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40. VEGETATIVE AND FLOWERING PHENOLOGIES OF SOME WEEDY LABIATES IN RELATION TO RAINFALL

There have been very few studies attempted to define flowering and other phenological events in tropical latitudes (Stern and Roche 1974, Frankie *et al.* 1974, Gentry 1974, Bawa 1977, Opler *et al.* 1976, Subba Reddi and Reddi 1982). They demonstrate that breaking of dormancy leads directly or indirectly to anthesis as a result of reduction of water stress and temperature drop associated with rainstorms or monsoon rains. The adaptations in floral seasonality, phenology and morphology are the raw materials which produce various pollination mechanisms in different flower species. This paper examines the vegetative and blooming phenology of five different species of Lamiaceae which flower annually in relation to rainfall.

Role of rainfall in vegetative and flowering phenology:

In the course of my studies of the reproductive behaviour and ecology of tropical weedy Labiates in Andhra Pradesh from 1983 to 1987, I have found that rainfall directly or indirectly plays an important role in the initiation, timing and synchronization of vegetative and flowering phenology with the resultant reduction in water stress or sharp temperature drop in *Ocimum americanum*, *O. basilicum*, *Anisomeles malabarica*, *A. indica* and *Hyptis suaveolens*. The species are herbaceous perennials and grow from perennating root stocks or seeds. Except for *A. indica*, their natural habitats are disturbed and undisturbed places with soils saturated or unsaturated. *A. indica* is confined to undisturbed areas with saturated soils. They usually have patchy distribution, and each patch may reseed itself and persist for several years.

Ocimum and *Anisomeles* broke dormancy and initiated vegetative growth with the first rains in June after a 3 month dry spell. Two weeks later *Ocimum* began flowering in October. *Anisomeles* began flowering 5 weeks after the end of the dry spell and continued until January. In *A. indica* flowering was associated with moisture content of the soil. Vegetative growth in *Hyptis* appeared in September and flowering began 3 weeks later and continued until December. Such phenology has been evident in *Croton bonplandianum* and *Euphorbia geniculata* (Subba Reddi and Reddi 1982). It shows that these species have a long flowering season, which is a

characteristic feature of weedy flora (Baker 1974). Each individual plant produced flowers every day throughout its flowering phase, a feature known as steady state flowering (Gentry 1974). The continuous flowering for prolonged periods, particularly in rainy seasons, is a rare characteristic of perennial shrubs or herbs. In this sense, it is a peculiar perennial feature in these Labiates.

Although rainfall has a great bearing on breaking dormancy and stimulating vegetative growth and then flowering, it does not influence the timings of anthesis or anther dehiscence in any of the five species, unlike what has been reported by Opler *et al.* (1976). In *Anisomeles* and *Hyptis*, anthesis as well as anther dehiscence is delayed about an hour on cloudy and foggy days. Pollinator activity is similarly delayed.

Floral features in relation to pollinators: The individuals of out-crossing species must flower in relative synchrony to effect appropriate gene exchange and seed set. Furthermore, for outcrossing different species must have seasonally different flowering periods or be separated by diurnal anthesis times. The outcrossing *Randia* species which have simultaneous flowering have different diurnal anthesis times and different pollinators (Opler *et al.* 1976). The two *Anisomeles* species are mainly out-crossers and usually occupy different habitats. They have simultaneous seasonal flowering but have different diurnal anthesis times. Their diurnal pollinators are the same. Competition for such pollinators has been avoided by their natural distribution in different habitats.

The two *Ocimum* and *Hyptis* species, on the other hand, are mainly selfers and usually grow intermingled with each other. The flexibility in their mating system to reproduce by selfing or crossing has made it possible to overcome unfavourable pollinator conditions for their continuous perpetuation in colonizing different habitats.

I thank Prof. L.W. Macior, Biology Department, University of Akron, Akron, U.S.A. for his constructive criticism on the manuscript.

