

## ABSTRACT

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The tea plant is a tropical, evergreen plant of the family Theaceae and genus *Camellia*. It is one of the most economically important beverage crops in the world. Chinese were the first to use tea as medicinal drink, later as beverage and have been doing so far for more than 3000 years. The original home or 'the primary centre of origin' of tea was South-East Asia. The cultivated taxa of tea comprise three main types, which are mainly differentiated on the basis of their leaf size. Assam type has the biggest leaf size while China type has the smallest. The Cambod type has leaf in between Assam and China types. Tea plant is a highly cross pollinated and genetically complex species. The genus *Camellia* includes more than 325 species which indicates genetic instability and high out-breeding nature of the genus. There are 600 cultivated varieties worldwide with unique traits, such as high caffeine content, drought tolerance, blister blight disease tolerant etc. In spite of having valued properties, improvement of tea by conventional methods is very laborious and time consuming and owing to its highly heterozygous nature and long reproductive cycle. In this context, it is noteworthy that, studies utilizing gametophytic cells are in infancy, in this tree species. *In vitro* haploid production from gametophytic cells enables the establishment of completely homozygous lines in a shortened time frame compared to conventional methods and has many potential applications in plant improvement to establish inbred lines rapidly and to observe recessive traits.

Therefore, the aim of the present study was to establish *in vitro* androgenic lines of tea from anthers. Androgenic haploids were produced by anthers, cultured at early-to-late uninucleate stage of pollen. Haploid development occurred via callusing of microspores. TV21 and TV19 cultivars were regenerated and developed to haploid plants. Further, the androgenic lines were checked for the production of medicinally important compounds, such as (+)-Catechin, (-)-Epicatechin, (-)-Epigallocatechin gallate, Caffeine and Theophylline. These compounds are observed to be present in maximum amount in young leaves of parent plants, followed by *in vitro* embryos and the least in calli. The presence of compounds has been confirmed by chromatographic and spectroscopic techniques. Antioxidant activity assays of *in vitro* androgenic cultures were also investigated and found that hot water extract (80°C for 20 min.) shows maximum activity. Batch kinetics

study in cell suspension cultures of TV21 cultivar was also performed and found that the production of (+)-Catechin, (-)-Epicatechin, (-)-Epigallocatechin gallate, Caffeine and Theophylline was observed to be growth associated and increased with an increase in fresh weight of the cells.

The thesis is divided into five chapters. Chapter 1, introduces and reviews all the major contributions and studies performed on tea until now, with regard to tissue culture, secondary metabolite production and antioxidant activity in tea. Chapter 2, contains all the protocols and methodologies used for the present work. Chapter 3, presents the results obtained in the current investigation. The tables and graphs are included within the text while all the figures have been compiled at the end of the thesis, in the form of plates. Inferences drawn from the results are discussed in chapter 4, in the light of other reports available on related aspects. Chapter 5, throws light on the major highlights of the present work and its future scope. This is followed by the appendix that mentions the taxonomic classification of the plants studied. The thesis concludes with the list of bibliography and visible research output in terms of peer-reviewed journal publications, book chapters and conference proceedings.