PHYTOSOCIOLOGICAL STUDIES OF *CHLOROPHYTUM TUBEROSUM* AND ASSOCIATED PLANTS IN THE FORESTS OF MANDU, M.P.

Avinash Tiwari and Sanjay Thakur

School of Studies in Botany, Jiwaji University, Gwalior-474 011, M.P., India

ABSTRACT

With the depletion of natural forests, the forest products are getting scarce. The Indian Institute of Forest Management has identified non-timber forest products (NTFP) as a potential revenue generator in future. Thus, all NTFPs have to be managed in such a way that they remain ecologically and socially sustainable. Because of the unawareness of the medicinal values and conservation of *Chlorophytum tuberosum,* it is being extracted from forests on a large scale to the extent that it has entered the list of endangered species. The phytosociological parameters projected that *Chlorophytum tuberosum* has a high value of percentage frequency and density. The percentage frequency class showed that the species was natural homogenous and regularly distributed in community.

INTRODUCTION

The floral biodiversity has a very wide taxonomic range. Loss of habitat, and exploitation and extraction of natural resources, pollution, disemployment of local community and destabilization of traditional management systems are pushing the wild species to the verge of extinction (Sharma 1996). Most of the wild species are being extracted for some reason or the other from natural habitats. Only a few studies have been undertaken on the dimensions of this loss, which further causes a decline in the species and variety level.

Non-timber forest products (NTFPs) are being exploited for their rural and forest economies. Not much work has been undertaken to study the ecological aspects of these NTFPs (Ghazala & Soumaya 2004). Thus, it is important to have a conservation assessment and management plan (CAMP). Among various NTFPs of Madhya Pradesh "safed musli" (*Chlorophytum tuberosum*) is of great importance. The state government policies have earmarked *Chlorophytum tuberosum* on its priority conservation map. *Chlorophytum tuberosum* grows wild in the forests of Madhya Pradesh including the forest of Mandu (District Dhar, M.P.). It has traditional and medicinal importance. The tuberous roots are the main plant parts to be extracted. *Chlorophytum,* a perennial herb belonging to Family Liliaceae, has white coloured flowers and tuberous root system (Oudhia 2000). The plant marks its arrival after first monsoon showers (mid June). It has been observed in natural forests that during active growing period very few herbs are found surrounding 'safed musli'. Among these species 'kali musli' (*Curculigo orchioides*) is the main species which also has a medicinal value. Due to its medicinal value the demand of safed musli is increasing day by day in international market. It is the primary source of income for tribal population in Madhya Pradesh. The international demand on dry safed musli is approximately 35,000 Mtones/annum whereas present supply is only about 15,000 Mtones/annum (Tajuddin et al. 2003, Oudhia 2003). The Increasing demand has created a pressure on Indian forests and if steps for timely conservation are not taken, the Indian forests will lose this highly valuable and important plant.

The present work proposes an exhaustive ecological study of *Chlorophytum tuberosum* in wild (natural forests) around Mandu. In absence of any in-depth ecological study, *Chlorophytum* is losing

its own local identity. *Chlorophytum tuberosum* growing in wild was studied on the basis of community dynamics (percentage frequency, density, abundance, distribution and community coefficient) as given by Misra (1973).

MATERIALS AND METHODS

The community dynamics of *Chlorophytum tuberosum* were studied at two different forest sites.

Site S_1 - Forest of Neelkanth valley (north facing, less sunlight)
Site S_2 - Forest of Sonegarh (east facing, slope, bright sunlight)

The study was made at every 20-day duration, i.e., in all three observations were made (Sampling date I - 13 July, 2003; Sampling date II - 02 August, 2003; Sampling date III - 22 August, 20030.

For each study a quadrat of 40×40 cm^2 was taken and placed randomly five times at both the sites. Observations from each quadrat were recorded for various quantitative characters. Percentage frequency, density, abundance and community coefficient were obtained by following formulae:

$$\text{Percentage frequency} = \frac{\text{No. of quadrats in which species occurred}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density} = \frac{\text{Total number of individuals of a species}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Abundance} = \frac{\text{Total number of individuals of a species}}{\text{Total number of quadrats of occurrence}} \times 100$$

$$\text{Community coefficient} = \frac{2W}{a + b} \times 100$$

Where, a = Sum total of % frequency of all species at site S_1.
     b = Sum total of % frequency of all the species at site S_2.
     W = Sum total of minimal value of % frequency of the species occurring on both of sites.

Density represents the numerical strength of species in the community. The density and frequency taken together are of prime importance in determining community structure (Oosting 1958).

