Report on the Monthly seminar held on 30 August 2019 at Extension Hall, IWST, Bengaluru.

Topic: Forensic discrimination of *Dalbergia* timber – An integrated approach

In continuation of the series of monthly seminar, a talk on "Forensic discrimination of *Dalbergia* timber- An integrated approach" was collectively delivered by Dr. M. Sujatha, CTO, WPU Division, Dr. Rakesh Kumar, Scientist –E and HOD,CBP Division, Dr. S.R.Shukla, Scientist –F, WPU division and Ms. Tresa Hamalton, Scientist- C, GTI division on 30th August 2019. Director, GCR (R), all the Scientists, Forest Officers, Technical & Research staff and Students were present during this seminar.

Dr. M.P. Singh, IFS, Director IWST chaired the seminar. Dr. V.P. Tewari, Group Co-ordinator (Research) welcomed the Director and all the participants. The seminar was started by Mrs. Tresa Hamalton giving a brief introduction of the topic and its significance. International trade of several *Dalbergia* wood species is regulated by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). It was suggested for delisting of *Dalbergia sissoo* from Appendix-II of CITES.

After this brief introduction .the following speakers presented talk on four different techniques of identification/ discrimination of the timber:

Dr. M. Sujatha, CTO, WPU Division, detailed about the methodology of timber identification by Wood Anatomical study. She made a presentation on the anatomical structure of five species of *Dalbergia* found in India. She opined due to the similarity in the anatomical structure and characters, distinguishing of *D. sissoo* from other *Dalbergia* species is quite challenging. .Also, the limitations in identifying a particular species by only anatomical approach were discussed. The Director checked if a Computer based App could be developed in order to simplify the procedure. Dr. M. Sujatha replied that it is underway and the work is being taken up by Mr. Soundara Rajan, Scientist C. The speaker mentioned that when she attended court for giving expert opinion on the confiscated samples, it was emphasised in the court, that identification process should involve multiple methods of tests especially DNA based test to be carried out for authentication of the sample identification.

Dr. Rakesh Kumar, Scientist –E and HOD, CBP division presented on topic "Assisting classification of *Dalbergia latifolia* and *Dalbergia sissoo* wood using HPLC Chromatogram" wherein he explained different methodologies like FTIR-GC & MS, Quantitative Wood Anatomy and Principal Components Analysis (PCA), DART. MS, HPLC and Hand held Laser Induced Breakdown Spectroscopy could be used for timber identification. Principal components analysis used elsewhere was used to provide basis for separating the 43 *Dalbergia* species. He also suggested that HPLC- method may be the best way in differentiating species where volatile components are not involved. Dr. K.K. Pandey, Scientist –G and Head, WPU Division, suggested to include fluorescence part also. Further, the speaker explained both advantages as well as the limitations of the methods and opined that standardization is essential in this regard. He also expressed that HPLC finger printing could be a supportive analysis in combination with wood anatomy in timber identification. Director suggested to use the technology and instruments available at Indian Institute of Science, Bengaluru in case of non- availability of advanced versions of instruments at IWST for further research purpose. It was also suggested to make chemical quantification for commercially important timber species by CBP Division.

Dr. S.R. Shukla presented the topic "Identification and classification of *Dalbergia* species by NIRS" and spoke about possibility of Forensic discrimination of *Dalbergia* timber by NIR (Near Infra Red) spectroscopy. He showed the result of his other research work, wherein, teak grown from four different localities could be differentiated based on NIRS. He opined that by increasing the sample quantity the precision of result could be enhanced and hence the commercial viability. The director suggested to limit his studies for only two species of *Dalbergia* i.e. *D. sissoo* and *D. latifolia*. Dr. S.S. Chauhan, Scientist -G suggested to take samples from standing trees.

Ms. Tresa Hamalton gave a talk on 'Forensic discrimination of *Dalbergia* timber using DNA Barcoding'. She explained about the parts of the plant which could be used and methods of DNA barcoding and spoke about both advantages and limitations of this method. If the intra-species variation is less and inter-species variation is more, it would give more clarity to identify the species. She expressed that the work on DNA barcoding is already being carried out by KFRI, but their results were not in the public domain. She has proposed to formulate a methodology for identification of the *Dalbergia* species using their DNA barcodes. Also she stressed about building up the reference database from different localities. She told that no external collaboration is required for her theme in the project. Director wanted to know whether FRI has done any work on DNA barcoding; for which Mrs. Tresa Hamilton replied that there is one ongoing project, but not in timber forensics, and report has not yet been submitted.

In conclusion it was opined instead of a single technique, a combination of all the four techniques presented are to be used for better accuracy and Director suggested that the project thus formulated to be submitted to DBT/DST. Finally the Director appreciated the presentations made and thanked all four speakers of the day.

Outcome of the seminar:

A. Identification of research needs:

IWST received a letter from MOEF &CC, GoI wherein querying about the ability to identify *Dalbergia sissoo* from other *Dalbergia* species traded from other countries especially those from Africa and Latin American countries by visual and rapid methods. In response to the query, it was expressed that a mega project would be taken up on various techniques of identification of *Dalbergia* timber in an integrated approach so as to increase the accuracy of discrimination of *Dalbergia* species.

B. Formulation of future strategies/road map

- A comprehensive project involving four different components viz., (1) Wood Anatomy,(2) HPLC finger printing,(3) NIR spectroscopy and (4) DNA Barcoding need to be formulated for Forensic discrimination of two major species of *Dalbergia* timber.
- A Computer based App may be developed to simplify the procedure of identification by anatomical studies.

C. Networking research identified

1. Indian Institute of Science, Bengaluru.
2. Kerala Forest Research Institute (KFRI).
3. National Chemical Laboratory (NCL), Pune identified as external network agencies.

D. Future research directions discussed for implementation and opportunities forfunding.

- To submit the comprehensive research proposal of a project to external funding such as DBT/DST on the topic “Discrimination of *Dalbergia* timber – an integrated approach”**.**