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Sadhna Kachlam
Research Scholar, Department of Horticulture, SGCARS, Jagdalpur, IGKV, Raipur, Chhattisgarh, India

Beena Singh
Scientist, Department of Horticulture, SGCARS, Jagdalpur, IGKV, Raipur, Chhattisgarh, India

Padmakshi Thakur
Scientist, Department of Horticulture, SGCARS, Jagdalpur, IGKV, Raipur, Chhattisgarh, India

Corresponding Author:
Sadhna Kachlam
Research Scholar, Department of Horticulture, SGCARS, Jagdalpur, IGKV, Raipur, Chhattisgarh, India

Agro-morphological characterization of bunda (*Colocasia esculenta* var. esculenta) in Bastar Plateau of Chhattisgarh

Sadhna Kachlam, Beena Singh and Padmakshi Thakur

Abstract
Bunda (C*olocasia esculenta* var. esculenta) is one of the most important tuber crops of the world belonging to the Family Araceae. It is commonly known as 'Shaken' in Chhattisgarh.The present experiment consisted of nine genotypes of bunda which was laid out in Randomized Block Design and replicated thrice at the Research cum Instructional Farm, S.G. College of Agriculture and Research Station, Jagdalpur, Bastar, Chhattisgarh, during the *Kharif* season of 2021-22. Twenty-seven morphological characteristics of bunda genotypes in Bastar Plateau were determined using agro-morphological traits. Phenotypic variation was observed in the characters *viz*., plant span, plant height, leaf length, leaf width, predominant leaf position, leaf blade margin, leaf blade colour, leaf blade margin colour, leaf blade colour variegation, petiole junction colour, leaf main vein colour, vein pattern, flower formation, corm branching, corm skin surface, corm skin colour, corm flesh colour and cormels flesh colour. Based on the descriptor of IPGRI among the nine genotypes five genotypes (TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8) had wide plant span, seven genotypes (TBd 17-1, TBd 17-2, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, IGB-6, IGB-10) were having erect-apex down leaf position, six genotypes (TBd 17-1, TBd 17-2, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10) exhibited green leaf blade colour while six genotypes (TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, TBd 17-9, IGB-10) had 'Y' vein pattern.

Keywords: *Colocasia esculenta*, agro-morphological traits, characterization, tuber

Introduction
Bunda (*Colocasia esculenta* var. esculenta) is originated in the Indo-Malaysian region of South East Asia (Matthews, 1990) [8]. It is an erect herbaceous perennial root crop widely cultivated in tropical and subtropical world belonging to the plant Family Araceae (Macharia, 2014) [7]. All parts of the plant including corm, cornels, rhizome, stalk, leaves and flowers are edible and contain abundant starch (Bose *et al.,* 2003) [4]. In India it is widely cultivated in Bihar, Uttar Pradesh, West Bengal, Assam, Himanchal Pradesh, Uttarakhand, Odisha, Arunachal Pradesh and Tamil Nadu. In Chhattisgarh it is mainly grown in Bastar, Sarguja, Surajpur, Kawardha, Dantewada, Korba, Mahasamund, Kanker, Balrampur, Raigarh Korea, Bilaspur and Raipur districts.
In India, this crop has a remarkable dietary significance and has multiple uses in the form of its edible stem and corm in various culinary preparations (Nakade *et al.,* 2013) [9]. It is a highly polymorphic vegetatively propagated and predominantly allogamous species characterized by protogyny (Purseglove, 1972) [11]. The main reason for its production is that the edible underground corms contain 70-80% of the starch, but a leafy vegetable is also used. Similar to many other tubers crops the corm of bunda is relatively low in protein (1.5%) and fat (0.2%) while it is a good source of starch (70-80g/100 dry matter), fiber (0.8%) and ash (1.2%). It is also a rich source of thiamine, riboflavin, iron, phosphorus, zinc, vitamin B5, vitamin C, niacin, potassium, copper and manganese (Quach, 2003) [12].
Morphological study on genotypes of taro becomes a necessity because morphological characters are the strongest tools used in taxonomic classification of plants, and this makes its application very crucial (Ezeabara *et al*., 2015) [5]. Morphological analysis can also help to identify clones and reduce duplication in cultivar collections maintained for conservation and breeding purposes (Bammite *et al*., 2018) [1]. The major characteristics of these accessions are that these are high yielding and nutritious. This will help identify their characteristics and their qualities for further improvement and will be very important in both germplasm conservation studies and the root and tuber improvement programmes.

