Conclusion

"It is wiser to find out than to suppose."
– Mark Twain

Having been born and brought up among the beautiful and lusty tea gardens of the magnificent Darjeeling district, I always wanted to contribute my knowledge to my paradise. Since time immemorial, the local people have been taking so much effort in nurturing and maintaining the essence of Darjeeling tea. I have always wondered how they can handpick and trap the most mystical flavor because of which our Darjeeling tea is renowned worldwide.

Subsequently, I made an effort to contribute towards tea research so that my work could put some light and benefit to the tea industry in any way possible. I initiated the present endeavor in midst of 2017 taking elite tea clones established for Darjeeling and Dooars, to explore different areas of research in tea. Comprehensive morphological documentation of the clones was collated referring to the previous records from different sources so that it could benefit the readers or give necessary information.

The mature tea leaves are not used for tea manufacturing and it is usually discarded at the time of pruning. Therefore, we screened the phytochemicals in mature tea leaves employing a different range of solvents. Polar solvents like acetone, methanol, and ethanol were found to be the most potent solvents for extraction of various phytochemicals like flavonoid, coumarin, cardiac glycoside, diterpenes, terpenoids, steroid, saponin, tannin, and reducing sugar. The potency of a particular solvent in extracting a specific compound of interest was thus determined through detailed qualitative phytochemical

profiling. Acetone extracts outperformed by giving the best results in radical scavenging assay, ferric reducing power assay, total phenol, and flavonoid estimation. The extracts also showed potent antimicrobial and bactericidal activity against *Staphylococcus* sp. The powerful antibacterial component identified by GC-MS and *in silico* investigation was phenol 3, 5-bis (1, 1-dimethyl ethyl). The information gathered in this study could help future research to be more efficient in its use of resources.

While considering molecular study, a good deal of genetic diversity was observed among the studied tea clones. A total of 803 and 298 polymorphic bands were generated using several RAPD primers and ISSR primers with polymorphism percentages of 99.50% and 100% respectively.

DNA barcode analysis through matK revealed variation within the matK gene among the elite tea clones. The matK region was used to explore intraspecific variation because of its known enhanced rate of substitution, low transition/transversion ratio, and speedy evolving rate. Our findings show that the matK region has evolved within the same species, since we report varied sites within the consensus region, and some of our studied tea clones showed more similarity with the other species of *Camellia* and therefore, we conclude with the fact of matK gene not being 100% conserved within *Camellia sinensis*.

Tea, on the other hand has various forms and types and the most popular being green tea and black tea. Lots of research work has been carried in these two forms of tea. However, there are still some other forms of tea like white tea, oolong tea, yellow tea, purple tea, etc. which are yet to be explored. Therefore, upon survey and analysis, I picked up purple tea manufactured in Darjeeling and tried to explore the unchartered areas of nanoscience and went for the biogenic synthesis of silver and zinc nanoparticles. My findings suggested purple tea as a good candidate for synthesis of pure metal nanoparticles with antimicrobial activity but also conclude the absence of stability over 24 hours due to agglomeration and settling down of nanoparticles. Since I aimed to go for green synthesis of nanoparticles, no chemical surfactant was added to avoid agglomeration. Therefore, I conclude purple tea with high antioxidant activity to be a good reducing agent but not a good capping agent during the synthesis of nanoparticles.

With the advancement of genome sequence technology and with the availability of genome sequence of

C. sinensis, I further studied the factors governing its codon and amino acid usage. The factors dictating the codon usage signature in the nuclear genome of tea were mainly the nucleotide compositional constraint (AT richness) along with the role of other factors like mutational bias, translational selection, and gene expression level. The tea genome indicated the absence of replication-associated mutational pressure. The amino acid usage signatures on the other hand were dictated mainly by the factors like hydrophobicity, aromaticity, and gene expression level. Leucine (L) and Serine (S) were found to be the amino acids used in higher frequencies and in both cases Axis 1 was found to be the principal governing axis of codon and amino acid usage signatures.

Further, the phytochemistry and polypharmacological studies was employed to investigate role of purple tea as well as mature tea leaf against several diseases. Due to the ever-increasing demands of competitiveness and workload in the modern period, stress, sedentary habits, and poor diet may eventually lead to the urban population succumbing to different lifestyle-ailments such as obesity, diabetes, heart disease, and cancer as a result of elevated ROS generation. People consume numerous health-related foods such as tea, coffee, wine, and other beverages to reduce stress as well as the risk of such diseases. Purple tea consumption is the most recent addition to this trend. By opting for this healthy option, you will be able to reduce the bad health effects. Due to its significant antioxidant characteristics, which makes this anthocyanin-rich tea more efficient and unique, the beverage is steadily attracting commercial attention. The polypharmacology investigation via network pharmacology and target fishing studies provided insight into the mechanism of action of purple tea as well as mature tea leaf in managing the aforementioned disorders.■