Available online at www.ijpab.com

ISSN: 2320 – 7051
Int. J. Pure App. Biosci. **2 (5):** 229-232 (2014)

Research Article

INTERNATIONAL JOURNAL OF PURE & APPLIED BIOSCIENCE

Seedling Morphology of Endangered *Eremostachys superba* Royle ex Benth. (Lamiaceae)

Vijai Malik[1]*, Seema Anand[2] and Inam Mohammad[1]
[1]Department of Botany, M. S. College, Saharanpur U.P. India
[2]Department of Botany, S. V. College, Aligarh U.P. India
*Corresponding Author E-mail: vijai.malik@rediffmail.com

ABSTRACT

Morphotaxonomic observations on the juvenile stages and seedlings of endangered Eremostachys superba Royle ex Benth. were observed upto 5th leaf stages. Morphological features of the seedling like collet, hypocotyl, epicotyl, shape and arrangement of paracotyledons, leaf base, colour, phyllotaxy, number of veins etc. represent high level of constansy within taxon and thus, have been found useful from taxonomic point of view in delimitation, identification and conservation of plants at juvenile stage.

Key words: *Eremostachys superba , endangered, seedling morphology, Sivalik, U. P .*

INTRODUCTION

The *Eremostachys superba* Royle ex Benth. is an endangered species of family Lamiaceae. Threatened status of this species was first reported by Botanical Survey of India[1]. This species inhabits the lower Sivalik of U. P. in a very narrow restricted population. It is a very handsome plant with showy and brightly colored flowers. It is distributed in north-west Indian Himalaya, Pakistan and in some parts of Afganistan. This species produce flowers normally in March-April and retain the potential for sexual reproduction. In adverse conditions the sexual reproduction turns to asexual reproduction. It reproduces clonally also by means of its thick deeply penetrating root stock, creeping roots or stems, propagules such as bulbils and tubers etc. The population reduction and deterioration of this species in its type locality i.e. Mohand, Dehradun have made emphasis on the conservation of this species[2]. Local people use root tuber of this species for curing mastitis and restoration of milching process in cows and bufalloes. Besides, there is also poor fruit and seed set due to limited pollinators. These two factors have caused the reduction in plant number[3] and inbreeding depressing in this species due to which it is on the verge of extinction[4]. The knowledge of seedling morphology can be beneficial for delimitation, identification, management and conservation of this endangered species at seedling stage. Keeping these facts in mind, an attempt has been made to explain and illustrate the seedlings morphology of *Eremostachys superba* Royle ex Benth.

MATERIAL AND METHODS

The mature and ripen seeds of *Eremostachys superba* were collected from natural habitat in Saharanpur forest division (U. P.) in 2013 and dried in the sun for one week. Morphological observations have been made with the help of hand- lens, dissecting and compound microscope. For correct identification, seedlings were collected from natural habitat and were compared and identified with the help of seedling raised from identified seeds. For the morphological observations of seedling, seeds were sown in the garden soil at a depth of 0.5 cm in February, 2013 (15.02.2013). In the present study morphological features of the seedlings of *Eremostachys superba* Royle ex Benth. have been described according to the terminology given in

several elaborated work[5,6,7]. Besides, deeds on seedling morphology of several other authors[8,9,10,11,12,13,14,15] have been followed in this study. Days and dates of appearance of leaves up to 5th true leaf stage were also recorded **(Table 1)**. Observations have been made on six seedlings.

Table 1: Days and dates of appearance of different leaves in the seedlings of *Eremostachys superba*

S. No.	Appearance of different leaves	Day	Date
1.	Seed leaf	13th day	28.02.2013
2.	1st true leaf	24th day	11.03.2013
3.	2nd true leaf	35th day	22.03.2013
4.	3rd true leaf	45th day	01.04.2013
5.	4th true leaf	55th day	11.04.2013
6.	5th true leaf	66th day	22.04.2013

OBSERVATIONS

Eremostachys superba Royle ex Benth. in Hook., Bot. Misc. 3: 381. 1833. Mukerjee in Rec. Bot. Surv. Ind. 14, 1: 201. 1940; Hedge in Notes Roy.Bot. Edinb. 23: 162. 1968; Stewart, Ann. Cat. Vasc. Pl. W. Pak. and Kashm. 613. 1972; Sharma and Kachroo, Fl. Jammu. 264. 1981.

Vernacular name: Gajar Mula

Life form: Herb

Type of fruit: Nutlet

Seedlings: Epigeal, macaranga type, seed coat persistent upto seed leaf (paracotyledon) stage; primary root non-fibrous, branched, white-opaque, smooth, teret; secondaries many, fine, non-fibrous; root length 6.1 cm at paracotyledon stage, 6.6 cm at first true leaf stage, 7.2 cm at second true leaf stage, 7.9 cm at third true leaf stage, 8.4 cm at fourth true leaf stage, 9.0 cm at fifth true leaf stage; *collet distinct white-opaque, squarish, smooth, without ring*; hypocotyl green- purple, slightly curved, smooth, angular; hypocotyl length 3.0 cm at paracotyledon stage, 3.5 cm at first true leaf stage, 3.9 cm at second true leaf stage, 4.3 cm at third true leaf stage;,4.8 cm at fourth true leaf stage, 5.4 cm at fifth true leaf stage.

Paracotyledons 2, phanerocotylar, isocotylar, opposite, exstipulate, leafy, petiolate, persist upto second true leaf stage.

Petiole green, smooth, angular, 0.3 cm long; blade ovate, 1.2 × 0.5 cm, broad base, apex acute, entire, adaxial surface dark green but abaxial surface light green, smooth, reticulate venation.

Epicotyl white-purple, smooth, solid, long, angular; epicotyl length 2.2 cm at first true leaf stage, 2.4 cm at second true leaf stage, 2.7 cm at third true leaf stage, 3.0 cm at fourth true leaf stage, 3.7 cm at fifth true leaf stage; length of internodes 1.0 cm in all true leaf stages.

First true leaves simple, exstipulate, petiolate, opposite decussate; petiole purple- green, hairy, squarish, 0.4 cm long; blade, ovate, 4.0 x 2.0 cm, margin serrate, apex acute, adaxial surface dark green, hairy, abaxial surface light green hairy; multicostate reticulate venation; other features of subsequent true leaves are same as first true leaf **(Plate-I).**

