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Performance of taro (*Colocasia esculenta* L.) genotypes for qualitative traits under Marathwada conditions

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Abstract
The experiment was laid out in Randomized Block Design with 21 treatments replicated thrice. Taro genotypes with "Apex down" leaf position include G_1-G_4, G_6, G_8, G_9, G_{11}, G_{13}, G_{14}, G_{15}, and G_{21}. Those with "Cup shaped" are G_5, G_7, G_{10}, G_{12}, and G_{16}-G_{20}. For leaf blade color, G_6-G_9, G_{16}-G_{19} and G_{21} are "Dark green", G_1-G_4, G_{10}-G_{15} and G_{20} are "Green". Genotypes G_4, G_7, and G_{17} have "Green" petioles, G_1-G_3, G_6, G_8-G_{13}, and G_{15} are "Light green", G_{16} and G_{18}-G_{21} are "Brown", and G_5 and G_{14} are "Yellow". Finally, G_1-G_4, G_6, G_7, and G_9-G_{21} have "Dumb bell" corms, while G_5 and G_8 have "Conical" and "Round" corms respectively. Higher amount of reducing sugar (3.58%) and starch content (22.51%) was recorded in (G_9) DPLT-9.

Keywords: Colocasia, genotypes, qualitative, taro

Introduction
Taro is a significant tuber crop. It is also a largely underutilized crop in India and is being grown only in a few areas. Its genotypes have not been extensively studied in terms of qualitative. Inspite of its leaves and corms are widely consumed in the Marathwada region of Maharashtra, but it is not commercially grown for high yield and market purposes. As a result, there is a little knowledge on high-yielding varieties, and no variety is suggested for cultivation in this region. However, except from a few attempts of cultivar collection and evaluation, not much work has been done so far in this crop towards the production of high yielding suitable varieties (Plucknette *et al.*, 1970) [6]. Therefore, it was felt necessary to conduct well-planned research in order to evaluate suitable taro genotypes for its qualitative traits.

Methodology
The present investigation was conducted at College of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra), during the year 2022-2023. The experiment was set up in a Randomized Block Design with twenty genotypes replicated thrice. According to the descriptor of International Plant Genetic Resources Institute (IPGRI), young, fully opened leaves were chosen to observe the position of the leaf lamina, the shapes of the leaf lamina were: (1) drooping; (2) horizontal; (3) cup-shaped; (4) erect-apex up and (5) erect-apex down. The color of the leaf blade and petiole color were observed on fully expanded and mature leaf with the help of IPGRI descriptor. Corm shapes were visually observed with the help of descriptors of IPGRI. As a result, corm morphologies were classified into eight different categories as conical (1), round (2), cylindrical (3), elliptical (4), dumb-bell (5), elongated (6), flat and multifaced (7) and clustered (8). The reducing sugars content was estimated by Lane Eynons method. Starch content in the cormels was estimated by anthrone reagent method on dry weight basis. The acridity of taro was tested orally by tasting the raw leaves and boiled corms of the taro and accordingly presence or absence of acridity was determined.

Results and Discussion

During the investigation, several qualitative traits of twenty one taro genotypes were recorded and are presented in Table 1.

Predominant position of leaf lamina surface

Taro genotypes G_1, G_2, G_3, G_4, G_6, G_8, G_9, G_{11}, G_{13}, G_{14}, G_{15} and G_{21} had “Apex down” predominant position of leaf lamina surface and G_5, G_7, G_{10}, G_{12}, G_{16}, G_{17}, G_{18}, G_{19} and G_{20} had “Cup shaped” predominant position of leaf lamina surface. Among the cultivars, two unique leaf orientations were identified. The predominant leaf position was the "Apex down" type, seen in the majority of the cultivars. In contrast, only a few cultivars displayed a "Cup shaped" orientation. The observed variation between the cultivars is likely attributable to genetic factors (Ankush 2017) [2].

Leaf blade color

Genotypes G_6, G_7, G_8, G_9, G_{16}, G_{17}, G_{18}, G_{19} and G_{21} were “Dark green” leaf blade color and genotypes G_1, G_2, G_3, G_4, G_{10}, G_{11}, G_{12}, G_{13}, G_{14}, G_{15} and G_{20} were “Green” leaf blade color, whereas genotypes G_5 was “Yellow” leaf blade color. Variations in leaf blade colors like dark green, green, yellow were noticed, potentially resulting from varietal differences. Chlorophyll, being the primary pigment responsible for the green coloration in plants, can cause changes in leaf shade depending on its concentration. Lower or higher chlorophyll levels could lead to paler or deeper green shades, respectively. Mabhaudi and Modi 2013 [3] and Ankitha 2018 [1] also reported similar variations in their work.

Petiole color

Taro genotypes G_4, G_7 and G_{17} had “Green” petiole color, genotypes G_1, G_2, G_3, G_6, G_8, G_9, G_{10}, G_{11}, G_{12}, G_{13} and G_{15} had “Light green” petiole color. While, genotype $G_{16,}$ G_{18}, $G_{19,}$ G_{20} and G_{21} had “Brown” petiole color and genotypes G_5 and G_{14} had “Yellow” petiole color. Similar variations were reported by Mabhaudi and Modi 2013 [3] and Ankitha 2018 [1]. The observed variations in petiole color are due to genetic makeup among the various genotypes.