One of the objectives of the present study was therefore to determine the important distinct characteristics of bunda genotypes using agro-morphological traits.

Material and Methods

The present experiment was conducted at S.G. College of Agriculture and Research Station, Jagdalpur, during the *Kharif* season of 2021-22 in randomized block design (RBD) with three replications. Bastar lies at $19^0$10' N latitude and $81^0$95' E longitude with an altitude of 552 meters above the mean sea level. Kumhrawand comes under the Bastar district which lies between $19^0$05'31' N latitude and $81^0$57'48' E longitude.Jagdalpur comes under the subtropical, sub humid region that lies in the southern direction of Chhattisgarh. The soil of Bastar region is majorly Entisol, Inceptisol and Alfisol wherein organic material like FYM or compost improves the water retention and storage capacity of soil with a pH range between 5.5 and 6.8.

Nine genotypes *viz*., TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, TBd 17-9, IGB-6, IGB-10 and C.G. Shaken Bunda-1 were characterized based on their performance in Bastar Plateau of Chhattisgarh. In each replication the plant spacing was kept 60 x 45cm. The agro-morphological characterization of the genotypes was based on the IPGRI descriptor. Twenty-seven agro-morphological characteristics *viz*., plant span, plant height, leaf length, leaf width, predominant position of leaf, leaf blade margin, leaf blade colour, leaf blade margin colour, petiole junction colour, leaf main vein colour, leaf main vein variegation, vein pattern, petiole colour, petiole basal-ring colour, cross-section of lower part of petiole, sheath length, leaf sheath colour, flower formation, corm skin colour, corm shape, corm length, corm branching, corm skin surface, corm flesh colour, cormels shape, cormels flesh colour, number of cormels were assessed as per the descriptor. Three competitive plants from each plot were arbitrarily selected and tagged for recording various qualitative characters.

Results and Discussion

The result of the present investigation was based on the morphological characterization of Bunda based on the plant growth habit along with the corm and cormels characteristics (Table 1). Wide variation was observed in the phenotypic characters of the crop. The plant span of Bunda was characterized as medium, wide and dwarf. 44.44% genotypes (C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10) had medium plant span while 55.55% (TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8) had wide plant span. Among the nine genotypes 11.11% genotypes (TBd 17-9) was classified under dwarf heightened plant while 22.22% (IGB-6, IGB-10) as medium and 66.66% (TBd 17-1, TBd17-2, TBd 17-3, TBd17-4, TBd 17-8, C.G. shaken bunda-1) having wide plant height.

Results of the present investigation revealed that among the nine genotypes 22.22% (TBd 17-3, TBd 17-9) exhibited cup-shaped predominant leaf position and 77.77% (TBd 17-1, TBd 17-2, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, IGB-6, IGB-10) comprised erect-apex down predominant leaf position. Two dominant leaf blade colors were observed among bunda genotypes *viz*., green and dark green. 66.66% (TBd 17-1, TBd 17-2, TBd 17-9, IGB-6, IGB-10, C.G. shaken bunda-1) and 33.33% (TBd 17-3, TBd 17-4, TBd 17-8) of the genotypes exhibited green and dark green leaf blade colours respectively. With respect to leaf blade margin the bunda genotypes were divided into two categories *viz*., entire and sinuate. 44.44% (TBd 17-1, TBd 17-8, TBd 17-9, C.G. shaken bunda-1) were classified as entire and 55.55% (TBd 17-2, TBd 17-3, TBd 17-4, IGB-6, IGB-10) as sinuate. The results of principle component analysis based on qualitative traits also revealed the existence of diversity among the bunda accessions used in this study. Quite similar results were obtained Beyene (2013) [2] in taro genotypes.

