# SECTION I

# CHAPTER 1

# INTRODUCTION

## 1.1. What is autecology?

Plant ecology is the study of plants in reciprocal relationship with their environment. It is divided into two - autecology and synecology. Autecology deals with the ecology of individual species. Synecology deals with the ecology of plant communities. Autecology can be otherwise defined as biology of individual species (Clapham, 1956).

## 1.2. Importance of autecological studies

Early ecologists confined their work to synecology and the field of autecology remained neglected for a considerably long period. It was later realised that in order to understand the ecology of a community, the ecological life histories of at least the most important plants in it must be understood. Thus autecology is of necessity the foundation upon which a sound study of synecology can be built. As early as 1928 Salisbury while stressing the necessity of compiling a Biological flora for the British Isles wrote, " Such autecological data are of great value for their own sake and the progress of study of the plant communities is greatly hampered by the lack of information respecting the life history and biotic relations of their constituent species. Further,until

such data are available it is useless to attempt to unroll the complex tangle of factors involved in the phenomena of competition". Careful and thorough work of autecological nature is indeed one of the greatest needs of ecology (Tansley, 1949) or to quote Misra (1957) a correct assessment of the ecological niches of any plant can be gained by a study of its autecology. Workers like Sampson (1917), Phillips (1917), Olmsted (1941), Korolef (1944) and Duncan (1952) laid much emphasis on the importance of autecological studies to the applied plant sciences especially forestry, range management, soil conservation and weed control. Others like Clements and Weaver (1924), Tansley (1949) and Oosting and Reed (1952) emphasized its importance in synecological studies. Tansley (1949) even went to the extent of remarking that thorough knowledge of a community cannot be acquired without close study of the autecology of its dominants. The character of the individual plant and the conditions under which it grows have much to do with the distribution of the species.

## 1.3. Previous work done in the field of autecology

Earlier contributions on autecological studies were mostly from European workers. Olsen's (1921) work on Urtica dioica was perhaps the first of its kind. This was followed by Mukherji (1936), Conway (1937) and others. "The Biological Flora of the British Isles" published in parts in the Journal of Ecology from 1941 onwards is, however, making an important and substantial contribution to autecology. Anonymous (1941),

Stevens and Rock (1952), Duncans (1952), Pelton (1951, 1953) and Anonymous (1958) have given comprehensive schemes for working out the ecological life history of herbaceous plants and trees. Pandeya (1962) and Mall (1971) have also given schemes for such studies in a systematic manner.

Autecological studies in India are of recent past. Nevertheless, in early days some observations in the form of autecological notes were made by Dastur and Saxton (1922), Tadulingam and Cheriyan (1924) and Mukerji (1932), but the stimulus for the detailed study of individual plants came from the economic importance of certain tree species, like Shorea robusta, Tectona grandis, Anogeissus latifolia, Dendrocalamus strictus, Morus alba, Dalbergia sissoides, Boswellia serrata etc. Notable contributions on these species were made by Smythies (1939), Raynor (1940), Rowntree (1940), Warren (1941), Davis (1944), Chakravarti (1948), Griffith (1947), Nicolson (1945), Bhatia (1955), Prasad (1943), Kadambi (1949 a, b, c) and Sharma (1955).

Comparatively little work on the autecology of herbaceous plants was done during this perioc in India. A beginning in this line was, however, made by Misra and Siva Rao (1948), when they worked out the autecology of Lindenbergia polyantha. The study revealed facts of great interest and inspired by this, studies on herbs, both wild and of economic value, were pursued mostly by Misra and his students, viz., Bakshi (1952, 1954), Bakshi and Kapil (1952), Pandeya (1953), Sharma (1955),

Mall (1954, 1955, 1956, 1957), Trivedi (1955), Mall and Arzare (1956), Kaul (1965a,b,c, 1959), Ramakrishnan (1959), Rugmini (1960), Wakhloo (1961), Varshney (1964), Tripathi (1965), Dixit (1966), Das (1968) and others. These studies have not only helped towards a better understanding of the distribution of species, but also in evaluation of environment, adaptation and speciation.

Autecological studies of several medicinal plants such as Ageratum conyzoides, Argemone mexicana and Mecardonia dianthera (Kaul, 1965), Bacopa monnieri (Sah, 1966), Biophytum sensitivum (Shetty, 1967), Tribulus terrestris (Pathak, 1967), Eclipta prostata (Gupta, 1958), Achyranthes aspera (Ratra, 1970), Scoparia dulcis and Chrozophora rottleri (Bechu[illegible]al, 1976) and many others have also been made recently.

