International Journal of Botany Studies
ISSN: 2455-541X
www.botanyjournals.com
Volume 1; Issue 2; February 2016; Page No. 24-31

Tinospora cordifolia (Willd.) Miers ex Hook. F and Thoms: An important medicinal, climber plant and its multiplication in Herbal garden for *ex-situ* conservation

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Abstract
The plant is marked for its potential medicinal value among the human beings. As the plant is well adapted to develop in almost all type of soil in wide range. It is a climbing nature Medicinal plant and is well performing their propagation by using their stem cutting modes. Its multiplication study was made in Herbal garden developed for the aim of *ex-situ* conservation of Medicinal and Aromatic plants.

Older plants basal parts become woody whereas upper parts are herbaceous in nature. The plants stem cuttings was potentially used for further development of new individuals of the plants like their parental ones. Mature stem around 10–15 cm long were obliquely cut and deep in soil for generations of new buds/roots for further development of its new plants.

The strategy was done in Herbal garden for their rapid multiplication as well as for dispersal in varied needed sites. Selection, utilization and management of the plant parts to form a new plant were discussed in current paper. This procedure not only supports its proper growth/propagation but also is remarkable for its *ex-situ* conservation.

Keywords: Tinospora cordifolia (Willd.) Miers ex Hook. F and Thoms, Stem cutting, Climber, Multiplication, Herbal Garden.

Introduction

Plants are remarkable sources for construction of biological diversity. Availability of certain plant species is leading by several factors like biotic and abiotic factors which are directly or indirectly affecting the plant life. Plants are interacting with nature from starting to ending of their life marked as plant life cycle. Several changes can be observed during the tenure of its life.

It is a climber plant of wide medicinal quality need for much care during early stage of its development. Optimum levels of environmental variables are supporting plant life as well as are important for successful propagation by a particular mode. The plant *Tinospora cordifolia* (Willd.) Miers ex Hook. F and Thoms is commonly known as Guduchi, Giloy and is well registered for its rapid propagation by their mature stem cuttings. Older plant parts performing much better for the above targets. As per significance of the plant species are marked for different categories like the plants of medicinal sources are referred as Medicinal plants. These are different in their habitat, habit, presence etc. followed by their genes and by their surroundings. Plant diversity focus on the variety and variability of different plant species in nature.

Plants associates and grow in certain ecological areas where they can adapt easily. This area not only supporting their successful growth& development but also providing better chances to reproduces itself like their parental plants using seeds or by vegetative modes. Climatic changes leads the alteration of plant population formation which further effect the healthy plants association in specific ecological areas.

Gururaj *et al*., 2007 [2] experimented on micropropagation of *Tinospora cordifolia* (Willd.) Miers ex Hook. F and Thoms – A multipurpose medicinal plant. Choudhary *et al*., 2001 [1] found Tinospora cordifolia Ethnobotany, Phytopharmacology and Phytochemistry Aspects. Mishra *et al*., 2014 [4] studied on phytochemical analysis and assessment of in vitro antibacterial activity of *Tinospora cordifolia*. Pandey *et al*., 2012 [6] found *Tinospora cordifolia*: a climbing shrub in health care management.

Praveen *et al*., 2012 [8] recorded antioxidant activity of *Tinospora cordifolia* leaf extracts through non-enzymatic method. Khosa and Prasad 1971 [3] studied on pharmacognostical studies on Guduchi (*Tinospora cordifolia M*iers). Premanath and Lakshmidevi 2010 [9] Studied on Anti-oxidant activity of *Tinospora cordifolia* (Miers.) Leaves using *in vitro* models. Mittal *et al*., 2014 [5] recorded Tinospora cordifolia: a multipurpose medicinal plant- A review. Prakash and Rai 1996 [7] studied role of Tinospora cordifolia (Willd.) Miers (Guduchi) in the treatment of infective hepatitis.

