COMPUTERIZATION OF IMPORTANT PAKISTANI TIMBERS
FOR THEIR EFFICIENT IDENTIFICATION

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ABSTRACT

A database software program was developed for computer aided identification of important Pakistani Timbers. Wood samples of commercial/ non-commercial timbers were collected from different climate areas of Khyber Pakhtunkhwa. Basic anatomical data with three Dimensional images (3D) were loaded into the developed software program. Each species was properly given; Scientific name, possible local names, catalogue number, nature of wood (soft/hard), region, Identification features and its distribution. The developed software program proved to be robust and efficient for wood identification process.

INTRODUCTION

Wood identification is extremely important in the modern forest industry. It also has significant applications in scientific research like forensics, archeology, and ecology. Wood anatomical features provide a considerable amount of information that are used for identification, certification, and timber tracing, but these are mostly useful for experts with a good knowledge in the relevant field (Jayeola *et al.* 2009; Carolina,2011). Using light microscopic techniques, up to 100 anatomical characters can be used following the internationally standardized IAWA lists of "Microscopic Features for Hardwood and Softwood Identification" (Wheeler *et al.* 1989; Elizabeth,1998). Overall, the microscopic descriptions of about 8,700 taxa of hardwoods are currently available and documented in several computerized databases, e.g., Inside Wood (https://insidewood.lib.ncsu.edu/) or Commercial timbers (Delta-Intkey-System) (Dallwitz,1980; http://delta-intkey.com).

In the past different procedures like dichotomous keys and perforated card system were developed by the researchers of Pakistan Forest Institute but no quick and computerized method of wood identification was available for the wood species of Pakistan (Saeed, 1986). Wood Anatomy Lab at Pakistan Forest Institute, Peshawar is carrying out research in the field of wood structure and identification and assess the technological properties of wood for better utilization. Every year this lab. deals a number of wood identification assignments used in research and in the form of queries from different public/private organizations. To identify a species the manual procedures takes about one

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week or more. Therefore, a need to develop a computer aided database program was realized for quick and efficient identification of different Pakistani wood species.

The current study has been carried out with the objectives to collect the basic anatomical data of important timbers grown in the prevailing climatic conditions of Khyber Pakhtunkhwa, Pakistan, compiled into datasets and developed a database software program for their computer aided identification.

METHODOLOGY

To carry out the research work, the wood material was brought from Chitral valley, Swat Valley, Dir Valley, Malakand Valley, Hazara Valley, D.I.Khan and Kohat Valley of Khyber Pakhtunkhwa. Standard blocks of 1x1x2 inches were prepared from the wood samples of each species. Permanent slides of cross, radial and tangential sections for all the wood species were prepared by standard laboratory procedures and observed under microscope for various structural features. To observe the fiber length, a small portion of wood from each sample was macerated in Schulze's mixture (20% Nitric acid and Potassium chlorate) to separate the fibers (Anon., 1974). Data were collected for the frequency and dimensional measurements of different wood elements/ structures in each wood species by the process of micrometry from the prepared wood sections (Anon., 1971, Guay, 2013). The anatomical data was compiled and analyzed for statistical variables for each feature in each species.

RESULTS AND DISCUSSION

The information about each wood like scientific name, local names, distribution, general characteristics, Wood identification features etc. were incorporated into datasets. A database software program named CIPT (Computerization of Important Timbers) (Fig.1) was developed through SQL programming and datasets of all studied wood species (table1) were entered into the software as database to ease identification process (Ilie,1993; Carolina,2011).