January 23, 1990

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41. FIRST REPORT ON TYPE LOCALITY AND REDISCOVERY IN NATURE OF A RARE INDIAN ORCHID SPECIES, *BULBOPHYLLUM ROTHSCILDIANUM* (O'BRIEN) J.J. SMITH

(With a text-figure)

During the course of a botanical exploration in the Mokokchung district (25°45'-26°36' N; 94°-94°45' E; average annual rainfall 2500-3000 mm) of Nagaland, we collected some interesting and rare species of *Bulbophyllum* from certain forest pockets. One of these was identified as *B. rothschildianum*. The species has been reported only once from the hills beyond Darjeeling in the eastern Himalayas as a new species named *Cirrhopetalum rothschildianum* by O'Brien in Gard. Chron. 1895, 2:608. O'Brien's report is based merely on specimens received from a nursery man somewhere in the hills beyond Darjeeling. Further, the report is silent about the actual place of its occurrence, habitat, flowering time, and distribution. Our search for the type locality of this species in and around Darjeeling hills proved futile, leading to the conclusion that the hills beyond Darjeeling cannot be the type locality. So far no one knows the type locality of this orchid species. Subsequent to O'Brien's report in 1895 there is no other report on its collection from nature (Seidenfeden 1973). The present collection from Mokokchung district is after a lapse of about a hundred years and forms the first report on its type locality.

The species, commonly called red chimney, is perhaps the most beautiful among all bulbophyllums and horticulturally, it is one of the most attractive orchid species. The whole flower is so remarkably attractive that it commands attention even from those who prefer none but the most flamboyant orchids. At the meeting of the Orchid Committee of the Royal Horticultural Society on 15 October 1895, Hon. Walter Rothschild exhibited what was unanimously agreed to be the handsomest of the plume bearing section of *Cirrhopetalum*, and under the above name, it was awarded a First-Class Certificate (O'Brien 1895). It is also the parental source of many attractive orchid hybrids. One such hybrid, i.e. *Cirrhopetalum* 'Elizabeth Ann' (*rothschildianum* x *longissimum*) commonly known as buckleberry was awarded the Award of

Merit by the American Orchid Society (Linder 1987).

Bulbophyllum rothschildianum (O'Brien) J.J. Smith, Bull. Buitz. 2. s. 8: 27, 1912. *Cirrhopetalum rothschildianum* O'Brien, Gard. Chron. 1895. 2: 608; O'Brien, Proc. R. Hort. Soc. 19: 208, Fig. 83, 1896; Rolfe, Orch. Rev. 15: 328, 1907; Gard. Chron. 60: 188, Fig. 75, 1916; Orch. Rev. 30:353; 1922; J.T.B., Gard. Chron. 78: 288; 1925; R.E. Arnold, Orch. Rev. 45: 275, 1937; Orch. Rev. 65: 36, 1957; Seidenf., Notes on *Cirrhopetalum* in Dansk Bot. Arkiv. 29. 1973.

A creeping epiphytic plant with a stout rhizome, growth sympodial; pseudobulbs 4-angled, borne 5 cm apart, varying in form from ovate to pear-shaped, each 1-leaved. Leaf fleshy, erect, elliptic - oblong, the apex retuse, the base twisted, up to 16 cm long, 3 cm broad, scape erect, 13-14 cm in height, bearing a terminal one-sided umbel of bright crimson-purple. Flowers blotched with yellow on the sepals, each flower over 15 cm in length and 1.5 to 2 cm across the broadest part of the lower sepals, the cucullate upper sepal yellow with purple lines, and with marginal fringe and a very sensitive plume of a purple colour at the apex, the lower sepals with 2 slender tail-like appendages; the petals are narrower, but similarly coloured and decorated; the triangular, grooved, hinged labellum is purple (Fig. 1).

Flowering: September - October.

Specimen cited: INDIA: Mokokchung district (Nagaland): Longkhum, 11 Oct. 1987, *Gurung* 847 (NEHU). The abbreviation 'NEHU' is used for the herbarium of the North Eastern Hill University; it has not yet been registered in Index Herbarium.

Distribution: INDIA: Mokokchung (Nagaland), Hills beyond Darjeeling (7) (Fig. 2). Epiphytic on tree trunks in mixed evergreen broad-leaved humid forest, predominantly composed of *Elaeocarpus floribundus*, *Quercus serrata*, *Cinnamomum* sp. and *Engelhardtia spicata*.

We are grateful to Dr. Jeffrey J. Wood, Orchid Her-



Raju, Aluri Jacob Solomon. 1991. "Vegetative and flowering phenologies of some weedy labiates in relation to rainfall." *The journal of the Bombay Natural History Society* 88, 138–139.

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