Among the nine genotypes under study, 44.44% genotypes (TBd 17-1, TBd 17-8, TBd 17-9, IGB-6) had yellow leaf blade margin colour, 11.11% genotype (TBd 17-3) had green colour while, 44.44% genotypes (TBd 17-2, TBd 17-4, C.G. shaken bunda-1, IGB-10) had purple colour. As regards the leaf blade colour variegation of Bunda, the genotypes were characterized as its presence and absence. All the genotypes (TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, TBd 17-9, IGB-6, IGB-10, C.G. shaken bunda-1) had leaf blade colour variegation. Beyene (2013) [2] also obtained similar results in Bunda. On the contrary Vinutha (2015) [13] reported the absence of leaf blade colour variegation in few genotypes of colocasia.

With respect to leaf main vein colour, 44.44% genotypes (TBd 17-1, TBd 17-8, TBd 17-9, IBG-6) recorded yellow colour while 55.55% genotypes (TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, IGB-10) had purple coloured leaf main vein colour. Out of nine genotypes, three genotypes (TBd 17-1, TBd 17-8, IGB-6) had 'V' vein pattern while six genotypes (TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, TBd 17-9, IGB-10) had 'Y' vein pattern. The results of Beyene (2013) [2] and Bompong *et al.* (2018) [3] are quite similar to the present investigation for 'Y' vein pattern.

Wide variations were observed for petiole colour (Table 1). 11.11% genotype had whitish (TBd 17-1) and green (IGB-10) coloured petiole, 33.33% genotypes (TBd 17-8, TBd 17-9, IGB-6) had light green colour and 44.44% genotypes (TBd 17-3, TBd 17-4, TBd 17-2, C.G. shaken bunda-1) recorded purple with green colour of petiole. 77.77% genotypes (TBd 17-1, TBd 17-3, TBd 17-4, TBd 17-8, TBd 17-9, C.G. shaken bunda-1, IGB-6) had whitish leaf sheath colour and 22.22% (TBd 17-3, IGB-10) had light green leaf sheath colour. Among the nine genotypes 11.11% (TBd17-9) had medium sheath length while 88.88% genotypes (TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, IGB-6, IGB-10) recorded high sheath length. The present results are in corroboration with the results of Ouedraogo *et al.* (2018) [10].

The petiole basal ring colour was studied under the present investigation for the characterization of bunda genotypes. Results revealed that 55.55% of the genotypes (TBd 17-1, TBd 17-2, TBd 17-8, TBd 17-9, IGB-6) showed white colour, 22.22% (TBd 17-3, TBd 17-4) of the genotypes showed green while 22.22% genotypes (C.G. shaken bunda-1, IGB-10) showed purple petiole basal ring colour. With respect to the petiole junction colour, 55.55% (TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, IGB-10) showed purple colour, 22.22% genotypes (TBd 17-8, TBd 17-9) showed yellow colour while 11.11% genotype (IGB-6) showed green and purple with green (TBd 17-1) colour.

Results of the present study revealed absence of flowering in all the genotypes. With regard to the corm branching and corm skin colour all the genotypes depicted branched type and fibrous corm skin surface. For the corm flesh colour,

77.77% (TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-9, IGB-6, IGB-10 C.G. shaken bunda-1) had cream colour while 22.22% genotypes (TBd 17-1, TBd 17-8) had white flesh colour. White and pink corm flesh colour was also obtained by Beyene (2013) [2] in taro genotypes.

