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CYTOLOGICAL STUDY OF *TINOSPORA CORDIFOLIA (*WILLD.) MIERS EX HOOK F.& THOMS. GROWING IN FOUR DIFFERENT PLACES OF HAZARIBAG (JHARKHAND).

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Abstract

Tinospora cordifolia (Willd.) Miers ex Hook F.& Thoms. is an evergreen perennial climber. This plant belongs to Menispermaceae family. The present cytological study of *Tinospora cordifolia* was done with the leaf bud. Mitotic index Value was calculated by using Mitotic index formula. This plant is also known as giloy or Amrita. This has been known to possess immunomodulatory, hypoglycaemic, antiallergic, antioxidant, anti-inflammatory, diabetes mellitus etc.

Key words: *Tinospora cordifolia*, Evergreen, Giloy, Mitotic index.

Introduction

Tinospora cordifolia (Willd.) Miers ex Hook.F. & Thoms. (Giloy) is important dioecious plant. It is also called magical herb due to curing property of many diseases. It is glabrous, deciduous, climbing shrub (Sultana *et al.,* 2017). The leaves are of heart shaped (Sarangi *et al.,* 2013). The whole plant are used for medicinal purpose. The medicated oil of the plant is effectively used to reduce the pain oedema. The plant bears small yellow flowers. This plant is found throughout India, especially tropical parts of country and china (Rani Jyoti *et al.,* 2015). The plant is rich in calcium and phosphorus (Khosa and Prasad 1971; Akhtar, 2010). In present era people are once again reverting towards herbal treatment because adverse effect of antibiotics and other synthetic drugs are posing threat to human health. In that respect *Tinospora cordifolia* is a gift from nature because it has got properties to cure a large number of diseases. The plant is anti-allergic, anti-inflammatory, immunosuppressive, immunomodulator and helminthic. Diabetes now a days is becoming too much common in country like India and the plant *Tinospora cordifolia* has got capacity to control sugar as well. In some of reports anti cancerous properties have also been claimed. The other fact however is that ever increasing demand of this plant is causing fast decline of its population. To maintain the supply of this plant, the possibility of its large scale propagation must be explored. For this purpose scientific study of different aspects of *Tinospora cordifolia* is essential.

In present work an attempt is being made to study cytological parameter (Mitotic index) in different ecological conditions of Hazaribag is studied. Needless to mention that the mitotic index is direct reflection of growth of the plant.

Material and Methods

Samples of *Tinospora cordifolia* were collected from four different places of Hazaribag *i.e.* Department of Botany VBU, Pugmil, Hirabag Chowk, Botanical garden of VBU.

Cytological study was done with the leaf bud.

Staining was done with the help of Acetocarmine.

Preparation of slide

First of all the leaf buds were selected and the apical portion of leaf was taken and then the few drops of acetocarmine was added to it and was heat for 2-3 minutes and the leaf bud was transferred to the slide. Carefully excess stain was drained using blotting paper and was retain it in other slide.

Preparation of Acetocarmine

1. Mixture of 45% of Acetic acid solution (45ml) and 55 ml of distilled water was added and boiled.
2. 0.5 gm of carmine was and added heated for 15-20 minutes.

Table 1: Mitotic index of *Tinospora cordifolia* growing in Department of Botany, Vinoba Bhave University. (Potted plants).

Microscopic Field	Total no of cell	Total no of dividing cell	Mitotic index=Total no of dividing cell/Total no of cell × 100	Average (%)
Field 1	150	90	MI = 90/150 × 100 = 60%	
Field 2	121	50	MI = 50/121 × 100 = 41.32%	224.43/5 = 44.88
Field 3	100	28	MI = 28/100 × 100 = 28%	
Field 4	151	87	MI = 87/151 × 100 = 57.61%	
Field 5	80	30	MI = 30/80 × 100 = 37.5%	

Table 2: Mitotic index of *Tinospora cordifolia* growing in Pugmil.

