METHODOLOGY:

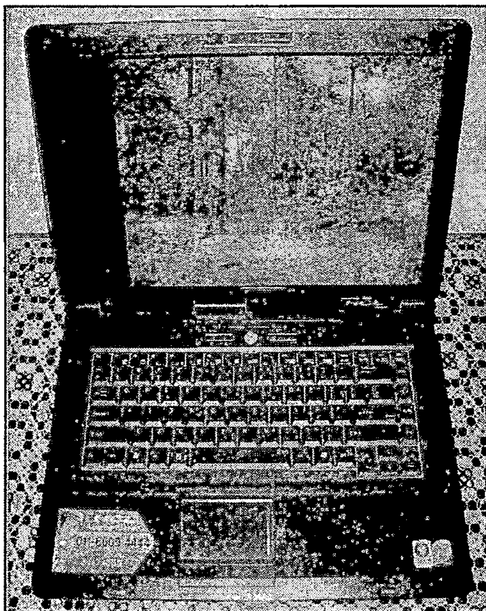
Various forms of literature incorporating description, illustrations and identifications keys are useful for proper identification of unknown plants. The literature of taxonomy is one of the oldest and most complicated literatures of science. The growing literature of worldwide interest is published mainly in popular international languages such as English, Russian, German, French, Spanish etc but the ancient literature is in Latin. As far as Indian flora is concerned we have no other authentic literature on the plant wealth except the Flora of British India (7 volumes) compiled by Sir J D Hooker (1872-97). How ever, the efforts of Botanical Survey of India (BSI) in the area of documentation of plants diversity in form of national, regional, state and district floras and other publications are remarkable. During the years 2005-06, BSI collected 4,500 specimens of plants from different parts of the country of which 3,500 specimens belonging to 385 species were identified.

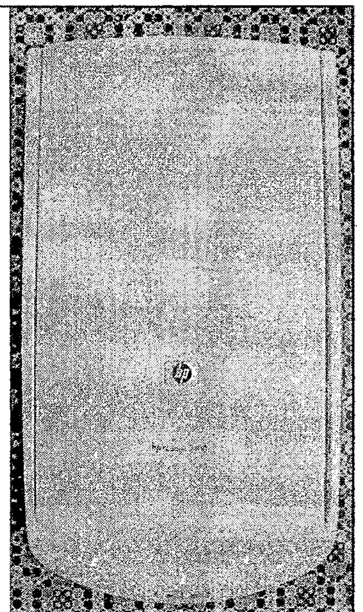
Taxonomic literature

The taxonomic literature exists in the form of General Taxonomic Indexes, World Floras and Manuals, Monographs and Revisions, Bibliographies, Catalogues and Review Serials, Periodicals, Glossaries and Dictionaries, Cultivated and Economic Plants, Maps and Cartography, Biological references, Dates of Publications, Locations of Type Specimens, Directories and Addresses of Color Charts, Outstanding Botanical Libraries and voluminous books. The literature to be studied usually is scattered, and there is no single index to it.

