# Effect of Different Sites and Dates of Sample Collection on Nitrogen Content in *Chlorophytum tuberosum* Leaves and Tubers

**Sanjay Thakur and Avinash Tiwari**

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

**Key Words:**

Medicinal plants
Natural medicines
Non-timber forest produce
*Chlorophytum tuberosum*
Nitrogen content
Saponin

**ABSTRACT**

World Health Organization (WHO) has estimated that at least 80% of the world population rely on traditional systems of medicine for their primary health needs. These systems are largely plant based. The Indian Institute of Forest Management (IIFM), Bhopal under its conservation assessment and management plan (CAMP) studied status of some selected species of non-timber forest produce (NTFP) of Madhy Pradesh. Researches on amla *(Emblica officinale)*, safed musli (*Chlorophytum tuberosum)* and chirongi (*Bachanania lanzan*) have led to a change in State Government policy. An effort was made to study the effect of different sites and dates of sample collection on nitrogen content in *Chlorophytum tuberosum* at Mandu. The percentage nitrogen content in the leaves at the time of final sampling was maximum at natural site $S_1$ (1.42 percent). The interaction between site and date in the percentage nitrogen content of tubers was statistically significant.

## INTRODUCTION

According to World Health Organization (WHO), over 21000 plant species are useful in the preparation of medicines and at least 80% of the world population rely on traditional system of medicine for their primary needs (Purohit & Vyas 2004). Herbal plant global market growth rate is approximately 15% per annum in India, and 7% globally. Considering inherent strength of India like suitable agri-climatic conditions and vast biodiversity, Indian farmers can harness the benefit of this growing market.

The uncontrolled collection and sale of large quantities of plant material from forests lead to destruction of many forest plants. This is a serious problem. Among these plants is *Chlorophytum tuberosum*. The Indian Institute of Forest Management (IIFM), Bhopal is planning to promote *Chlorophytum tuberosum* as an important non-timber forest produce (NTFP). The contribution of NTFP in rural and forest economics is immense (Ghazala & Soumya 2004).

*Chlorophytum tuberosum* is an important medicinal plant known as safed musli, used in many Ayurvedic vital tonics and aphrodisiac formulation. The species was first described from India in 1954 and reached rare status in nature due to overexploitation (Maiti & Geetha 2005). Out of 175 species of *Chlorophytum* reported globally, only 13 species have been found in India (Oudhia 2000, Bordia et al. 1995).

*Chlorophytum tuberosum* a perennial herb belongs to family Liliaceae. It has white coloured flowers and tuberous root system, which is the main plant part to be extracted. *Chlorophytum tuberosum* prefers high organic matter and bright sun-light for good growth. The main drug component is 'saponin'. The percent work will promote the survival of species as well as optimal drug extraction and henceforth revenue will also be generated in the benefit of all.

## MATERIALS AND METHODS

Proposed site was Mandu in district Dhar of M.P. It harbours wild *C. tuberosum* and the same species is cultivated by some of the farmers in the adjoining areas. The following four sites were selected for natural (control) and cultivation.

Site $S_1$ – Forest/natural – 'Neelkanth valley' (north facing, lowland case sunlight).
Site $S_2$ – Forest/natural – 'Songarh' (east facing, slope more sunlight)
Site $S_3$ – Agricultural – Mandu (conventional)
Site $S_4$ – Agricultural – 'Neelkanth' (crop geometry)
$S_4$ (a) – East west facing rows
$S_4$ (b) – North south facing rows
$S_4$ (c) – Circular rows

Plants of *Chlorophytum tuberosum* were collected from natural forests and then transplanted to the agricultural sites. An attempt was made to study various cultivation patterns. Plots of size $2 \times 2$ $m^2$ were maintained at agricultural sites. From each plot, monolith of $30 \times 30 \times 10$ $cm^3$ was drawn randomly at an interval of ten days. In all, six plant samples were drawn during cropping season ($D_1$ to $D_6$). The samples were taken to laboratory for chemical analysis.

Semi-Kjeldahl method suggested by Jackson (1973) and modified by Iswaran & Marwaha (1980) was used for rapid determination of % nitrogen. The observations were statistically analysed by 'factorial randomized block design method'.

