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STUDY ON MORPHOLOGICAL VARIABILITY AMONG MADHUNASHINI (*GYMNEMA SYLVESTRE*) ACCESSIONS IN ANDHRA PRADESH INDIA

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ABSTRACT

Gymnema sylvestre (L.) R. Br., an important medicinal plant with strong anti-diabetic properties, has been utilized in traditional medicine for centuries. The present study, conducted at the Horticultural Research Station, Venkataramannagudem (2024–2025), Andhra Pradesh, evaluated morphological variability among 17 accessions in a randomized block design with two replications. Significant differences were recorded for plant height, number of branches, leaf area, fresh and dry leaf weights, number of capsules per plant, and seed traits. APGs-13 (Dekkagal) showed maximum plant height, branching, and leaf number, while APGs-12 (Munirabad) excelled in fresh and dry leaf weights. Maximum leaf area was recorded in APGs-15 (Chintapalli), highest capsules per plant in APGs-16 (Rajahmundry), and superior seed traits in APGs-14 (Arabhavi) and APGs-10 (Yerrabalem). The results revealed substantial diversity, which can be effectively utilized in breeding programmes to identify elite accessions and improve yield potential. The study highlights the scope of exploiting genetic variability in Madhunashini for conservation, crop improvement, and value addition in herbal medicine.

***Key words*:** *Gymnema sylvestre*, Morphological, Anti-diabetic, Accessions.

Introduction

Gymnema sylvestre (L.) R. Br belonging to the family, Asclepiadaceae is one of the plant extract which shows the anti-diabetic properties. It has a significant role in Indian system of medicine, for more than 2000 years. The plant is popularly known as Gurmar and Madhunashini which means sugar destroyer in Sanskrit, its most characteristic property being “the loss of sweetness in taste”. It grows well in Southern Western Region of India and China, South Africa, Oceania and Australia. In India it was discovered in the Forests of Andhra Pradesh, Chhattisgarh, Kerala, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu, Uttar Pradesh and West Bengal.

The plant is a slow growing, large perennial woody climber with a more or less pubescent texture. The leaves are opposite, decussate, typically elliptic or ovate with an acute to acuminate base and a smooth texture. The small, yellow flowers grow in axillary and lateral umbel-like clusters, supported by long pedicels and the calyx lobes are ovate, obtuse, and covered with fine hairs. As the leaves possess active principle which exhibits hypoglycemic activity due to the presence of bioactive compounds like gymnemic acids, which play a major role in reducing blood glucose levels, which is also known as “Wonder drug” for diabetes. It is commonly prescribed for diabetes, weight loss, rheumatism, cough, ulcers, eye pain, indigestion, jaundice, hemorrhoids, asthma, bronchitis,

conjunctivitis, and leucoderma. Notably, the roots are also traditionally used as an antidote for snakebites. The main objective was to study the morphological variability among Madhunashini germplasm accessions.

Materials and Methods

The present study was carried out during July, 2024 to July 2025 at Horticultural Research Station, Venkataramannagudem, West Godavari District, Andhra Pradesh. A total number of 17 accesions were collected from different locations that are listed in Table 1.

No of treatments (accessions): 17 accessions

No of replications: 2

Design: RBD (randomized block design)

Spacing: 1.0 m × 1.0

Plot size: 3.0 m × 4.0 m

Date of planting: July 2024

The plant is propagated by semi hardwood and hardwood cuttings. 10 cm long hard wood cuttings with 2 to 3 nodes were taken and treated with IBA @ 300 ppm to promote adventitious root formation which are planted in portrays filled with standardized rooting medium. The trays were maintained under controlled polyhouse conditions for a period of three months to facilitate rooting and for initial establishment. Transplanting was done by placing each rooted cutting into pits measuring 30 cm in depth at spacing of 1 m × 1 m maintained over a 12 m² plot. After one year of planting, morphological observations like plant height (cm), measured from the base to the tip of the stem, number of branches per plant and number of leaves per plant were counted manually and leaf area (cm²) determined using a portable leaf area meter. Yield traits were assessed where fresh leaf weight per plant (g) was measured using a precision balance and dry weight was determined after shade- and oven-drying to constant weight. The number of capsules per plant and number of seeds per capsule were counted manually, while 100-seed weight (g) was recorded from a random seed sample.