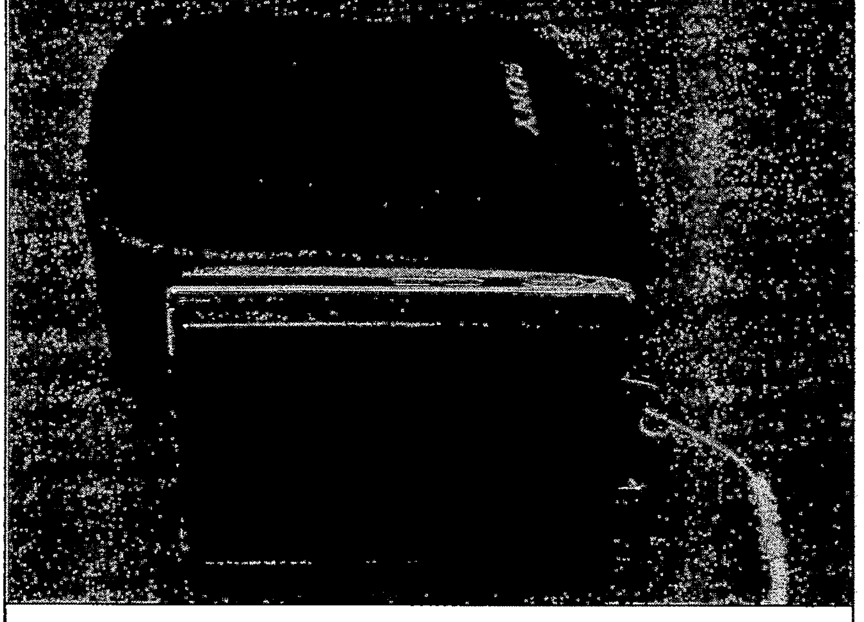
Based on the literature, studies and various data available for trees of Gujarat, a tree list was prepared. Some trees were selected from the list on the basis of their importance in economic, medicinal, timber, NTFP values and detailed database has been prepared for them. Exhaustive field work has been done in various parts [illegible]ujarat to collect the plant [illegible] herbarium preparation and [illegible]graphs were taken with help of [illegible]mera. Some of the plant parts [illegible] also scanned by HP laser[illegible] better close up to cover [illegible]hological characters of the pla[illegible]dy the Bentham and Hooker [illegible]ification is being followed to [illegible]imen and also to prepare the [illegible]ification key of the tree specie[illegible]preparation of herbaria of the [illegible] specimen are given below.

[illegible]**arium methods (Document**[illegible]m is a place where plant [illegible]men is preserved using various [illegible]arranged in the sequence of an [illegible]ed system of classification to [illegible]ication and nomenclature and [illegible]rve the records of plant. The [illegible]were identified by consulting [illegible] and experts. Plant specimen [illegible]which is free from disease is [illegible]cted with flower or fruit if pres[illegible]lant material is pressed in the [illegible]paper and blotting papers if requ[illegible]plant press for drying.



