

A photograph of a researcher in a white lab coat standing in a herbarium. He is looking down at a large sheet of paper he is holding. The background shows wooden shelves filled with stacks of papers and folders. The lighting is warm and focused on the researcher.

Herbarium Techniques

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TOPIC: Herbarium Techniques

THEME: Plants

DEPARTMENT: Botany



Lesson Objectives

1. The participants shall identify and describe collection and preparation techniques for plant specimens.
2. The participants shall appreciate the process of plant identification, classification and naming.
3. The participants shall describe the plant labelling techniques and preservation process.
4. The participants shall explore best plant conservation practices.

Learning resources

1. Text
2. Video
3. Photo

Define Herbarium and Herbarium Techniques

Herbarium is a collection of preserved plant specimens used for scientific study and research.

Herbarium techniques refer to the methods used to collect, preserve, and maintain plant specimens in a herbarium. Herbarium techniques require careful attention to details and specialised knowledge to ensure that the specimens are properly collected, preserved, and maintained for future study and research. Common herbarium techniques include:

- Collection
- Pressing
- Mounting
- Labelling
- Storage
- Digitization

Collection

The first step in herbarium techniques is collecting the plant materials. This involves selecting and cutting a healthy representative plant sample of interest from the field. Information about the sample including where it is collected, Global Positioning System (GPS) coordinates, collector's name and date is recorded for future reference.



Collected plant materials
Source: NMK - Botany

Pressing:

After collection, the specimen is placed between sheets of blotting paper and pressed to flatten it. This process removes excess moisture and allows the plant to dry and be preserved in its shape without losing its features.



*Researcher pressing collected plant materials
between sheets of blotting paper*
Source: NMK - Botany

Mounting:

Once the specimen is dry, it is mounted on a sheet of archival paper using wood glue or tape. It is accompanied by a label which contains information about the specimen, including the species name, collector's name, location and date of collection.



Dry specimen mounted on a sheet of archival paper
Source: NMK - Botany

Labelling:

A label with the specimen's information is attached to the bottom of the sheet, and a barcode or other identification system may be used to track the specimen in the herbarium database.



Labelling the dry mounted specimen
Source: NMK - Botany

Storage:

The mounted specimen is then stored in a protective folder or envelope, and the folders are stored in cabinets in a climate-controlled environment to prevent damage from pests, light, and humidity.

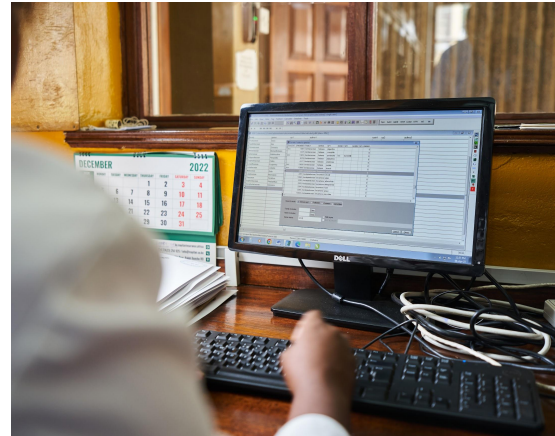


Researcher accessing the specimens within the herbaria

Source: NMK – Botany

Digitization:

This refers to digitizing collections through making high-resolution images of the specimens and entering the data into searchable databases. This allows researchers to access the specimens remotely and provides a backup of the physical collection.



Researcher entering images and data into the searchable herbarium database

Source: NMK – Botany

Collection of specimen

Collecting a plant specimen involves several steps to ensure the accuracy of the collected sample, and minimise any harm to the plant or its environment. Here are the general steps for collecting a plant specimen:

- **Aim or objective of collection:** The first step is to correctly identify the purpose for doing the collection of the species you wish to collect. Distinguish if you are collecting for specific taxa or a floristic collection.
- **Choose the right time:** It is best to collect a plant specimen when it is in its reproductive stage, such as when it is flowering or bearing fruit. This allows for proper identification and helps ensure that the collected sample is genetically representative of the species.
- **Collection Tools:** When collecting the specimen, it is advisable to at least have secateurs or a knife, GPS, notebook, and digger. Collect a portion of the plant, for example a branch bearing flowers, and/or fruit if it is a tree or shrub. If it is a herb, it is advisable to uproot one or two fertile individuals.
- **Record data:** Make sure to record the date, location, habitat, GPS coordinates, and other relevant information about the specimen such as information about life form, height of the plant and colour of the flowers. This information will help identify the plant correctly.