Results and Discussion

The results were presented in the Table 2 and illustrated in Fig. 1 and 2. The results revealed that accession APGs-13(Dekkagal) had recorded maximum plant height (577.10 cm), number of branches (15.20), number of leaves (3215.50). This was followed by accession APGs-11 (Ningapur). Whereas lowest plant height (193.60 cm) and number of leaves (727.00) was recorded in accession APGs-7 (Ramannagudem) and lowest number of branches (8.11) was recorded in accession APGs-2 (Polavaram). APGs-15 (Chintapalli) recorded highest plant leaf area (12790.65) and lowest in accession APGs-11 (Ningapur). APGs-12 (Munirabad) recorded maxiumum fresh leaf weight (462.07 g) and dry leaf weight (232.15 g) and minimum fresh leaf weight and dry leaf weight in APGs-9 (Mangalagiri). The accession APGs-16 (Rajahmundry) recorded highest number of capsules per plant (12.25) and lowest in APGs-1 (Polavaram). Number of seeds per capsule was maximum in APGs-14 (Arabhavi) and minimum in APGs-1 (Polavaram). APGs-10 (Yerrabalem) recorded highest 100 seed weight (0.94 g) and lowest in APGs-1

Table 1: List of 17 accessions used in the present study.

S. No	Accession Name	Place of collection	District	State	Latitude	Longitude	Altitude
1.	APGs-1	Polavaram	West Godavari	Andhra Pradesh	17.16° N	81.39° E	25m
2.	APGs-2	Polavaram	West Godavari	Andhra Pradesh	17.16° N	81.39° E	25m
3.	APGs-3	Hanumanthuni gudem	Krishna	Andhra Pradesh	16.84° N	80.83° E	120m
4.	APGs-4	Siddharthanagar	East Godavari	Andhra Pradesh	16.97° N	82.24° E	340m
5.	APGs-5	Edulagudem	Krishna	Andhra Pradesh	16.68° N	80.84° E	24m
6.	APGs-6	Venkataramannagudem	West Godavari	Andhra Pradesh	16.07° N	81°01° E	14m
7.	APGs-7	Ramannagudem	West Godavari	Andhra Pradesh	17.20° N	81.29° E	30m
8.	APGs-8	Rajendranagar	Ranga Reddy	Telangana	17.31° N	78.40° E	542m
9.	APGs-9	Mangalagiri	Guntur	Andhra Pradesh	16.43° N	80.56° E	43m
10.	APGs-10	Yerrabalem	Guntur	Andhra Pradesh	15.84° N	79.48° E	592m
11.	APGs-11	Ningapur	Koppal	Karnataka	16.33° N	75.28° E	594m
12.	APGs-12	Munirabad	Koppal	Karnataka	15.31° N	76.33° E	476m
13.	APGs-13	Dekaggal	Bellary	Karnataka	15.39° N	76.90° E	458m
14.	APGs-14	Arabhavi	Belagavi	Karnataka	16.14° N	74.81° E	608m
15.	APGs-15	Chintapalli	Palnadu	Andhra Pradesh	16.41° N	80.08° E	839m
16.	APGs-16	Rajahmundry	East Godavari	Andhra Pradesh	16.98° N	81.78° E	14m
17.	APGs-17	Ummetha	East Godavari	Andhra Pradesh	16.50° N	82.30° E	19m

Table 2: Mean performance of morphological and yield parameters in madhunashini accessions.

Accessions	Plant height	Number of branches	Number of leaves	Plant leaf area	Fresh weight	Dry weight	No. of capsules per plant	No. of seeds per capsule	100 g seed weight
APGs-1	220.00	12.10	931.00	9146.25	233.65	118.02	3.25	2.50	0.47
APGs-2	200.60	8.11	813.50	7802.45	237.17	113.84	5.25	3.00	0.58
APGs-3	291.40	11.90	1126.50	9475.30	254.37	117.38	7.25	5.50	0.56
APGs-4	227.80	8.40	886.50	10300.90	279.69	134.63	6.75	5.00	0.60
APGs-5	495.80	13.60	1234.50	8607.45	271.52	116.06	7.75	4.50	0.51
APGs-6	327.50	11.20	1543.00	11676.85	261.11	105.99	9.75	6.00	0.60
APGs-7	193.60	10.62	727.00	9772.35	440.64	230.47	11.25	4.10	0.56
APGs-8	324.50	11.50	1105.00	9706.80	277.56	155.51	8.25	7.00	0.57
APGs-9	416.90	12.10	1017.50	12397.35	218.72	78.94	7.75	5.50	0.55
APGs-10	214.40	10.30	904.50	9298.55	265.58	87.14	4.25	5.50	0.94
APGs-11	553.60	14.05	3022.00	6126.60	222.93	110.27	11.75	6.00	0.61
APGs-12	498.10	10.90	1325.50	11352.65	462.07	232.21	8.25	6.50	0.58
APGs-13	577.10	15.20	3215.50	7154.85	223.22	120.5	10.75	5.50	0.57
APGs-14	259.20	9.10	966.00	10625.45	267.21	155.29	8.25	8.00	0.71
APGs-15	287.20	10.03	1033.50	12790.65	316.71	181.97	11.25	6.00	0.57
APGs-16	356.80	13.20	1376.50	9720.70	298.22	171.78	12.25	5.00	0.53
APGs-17	219.00	12.90	825.50	10535.45	287.53	186.19	9.25	5.50	0.48
Mean	**333.15**	**11.48**	**1297.26**	**9989.01**	**283.25**	**142.13**	**8.43**	**5.36**	**0.59**
S.EM	**1.19**	**0.26**	**0.31**	**0.14**	**3.421**	**1.02**	**0.12**	**0.05**	**0.01**
C.D. 5%	**3.58**	**0.77**	**0.94**	**0.43**	**10.25**	**3.08**	**0.36**	**0.15**	**0.03**

