Evaluation of Taro (*Colocasia esculenta* L.) Genotypes for Morphological and Physico-chemical Traits under Marathwada Condition.

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Abstract:

The present investigation was carried out at College of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (MS), during the year 2024-2025. Taro genotypes G_1, G_2, G_5, G_6, G_7, G_8, G_9 and G_{10} had "Apex down" while G_3, G_4, G_{11} and G_{12} had "Cup shaped" predominant position of leaf lamina surface. Taro genotypes G_1, G_3, G_5, G_6, G_7, G_8, G_9 and G_{10} had "Light green", G_2 and G_4 had "Green" while G_{11} and G_{12} had "Brown" petiole colour. Taro genotypes G_1, G_2, G_4, G_6, G_7, G_8, G_9, G_{10}, G_{11} and G_{12} exhibited "Dumb bell" shape, whereas in G_3 and G_5 had "Conical" and "Round" corm shape observed, respectively. The maximum amount of reducing sugar (3.44%), starch (19.70%), total phenol content (75.95 mg GAE/100g), vitamin A (6.98 IU) and vitamin C (8.39 mg/100g) was recorded in (G_6) DPLT-20, (G_6) DPLT-20, (G_{11}) PBNT-1, (G_5) DPLT-19 and (G_{11}) PBNT-1 respectively. Corms of G_{10} and G_{11} was identified as non-acrid.

Keywords: Genotypes, morphological, physico-chemical, Taro.

Introduction:

Taro (*Colocasia esculenta* L.), often called “arvi” or “eddoe” type, is herbaceous perennial tuber-bearing plant that is a member of the monocotyledonous “Araceae” family (Vanwyk, 2005). In the category of underutilized roots and tuber crops, taro (*Colocasia esculenta* L.) is recognized as a future smart food to fight chronic malnutrition and hidden hunger in Asia (Siddique *et al*., 2021). It is also referred to as "Potato of the Tropics". It is the staple source of people’s diet and the fourteenth most consumed vegetable worldwide (Rao *et al*., 2010). In terms of consumption, taro ranks second to sweet potatoes as a staple root crop (Singh *et al*., 2006). Colocasia is a popular food due to its excellent nutritional content, pleasant taste and flavour.It is rich in carbohydrates, protein, vitamins, and minerals such as Ca, Fe and P. Every portion of the plant, including the corm, cormels, petiole, leaves and flowers, is high in starch and are edible. The minute size of the starch granules accounts for its excellent digestibility with the efficient release of nutrients during digestion and absorption (Standal, 1983). The quality of starch in taro has made it a better choice for the food processing industry especially the baby food product industry (Aditika *et al*.,2022). The quality of corms is determined by their acridity and fibre content. Products such as chips, flour, soups, biscuits, drinks, pudding and breads are made from taro corms. In addition, taro mucilage has potential usefulness as an emulsifying, thickening and smoothing agent for creams, suspensions and other colloidal food preparations.

Taro is widely underutilized crop in our country, growing in only a few locations. Its genotypes have not been thoroughly researched in terms quality attributes. Thus, considering above facts present research was conducted to study the morphological and physico-chemical traits of taro genotypes under Marathwada condition.

Materials and Methods:

The experiment entitled, "Evaluation of taro (*Colocasia esculenta* L.) genotypes for morphological and physico-chemical traits under Marathwada condition" was conducted at College of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (MS), during the year 2024-2025. The experiment was laid out in Randomized Block Design consisting of twelve treatments with three replications. Observations of quality attributes were recorded after harvesting. International Plant Genetic Resources Institute (IPGRI) descriptions were used to record morphological observations. The reducing sugar, starch content, total phenol and vitamin C was estimated by Lane Eynon method, Anthrone reagent method, Folin–Ciocalteu method and titration method respectively. Acridity was tested orally by tasting raw leaves and boiled corms of the taro.Therecorded data were statistically analysed as per method described by Panse and Sukhatme (1985).

Results and Discussion:

Morphological traits

Several morphological traits of twelve taro genotypes were recorded and presented in Table 1.

Predominant position of leaf lamina surface

Taro genotypes (G_1) DPLT-15, (G_2) DPLT-16, (G_5) DPLT-19, (G_6) DPLT-20, (G_7) DPLT-21, (G_8) DPLT-22, (G_9) DPLT-23 and (G_{10}) Sree Pallavi had "Apex down" predominant position of leaf lamina surface and (G_3) DPLT-17, (G_4) DPLT-18, (G_{11}) PBNT-1 and (G_{12}) PBNT-2 had

"Cup shaped" predominant position of leaf lamina surface. Akwee *et al.* (2015), Nehail (2019) and Vinutha *et al.* (2024) reported similar variations in their research.