The population at any time consists of two components, the original plant and offsprings of those plants. Plant population shows over-dispersion either by vegetative propagation or slow rate of dispersal around the parent plant. Cole (1946) advocates the use of terms contagious and negatively contagious rather than over and under dispersion.

High frequency and low abundance = Regular distribution

Low frequency and high abundance = Contagious distribution

Therefore, the ratio of abundance to frequency is relative measure of degree of contagiousness of the distribution of any species.

RESULTS AND DISCUSSION

Percentage frequency: At site S_1 (north facing) the percentage frequency of *Chlorophytum tuberosum* was 80 percent whereas that for *Ocimum sanctum* and *Ageratum conyzoides* was 100 percent at the

Table 1: Community Interaction for site S_1.

Species	Percentage frequency	Density (per m²)	Abundance
Sample I (Date-13 July 2003)			
Ocimum sanctum	80%	20.00	4.00
Dolichos lablab, Linn.	80%	16.25	3.25
Ageratum conyzoides, Linn.	80%	11.25	2.25
Pachystoma senile	80%	43.75	8.75
Tridax procumbens	80%	11.25	2.25
Curculigo orchioides	100%	31.25	5.00
Chlorophytum tuberosum	60%	35.00	9.33
Sample II (Date-02August 2003)			
Ocimum sanctum	100%	23.75	3.80
Dolichos lablab, Linn.	100%	21.25	3.40
Ageratum conyzoides, Linn.	80%	11.25	2.25
Pachystoma senile	80%	43.75	8.75
Tridax procumbens	60%	10.00	2.66
Curculigo orchioides	100%	32.50	5.20
Chlorophytum tuberosum	80%	38.75	7.75
Sample III (Date-22August 2003)			
Ocimum sanctum	100%	26.25	4.20
Dolichos lablab, Linn.	80%	22.50	4.50
Ageratum conyzoides, Linn.	100%	12.50	2.00
Pachystoma senile	80%	42.50	8.50
Tridax procumbens	60%	13.75	3.66
Curculigo orchioides	80%	33.75	6.75
Chlorophytum tuberosum	80%	15.00	3.00

Table 2: Community Interaction for site S_2.

Species	Percentage frequency	Density (per m²)	Abundance
Sample I (Date-13 July 2003)			
Ocimum sanctum	80%	21.25	4.25
Dolichos lablab, Linn.	80%	13.75	2.75
Ageratum conyzoides, Linn.	100%	12.50	2.00
Pachystoma senile	80%	38.75	7.75
Tridax procumbens	60%	13.75	3.66
Curculigo orchioides	100%	35.00	5.60
Chlorophytum tuberosum	100%	40.00	6.40
Sample II (Date-02 August 2003)			
Ocimum sanctum	100%	22.50	3.60
Dolichos lablab, Linn.	80%	11.25	2.25
Ageratum conyzoides, Linn.	80%	15.00	3.00
Pachystoma senile	100%	43.75	7.00
Tridax procumbens	80%	16.25	3.25
Curculigo orchioides	80%	32.50	6.50
Chlorophytum tuberosum	100%	37.50	6.00
Sample III (Date-22 August 2003)			
Ocimum sanctum	80%	26.25	5.25
Dolichos lablab, Linn.	100%	13.75	2.20
Ageratum conyzoides, Linn.	80%	12.50	2.50
Pachystoma senile	100%	45.00	7.20
Tridax procumbens	60%	17.50	4.66
Curculigo orchioides	60%	28.75	7.66
Chlorophytum tuberosum	100%	18.75	3.00

Table 3: Community coefficient between Site S_1 (north facing) and S_2 (east facing).

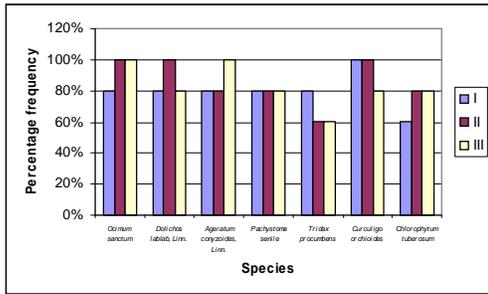| Sampling date	Community Coefficient
I - 13 July 2003	93.10 %
II - 02 August 2003	91.80 %
III - 22 August 2003	89.65 %