Table1.   list of studied wood species

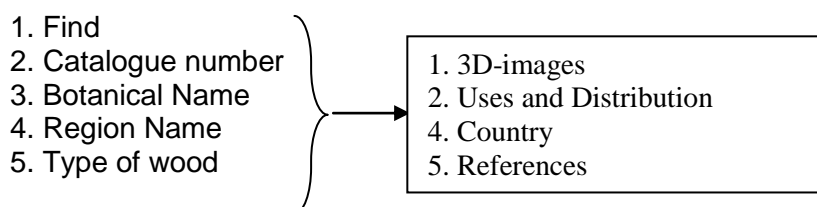| S.No.	Common Name	Botanical Name	Type of Wood
1.	Himalayan Cedar, Diar, Deodar, Paludar	*Cedrus deodara* Loudon.	Softwood
2.	Himalyan Spruce, Partal, Kachal, Morinda, Riar.	*Picea smithiana (Wall)Boiss.*	Softwood
3.	Blue pine, Kail, Biar, Puyuch	*Pinus wallichiana* A.B.Jackson	Softwood
4.	Rose wood, Shisham, Tali , Shawa,	*Dalbergia sissoo* Rox.	Hard wood
5.	Wallnut, Akhrot, Guz	*Juglan regia* Linn.	Hard wood
6.	Mulbery , Toot, Shahtoot	*Morus alba* Linn.	Hard wood
7.	Plane Tree, Chinar,	*Platanus orientalis* Linn.	Hard wood
8.	Kikar, Babul	*Acacia nilotica*(Linn) Delile	Hardwood
9.	Chinese date, Beer	*Zizyphus mauritiana* Lam.	Hard wood
10.	Himalyan Ash, Sum, Hum, Sinnun	*Fraxinus excelsior* Linn.	Hard wood
11.	White Willow	*Salix alba* Lam.	Hard wood
12.	Red Willow, Indian Willow, Bed-i-Laila,Yir, Bin	*Salix tetrasperma* Roxb.	Hard wood
13.	Persian Lilac, Bakain, Dhrek	*Melia azedarach* Linn.	Hardwood
14.	Maple, Trekhan	*Acer saecium* Wall.	Hardwood
15.	Red river Gum, Lachi, Sofeda, Gond	*Eucalyptus camaldulensis* Dehn.	Hardwood
16.	Poplar, Euphrates poplar, Bhan, Bahan	*Populus euphratica* Olivier.	Hardwood
17.	Tun, Drawi	*Cedrela toona* Rox.Ex.Wild.	Hard wood
18.	Black Plum, Jaman, Jamun, Jammu,	*Syzygium cumini* Linn. Skeel	Hard wood
19.	Tree of Heaven, White Bakain, Asmani	*Alinthus altissima* (Mill). Swingle	Hard wood
20.	White Oak, Bunj,Banj	*Quercus incana* Rox.	Hardwood
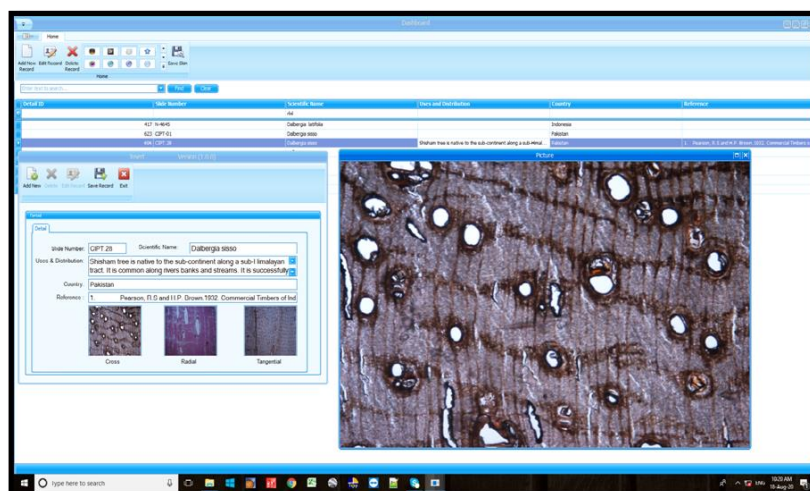
Figure1. Snapshot of Database software program with 3D
Image sand database of *Dalbergia sissoo*

Search of a Database

There are five main sections of the CIPT program corresponding to the steps required to retrieve the information from the database. These are given as:

1. Find
2. Catalogue number
3. Botanical Name
4. Region Name
5. Type of wood

1. 3D-images
2. Uses and Distribution
4. Country
5. References

By providing any one of these input information in the relevant section, the database about the species is pop out in a new window. The new window reflected the catalogue number of the species like CIPT-01 for *Dalbergia sisso*, its scientific name, its distribution in Pakistan and in the region and its uses in furniture and other wood-based industries. In this window option of origin of country and authentic reference has also been provided. Along with all these information three-dimensional (3D) i.e., cross view, radial view, and tangential view of wood structure of each species has also been uploaded for quick and efficient identification of unknown wood species by referencing these images. Moreover, for the entry of new species database in the software and to edit the previous information, the option of add new and edit record also exist.

Wood Anatomy Lab. at Pakistan Forest Institute, Peshawar has good collection of wood species from nearly 30 different countries of the world and each month this lab. deals a number of wood identification queries received from different public and private sectors. This database software has proved very helpful for quick and efficient identification of not only local wood species but also imported wood species.

CONCLUSIONS AND RECOMMENDATIONS

Using the developed database software program, it is concluded that the program is very efficient and helpful for quick access of information and identification features with 3D images of a particular wood species. This software is a baseline for future research work on automated identification of Pakistani Timbers grown in other provinces also. Therefore, it is recommended that work on automated wood identification, development of mobile phone App. for on-site identification should be focused on future research.

REFERENCES

Annon. 1971. Examination of Timber, Teaching Aid No.7. Timber Research and Development.

Anon., 1974. The Preparation of Wood for Microscopic Examination. TIL 52. Building Research Advisory Service; Building Research Station Garston, Watford WD27 Jr.

Carolina, S., P., C. Heinz, Détienne, J. Molino, P. Grard and P. Bonnet, 2011. PL@NTWOOD: A Computer-assisted identification tool for 110 species of amazon trees based on wood anatomical features. IAWA Journal, Vol. 32 (2), 2011: 221–232.

Dallwitz, M. J., 1980. A general system for coding taxonomic descriptions. Taxon 29: 41–46.

Elisabeth A., Wheeler and P. Baas, 1998. Wood Identification -A Review. IAWA Journal, Val. 19 (3), 1998: 241-264.

Guay, R., 2013. WinCell 2013 for wood cell analysis. Regent Instruments Inc., Quebec City, Quebec, Canada.

Ilie, J., 1993. Computer Aided Wood Identification Using Csiroid. IAWA Journal, Vol. 14 (4), 1993: 333-340.

Jayeola, A. A., D. O. Aworinde and A. E. Folorunso, 2009. Use of wood characters in the identification of selected timber species in Nigeria. Not. Bot. Hort. Agrobot. Cluj 37: 28–32.

Saeed, S. and M. Ayaz, 1986. Identification of Some of the Common Commercial Timbers of Pakistan. Pakistan Forest Institute. Bulletin No.1.

Sheikh, M. I., 1993. Trees of Pakistan. Pakistan Forest Institute, Peshawar. pp-59.

Siddiqui, K. M., M. Ayaz and I. Mahmood, 1996. Properties and Uses of Pakistani Timbers. Pakistan Forest Institute, Peshawar.pp42-44.

Wheeler, E.A., P. Baas and P. E. Gasson (eds.). 1989. IAWA list of microscopic features for hardwood identification. IAWA Bull. n.s. 10: 219–332.