ABSTRACT

Tropical biodiversity holds the world’s richest natural bio-resources. The tropical forest trees provide several ecosystem services such as species conservation, prevention of soil erosion, and preservation of habitat for plants. Majority of the tropical tree species are vulnerable due to habitat destruction, illegal logging of timbers and indiscriminate collection of medicinal plants. The species extinction in these ecosystems is increasing at the rate of 0.8 to 2% per year due to over exploitation of forest resources and climatic change.

India is a part of tropical biodiversity which endowed with four global biodiversity hotspots, several endemic and threatened plant species. Unambiguous identification of plants play significant role in protecting the biodiversity and to conserve natural resources. Currently, there is no reliable method for the rapid and accurate identification of plant species; especially when the specimen is in incomplete stage. Therefore, utilizing an advanced molecular technique like plant DNA barcoding could be helpful for this purpose and to promote traditional methods for species identification.

We report first tropical dry evergreen forest (TDEF) barcode study in the World and the first attempt to assemble a TDEF reference DNA barcode library of India. We sampled 429 trees representing 143 TDEF species, which included 16 threatened species. This library also includes several tree species with commercial timber and high trade medicinal value. DNA barcoding was employed using CBOL suggested *rbcL* and *matK* markers. DNA sequence editing was done using Sequence Scanner Software, and species recovery was estimated by BLAST from NCBI and
BOLD database. Species identification was done by using best match method in TaxonDNA V 1.6.2., neighbor-joining tree method using MEGA V 5.1., and characteristic attribute organization system method using MESQUITE v. 2.6.

Ability to resolve taxonomically diverse tree species of TDEF was comparable among the best match method, the phylogenetic method, and the characteristic attribute organization system method. Species resolution was 90.2% (rbcL) and 96% (matK) as estimated using three different methods of analysis. This high level of species resolution was largely due to the fact that the tree species were taxonomically diverse in the TDEF.

We also demonstrated the utility of the TDEF reference DNA barcode library in the identification of 25 wood samples and 25 medicinal plant raw drugs. Using this DNA barcode library we could able to identify 21 out of 25 timber samples at the species level, and the remaining 4 samples were identified at the genus level. In case of raw drugs, 15 out of 25 samples were identified at species level and the remaining 3 samples were identified at the genus level. We also found that 7 of the raw drugs had high divergence with the expected species that confirmed adulteration.

This pilot research study will enable more comprehensive surveys of the illegal timber trade of threatened species in the TDEF. This DNA barcode library also contains trees that have medicinal trade value, which could be used to monitor unsustainable and indiscriminate collection of plants from the wild for their medicinal value.