The corm shape differed widely in bunda genotypes. 22.22% (TBd 17-8, TBd 17-9 and TBd 17-1, TBd 17-2) had round and conical corm shape respectively, 33.33% genotype (TBd 17-4, IGB-6, IGB-10) had cylindrical corm shape while 11.11% had elongated (C.G. shaken bunda-1) and elliptical (TBd 17-3) corm shape. Quite similar result was obtained by Boampong *et al.* (2018) [3]. 66.66% genotypes (TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, IGB-6) showed light brown corm skin colour whereas 33.33% genotypes (TBd 17-8, TBd 17-9, IGB-10) showed brown corm skin colour.

Out of nine genotypes, 11.11% genotypes (TBd 17-1) had conical cormel shape, 22.22% genotype (TBd 17-8, TBd 17-9) had round cormel shape, 55.55% genotypes (TBd 14-2, TBd 17-3, TBd 17-4, IGB-6, IGB-10) had elliptical cormel shape and 11.11% genotype (C.G. shaken bunda-1) had elongated cormel shape. With regard to the cormel flesh colour 55.55% genotypes (TBd17-1, TBd17-2, TBd17-3, TBd17-8, TBd17-9, C.G. shaken bunda1) showed white colour and four genotypes 44.44% (TBd 17-2, TBd, 17-4, IGB-6, IGB-10) showed cream cormel flesh colour. Boampong *et al.* (2018) [3] reported quite similar results in Colocasia genotypes.

Table 1: Morphological characterization in Bunda based on the IPGRI descriptor

S. No	Traits	Descriptor Scale (0-9, 99)	Class/scale of descriptor	Distribution by classes of descriptor
1	Plant span	1- Narrow (<50 cm) 2-Medium (50-100 cm) 3- Wide (>100 cm)	2- C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	44.44%
			3- TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8	55.55%
2	Plant height	1-Dwarf (<50 cm) 2- Medium (50-100cm) 3-Wide (>100 cm)	1-TBd 17-9	11.11%
			2- IGB-6, IGB-10	22.22%
			3-TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1	66.66%
3	Leaf length	1- Small (12-14 cm) 3-Medium (14-18 cm) 5- Large (>18 cm)	5-TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	100%
4	Leaf width	1- Small (12-14 cm) 3- Medium (14-18 cm) 5- Large (>18 cm)	5-TBd17-1, TBd17-2, TBd17-3, TBd17-4, TBd17-8, TBd17-9, IGB-6, IGB-10, C.G. shaken bunda-1	100%
5	Predominant position of leaf	1- Drooping 2- Horizontal 3- Cup-Shaped 4- Erect Apex Up 5- Erect Apex Down	3-TBd 17-3, TBd 17-9	22.22%
			5-TBd 17-1, TBd 17-2, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, IGB-6, IGB-10	77.77%
6	Leaf blade margin	1- Entire 2- Undulate 3- Sinuate	1-TBd 17-1, TBd 17-8, TBd 17-9, C.G. shaken bunda-1	44.44%
			3-TBd 17-2, TBd 17-3, TBd 17-4, IGB-6, IGB-10	55.55%
7	Leaf blade colour	1- Whitish 2-Yellow/Yellow Green 3- Green 4- Dark Green	3-TBd 17-1, TBd 17-2, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	66.66%
			4-TBd 17-3, TBd 17-4, TBd 17-8	33.33%
8	Leaf blade margin colour	1- Whitish 2- Yellow 3- Orange 4- Green 5- Pink 6- Red 7- Purple	2-TBd 17-1, TBd 17-8, TBd 17-9, IGB-6	44.44%
			4-TBd 17-3	11.11%
			7-TBd 17-2, TBd 17-4, C.G. shaken bunda-1, IGB-10	44.44%
9	Leaf blade colour variegation	0- Absent 1- Present	1- TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	100%
10	Petiole junction colour	1- Yellow 2- Green 3- Red 4- Purple 99-Other (Purple with green)	1-TBd 17-8, TBd 17-9	22.22%
			2-IGB-6	11.11%
			4-TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, IGB-10	55.55%
			5-TBd 17-1	11.11%
11	Leaf main vein colour	1- Whitish 2 -Yellow 3 -Orange 4 -Green 5 -Pink 6 -Red 7 -Brownish 8 -Purple	2-TBd 17-1, TBd 17-8, TBd 17-9, IBG-6	44.44%
			8-TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, IGB-10	55.55%