(Polavaram).

The significant differences observed for plant height, number of branches, and leaf area suggest that considerable genetic variability exists among the accessions, which can be effectively utilized in selection and breeding programmes. Morphological variations like

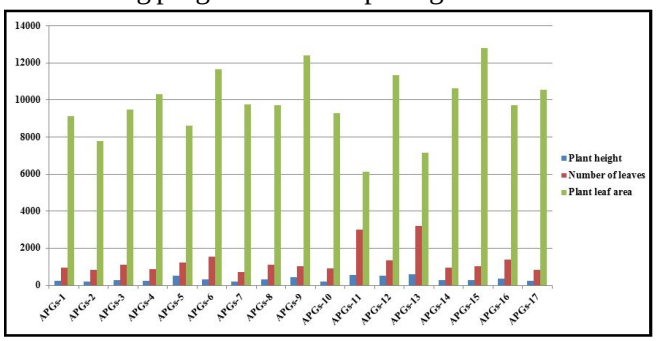

Fig. 1: Variability for morphological traits in madhunashini accessions.

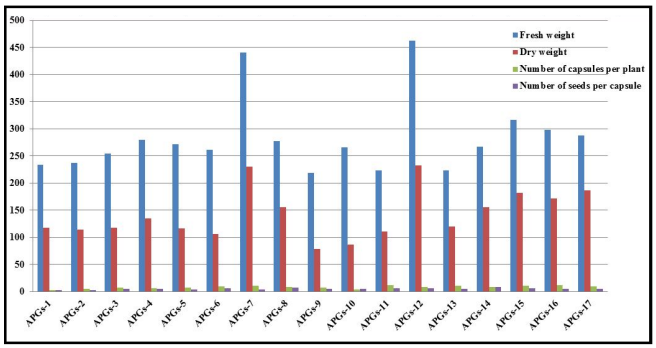

Fig. 2: Variability for yield traits in madhunashini accessions.

plant height (cm), number of branches per plant, number of leaves per plant, plant leaf area have similar findings in accordance with Krishnamuthy *et al.*, (2015), Madhavan *et al.*, (2019) in madhunashini. In terms of yield traits fresh leaves weight per plant (g), dry leaves weight per plant (g) has been reported by Krishnamuthy *et al.*, (2015), Dhanani *et al.*, (2015), Madhavan *et al.*, (2019), Rohini *et al.*, (2024) in madhunashini and Singh *et al.*, (2022) in mandukaparani. Similar findings regarding number of capsules per plant, number of seeds per capsule, 100 seed weight (g) were reported by Krishnamuthy *et al.*, (2015), Madhavan *et al.*, (2019).

Conclusion

The wide range of variation observed across accessions highlights the scope for selecting elite genotypes with superior agronomic and yield traits. These promising accessions can be effectively utilized in crop improvement, conservation programmes and future breeding strategies to enhance productivity and meet the growing demand for Madhunashini as a medicinal resource.

References

Aneesa Rani, M.S. (2002) Evaluation of ecotypes, gymnemic acid in plant parts and production of secondary metabo lites through cell suspension culture in Gymnema sylves tre R.Br. Dissertation, Department of Floriculture and Landscaping, Horticultural College and Research Institute Tamil Nadu Agricultural University, Coimbatore,

Tamil Nadu, India.

Chinapolaiah, A., Chand D., Thondaiman V., Mittal M.K., Parthvee R.D., Manivel P. and Kumar S. (2019). Exploration, collection and conservation of Gymnema sylvestre germplasm from different parts of India. *Journal of Pharmacognsy and Phytochemistry*. **8**, 38-45.

