

**STUDIES ON THE ECOLOGY OF VESICULAR-ARBUSCULAR MYCORRHIZA
OF EUPATORIUM RIPARIUM Regel, E. ADENOPHORUM Spreng AND
OSBECKIA CRINITA Wall. ex D. Don, THE COMMON WEEDS OF
N. E. REGION OF INDIA**

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**THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENT OF
THE DEGREE OF DOCTOR OF PHILOSOPHY**



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I certify that the thesis entitled "Studies on the Ecology of Vesicular-arbuscular mycorrhiza of Eupatorium riparium Regel, E. adenophorum Spreng and Osbeckia crinita Wall. ex D. Don., the common weeds of N.E. Region of India" submitted by Mr. Nagendra Kumar Verma for the Degree of Doctor of Philosophy of the North-Eastern Hill University, Shillong, embodies the record of original investigation carried out by him under my supervision. He has been duly registered and the thesis presented is worthy of being considered for the award of the Ph.D. Degree. This work has not been submitted for any Degree of any other University.

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GENERAL INTRODUCTION

Amongst a number of weed species common in north-east region of India, Eupatorium adenophorum, Spreng, E. riparium, Regel, and Osbeckia crinita Wall. ex. D. Don, are very frequent. The genus Eupatorium belongs to family Asteraceae and the Osbeckia to Melastomataceae.

E. adenophorum is native of Mexico and was reported from India, first of all from Nilgiris (Fyson, 1915, 1920; Shankarnarayan, 1958). Dutta (1978) reported the wide occurrence of E. adenophorum and its distribution in cultivated fields as well as in open forest areas of N.E. region, between the altitude 1066 m to 2130 m.

E. riparium is native of America, but the literature about its distribution is lacking from India and abroad. MoTooka et al., (1967) reported its occurrence as a weed species from Hawaii while Auld (1970) reported its presence in Australia. Dev (1981) surveyed the distribution of E. riparium and noted that it is very much restricted in distribution. It could be located only around the altitude of 1500 m.

Osbeckia crinita is the indigenous species. Clarke (1879) described two species of Osbeckia, the O. stellata and O. crinita, distributed in Himalaya Terai from Kumaon to Bhutan (alt. 500 ft) and in Khasi hills (alt. 3000-6000 ft). Balakrishnan (1981) merged the O. crinita in O. stellata and reported its wide distribution in Meghalaya. However, in the present work, the name Osbeckia crinita has been retained

because, the merger of the two species is still to get an acceptance.

The success of any plant species introduced in an area depends on a number of ecological factors. Grime (1979) in his ecological classification of plants proposed, the competitors, the stress-tolerators and the ruderals. He also emphasized the importance of mycorrhizal associations particularly, the ectotrophic type, associated with the plant species adapted to nutrient stresses. His conviction seems to hold good for the tree species, as most of such species are reported to have ectomycorrhizal associations and only a few genera of forest trees of economic importance form endomycorrhiza (i.e. Acer, Ulmus, Liquidamber, Fraxinus (Mexal, 1980). However, considering the plant communities as a whole, the ectotrophic mycorrhizal associations are found only in 3% (Meyer, 1973) or 5% (Mexal, 1980) plants while the vast majority of the remaining species possess the vesicular-arbuscular^{us} type of mycorrhiza (Gerdemann, 1975; Mexal, 1980).

The introduced weed species E. adenophorum is highly aggressive and dominating followed by E. riparium. Although, O. crinita is the indigenous species but compared to the other two, its distribution is very sparse. A third species of Eupatorium, E. odoratum, which is also prevalent at lower altitudes (between 100-950 m.) has been reported to be highly mycotrophic (Graw et al., 1979). It may be that E. adenophorum as well as the E. riparium are also highly mycotrophic and

because of this they are growing luxuriantly in the vast area of north east region. The soil of north east region is phosphate deficient and the successful growth of the mycotrophic species in such a condition may be expected. Moreover, the land of this region has been greatly disturbed through the shifting agriculture, resulting into poor soil nutrient status. Therefore, the chances of survival of the plant species entering into the symbiotic relationship with the beneficial microorganisms is more.

The present study was undertaken to evaluate the mycorrhizal status of E. adenophorum, E. riparium and Osbeckia crinata. The study includes the field observations and glass house experiments dealing with the various aspects of vesicular-arbuscular mycorrhiza. The general mycorrhizal status of highly disturbed and relatively less disturbed lands, and the infective potential of the mycorrhizal propagules of the soils have also been evaluated in order to understand the impact of the present agriculture system on the efficient functioning of vesicular-arbuscular mycorrhiza.