## RESULTS AND DISCUSSION

### Leaves

**Effect of site:** The natural site $S_1$ and $S_2$ projected higher value of percent nitrogen during first sampling (1.22 and 1.20 percent respectively) whereas the agricultural sites as $S_4$ (a) and $S_4$ (b) showed relatively leaser values, i.e., 1.18 and 1.17 percent respectively. On all the sampling dates different sites showed a variation in the percent of nitrogen. At the time of final sampling, site $S_1$ and $S_3$ had approximately similar maximum values (1.43 and 1.42 percent respectively) whereas all the other sites had quite similar values. The final mean values showed that $S_3$ site has maximum nitrogen content (1.33 percent) followed by the natural site $S_1$ (1.32 percent). The minimum values were for $S_4$ (a) and $S_4$ (b), i.e., 1.25 percent.

**Effect of date:** The percent nitrogen content in leaves of *Chlorophytum tuberosum* at the time of final sampling ($D_6$) was maximum at the natural site $S_1$ (1.42 percent). This confirms of the work of Ovington (1962) who stated that the nitrogen content in leaves of tropical gallery forest is much higher as compared to temperate pine forests.

**Effect of interaction of site and date:** The interaction between site and date of sample collection for nitrogen content in leaves of *Chlorophytum tuberosum* was not significant (Table 1, Figs. 1(i) and 1(ii)]

### Tubers

**Effect of site:** The nitrogen content in the tubers of *Chlorophytum tuberosum* differed significantly at various sampling sites. The final mean values showed that site $S_4$ (b) has maximum nitrogen
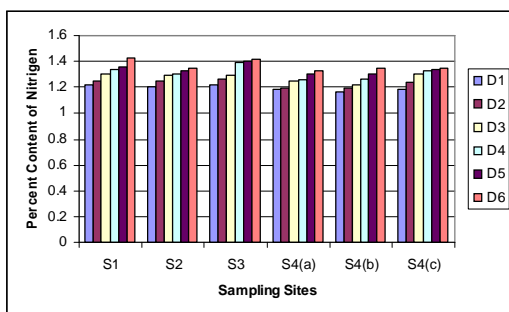
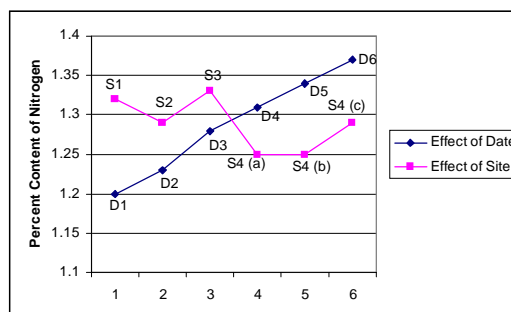Fig. 1(i): Total nitrogen (percent) in leaves.



Fig. 1(ii): Effect of different sites and dates of sample collection on nitrogen content in *Chlorophytum tuberosum* leaves.

Table 1: Effect of different sites and dates of sample collection on nitrogen content in *Chlorophytum tuberosum* leaves.

| Sampling | Nitrogen content (percent) | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | S1 | S2 | S3 | S4(a) | S4(b) | S4(c) | Mean |
| D1 | 1.22 | 1.20 | 1.22 | 1.18 | 1.17 | 1.18 | 1.20 |
| D2 | 1.25 | 1.25 | 1.27 | 1.19 | 1.19 | 1.24 | 1.23 |
| D3 | 1.30 | 1.29 | 1.29 | 1.25 | 1.22 | 1.30 | 1.28 |
| D4 | 1.34 | 1.30 | 1.39 | 1.26 | 1.27 | 1.33 | 1.31 |
| D5 | 1.36 | 1.33 | 1.40 | 1.30 | 1.30 | 1.34 | 1.34 |
| D6 | 1.43 | 1.35 | 1.42 | 1.33 | 1.35 | 1.35 | 1.37 |
| Mean | 1.32 | 1.29 | 1.33 | 1.25 | 1.25 | 1.29 | |

| | Site | Date | Interaction S × D |
|---|---|---|---|
| S. Em ± | 0.0055 | 0.0055 | 0.011 |
| CD at 5 % | 0.020 | 0.020 | NS. |

S. Em = Standard Error of Mean
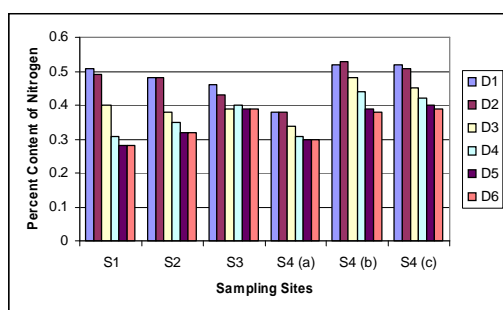CD = Critical difference



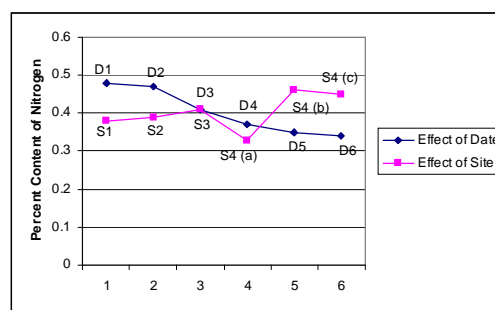Fig. 2:(i) Total nitrogen (percent) in tubers.