Sharma *et al*., 2015 [13] experimented on *Tinospora cordifolia* (willd.) Miers ex Hook. F & Thoms. (Menispermaceae): rapid *in vitro* propagation through shoot tip explants. Singh *et al*., 2005 recorded effect of *Tinospora cordifolia* on the anti-tumor activity of tumor-associated macrophages derived dendrite cells. Raghunathan and Sharma 1969 [10] analyzed aqueous extract of *T. cordifolia* used reduction of blood sugar in alloxan induced hyperglycemic rats and rabbits. Sarma *et al*., 1998 [11] found constituents of *Tinospora cordifolia* root.

Spelman 2001 [17] studied on traditional and clinical uses of *Tinospora cordifolia*, guduchi. Spandana *et al*., 2013 [16] reviewed on *Tinospora cordifolia*. Sharma *et al*., 2010 [12] recorded on *Tinospora cordifolia* (Willd.) Hook. F. & Thomson - A plant with immense economic potential. Singh *et al*., 2003 studied on chemistry and medicinal properties o*f Tinospora cordifolia* (Guduchi). Stanely and Menon 2001 [18] found Antioxidant action of *Tinospora cordifolia root* extract in alloxan diabetic rats.

Tanwar *et al*., 2012 [19] analyzed on Standardization and Phytochemical evaluation of *tinospora cordifolia* (willd.) Miers. (Menispermaceae). Tripathi *et al*., 2015 [20] recorded a critical review on guduchi (*Tinospora cordifolia* (willd.) Miers) and its medicinal properties.

Material and methods

The plant *Tinospora cordifolia* (Willd.) Miers ex Hook. F and Thoms is climber, basal part is woody in comparison of upper part. That plant parts are commonly useful for its rapid propagation due to its rich potential to convert in to new plants using their stem cutting. Older stem cuttings were collected and cut were made 10-15 cm long bearing 4-8 nodes. These are applied to develop new individuals of *Tinospora cordifolia* (Willd.) Miers ex Hook. F and Thoms. The experiment was done in rainy season during 2015 and changes recorded twenty days interval.

The experiment was done in Herbal garden during August to December 2014 in prepared beds as well as in poly bags filled with soil, manure and sand equally. Proper water and other facilities were given to the developing stem cuttings of this plant in each one poly bags. Fifty poly bags were taken in experiment to develop these plants by vegetative modes.

After well development of shoot system these are transferred to selected sites in Herbal garden aimed for their *ex-situ* conservation.

Pictures Showing Gradual Morphological Changes


Start of Vegetative Propagation







Images During plant development







Transplantation of new plants in the field






Transplantation of new plants in the field

Mature plant of *Tinospora cordifolia* (Willd.) Miers ex Hook. F and Thoms:

Result and Discussions

The plant *Tinospora cordifolia* (Willd.) Miers ex Hook. F and Thoms include a great medicinal value and is climber in nature need for substratum for proper climbing and to proper development of the plant. It is a member of family Menispermaceae. Upper portion of the plant is herbaceous and below portion become woody after its maturation. A moderate range of water need for suitable growth of the plant. Roots are tap root, well developed. Stems are Long, cylindrical, solid, smooth and branched, climbing tendency. Leaves are Petiolate, Green, Heart shaped, Alternate, Apex pointed, Smooth surface, Unicosted reticulated venation. Flowers are small and in clusters. Fruits are small, round and in clusters.

The plant is important for its rich medicinal values among the community. It is well adapted for its potential growth/propagation using its mature stem cuttings. This practices is well resulted in the presence of favourable environmental condition and as per need of the developing plantlets water, light etc requirements were managed.

Acknowledgement

The current work is supported by New Delhi is under Start up Grant research project on the Topic "Ex – situ Conservation of important Medicinal and Aromatic Plants (MAPs) Resources from Chhattisgarh in Guru Ghasidas Vishwavidyalaya (A Central University) Campus, Bilaspur (C.G.)" No. F. 20–17(3)/2012 (BSR) - Dated 8 March 2013 I am thankful for the same.

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