of anthocyanin colouration of nodes	Weak	42	84
		Medium	3	6
		Strong	5	10
25	Stem: anthocyanin colouration of internodes	Absent	38	76
		Present	12	24
26	Flag leaf: attitude of blade (late observation)	Erect	15	30
		Semi-erect	28	56
		Horizontal	5	10
27	Panicle: curvature of main axis	Straight	17	34
		Semi-straight	33	66
28	Spikelet: colour of tip of lemma	Yellowish	23	46
		Brown	13	26
		Black	14	28
29	Lemma and palea: colour	Gold straw	24	48
		Brown straw	9	18
		Brown(tawny)	3	6
		Black	14	28
30	Panicle: awns	Absent	38	76
		Present	12	24
31	Panicle: colour of awns (late observation)	Yellow	3	6
		Absent	38	76
		Brown	5	10
		Black	4	8
32	Panicle: distribution of awns	Tip only	3	6
		Upper half only	1	2
		whole length	8	16
		Absent	38	76
33	Panicle: presence of secondary Branching	Present	50	100
34	Panicle: secondary branching	Weak	28	56
		Clustered	7	14
		Strong	16	32
35	Panicle: attitude of branches	Erect	5	10
		Erect to semi-erect	13	26
		Semi-erect	28	56
		Semi-erect to spreading	4	8
36	Panicle: exertion	Partially exerted	9	18
		Mostly exerted	13	26
		well exerted	28	56
37	Leaf: Senescence	Early	16	32
		Medium	30	60
		Late	4	8
39	Sterile lemma: colour	Straw	50	100
39	Decorticated grain: shape (in lateral view)	Short slender	4	6
		Short bold	7	14
		Medium slender	16	32
		Long bold	16	32
		Long slender	7	14
40	Decorticated grain: colour	White	30	60
		Light brown	4	8
		Dark brown	1	2
		Light red	15	30
41	Decorticated grain: aroma	Absent	41	82
		Present	9	18

Purple auricle

Lemma anthocyanin of keel

White auricle

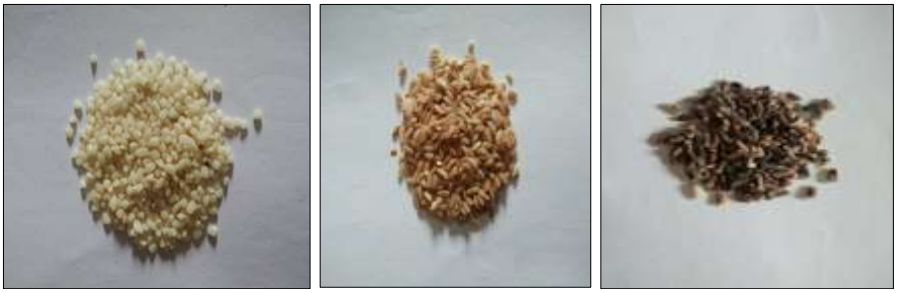
Purple colour of stigma

Purple leaf sheath

Awn absent

Green leaf sheath

Awn present



White rice Red rice Black rice

Fig: Decorticated grain: colour

Present Absent

Fig: Phenol reaction of lemma

Table 3: Unique identification of germplasm accessions

Characters	No. of accessions	Unique germplasm accessions
Basal leaf sheath colour	8	Khut buti, Nagkeshar, Hundar, Barhasal, R-RKM-1, Kujjii, Chepti gurmatiya, Madhuraj dhan-55
Leaf anthocyanin colour of auricles	4	R-RKM-1, Parwatkala, Kujjii, Saraiphool
Lemma anthocyanin colouration of keel	8	Karanga, Karela, Parra, Nagkeshar, Barhasal, R-RKM-1, Kala jeera, Parwatkala
Spikelet colour of stigma	15	Ramshri, Khut buti, Sathaka, Barhasal, Parwatkala, Kujjii, Sendur singha, Gathuwan, Saraiphool, Danwar, Suldhan, Chepti gurmatiya, Zinc rice-1, Zinc rice-2, Madhuraj dhan-55
Decorticated grain colour	1	R-RKM-1
Grain phenol reaction of lemma	9	Kali much, Aalcha, Korma, Barhasal, Kalajeera, Tilkasturi, Laycha, Maharaji, Baisoor

Conclusion

In the current study, among the agro-morphological traits *viz*., colour of coleoptile, colour of leaf intensity of green colour, basal leaf sheath, attitude of culm, lemma anthocyanin coloration below apex; stem thickness; lemma and palea colour and panicle length of main axis value showed highest differences among accessions. The unquie germplasm accessions are showed on basal leaf sheath colour, leaf anthocyanin colour of auricles, lemma anthocyanin colouration of keel, spikelet colour of stigma, decorticated grain colour, grain phenol reaction of lemma were found on the basis of agronomical characteristics. Hence characterization of germplasm accessions creates uniqueness between rice genotypes. In breeding programme, not only used for suitable base donors, although in current time it is useful for preserving the unique rice.

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