Fig. 2 (ii). Effect of different sites and dates of sample collection on nitrogen content in *Chlorophytum tuberosum* tubers.

Table 2: Effect of different sites and dates of sample collection on nitrogen content in *Chlorophytum tuberosum*-Tubers.

| Sampling Date | Nitrogen content (percent) | | | | | | |
|---|---|---|---|---|---|---|---|
| | S1 | S2 | S3 | S4(a) | S4(b) | S4(c) | Mean |
| D1 | 0.51 | 0.48 | 0.46 | 0.38 | 0.52 | 0.52 | 0.48 |
| D2 | 0.49 | 0.48 | 0.43 | 0.38 | 0.53 | 0.51 | 0.47 |
| D3 | 0.40 | 0.38 | 0.39 | 0.34 | 0.48 | 0.45 | 0.41 |
| D4 | 0.31 | 0.35 | 0.40 | 0.31 | 0.44 | 0.42 | 0.37 |
| D5 | 0.28 | 0.32 | 0.39 | 0.30 | 0.39 | 0.40 | 0.35 |
| D6 | 0.28 | 0.32 | 0.39 | 0.30 | 0.38 | 0.39 | 0.34 |
| Mean | 0.38 | 0.39 | 0.41 | 0.33 | 0.46 | 0.45 | |

| | Site | Date | Interaction S × D |
|---|---|---|---|
| S. Em ± | 0.006 | 0.006 | 0.011 |
| CD at 5 % | 0.022 | 0.022 | 0.032 |

S. Em = Standard Error of Mean

CD = Critical difference

content, i.e., 0.46 percent followed very closely by site $S_4$(c) (0.45 percent). The minimum value of nitrogen content was for $S_4$(a), i.e., 0.33 percent.

**Effect of date:** The percent nitrogen content in tubers of *Chlorophytum tuberosum* decreased for all the dates at various sites. The maximum value of nitrogen content was for $D_1$ (0.48 percent), and the minimum (0.34 percent) The percentage nitrogen content in tubers varied between 0.28 and 0.53 on various sampling dates.

**Effect of interaction of site and date:** The interaction between the site and date in the percentage nitrogen content of *Chlorophytum tuberosum* was statistically significant. Statistically, site $S_4$(b) has maximum nitrogen content in tubers (0.46 percent) and the first sampling date ($D_1$) projected the maximum value i.e., 0.48 percent. (Table 2, Figs. 2(i) and 2(ii)) .

## REFERENCES

Bordia, P.C., Joshi, A. and Simlot, M.M. 1995. Safed musli. pp. 492-452. In: K.L. Chadha and Rajendra Gupta (eds), Advances in Horticulture, Vol.II (Medicinal and Aromatic plants), Malhotra Pub. House, New Delhi.

Gazala, Shabuddin and Soumya, Prasad 2004. Assessing ecological sustainability of non-timber forest produce extraction. The Indian Scenario Conservation and Society, 212.

Ishvaran, V. and Marwaha, T.S. 1980. A modified Kjeldahl method for determination of total nitrogen in agriculture and biological material. Geobios, 7: 281-282.

Jackson, M.L. 1973. Soil Chemical Analysis. Prentice Hall of India Pvt. Ltd., New Delhi, pp. 498.

Maiti, Satyabrata and Geetha, K.A. 2005. Characterization, genetic improvement and cultivation of *Chlorophytum borivilianum,* an important plant of India. Plant Genetic Resources Characterization and Utilization, 3(2): 264-272.

Oudhia, P. 2000. Can we save the endangered medicinal plant-Safed musli (*Chlorophytum borivilianum)* in Indian forest? An article written for an American website, www.herb.com. July-August.

Ovington, J.D. 1962. Quantitative ecology and the woodland ecosystem concept. In: Advances in Ecological Research (Cragg, ed.) Academic Press, New York, Vol. 1: 103-192.

Purohit, S.S. and Vyas, S.P. 2000. Medicinal plants cultivation: A scientific Approach: Including Prising and Financial Guidelines. Agrobios, xxii, 624p.