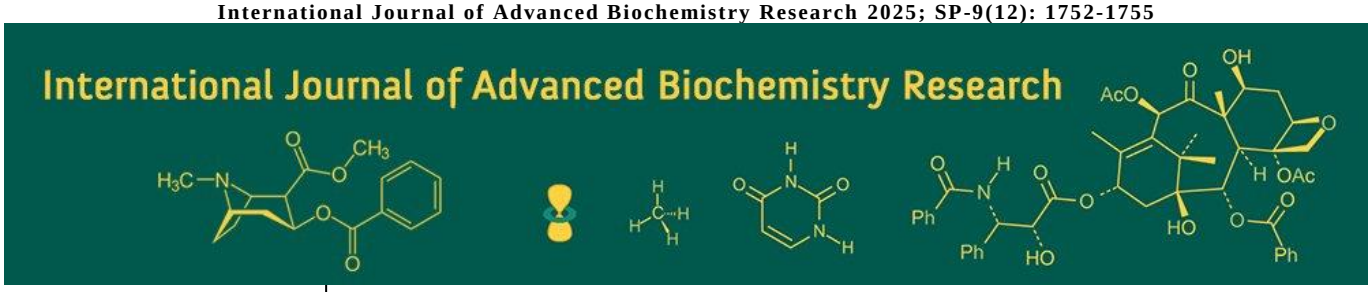

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Morphological characterisation of leaves among *Portulaca germplasm*

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Abstract
The present experiment was conducted at the Greenhouse complex, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari Agricultural University, Navsari (Gujarat) during 2024-25. As per the analysis of 19 genotypes of Portulaca, G_{18} germplasm of *Portulaca oleracea* also performed well in case of internodal length (3.68 cm), leaf area (1.27 cm^2), leaf length (3.03 cm) and leaf width (1.55 cm). Germplasms G_7, G_{10}, G_{11}, G_{16} and G_{17} had leaves with green colour group, while the remaining germplasms showed yellow-green colour group. Leaf thickness in all the germplasms of *Portulaca* ranged between 1.37 mm to 1.59 mm. Maximum number of leaves (52.89) were recorded in G_{17} germplasm of *Portulaca pilosa*. G_1 to G_9 and G_{19} Germplasms of *Portulaca grandiflora* and G_{17} germplasm of *Portulaca pilosa* produce cylindrical leaves, while G_{10} to G_{16} germplasms of *Portulaca umbraticola* and G_{18} germplasm of *Portulaca oleracea* produce obovate leaves.

Keywords: *Portulaca grandiflora, Portulaca umbraticola,* cylindrical leaves, moisture

Introduction
Portulaca is a succulent flowering plant belonging to the *Portulacaceae* family, also known as Moss rose, 10 o'clock plant and Purslane. Portulaca is renowned for its striking colours, hardiness, growth pattern and sun-loving nature. Plants from the Portulaca genus are known for their use in landscaping and ornamentation of gardens as well as their high nutritional value. About 100 species of herbaceous plants belong to the Portulaca (Moss Rose) genus (Ocampo and Columbus, 2012) [6]. As a member of the *Portulacaceae* family, it originates from southern Brazil, Argentina and Uruguay but has garnered global cultivation, including regions like India, South America and Australia. Portulaca plant species is esteemed for its dazzling, flamboyant flowers and succulent foliage, rendering it a favoured selection for garden adornment, landscaping and container gardening (Mane *et al*., 2022) [3].
It possesses an inherent tolerance to drought and heat and is resilient in arid climates, making it an ideal candidate for xeriscaping and water-conserving gardening practices (Jin *et al*., 2016) [1]. *Portulaca grandiflora* Hook. Typically produces multi petalous flowers with various hues and has elliptical leaves as well as semi-upright growing habit. *Portulaca pleracea* L. on the other hand produces flowers with five petals, spatulate leaves and have creeping type of growing habit (Setiawan *et al*., 2016) [10]. *Portulaca umbraticola* Kunth. Characterized by succulent, prostrate stems, it forms dense mats of foliage that sprawl across the ground or cascade over container edges. The petite and fleshy leaves adopt a cuneiform, spatulate to linear shape and are arranged alternately along the stems (Souza *et al*., 2024) [11]. *Portulaca pilosa* L. have unique growing habit with compact leaves, shorter stem with pink flowers.

Materials and Methods
The present experiment was carried out during the year 2024-2025 at the Greenhouse complex, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat, under 'South Gujarat Heavy Rainfall Zone-I, AES-III', which comes under tropical climate. Pot media was prepared in a ratio of 3:1 containing garden soil and farm yard manure (FYM) respectively.

Cultural practices were followed throughout span of experiment. Experiment was conducted in completely randomized design (CRD) having 19 genotypes as treatment and three repetitions in which each pot contained 6 cuttings a length of 8-10 cm.