Dhanani, T., Singh R., Waman A., Patel P., Manivel P. and Kumar S. (2015). Assessment of diversity amongst natural populations of Gymnema sylvestre from India and development of a validated HPLC protocol for identification and quantification of gymnemagenin. *Industrial Crops and Products*. **77**, 901-09.

Kakaraparthi, P.S., Rajput D.K., Komaraiah K., Kumar N. and Kumar R.R. (2013). Effect of sowing dates on morphological characteristics, root yield and chemical composition of the root of Withania somnifera grown in the Semi Arid regions of Andhra Pradesh. *Indian. J. Sci. Res. Reports*. **2(1)**, 121-32.

Krishnamurthy, R., Chandorkar M.S., Pathak J.M., Animasaun D.A. and Gupta R. (2015). Selection of elite lines from accessions of Gymnema sylvestre (Gudmar) based on characterization of foliage and gymnemic acid yield. *Int J Med Plants Photon*. **108**, 596-05.

Kumar, U. (2017). Evaluation of brahmi (*Bacopa monnieri* L.) genotypes for growth and herbage yield under North Bihar agroecological conditions. *J. Pharmacog Phytochem*, **6**, 427-429.

Madhavan, S., Rajkumar M. and Sha K. (2019). Evaluation of Gymnema ecotypes. *J. Emerg Technol Innov Res*. **6(3)**, 316-19.

Nair, S. and Keshavachandran R. (2006). Genetic variability of chakkarakolli (*Gymnema sylvestre* R. Br.) in Kerala assessed using morphological and biochemical markers. *Journal of Tropical Agriculture*. **44**, 64-67.

Nalina, L., Rajamani K., Manivel P. and Kumar S. (2021). TNGsy-55 Mettupalayam Local 4 (IC0630558; INGR20058), a Gymnema (*Gymnema sylvestre*) Germplasm with Elliptic Leaf Shape and Obtuse Base. 353-54.

Norkumai, P., Wongkaew M., Tangpao T., Sritontip P., Wongsiri S., Junmahasathien T. and Sommano S.R. (2023). Relationships between Phenotypes and Chemotypic Characteristics of Local Gymnema inodorum Plants in Northern Thailand. *Horticulturae*. **9(4)**, 484.

Padmapriya, S., Kumanan K. and Rajamani K. (2010). Studies on effect of organic amendments and bio-stimulants on morphology, yield and quality of *Gymnema sylvestre* R. *Br Br Afr J Agric Res*. **5(13)**, 1655-1661.

Prasad, A., Dhawan S.S., Mathur A.K., Prakash O., Gupta M.M., Verma R.K., Lal R.K. and Mathur A. (2014). Morphological, chemical and molecular characterization of Centella asiatica germplasms for commercial cultivation in the Indo-Gangetic plains. *Nat Prod Commun*, **9(6)**, 779-784.

Rashmi, R. and Trivedi M.P. (2014). Assessing the morphological characters for taxonomic significance among intraspecific variations of Catharanthus roseus. *Biolife*. **2(4)**, 1002-07.

Ravi, C.S., Umesha K., Hima Bindu K., Raviraja Shetty G. and Anil Kumar G.S. (2019). Collection and morphological varia bility in ecotypes of Indian pennywort (*Centella asiatica* L.) of hill zone of Karnataka, India. *Int J. Curr. Microbiol App Sci*., **8(9)**, 94-1008.

Rohini, M.R., Raghavendra H.C., Rao V.K. and Sreenu B. (2025). Insight into the morphological and bioactive variability in the ex-situ genepool of Gymnema sylvestre accessions collected from Peninsular India. *Genetic Resources and Crop Evolution*. **72(2)**, 1783-01.

Singh, L.J., Sane A. and Thuppil V.K. (2022). Assessment of morphological Characterization and genetic variability of mandukaparni (*Centella asiatica* L.) accessions. *Indian Resources*. **35(02)**, 189-93.

Tripathi, N., Saini N. and Tiwari S. (2013). Morphological and molecular characterization of endangered medicinal plant species Coleus forskohlii collected from central India. *Journal of Crop Science and Biotechnology*. **16(4)**, 253-61.

Zhang, J.Y., Zhang J., Yang W.Z., Wang Y.Z., Yu H. and Jin H. (2011). Morphological diversity of wild medicinal Paris L. from China and Vietnam. *African Journal of Biotechnology*. **10(73)**, 16421-28.