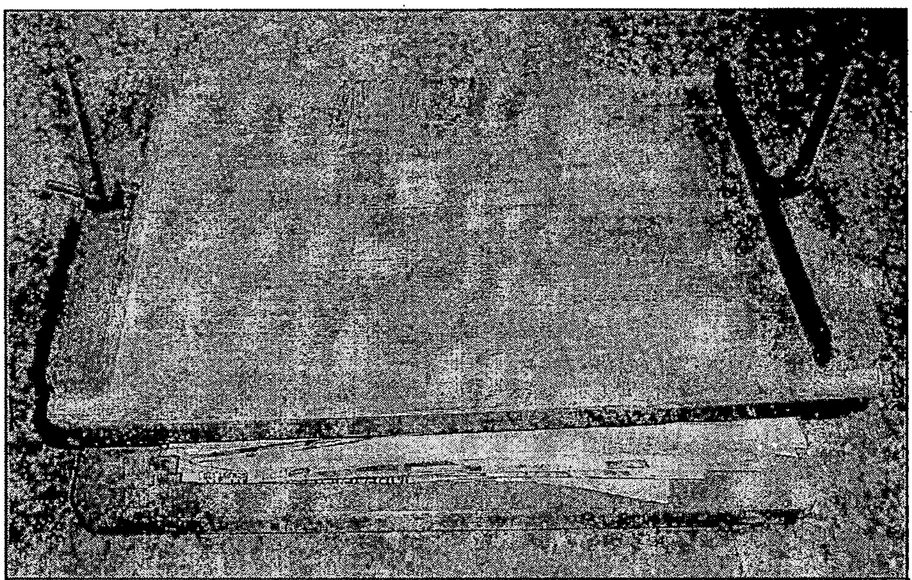


Laptop | **Scanner**

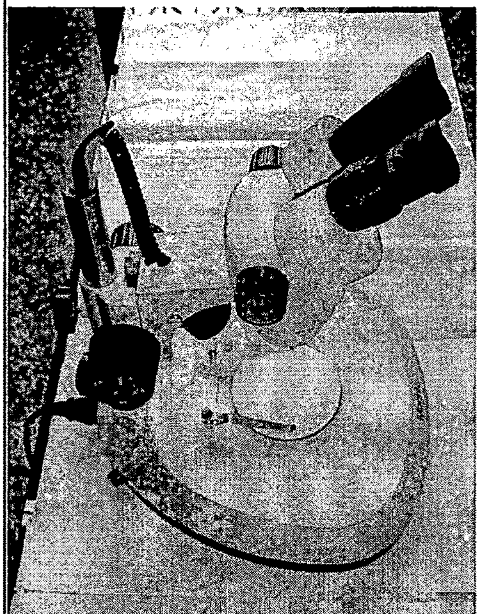


Digital camera

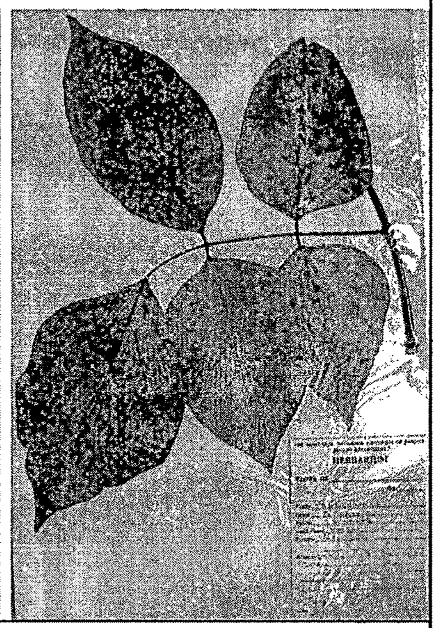
Plate – 1: The instruments used for plant documentation



Field press



Microscope



Herbarium

Plate – 2: The equipments used for plant collection and identification

Some of the methods to maintain the herbaria are given below.

Poisoning and Preparation of Specimens:

Herbarium methods include preservation of plants, their identification, labeling, incorporation and documentation. Following methods are used for preservation of plant specimens in the herbarium.

- **Mercuric Chloride**: The poisoning is generally done by dipping the whole plant in a saturated solution of mercuric chloride in ethyl alcohol. The plants are again put in dryers till it gets completely dried. The plant is dipped in the solution for 15-20 seconds. Mercuric chloride is also used to poison mounted specimens. The specimens are poisoned applying the solution with the help of brush.
- **Lauryl pentachlorophenate (LPCP):** It is used as substitute for mercuric chloride and reported to be very effective and comparatively safer in handling.
- **Formalin**: The formalin method is highly suited for tropical countries. The collections are spread out in ordinary newspapers and bundled up. Each bundle is then placed in a large polythene bag. 10 % formalin is poured over the bundles so that the bundle just gets soaked thoroughly. The bags are then tied airtight. On reaching to headquarters, the bundles are opened out; the bundles are exposed to air to drive away the excess of formalin fumes. Then the specimens are spread out for pressing and drying as usual. The method is found to be very useful.
- **Fumigation**: This is done for killing pests in mounted as well as unmounted duplicate specimens. This process involves any one of the volatile poisonous liquids like methyl bromide, carbon disulphide or carbon tetrachloride. These are placed in small saucers or petriplates in each herbarium case and the cases are kept closed for about a week. Sometimes paradichlorobenzene (PDB) is used. Small cloth bags with paradichlorobenzene are placed in all or many of the pigeonholes. This chemical can also be sprinkled on sheets or on bundles.

Fumigation does not kill eggs or pupae of insects and so fumigation should be done at regular intervals.

- **Heating**: Some herbaria use electric heat instead of fumigation.

Special Methods for preservation of Colours.

The normal method of herbarium leads to discoloration of flowers and leaves. For preserving colours of flowers, absorbent carbon monohydroxide (COH) is soaked in formaldehyde and placed in the bottom of a jar. Some gauge is placed on it, and above the gauge is placed the flowers.

