

CHAPTER 3

pressing and drying



*People forget how fast you did a job—
but they remember how well you did it.*

—Howard Newton

After you have collected plant material, pressing is the next step in the creation of a specimen. Pressing flattens and dries the plants and makes it possible to mount and preserve them.

Main aims

When pressing specimens, your aims should be to

- Flatten the specimens as much as possible, as bulky specimens take up a large amount of space.
- Prevent wilting.
- Position specimens in such a way that the different parts of the plant are clearly visible.
- Preserve delicate organs without crushing them.

The plant press

Two things happen when you press plant specimens: the plant material gradually loses its moisture, while the pressure exerted on it by the press flattens the material.

Components of a plant press

A plant press consists of the following parts:

- Two strong, rigid, wooden or metal **lattice frames** slightly larger than the standard herbarium mounting board.
- