Patterns of life history traits among rare/endangered flora of South India

R. Lokesha and R. Vasudeva*

Regional Research Station, Raichur 584 101, India
*College of Forestry, Sirsi 581 401, India

In this paper, we analyse the life history strategies that predispose plant species to become rare, endangered and threatened. We show that specific features such as habit, pollination and dispersal modes might be important in rendering plants to become threatened.

UNDERSTANDING rarity has been an important task among plant ecologists. There are many ways by which a species can become rare and the process has diverse ecological consequences[1]. Human-induced perturbations such as habitat loss are identified as one of the important causes of rarity. However, intrinsic features such as breeding behaviour, dispersal modes, habitat specificity, etc. are also likely to govern the distribution and survival of species in their natural habitats and hence might render species to become rare and endangered[2,3]. There are, however, only a few studies comparing such life history traits between rare and common species[4–6]. Our earlier analysis has revealed that among Indian orchids, a greater proportion of species occupying terrestrial habitat are endangered than the epiphytic species and rare orchid species differ in their flowering phenology compared to the common ones[4]. In this article we compare a few life history traits of rare/endangered (RE) species of South Indian flora with those of common ones so as to identify specific life history syndromes, if any, that predispose a species to become RE.

For a set of 487 rare/endangered (including 'rare', 'endangered' and 'vulnerable' groups) angiosperm species of South India, listed by the Plants Threatened Committee, International Union for Conservation of Nature[6], we developed a database on their life form (herb or shrub or tree or liana) and reproductive

Table 1. Distribution of RE species into different life forms

Life form	Number of species: Observed	Expected*
Herb	197 (40.29)	251 (51.54)
Shrub	150 (30.68)	91 (18.68)
Tree	122 (24.98)	116 (23.82)
Liana	20 (04.09)	29 (05.96)
Total	487 (100.00)	487 (100.00)

$\xi^2 = 52.97$, $df = 3$, $P < 0.001$.
*Computed based on random sample of 1214 species of flora of south India[7]. Values in the parentheses are percentages calculated for each column total.

Table 2. Distribution of RE species into different dispersal modes

Dispersal mode	Number of species: Observed	Expected*
Animal	186(38.19)	86 (17.66)
Wind/water	117(24.02)	170 (34.91)
Explosive	184(37.79)	231 (47.43)
Total	487 (100.00)	487(100.00)

$\xi^2 = 142.00$, $df = 2$, $P < 0.001$
*Computed based on data ($N = 855$) from Uma Shaanker *et al.*[8]. Values in the parentheses are percentages calculated for each column total.

Table 3. Distribution of RE species into different dispersal units

Dispersal units	Number of species	
	Observed	Expected *
Seed	201 (41.27)	276 (56.67)
Pod/fruit	286 (58.73)	211 (43.22)
Total	487 (100.00)	487(100.00)

$\xi^2 = 47.04$, $df = 1$, $P < 0.001$

*Computed based on data ($N = 883$) from Uma Shaanker *et al.*[8] Values in the parentheses are percentages calculated for each column total.

features, viz. dispersal modes (animal or explosive or wind/water), and dispersal unit (fruit/pod or seed) by consulting various published botanical sources such as floras of various regions of South India, forestry literature, Red data book of IUCN, and other published sources[5]. Frequency tables were constructed for the various categories of the three features and were compared with those observed from natural flora (random sample obtained from Gamble[7]; Uma Shaanker *et al.*[8]). ξ^2 test was adopted to analyse the goodness of fit of the data with the expected[9].

Significantly more of shrubs and less of herbs, than expected from a random distribution among natural flora, appear to be in the RE group (Table 1); frequency of trees and lianas did not differ from that expected based on the natural frequency. This suggests that shrubs have a higher risk of becoming endangered than herbs. Data on the modes of dispersal suggest that a greater fraction of species that disperse their propagules through biotic agents than through wind/water or by passive means (explosive) are likely to become RE (Table 2). Further, RE species tend to have fruit (or pod) as the unit of dispersal than seed (Table 3). Strong associations between modes of dispersal and pollination have been identified for several flora[8]. Hence it is likely that RE species depend on biotic vectors for their pollination also. Any limitations of these vital vectors may jeopardize successful reproduction of these RE species. At this stage it is difficult to conclude whether the observed patterns among RE species are the consequences or cause of their rarity. It may be important to use these syndromes as thumb rules to identify the RE species and to concentrate our conservation efforts on these species.

1. Robinowitz, D., in *Biological Aspects of Rare Plant Conservation* (ed. Hugh Synge), John Wiley and Sons, New York, 1981.
2. Stebbins, G. L., in *Flowering Plants – Evolution above the Species Level*, Edward Arnold, London, 1974.
3. Kruckeberg, A. R. and Rabinowitz, D., *Annu. Rev. Ecol. Syst.*, 1985, **16**, 447–479.
4. Lokesha, R. and Vasudeva, R., *J. Orchid Soc. India*, 1993, **7**, 53–60.
5. Lokesha, R. and Vasudeva, R., *Curr. Sci.*, 1992, **63**, 740–742.
6. Lucas, G. and Syng, H., *The IUCN Red Data Book*, Int. Union Conserv. Nat., Switzerland.
7. Gamble, J. S., *Flora of Presidency of Madras*, Adlard and Son, London, 1935.
8. Uma Shaanker, R., Ganeshaiah, K. N. and Radhamani, T. R., *Evol. Trend. Plants*, 1990, **4**, 107–111.
9. Sokal, R. R. and Rohlf, F. J., *Biometry*, W. H. Freeman, USA, 1969.