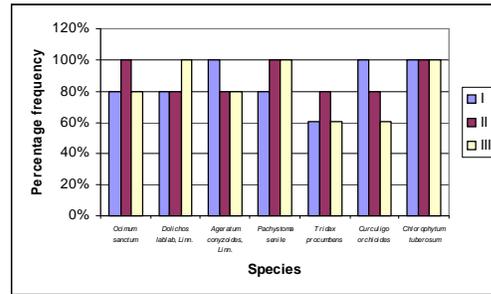Fig. 1(i): Percentage frequency for site S_1.
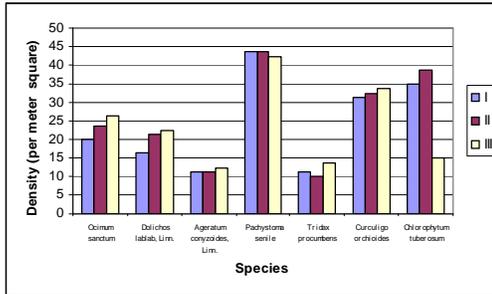

Fig. 1 (ii): Percentage frequency for site S_2.

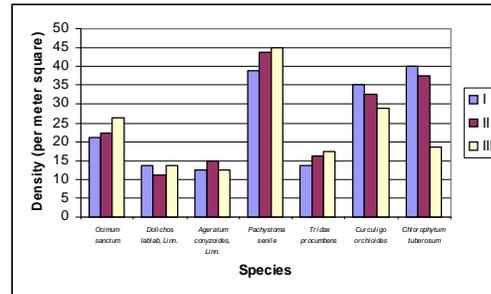Fig. 2 (i): Density (per m²) for site S_1.

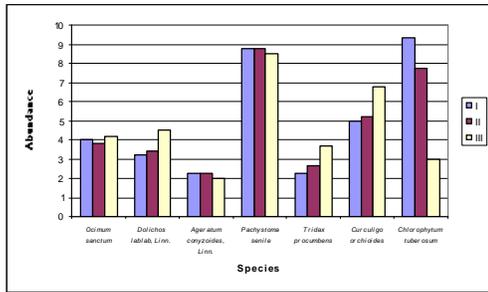Fig. 2 (ii): Density (per m²) for site S_2.
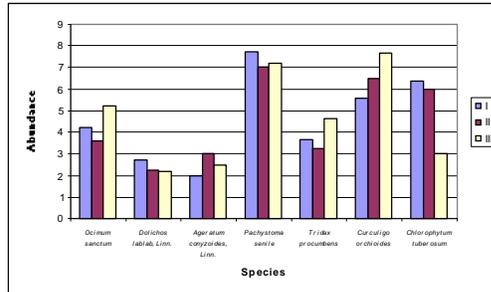

Fig. 3 (i): Abundance for site S_1.

Fig. 3 (ii): Abundance for site S_2.

time of final sampling. On the contrary, site S_2 (east facing) right from the first sampling date to the last sampling date had *Chlorohytum tuberosum* with 100 percent frequency along with *Dolichos lablab* and *Pachystoma senile*. The percentage frequency reflects that the east-facing site (S_2) was more favourable for *Chlorophytum tuberosum*, *Pachystoma senile and Dolichos lablab* (Tables 1 & 2 and Figs. 1 & 2).

At the time of final sampling both the sites had only D and E Raunkiaer frequency class (Raunkiaer 1934) and relationship between them was D < E. This clearly shows that as per Raunkiaer frequency class ratio, both the communities at site S_1 and S_2 were natural and homogeneous.

Density: The density of *Chlorophytum tuberosum* increased during second sampling but at the time of final sampling, it got reduced to less than half the value of second sampling i.e., from 38.75 per m^2 to 15.00 per m^2 at site S_1. At site S_2 the density at the time of 1st sampling was 40.00 per m^2, and at the time of final sampling 18.75 per m^2. This projects that the climatic conditions at site S_2 were more favourable as compared to site S_1 (Tables 1 & 2 and Figs. 1 & 2).

Abundance: At site S_1 the abundance value of *Chlorophytum tuberosum* went on decreasing during successive samplings, i.e., 9.33 at the time of first sampling to 3.00 at the time of final sampling. Whereas the abundance value at site S_2 went on decreasing from 6.40 (first sampling) to 3.00 (final sampling). Sites S_1 and S_2 preferred *Pachystoma* senile with a high value of abundance, i.e., 8.50 and 7.75 respectively (Tables 1 & 2 and Figs. 1 & 2).

Distribution: At the time of final sampling *Chlorophytum tuberosum* had frequency of 80% and abundance of 3.00 at site S_1 while at site S_2 the percentage frequency was 100% and abundance 3.00. This states that frequency was high and abundance was low, leading to the conclusion that *Chlorophytum tuberosum* at sites S_1 and S_2 had regular distribution at the time of final sampling.

Community coefficient: The values for community coefficient at the sites S_1 and S_2 were quite similar during the first sampling, but during further sampling the value reduced to 89.65 percent (Table 3).

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