Microscopic Field	Total no of cell	Total no of dividing cell	Mitotic index=Total no of dividing cell/Total no of cell × 100	Average (%)
Field 1	200	180	MI = 180/200 × 100 = 90%	
Field 2	150	100	MI = 100/150 × 100 = 66.66%	
Field 3	100	92	MI = 92/100 × 100 = 92%	388.87/5 = 77.77%
Field 4	200	150	MI = 150/200 × 100 = 75%	
Field 5	230	150	MI = 150/230 × 100 = 65.21%	

3. And the solution was cooled .
4. Solution was filtered to remove any precipitate.

Observation of microscopic field was done with the microscope.

Slides of Mitotically dividing cells were prepared and studied under compound microscope. Total no of cells in focus area was also counted. Mitotic index was calculated by the formula as follows:

$$\text{Mitotic index} = \frac{\text{Number of dividing cells}}{\text{Total number of counted cells}}$$

$$\text{\% cells in mitosis} = \frac{\text{Total number of cells undergoing mitosis}}{\text{Total number of cells}} \times 100$$

This gave the % of dividing cell which is also known as Mitotic index.

Results and Discussion

Details regarding number of dividing cell in focus area, Total number of cell in focus area and calculation of Mitosis index of test plant growing in different areas of Hazaribag is presented in Table 1-4. Mitotic index of *Tinospora cordifolia* growing in pots at dept. of Botany at Vinoba Bhave University was recorded 44.88% the test plant in Pugmil area had mitotic index 77.77%. *Tinospora cordifolia* growing in Hirabag chowk had mitotic index 70.6% whereas the highest value of Mitotic index of the same plant was found in sample collected from Botanical garden and the value was 81.24%.

Several previous workers have reported importance of ecological conditions on Mitotic index and cell cycle (Halaban, 1972) has reported that variation in photoperiods remarkably affects the mitotic index and cell cycle of

Table 3: Mitotic index of *Tinospora cordifolia* growing in Hirabag Chowk.

Microscopic Field	Total no of cell	Total no of dividing cell	Mitotic index=Total no of dividing cell/Total no of cell × 100	Average (%)
Field 1	300	247	MI = 247/300 × 100 = 82.33%	
Field 2	400	200	MI = 200/400 × 100 = 50%	
Field 3	250	190	MI = 190/250 × 100 = 76%	353/5 = 70.6
Field 4	300	250	MI = 250/300 × 100 = 83.33%	
Field 5	400	250	MI = 250/400 × 100 = 62.5%	

Table 4: Mitotic index of *Tinospora cordifolia* growing in Botanical Garden VBU.

Microscopic Field	Total no of cell	Total no of dividing cell	Mitotic index=Total no of dividing cell/Total no of cell × 100	Average (%)
Field 1	450	400	MI = 400/450 × 100 = 88.88%	
Field 2	250	200	MI = 200/250 × 100 = 80%	406.22/5 = 81.24%
Field 3	670	500	MI = 500/670 × 100 = 74.62%	
Field4	550	400	MI = 400/550 × 100 = 90%	
Field 5	450	400	MI = 400/450 × 100 = 88.88%	

Lemna perpusilla. Dmitrieva SA *etal* Tsitologiia, (2006) has studied the impact of cells cycle modulators on mitotic index of *Pisum sativum* . Rossato *et al.,* (2010) have studied in detail how different conditions affect mitotic index and how mitotic index in turn affect growth pattern of plants. Sinha Sangram *et al.,* (2016) also reported that somatic chromosomes studied from the root tip cells of the plants for cytological investigations .In dioecious plant species like *Coccinia grandis* the young leaves of the respective sexual phenotypes were used as tissue samples for mitotic chromosome analysis. Bhatta and Sakya have also studied mitotic index of *Allium cepa* under various treatment conditions. Chaurasia 1987, Abraham and Nair 1989; Mohand das and Grant, 1972 etc are some other authors who have studied mitotic index of different plants and found that it varies significantly under different ecological conditions. The result obtained during present study further confirm that different ecological conditions has cummulative impact on mitotic division which ultimately effect growth of plant.

Conclusion

MI of Botanical Garden of VBU is highest by 81.24% followed by Pugmil (77.7%) & Hirabag chowk by 70.6%. Whereas least value was observed in department of Botany, VBU by 44.88%.

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