Observations such as number of leaves were counted from 10 cm segment of shoot. Internodal length, leaf thickness, Leaf length and leaf width were measured using vernier caliper. Leaf area was recorded using leaf area meter while leaf colour and lead shape were recorded based on visual observations.

Results and Discussion

Number of leaves per 10 cm segment

The maximum number of leaves 52.89 recorded in the G_{17} germplasm of *Portulaca pilosa* followed by germplasms of *Portulaca grandiflora* ranged from 18.89 to 20.67 leaves. G_{10} to G_{16} germplasms of *Portulaca umbraticola* showed midrange of 14.44 to 15.89 leaves per 10 cm of shoot segment. Minimum number of leaves was recorded in the G_{18} germplasm of *Portulaca oleracea* (12.33).

Internodal length

Data revealed that maximum internodal length was recorded significantly higher in the G_{18} germplasm of *Portulaca oleracea* with 3.68 cm, followed by G_{10} to G_{16} germplasms of *Portulaca umbraticola* which varied between 0.69 to 0.71 cm and G_1 to G_9 and G_{19} germplasms of *Portulaca grandiflora* ranged within 0.53 to 0.65 cm. Minimum internodal length was observed in the G_{17} germplasm of *Portulaca pilosa* (0.28 cm).

Leaf area (cm^2)

Maximum leaf area was observed higher in G_{18} germplasm of *Portulaca oleracea* (1.27 cm^2) followed by G_{10} to G_{16} germplasms of *Portulaca umbraticola* ranged from 0.65 cm^2 to 0.97 cm^2, while G_1 to G_9 and G_{19} germplasms of *Portulaca grandiflora* ranged between 0.27 cm^2 to 0.38 cm^2. Least leaf area was observed in the G_{17} germplasm of *Portulaca pilosa* (0.15 cm^2).

Table 1: Variation in number of leaves per 10 cm segment, internodal length and leaf area in various *Portulaca germplasm*

Germplasm	Number of leaves per 10 cm segment	Internodal length (cm)	Leaf area (cm^2)
G_1 (*Portulaca grandiflora*)	20.44	0.57	0.31
G_2 (*Portulaca grandiflora*)	20.00	0.60	0.27
G_3 (*Portulaca grandiflora*)	20.33	0.53	0.38
G_4 (*Portulaca grandiflora*)	20.67	0.58	0.34
G_5 (*Portulaca grandiflora*)	19.22	0.55	0.35
G_6 (*Portulaca grandiflora*)	19.89	0.58	0.29
G_7 (*Portulaca grandiflora*)	19.44	0.65	0.35
G_8 (*Portulaca grandiflora*)	19.78	0.56	0.33
G_9 (*Portulaca grandiflora*)	18.89	0.55	0.32
G_{10} (*Portulaca umbraticola*)	14.56	0.69	0.88
G_{11} (*Portulaca umbraticola*)	14.78	0.69	0.65
G_{12} (*Portulaca umbraticola*)	15.11	0.71	0.78
G_{13} (*Portulaca umbraticola*)	14.67	0.70	0.77
G_{14} (*Portulaca umbraticola*)	14.44	0.70	0.97
G_{15} (*Portulaca umbraticola*)	15.89	0.70	0.95
G_{16} (*Portulaca umbraticola*)	15.67	0.70	0.85
G_{17} (*Portulaca pilosa*)	52.89	0.28	0.15
G_{18} (*Portulaca oleracea*)	12.33	3.68	1.27
G_{19} (*Portulaca grandiflora*)	19.67	0.56	0.30
CD at 5 %	1.66	0.09	0.09

The variation among number of leaves, internodal length and leaf area in different germplasms of *Portulaca* could be due to the influence of their genetic makeup. During the study, it was found that G_{18} germplasm of *Portulaca oleracea* showed higher values concerning internodal length followed by germplasms of *Portulaca grandiflora* and germplasms of *Portulaca umbraticola*. G_{17} germplasm of *Portulaca pilosa* demonstrated the highest number of leaves compared to other germplasms in the study.

Leaf thickness, length and width: That leaf thickness of the germplasms in the study was found non-significant, in which leaf thickness ranged between 1.37 mm to 1.59 mm in all genotypes. The maximum leaf length was recorded in the G_{18} germplasm of *Portulaca oleracea* (3.03 cm, while the minimum leaf length was observed in the G_{17} germplasm of *Portulaca pilosa* (1.53 cm). Significant variation was observed in case of leaf width in which maximum leaf width was observed in the G_{18} germplasm of *Portulaca oleracea* with 1.55 cm and Minimum width was recorded in the G_1 germplasm of *Portulaca grandiflora*, having a 0.25 cm leaf width.