- **Press the specimen:** To better manage the specimen in the field and for preservation, press it between sheets of newspaper or blotting paper and then place it in a plant press. Afterwards, dry the specimen using a dehydrator or an oven. Make sure the specimen is completely dry before storing it.

Different plant species require different handling measures. For example, fleshy plant samples should be put in the drier immediately after pressing to avoid the samples rotting. Normal plant samples may stay for a while after pressing, depending on the prevailing weather conditions and the plant species.



Researcher pressing collected plant materials between sheets of blotting paper
Source: NMK – Botany

Plant identification, classification and naming

Plant identification, classification, and naming are important processes in the Botany and Herbarium Management System. Various tools and methods are employed to identify, classify, and name different plant species. The process typically involves the following steps:

1. Observation

The first step in identifying a plant is to carefully observe its physical characteristics including its leaf shape, flower colour, type of fruit or stem structure. These observations can provide important clues about the plant's family, genus and species.

2. Use of identification keys

Identification keys are tools that use a series of questions and choices to help narrow down the possible species of a plant. These keys may be based on various characteristics such as leaf arrangement, flower structure or fruit type etc.

3. Comparison with reference materials

Once the plant has been identified using an identification key, it is important to compare it with reference materials such as specimens stored at the herbaria, books or online databases to confirm the identification.



*Researcher comparing specimens with reference materials
Source: NMK – Botany*

4. Classification

Once the plant has been identified, it is classified into a specific family, genus and species based on its physical characteristics and genetic information. This classification system helps to organise and categorise different plants according to their evolutionary relationships.

5. Naming

Finally, the plant is given a scientific name, which consists of a genus and species name. This naming system, called binomial nomenclature, was developed by Carl Linnaeus in the 18th century and provides a standardised way of naming and organising different plant species. The scientific name is usually in Latin and written in italic form, and may be accompanied by a common name in the local language.

Generally, the process of plant identification, classification, and naming is an important part of botany that helps researchers and enthusiasts to better understand and appreciate the diversity of plant life around the world.

Labelling

Labelling plant specimens is a crucial step in the process of plant collection, preservation, and storage. The following are the typical steps involved in labelling plant specimens:

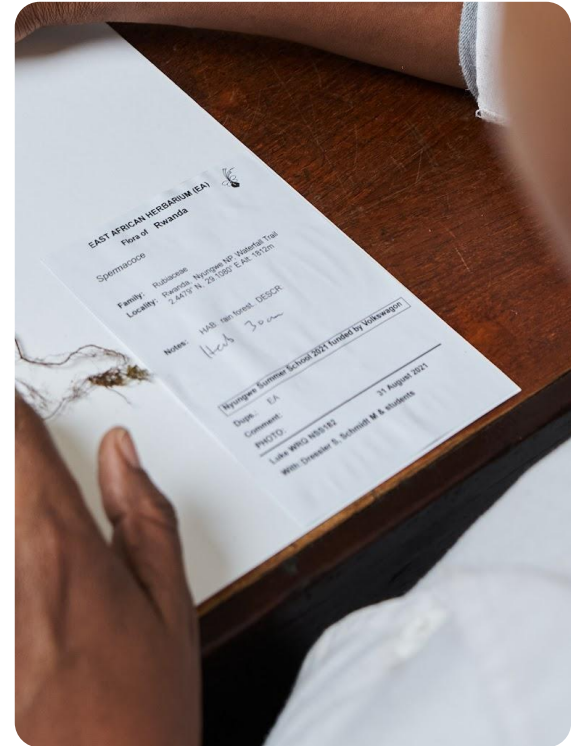
Preparing a plant specimen label

Labelling plant specimens is a crucial step in the process of plant collection, preservation, and storage. The following are the typical steps involved in labelling plant specimens:

Collection number: this is a unique identifier for the specimen.