## 1.4. What are weeds?

Now a word about the term weed : Man's struggle with weeds goes back to earliest times and the literature in this field is sufficiently extensive. The term has now come to be used very loosely so much so that under certain circumstances it is made to apply to almost any plant in any situation. The definitions given by Beal (1930) as quoted by Chesters (1938), Salisbury (1942b), Muenscher (1949) and Webster (1948), fall into one category, as that of a plant out of place. In U.S. department of Agriculture Farmers' Bulletin 660 (1915) entitled "weeds - How to control them?" - by

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H. R. Cox a weed is defined as a wild plant that has the habit of intruding. Robbins, Crafts and Raynor (1942) define weeds as "those undesirable, unwanted, nonuseful, often prolific and persistent plants which interfere with agricultural operations, increasing the labour and adding to costs and also reducing the yield". According to Chesters (1935) (Cf. Rugmini (1960)) "a weed is a herbaceous plant whose potentialities for harm are greater than its potentialities for good". Inspite of the special favour done to the crop through agricultural practices, weeds are able to adjust their life cycle within the interim period of intercultural operations.

## 1.5. Importance of autecological studies of weeds

Indeed, "Weeds, as a class, have much in common with criminals. When not engaged in their nefarious activities both may have admirable qualities; a thief may be an affectionate husband and father outside business hours; an aggressive weed in one environment may be charming wild flower in another. Modern scientific psychology has done much to illuminate the criminal mentality, and a thorough knowledge of the biology of the species concerned is equally important in the understanding of the behaviour and control of weeds ". - Salisbury (1961).

Hence studies in ecological life history of weeds are important for their decimation and control as they cause colossal damage to crops, fisheries and pastures. A knowledge of the germination behaviour of seeds and propagules, and effect of edaphic, climatic and biotic factors on growth and

reproduction, help to gain an insight in the mechanism of speciation and distribution of the species. Such studies reveal the interactions between species and their environment, and thus offer an opportunity to locate vulnerable points in their life histories at which the weeds can be successfully attacked for their control.

It has been emphasized that the information gathered on the ecology of weeds may prove helpful in designing efficient control measures (Harper, 1958). But unfortunately, weed ecology did not receive sufficient attention till recently. The publication of The Biology of Weeds by the British Ecological Society (ed. J. L. Harper) in the year 1960 gave the much needed impetus to research in weed biology and some significant contributions have since been made (Harper, 1960; Sagar, 1968 a, b; Tripathi and Misra, 1971; Tripathi and Harper, 1973; Baker, 1965, 1972, 1974; Kapoor and Ramakrishnan, 1975). Mention may also be made of the important contributions in this field of Sen and his students under their project - "Ecology of Indian Arid Zone Weeds" (Sen et al., 1977; Bhandari, at al., 1977; Ashraf et al., 1977; Bohra et al., 1977; Bansal and Sen, 1978; Daiya et al., 1978; Bhati et al., 1979).

## 1.6. Choice of the species for autecological studies

As suggested by Mall (1971), the species which should be given priority for such studies can be : (1) economically

important ones such as plants of medicinal value, (2) plants with some peculiar habitat and distribution, (3) plants having polymorphic forms.

The following three species having peculiar habitat and distribution in Baroda were selected for the present work :

(1) Abutilon ramosum Guill. & Perr.

(2) Euphorbia geniculata Orteg.

(3) Rivinia humilis Linn.

Out of these three species, Abutilon ramosum is an indigenous weed having peculiar restricted distribution in Baroda. Though abundant in certain parts of L. V. Palace compound, it is not found growing outside that locality anywhere else in Baroda. Euphorbia geniculata is an introduced weed, which is rapidly spreading in this country. In Baroda it is abundant in certain parts of the University Campus. Rivinia humilis is an introduced garden plant, which grows abundantly as an escape in certain parts of L. V. Palace compound. Further, all these three species have one feature in common, that they usually grow in more or less moist, humus-rich and shaded localities. The present work is an humble attempt to understand their ecology and to disclose the causes of their peculiar behaviour and distribution.

## 1.7. Sites of study

The following localities were selected for detailed study

of the natural habitat of the species selected for the present work :

(1) L. V. Palace compound - (a) Temple area and (b) Museum area, where Abutilon ramosum is growing abundantly.
(c) Navlakhi area, where Rivinia humilis and Abutilon ramosum are growing abundantly.

(2) University Campus - (a) Wire House compound (b) University Library area and (c) Arts Faculty area, where Euphorbia geniculata is growing abundantly.

The present study is based on collections of plant material from the above-mentioned study sites. However, in some germination experiments seeds of Euphorbia geniculata collected from Cotton Farm and a private orchard at Surat were also used. Similarly seeds of Rivinia humilis collected from a private orchard at Surat were also used in some germination experiments.

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