12	Vein pattern	1- V Pattern 2- I Pattern 3- Y Pattern	1-TBd 17-1, TBd 17-8, IGB-6	33.33%
			3-TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, TBd 17-9, IGB-10	66.66%
13	Petiole Colour			
a.	Colour of top third	1- Whitish 2-Yellow 3 -Orange 4- Light Green 5- Green 6- Red 7- Brown 8- Purple 99- Other (Yellow with green, Purple with green, Green with purple)	1-TBd 17-1, TBd 17-8, IGB-6	33.33%
			4-TBd 17-9	11.11%
			8-TBd 17-2, TBd 17-3, TBd 17-4, IGB-10	44.44%
			99 (Yellow with green)- C.G. shaken bunda-1	11.11%
b.	Colour of middle third		1-TBd 17-1	11.11%
			4-TBd 17-8, TBd 17-9, IGB-6	33.33%
			5-IGB-10	11.11%
			99 (Purple with green)- TBd 17-3, TBd 17-4 TBd 17-2, C.G. shaken bunda-1	44.44%
c.	Colour of basal third		4-TBd 17-1, TBd 17-8, C.G. shaken bunda-1, TBd 17-9, IGB-6	55.55%
			5-IGB-10	11.11%
			99 (Green with purple)-TBd 17-2, TBd 17-3, TBd 17-4	33.33%
14	Petiole basal-ring colour	1- White 2- Green 3- Pink 4- Red 5- Purple	1-TBd 17-1, TBd 17-2, TBd 17-8, TBd 17-9, IGB-6	55.55%
			2-TBd 17-3 TBd 17-4	22.22%
			5-C.G. shaken bunda-1 IGB-10	22.22%
15	Cross-section of lower part of petiole	1- Open 2- Closed	1- TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	100%
16	Sheath length	1- Low (<10cm) 2- Medium (10- 20) 3- High (>20cm)	2-TBd17-9	11.11%
			3-TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, IGB-6, IGB-10	88.88%
17	Leaf sheath colour	1- Whitish 2- Yellow 3- Light Green 4- Red Purple 5- Brownish	1-TBd 17-1, TBd 17-3, TBd 17-4, TBd 17-8, TBd 17-9, C.G. shaken bunda-1, IGB-6	77.77%
			3-TBd 17-3, IGB-10	22.22%
18	Flower formation	0- Absent 1- Rarely flowering (<10%) 2- Flowering (>10%)	0- TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	100%
19	Corm length	1- Short (8 cm) 5- Intermediate (12 cm) 7- Long (18 cm)	5-TBd 17-8, TBd 17-9, IGB-6	33.33%
			7-TBd 17-1, TBd 17-2,TBd 17-3, TBd 17-4, C.G. shaken bunda-1, IGB-10	66.66%
20	Corm branching	0- Unbranched 1- Branched	1- TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	100%
21	Corm skin surface	1- Smooth 2- Fibrous 3- Scales present 4- Fibrous and scales present	2- TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	100%
22	Corm skin colour	1- Brown 2- Light brown 3- Dark brown	1-TBd 17-8, TBd 17-9, IGB-10	33.33%
			2-TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, IGB-6	66.66%
23	Corm shape	1- Conical 2- Round 3- Cylindrical 4- Elliptical 5- Dumb-Bell 6-Elongated	1-TBd 17-1, TBd 17-2	22.22%
			2-TBd 17-8, TBd 17-9	22.22%
			3-TBd 17-4, IGB-6, IGB-10	33.33%
			4-TBd 17-3	11.11%
			6-C.G. shaken bunda-1	11.11%
24	Corm flesh colour	1- White 3- Cream 9- Light Purple	1-TBd 17-1, TBd 17-8	22.22%
			3-TBd 17-2, TBd 17-3, TBd 17-4, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	77.77%
25	Shape of cormels	1- Conical 2- Round 3- Cylindrical 4- Elliptical 5- Elongated 6- Elongated and curved	1-TBd 17-1	11.11%
			2-TBd 17-8, TBd 17-9	22.22%
			4-TBd 14-2, TBd 17-3, TBd 17-4, IGB-6, IGB-10	55.55%
			6-C.G. shaken bunda-1	11.11%
26	Number of cormels	1-Low 3-High	1- TBd 17-1, TBd 17-2, TBd 17-3, TBd 17-4, TBd 17-8, C.G. shaken bunda-1, TBd 17-9, IGB-6, IGB-10	100%
27	Flesh colour of cormels	1 -White 2- Yellow 3- Orange	1-TBd17-1, TBd17-2, TBd17-3, TBd17-8, TBd17-9, C.G. shaken bunda-1	55.55%
			99-TBd 17-2, TBd 17-4, IGB-6, IGB-10	44.44%