Table 2: Variation in leaf length, leaf width and leaf thickness in various *Portulaca germplasm*s

Germplasm	Leaf length (cm)	Leaf width (mm)	Leaf thickness (mm)
G_1 (*Portulaca grandiflora*)	2.20	0.25	1.43
G_2 (*Portulaca grandiflora*)	2.70	0.30	1.38
G_3 (*Portulaca grandiflora*)	2.53	0.30	1.48
G_4 (*Portulaca grandiflora*)	2.43	0.28	1.45
G_5 (*Portulaca grandiflora*)	2.53	0.32	1.41
G_6 (*Portulaca grandiflora*)	2.49	0.33	1.38
G_7 (*Portulaca grandiflora*)	2.44	0.26	1.41

G_8 (*Portulaca grandiflora*)	2.46	0.30	1.39
G_9 (*Portulaca grandiflora*)	2.54	0.30	1.40
G_{10} (*Portulaca umbraticola*)	2.34	0.97	1.40
G_{11} (*Portulaca umbraticola*)	2.14	0.87	1.41
G_{12} (*Portulaca umbraticola*)	2.02	0.89	1.43
G_{13} (*Portulaca umbraticola*)	2.31	0.93	1.40
G_{14} (*Portulaca umbraticola*)	2.02	1.17	1.50
G_{15} (*Portulaca umbraticola*)	2.29	0.88	1.39
G_{16} (*Portulaca umbraticola*)	2.06	0.94	1.37
G_{17} (*Portulaca pilosa*)	1.53	0.54	1.52
G_{18} (*Portulaca oleracea*)	3.03	1.55	1.59
G_{19} (*Portulaca grandiflora*)	2.58	0.26	1.43
CD at 5 %	0.31	0.06	NS

Leaf colour and shape

Leaf colour of different *Portulaca germplasm* was recorded by using the RHS colour chart, 2015 from which it was determined that G_7 of *Portulaca grandiflora*, G_{10}, G_{11}, and G_{16} germplasms of *Portulaca umbraticola* and G_{17} germplasm of *Portulaca pilosa* all belong to green group, while all the other germplasms produced yellow green coloured leaves. In case of leaf shape, it was observed that all the germplasms were mainly divided into two groups according to their leaf shape, *i.e.* cylindrical and obovate. Sajiv *et al*. (2022) [9] observed significant variation in leaf area, leaf length, leaf breadth and leaf thickness in 15 accessions of *Portulaca oleracea.*

Table 3: Variation in leaf colour and leaf shape of various *Portulaca germplasm*s

Germplasm	Leaf colour	Leaf shape
G_1 (*Portulaca grandiflora*)	Yellow green group 146-D	Cylindrical
G_2 (*Portulaca grandiflora*)	Yellow green group 146-A	Cylindrical
G_3 (*Portulaca grandiflora*)	Yellow green group 144-A	Cylindrical
G_4 (*Portulaca grandiflora*)	Yellow green group 144-C	Cylindrical
G_5 (*Portulaca grandiflora*)	Yellow green group 146-C	Cylindrical
G_6 (*Portulaca grandiflora*)	Yellow green group 144-A	Cylindrical
G_7 (*Portulaca grandiflora*)	Green group 143-B	Cylindrical
G_8 (*Portulaca grandiflora*)	Yellow green group 144-A	Cylindrical
G_9 (*Portulaca grandiflora*)	Yellow green group 146-C	Cylindrical
G_{10} (*Portulaca umbraticola*)	Green group 139-A	Obovate
G_{11} (*Portulaca umbraticola*)	Green group 139-A	Obovate
G_{12} (*Portulaca umbraticola*)	Yellow green group 146-C	Obovate
G_{13} (*Portulaca umbraticola*)	Yellow green group N144-C	Obovate
G_{14} (*Portulaca umbraticola*)	Yellow green group 144-C	Obovate
G_{15} (*Portulaca umbraticola*)	Yellow green group 145-A	Obovate
G_{16} (*Portulaca umbraticola*)	Green group 141-C	Obovate
G_{17} (*Portulaca pilosa*)	Green group 143-A	Cylindrical
G_{18} (*Portulaca oleracea*)	Yellow green group 146-A	Obovate
G_{19} (*Portulaca grandiflora*)	Yellow green group 146-C	Cylindrical

Conclusion

The study revealed that G_{18} germplasm of *Portulaca oleracea* exhibits the highest internodal length, leaf area, leaf length and leaf width. Highest number of leaves were recorded in G_{17} germplasm of *Portulaca pilosa*, while Leaf thickness was found non-significant during study. Leaf colour was observed between green colour group to yellow-green colour group. From the study it could be concluded that G_{18} germplasm of *Portulaca oleracea* exhibits significantly superior leaf characteristics as compared to other species utilized in study.

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