Mounting:

After specimen is pressed, dried and poisoned, it is affixed on a mounting sheet. The mounting sheets are made from heavy long lasting white card sheets of uniform size of 28x42 cm (± 1cm).

a. Gluing the plant on the sheet and Stitching: The common technique now in use is pasting specimens to sheet with animal glue. The glues paste is made by adding flakes of glue to boiling water, gradually and in small quantities till it makes a thin syrupy paste. Some thymol crystals are added to paste as insect repellant. There are two important methods of pasting by glue: i.) Glass Plate Method: the glue is uniformly spread with the help of a brush all over the surface of a glass-plate measuring 35x50 cm. The plant is placed on glass plate and thus one surface is glued. The specimen is lifted carefully and placed on sheet and then in between newspapers and dried. ii.) Application of glue on one side of Specimen: With the help of brush, glue is applied on one side of the specimen and then placed on the sheet.

b. **Strapping**: In this process the specimen is glued to the sheet, but only loosely strapped to the sheet by means of ordinary thread stitches or by some other device such as gummed cloth or paper tapes or by liquid plastic method.

Herbarium Equipment:

a. **Herbarium cases**: The almirahs or cases for housing specimens can be of wood or steel almirahs are preferred to prevent fire and insect hazards. The doors of these cupboards should close tightly. The inside size of one pigeonhole is almost universally accepted as more or less 45 cm deep, 31 cm wide and 15 cm high (45x31x15cm).
b. **Mounting Boards:** These boards or sheets are used for mounting the specimens with labels and packets of loose parts. The sheets are handled constantly and are indented to last for hundreds of years. So they should be made preferably from 100 % rag paper. It should be strong enough not to be bent easily. The size is 28x42 cm (±1 cm). The Hand Made Paper Institute at Poona manufactures papers suitable for mounting sheets, genus and species folders.
c. **Slips for identification:** Small strips of paper (2.5x10cm) are used for writing identifications or comments on name changes. These slips are also called 'Determinavit slips'. The word "Determinavit" is printed on the bottom left hand side of the slip. The person annotating the specimen puts on it the name of the plant and his signature with date & some times his critical notes.
d. **Boxes for dry fruits and seeds:** Fruits and seeds, which can not be mounted on herbarium sheets, are kept with appropriate labels with name, field number etc in a specially made box.
e. **E-herbaria** can also be prepared for the easy storage and access of the plant specimen by photographing the prepared herbaria or by taking live images of plant in the field itself.

Regarding the need for database preparation, a small survey with some basic questions about responses of individuals from various fields on plants and trees has been conducted. The survey involved semi-structured questionnaire (Kothari, 2003). As per survey people use the World Wide Web as an easy source of information for any field. The reason is the easy availability and fast access to the data. How ever, academicians, students and researchers still refuse to rely totally on internet information doubting about the authenticity of the information. In present work the maximum information about trees of Gujarat has been included.

The database was prepared with help of scientific data from literature study and data collected during field study like photographs/images of trees and their parts and herbariums etc. The identification key-system was also prepared for important trees of Gujarat. A data on plant morphological characters was also prepared with images as a basic need for various plant characteristics. The computer software used to prepare present work includes Macromedia Dreamweaver 8.0 and PHP language. Dreamweaver 8 is the industry-leading web development tool, enabling users to efficiently design, develop and maintain standards-based websites and applications. With Dreamweaver 8, web developers go from start to finish, creating and maintaining basic websites to advanced applications that support best practices and the latest technologies. Dreamweaver is available for both Mac and Windows operating systems. PHP originally stood for Personal Home Page. PHP is a scripting language originally designed for producing dynamic web pages. It has evolved to include a command line interface capability and can be used in standalone graphical applications. With the help of software developers the programming of prepared database has been done for trees of Gujarat and introduced on internet by a website named **www.gujtrees.com**. The programme CD is also prepared including the database of trees, images, glossary of botanical terminology and easy to use key to indentify tree species. The software used to prepare the CD-ROM includes HTML (Hyper Text Markup Language), FrontPage, Javascript, Adobe Photoshop. The hardware requirement is windows 98/XP/2000, minimum 128 MB RAM and 20 GB hard disk.