Scientific name: this denotes the genus and species of the plant.

Collection date: this indicates the date when the specimen was collected.



Specimen label
Source: NMK - Botany

Collector's name: this is the name of the person who collected the specimen.

Location: this is the specific location where the specimen was collected, including geographic coordinates if available.

Additional information: this includes information such as the common name of the plant, the habitat where it was found and any notes or comments about the specimen.

Record keeping: The label information is recorded in a database or on a spreadsheet to allow for easy retrieval and analysis of the collected specimens.

Label attached on plant specimen: The label is attached on mounted plant specimen at the lower side of the mounting sheet.

The labelling process is crucial to ensure that plant specimens can be accurately identified and studied for generations to come.

Preservation and display

Plant specimen preservation involves all described processes above; collecting, preparing and preserving plant specimens for study or display. Preservation and display of plant specimens are an important process for scientific study, education and appreciation of the natural world.

Plant specimens can be displayed in various ways, such as in herbarium cabinets, on walls as illustrations or as a live collection for example indoor plants. Displaying the specimens involves **selecting the plant specimens**. The specimens to be displayed are selected based on their uniqueness, rarity and aesthetic value.

Of importance in preservation and display is protecting the specimens. The plant specimens are protected from dust by storing them in folders and envelopes and ensuring the cabinets are closed when not in use. Plant specimens are also protected from pests by conducting annual fumigation and prohibiting food and drinks in the herbarium.

Disposal

There are several reasons why plant specimens may need to be disposed of. However, it is important to note that plant specimens should only be disposed of after careful consideration and in accordance with applicable regulations and guidelines. It is important to document the reason for disposal and the method used to ensure that the process is transparent and accountable. Some common reasons include:

1. The specimen is no longer needed: Plant specimens may be collected for research or educational purposes, but once the data has been gathered or the study has been completed, the specimen may no longer be needed.
2. The specimen is damaged or degraded: Plant specimens that have been damaged, degraded, or contaminated may no longer be useful for research or other purposes.
3. The specimen is taking up too much space: Large collections of plant specimens can take up valuable space in storage facilities or laboratories, and may need to be disposed of to make room for new.

Role of herbarium in plant conservation

Information contained within the herbarium is critical for the study of;

- **Plant taxonomy** researchers and taxonomists are able to identify new species.
- **Plant diversity** to appreciate diverse plant species in various ecosystems and habitats.
- **Ecology and evolution:** how plants interact with their environment and how they have come to evolve.

Researchers and botanists use herbarium collections to identify plant species, track changes in distribution, study historical plant data, and conduct various scientific investigations related to the plants and their conservation.

Conservation

Plant conservation is the practice of protecting and preserving native plant species and their habitats from destruction, or extinction. It involves the identification and assessment of endangered plant species and their habitats, as well as the development and implementation of conservation strategies to maintain and restore populations of these species. Conservation can be carried out through the following measures:

1. Protecting habitats: Habitat loss is a major threat to plant species. Conserving plant habitats is essential to protect the plant species that live there. This can be done by creating protected areas such as national parks and nature reserves; and by implementing land-use practices that are sustainable and compatible with plant conservation.

2. Control invasive species: Invasive species can outcompete native plant species and threaten their survival. Controlling the spread of invasive species is crucial for plant conservation. This can be done through early detection, rapid response and ongoing management.

3. Propagate and restore plant populations: Propagating and restoring plant populations can help to increase their numbers and ensure their survival. This can be done through techniques such as seed banking, plant tissue culture and out-planting, that is transplanting plants to their natural or intended habitat.

4. Reduce pollution: Pollution can have negative impacts on plant species, including reduced growth and reproduction. Reducing pollution through measures such as emission controls and wastewater treatment can help to protect plant species.

5. Educate the public: Educating the public about the importance of plant conservation can help to raise awareness and support for conservation efforts. This can be done through public outreach and educational programs.

6. Support conservation organisations: Supporting conservation organisations that work to protect plant species and their habitats can also help to conserve plants. Donations and volunteering can make a difference in conservation efforts.