Leaf blade colour

Taro genotypes (G_1) DPLT-15, (G_2) DPLT-16, (G_3) DPLT-17, (G_7) DPLT-21, (G_8) DPLT-22 and (G_9) DPLT-23 had "Green" leaf blade colour. (G_4) DPLT-18, (G_5) DPLT-19 (G_6) DPLT-20, (G_{10}) Sree Pallavi, (G_{11}) PBNT-1 and (G_{12}) PBNT-2 had "Dark green" leaf blade colour.Singh *et al.* (2006), Akwee*et al.* (2015) and Vinutha *et al.* (2024) also reported similar variations in their work.

Petiole colour

Taro genotypes (G_1) DPLT-15, (G_3) DPLT-17, (G_5) DPLT-19, (G_6) DPLT-20, (G_7) DPLT-21, (G_8) DPLT-22, (G_9) DPLT-23, (G_{10}) Sree Pallavi had "Light green" petiole colour. Genotype (G_2) DPLT-16 and (G_4) DPLT-18 had "Green" petiole colour. (G_{11}) PBNT-1 and (G_{12}) PBNT-2 had "Brown" petiole colour. Similar variations were found by Singh *et al.* (2006) and Vinutha *et al.* (2024).

Corm shape

Taro genotypes (G_1) DPLT-15, (G_2) DPLT-16, (G_4) DPLT-18, (G_6) DPLT-20, (G_7) DPLT-21, (G_8) DPLT-22, (G_9) DPLT-23, (G_{10}) Sree Pallavi, (G_{11}) PBNT-1 and (G_{12}) PBNT-2 had "Dumb bell" corm shape, whereas (G_3) DPLT-17 and (G_5) DPLT-19 had "Conical" and "Round" corm shape, respectively. Similar variations were reported by Singh *et al.* (2006), Devi *et al.* (2016) and Vinutha *et al*. (2024).

The observed variation in all morphological characters might be due to unique genetic makeup of genotype.

Physico-chemical traits

The data of Physico-chemical traits was statistically analysed and presented in Table 2.

Reducing sugar (%)

The reducing sugar ranged from 1.64% to 3.44%. Maximum amount of reducing sugar among taro genotypes was recorded in (G_6) DPLT-20 (3.44%) which was followed by (G_1) DPLT-15 (3.18%), (G_5) DPLT-19 (3.14%) and (G_{11}) PBNT-1 (3.07%). While, the genotype (G_7) DPLT-21 (1.64%) had minimum amount of reducing sugar. Awasthi (2000), Momin *et al.* (2021), Sangeeta *et al.* (2023) and Vinutha *et al.* (2024) have reported similar variations in reducing sugar content among different taro genotypes.

Starch (%)

There was significant difference in starch content among taro genotypes. The starch content in different taro genotypes ranged from 10.93% to 19.70%. Highest starch content was recorded in genotype (G_6) DPLT-20 (19.70%) while least starch content was recorded in genotype (G_3) DPLT-17 (10.93%). The variations in starch content might be influenced by various factors including soil conditions, environmental factors and genetic factors. Surjit and Tarafdar (2015), Shellikeri*et al.* (2019), Momin *et al.* (2021), Banti *et al.* (2025) and Vinutha *et al.* (2024) have documented similar findings in their respective studies.

Vitamin A (IU)

Vitamin A content in different taro genotypes was ranged from 6.01 IU to 6.98 IU. Highest vitamin A was observed in genotype (G_5) DPLT-19 (6.98 IU) which was statistically at par with (G_{11}) PBNT-1 (6.93 IU), (G_4) DPLT-18 (6.92 IU) and (G_7) DPLT-21 (6.88 IU). While the genotype (G_3) DPLT-17 had least vitamin A (6.01 IU). Differences in vitamin A may be attributed to genetic variation and maturity stage. Ferdaus *et al*. (2023) found 0.006 mg/100g vitamin A which is equivalent to 10 IU. Amzeri *et al*. (2022) recorded variation in vitamin A among different genotypes of muskmelon at same maturity stage.

Vitamin C (mg/100g)

Vitamin C content in different taro genotypes was ranged from 4.10 mg/100g to 8.39 mg/100g. The maximum vitamin C content was noted in (G_{11}) PBNT-1 (8.39 mg/100g) which was statistically at par with (G_5) DPLT-19 (8.33 mg/100g), (G_9) DPLT-23 (8.18 mg/100g), (G_{12}) PBNT-2 (8.09 mg/100g) and (G_6) DPLT-20 (8.06 mg/100g). While, genotype (G_8) DPLT-22 had minimum vitamin C (4.10 mg/100g). Variation in vitamin C content in taro might be due to differences in genotypes, maturity at harvest and analytical methods used for estimation. Momin *et al.* (2021), Lantemona *et al.* (2024) and Banti *et al.* (2025) noticed variation in vitamin C among taro varieties.