Plate-I

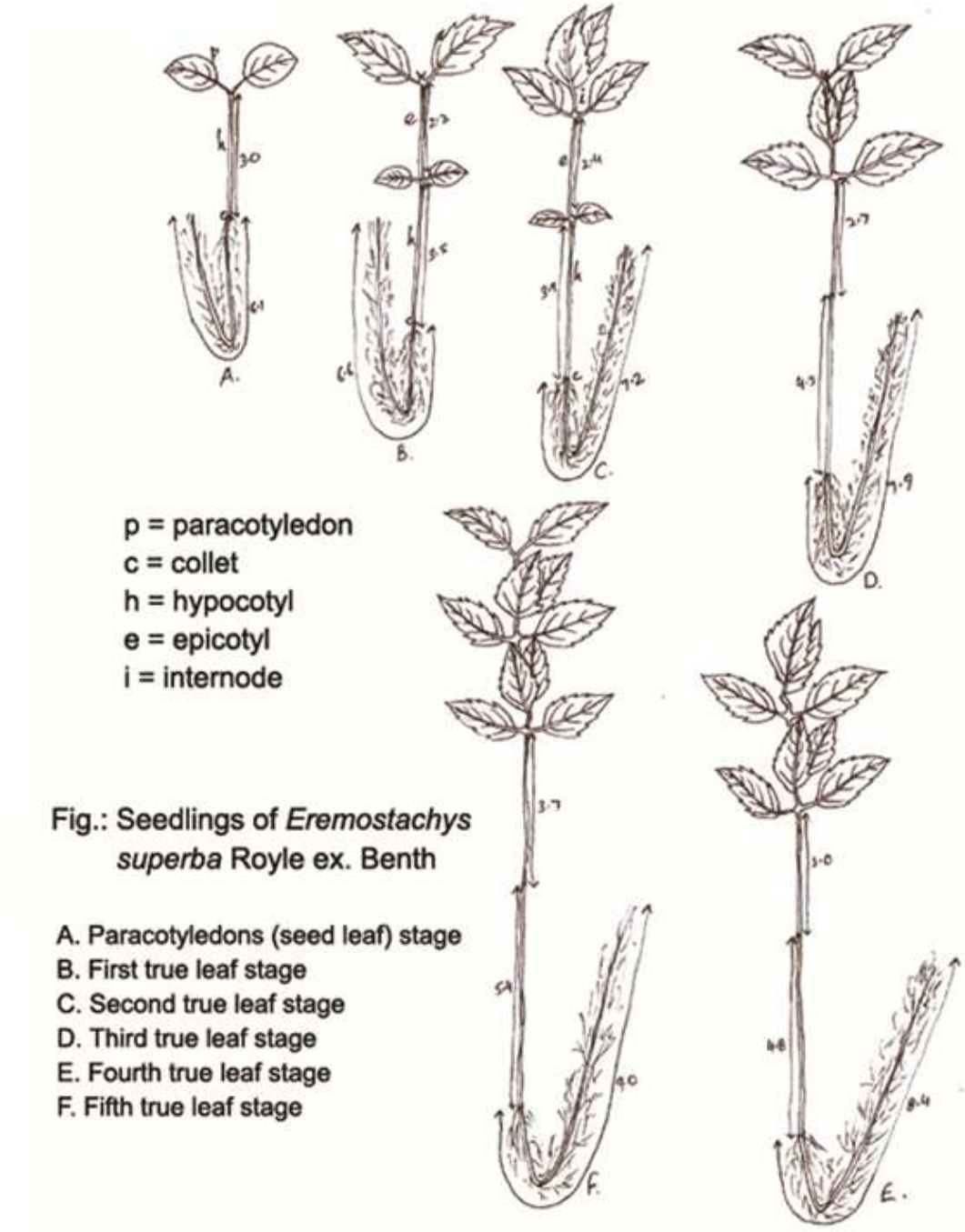

Fig.: Seedlings of *Eremostachys superba* Royle ex. Benth

A. Paracotyledons (seed leaf) stage
B. First true leaf stage
C. Second true leaf stage
D. Third true leaf stage
E. Fourth true leaf stage
F. Fifth true leaf stage

CONCLUSION

Seedlings started protruding above the soil on 13th day. The seedlings took another 66 days to reach the 5th true leaf stage **(Table-I)**. Poor germination % indicates inbreeding depression in this species. Many seedlings toppled at 2nd or 3rd true leaf stage. This may be due to poor genetic diversity in this species. The seedlings of this species show a higher rate of development at third, fourth and fifth true leaf stage and slower rate of development at first and second true leaf stage. Several juvenile characters represent constansy within taxon. So this study will be useful in delimitation, identification and conservation of this species at juvenile stage.

Acknowledgements

The authors are grateful to Prof. N. D. Paria of Kolkata University and Dr. A. K. Singh of U. P. Autonomous College, Varanasi for encouragement.

REFERENCES

1. Jain, S.K. and Shastry, A.R.K. The Indian Plant Red Data Book I: Botanical Survey of India, p. 90 (1984)
2. Rao, R.R. and Garg, A. Can *Eremostachys superba* be saved from extinction? Current Science, **67(2)**: 80-81 (1994)
3. Verma, S. Magotra, R. and Koul, A. K. Restoration of *Eremostachys superba* Royle ex Benth.- a critically endangered species. *Current Science*, **84**(10): 1307-1308 (2003)
4. Garg, A. Reproductive Behaviour and Inbreeding Depression in Endangered *Eremostachys supreba* Royle ex Benth. (Labiatae) in Dehradun Population, India. Taiwania, **49**(4): 237-249 (2004)
5. Burger, H. Seedlings of some tropical trees and shrubs, mainly of South East Asia. *PUDOC*. Wageningen p. 399 (1972)
6. Hickey, L.J. Classification of the architecture of dicotyledonous leaves. *American Journal of Botany*, **60**: 17-31 (1973)
7. Vogel, E.F. de. Seedlings of Dicotyledons. PUDOC, Wageningen p. 456 (1980)
8. Troup, R.S. The Silviculture of Indian Trees. Vol. I-IV. Clarendon Press, Oxford (1921)
9. Sampath Kumar, R. (1982). Studies on the cotyledonary leaves of some Convolvulaceae. Taxon, **31**: 53-56 (1982)
10. Canne, M. J. The taxonomic significance of seedling morphology in *Agalinis* (Scrophulariaceae). *Canadian Journal of Botany*, **1**(7): 1868-1874 (1983)
11. Augustine, K.T. Seedling Morphology of *Acasia holosericea* A. cunn. ex G. Don. *Journal of Economic & Taxonomic Botany*, **28**(1): 104-106 (2004)
12. Das, D.C. and Paria, N.D. Seedling morphology in identification of some Indian species of *Bauhinia* L. (Caesalpiniaceae). Feddes Reportium, **110** (5-6): 375-379 (2008)
13. Singh, A.K. Singh, S. Srivastava, M. and Srivastava, S. Seed and seedling morphology of a medicinal plant *Catharanthus roseus*. Indian Forester, **34**(4): 537-541 (2008)
14. Anand, S. Malik, V. and Pranita. Seedling Morphology of *Rivina humulis* L. (Phytolaccaceae). *Journal of Economic & Taxonomic Botany*, **35** No. 1: 3-5 (2011)
15. Singh, A.K. Seedling Morphology of Four Species of *Ocimum* l. (lamiaceae) and its Taxonomic Significance. *Bangladesh J. Plant Taxon*. **19**(1): 89-92 (2012)