INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	Ph.D.
Thesis Title	:	**Plant tissue culture and chemo-profiling of *Tinospora cordifolia* and *Stevia rebaudiana* for therapeutic metabolite content analysis**
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SHORT ABSTRACT

The present thesis was centralized on defining strategies for efficient germplasm conservation of two highly valued medicinal plants, *Tinospora cordifolia* and *Stevia rebaudiana* and providing alternative methods for their sustainable utilization. Their conventional conservation and propagation methodologies are unable to fulfil the demands of the soaring population. Plant tissue culture techniques are considered as best alternative strategy for large-scale propagation of the plant. It eliminates the seasonal and regional variability, provides yearly output, generates true-to-type elite lines and provides ease of physiological, metabolic and structural studies. An improved micropropagation methodology was developed for both the plant species. In the growth cycle of 6 weeks, rate of shoot multiplication was observed to be 10-fold in *T. cordifolia*, while multiplication rate in case of *S. rebaudiana* was noticed to be 54.0-fold and 52.1-fold in Sr1 and Sr2 experimental plant lines. Genetic integrity of elite lines was apprised using flow cytometry and inter simple sequence repeats (ISSR) molecular markers. The later technique revealed ≥95% monomorphism stating the true-to-type nature of the in vitro plants. With respect to *T. cordifolia*, in vitro callus cell line was also developed using leaf explants, for estimation of protoberberine alkaloids, jatrorrhizine and palmatine. Acid-base alkaloid extraction was employed for enhanced productivity of jatrorrhizine (11.0-fold) and palmatine (143.0-fold) with reduced phenolic contamination, from in vitro

callus cultures in contrast to mother plant. Besides, leaves of *S. rebaudiana* was chosen for analyses of steviol glycosides, rebaudioside A and stevioside, being the reservoir for the same. In vitro propagated plants generate a vividly better ratio of rebaudioside A : stevioside as 2.1 : 1.7, as compared to 1.5 : 1.2 ratio in the mother plants. The target bioactive secondary metabolites have been assessed qualitatively and quantitatively, against biofilm forming capabilities of *Staphylococcus aureus*, one of the key causative agents of diabetes. The alkaloids, palmatine and jatrorrhizine possessed 87.0% and 78.3% biofilm inhibition, respectively. While the steviol glycosides, rebaudioside A and stevioside demonstrated 65.8% and 70.0% reduction against biofilm formation by *S. aureus*. Furthermore, the study concludes with exploring anti-oxidative elucidations of protoberberine alkaloids, steviol glycosides and crude extracts in building effective future therapeutics.