Acridity in leaves and corms

Ten genotypes out of twelve genotypes including (G_1) DPLT-15, (G_2) DPLT-16, (G_3) DPLT-17, (G_4) DPLT-18, (G_5) DPLT-19, (G_6) DPLT-20 (G_7) DPLT-21, (G_8) DPLT-22, (G_9) DPLT-23 and (G_{12}) PBNT-2 showed an acrid taste in both parts, except for (G_{11}) PBNT-1 and (G_{10}) Sree Pallavi, whose corms were identified as non-acrid. Non-acrid trait considered desirable in taro. Findings are consistent with Shill and Nath (2015). Acridity, which causes a burning or irritating sensation in the mouth and throat, is mainly due to two factors: the presence of sharp, needle-like calcium oxalate crystals called raphides (Sakai *et al*., 1972) and possibly one or more chemical irritants found on their surface (Tang and Sakai, 1983; Nixon, 1987; Bradbury and Holloway, 1988).

Total phenol (mg GAE/100g)

Total phenol content ranged from 64.09 mg GAE/100g to 75.95 mg GAE/100g. Maximum total phenol content was recorded in (G_{11}) PBNT-1 (75.95 mg GAE/100g) which was statistically at par with (G_{10}) Sree Pallavi (75.63 mg GAE/100g), (G_1) DPLT-15 (74.99 mg GAE/100g) and (G_7) DPLT-21 (74.64 mg GAE/100g). While, genotype (G_8) DPLT-22 had minimum total phenol content (64.09 mg GAE/100g). The differences in the total phenolic content (TPC) of taro reported across studies may be attributed to various factors including differences in taro varieties, environmental conditions and analytical methods. Momin *et al.* (2021) and Banti *et al.* (2025) observed similar variation in total phenol.

Table 1: Response of different taro genotypes for morphological traits

Genotypes		Predominant position of leaf lamina surface	Leaf blade colour	Petiole colour	Corm shape
G_1	DPLT-15	Apex down	Green	Light green	Dumb bell
G_2	DPLT-16	Apex down	Green	Green	Dumb bell
G_3	DPLT-17	Cup shaped	Green	Light green	Conical
G_4	DPLT-18	Cup shaped	Dark green	Green	Dumb bell
G_5	DPLT-19	Apex down	Dark green	Light green	Round
G_6	DPLT-20	Apex down	Dark green	Light green	Dumb bell
G_7	DPLT-21	Apex down	Green	Light green	Dumb bell
G_8	DPLT-22	Apex down	Green	Light green	Dumb bell
G_9	DPLT-23	Apex down	Green	Light green	Dumb bell
G_{10}	Sree Pallavi	Apex down	Dark green	Light green	Dumb bell
G_{11}	PBNT-1	Cup shaped	Dark green	Brown	Dumb bell
G_{12}	PBNT-2	Cup shaped	Dark green	Brown	Dumb bell

Table 2: Physico-chemical characteristics of different taro genotypes

Genotypes		Reducing sugar (%)	Starch (%)	Total phenol (mg GAE /100g)	Vitamin A (IU)	Vitamin C (mg/100g)
G_1	DPLT-15	3.18	18.31	74.99	6.31	4.35
G_2	DPLT-16	2.31	11.91	66.35	6.45	4.42
G_3	DPLT-17	1.81	10.93	73.75	6.01	4.26
G_4	DPLT-18	1.83	15.08	65.26	6.92	4.14
G_5	DPLT-19	3.14	14.02	73.42	6.98	8.33
G_6	DPLT-20	3.44	19.70	72.11	6.48	8.06
G_7	DPLT-21	1.64	12.34	74.65	6.88	8.28
G_8	DPLT-22	2.20	13.52	64.09	6.57	4.10
G_9	DPLT-23	1.87	17.07	72.94	6.67	8.18
G_{10}	Sree Pallavi	2.47	14.26	75.63	6.75	4.12
G_{11}	PBNT-1	3.07	16.15	75.95	6.93	8.39
G_{12}	PBNT-2	2.34	11.63	65.08	6.63	8.09
SE±		0.08	0.37	0.51	0.04	0.12
CD @ 5%		0.23	1.09	1.51	0.11	0.35

*Each value is average of three determinations

Conclusion

In summing up the present investigation based on obtained results it may be concluded that among twelve taro genotypes, (G_{11}) PBNT-1 stands out superior in quality attributes such as total phenol and vitamin C. Corms of (G_{10}) Sree Pallavi and (G_{11}) PBNT-1 found non-acrid. The maximum amount of reducing sugar and starch was recorded in (G_6) DPLT-20. However, highest vitamin A was recorded in (G_5) DPLT-19. These qualitative attributes may helpful to bring improvement in taro by undertaking breeding programs in future.

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