Corm shape

Genotypes G_1, G_2, G_3, G_4, G_6, G_7, G_9, G_{10}, G_{11}, G_{12}, G_{13}, G_{14}, G_{15}, G_{16}, G_{17}, G_{18}, G_{19}, G_{20} and G_{21} were having “Dumb bell” corm shape, whereas G_5 and G_8 were having “Conical” and “Round” corm shape respectively. Similar variations were found by Ankitha 2018 [1]. The variation in corm shape may result from genetic variations among the distinct genotypes.

Reducing sugar (%)

Significant differences in reducing sugar content among the genotypes were observed and are illustrated in Table 2. The reducing sugar was varied from 1.38% to 3.58%. Highest amount of reducing sugar (3.58%) was recorded in (G_9) DPLT-9 and was statistically at par with (G_3) DPLT-3 (3.28%). Whereas, lowest reducing sugar (1.38%) was found in the genotype (G_{12}) DPLT-12. Sucrose is a predominant sugar in taro. Sugar content plays a crucial role in determining the suitability of taro for processing. The significant variations observed in the chemical composition of various taro cultivars are likely primarily attributed to varietal differences (Manisha *et al.*, 2021 and Sangeeta *et al.*, 2023) [5, 7].

Starch (%)

The highest amount of starch (22.51%) was obtained in (G_9) DPLT-9, which was statistically at par with (G_3) DPLT-3 (21.22%). While, lowest amount of starch (12.57%) was found in the genotype (G_5) DPLT-5. The observed variations in starch content might be influenced by various factors, including soil conditions, environmental factors, and inherent genetic differences (Mandal *et al.*, 2015) [4].

Table 1: Response of different taro genotypes for leaf, petiole and corm characteristics

Genotypes		Predominant position of leaf lamina surface	Leaf blade color	Petiole color	Corm shape
G1	DPLT - 1	Apex down	Green	Light green	Dumb bell
G2	DPLT - 2	Apex down	Green	Light green	Dumb bell
G3	DPLT - 3	Apex down	Green	Light green	Dumb bell
G4	DPLT - 4	Apex down	Green	Green	Dumb bell
G5	DPLT - 5	Cup shaped	Yellow	Yellow	Conical
G6	SreePallavi	Apex down	Dark green	Light green	Dumb bell
G7	DPLT - 7	Cup shaped	Dark green	Green	Dumb bell
G8	DPLT - 8	Apex down	Dark green	Light green	Round
G9	DPLT - 9	Apex down	Dark green	Light green	Dumb bell
G10	DPLT - 10	Cup shaped	Green	Light green	Dumb bell
G11	DPLT - 11	Apex down	Green	Light green	Dumb bell
G12	DPLT- 12	Cup shaped	Green	Light green	Dumb bell
G13	DPLT - 13	Apex down	Green	Light green	Dumb bell
G14	DPLT - 14	Apex down	Green	Yellow	Dumb bell
G15	Mahim	Apex down	Green	Light green	Dumb bell
G16	PBNT - 1	Cup shaped	Dark green	Brown	Dumb bell
G17	PBNT - 2	Cup shaped	Dark green	Green	Dumb bell
G18	PBNT - 3	Cup shaped	Dark green	Brown	Dumb bell
G19	PBNT - 4	Cup shaped	Dark green	Brown	Dumb bell
G20	PBNT - 5	Cup shaped	Green	Brown	Dumb bell
G21	PBNT - 6	Apex down	Dark green	Brown	Dumb bell

Table 2: Estimation of reducing sugar (%) and starch content (%) in different taro genotypes.

Genotypes		Reducing sugar (%)	Starch (%)
G_1	DPLT – 1	2.28	17.54
G_2	DPLT – 2	1.83	19.68
G_3	DPLT – 3	3.28	21.22
G_4	DPLT – 4	2.44	14.53
G_5	DPLT – 5	1.86	12.57
G_6	SreePallavi	2.57	17.77
G_7	DPLT – 7	2.15	18.28
G_8	DPLT – 8	3.23	17.94
G_9	DPLT – 9	3.58	22.51
G_{10}	DPLT – 10	2.69	16.29
G_{11}	DPLT – 11	2.74	15.37
G_{12}	DPLT- 12	1.38	14.48
G_{13}	DPLT– 13	1.88	15.29
G_{14}	DPLT– 14	2.52	17.36
G_{15}	Mahim	1.98	19.81
G_{16}	PBNT – 1	3.22	18.61
G_{17}	PBNT – 2	2.35	15.57
G_{18}	PBNT – 3	2.69	14.39
G_{19}	PBNT – 4	3.08	19.62
G_{20}	PBNT – 5	2.74	17.38
G_{21}	PBNT – 6	2.71	16.36
SE(m) ±		0.11	0.81
CD (P=0.05)		0.31	2.31

Conclusions

It may be concluded that, among the twenty-one taro genotypes, DPLT-9 (G_9) recorded highest amount of reducing sugar and starch content. Whereas, leaves of PBNT-1 (G_{16}) found less acrid as compared to rest of the genotypes which is considered as desirable character. Therefore, these qualitative parameters may helpful to bring improvement in taro by undertaking breeding programs in near future.

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