		4- Pink 5- Red 6- Red-purple 7- Purple 99- Other (Cream)		

Table 2: Characterization of bunda genotypes based on IPGRI descriptor (0-9, 99)

S. No.	Characters	A	B	C	D	E	F	G	H	I
1	Plant span	3	3	3	3	3	2	2	2	2
2	Plant height	3	3	3	3	3	1	2	2	3
3	Leaf length	5	5	5	5	5	5	5	5	5
4	Leaf width	5	5	5	5	5	5	5	5	5
5	Predominant Position of leaf	5	5	3	5	5	3	5	5	5
6	Leaf blade margin	1	3	3	3	1	1	3	3	1
7	Leaf blade colour	3	3	4	4	4	3	3	3	3
8	Leaf blade margin colour	2	7	4	7	2	2	2	7	7
9	Leaf blade colour variegation	1	1	1	1	1	1	1	1	1
10	Petiole junction colour	5	4	4	4	1	1	2	4	4
11	Leaf main vein colour	2	8	8	8	2	2	2	8	8
12	Vein pattern	1	3	3	3	1	3	1	3	3
13	Petiole colour	1	99	99	99	4	4	4	5	99
14	Petiole basal-ring colour	1	1	2	2	1	1	1	5	5
15	Cross-section of lower part of petiole	1	1	1	1	1	1	1	1	1
16	Sheath length	3	3	3	3	3	2	3	3	3
17	Leaf sheath colour	1	1	3	1	1	1	1	3	1
18	Flower formation	0	0	0	0	0	0	0	0	0
19	Corm length	7	7	7	7	5	5	5	7	7
20	Corm branching	1	1	1	1	1	1	1	1	1
21	Corm skin surface	2	2	2	2	2	2	2	2	2
22	Corm skin colour	2	2	2	2	1	1	2	1	2
23	Corm shape	1	1	4	3	2	2	3	3	6
24	Corm flesh colour	1	3	3	3	1	3	3	3	3
25	Shape of cormels	1	4	4	4	2	2	4	4	6
25	Number of cormels	1	1	1	1	1	1	1	1	1
27	Flesh colour of cormels	1	99	1	99	1	1	99	99	1

TBd 17-1, B- TBd 17-2, C- TBd 17-3, D- TBd 17-4, E-TBd 17-8, F- TBd 17-9, G- IGB-6, H- IGB-10, I- C.G. Shaken bunda-1

Fig 1: Petiole Pigmentation

Fig 2: vein pattern

Fig 3: Leaf blade margin pattern

Fig 4: Corm shape and length

Conclusion

From the present investigation it can be concluded that agro-morphological characterization is a very useful tool in identifying variations among the bunda genotypes. The characters under study showed wide phenotypic variations under the agro climatic conditions of Bastar Plateau in Chhattisgarh.

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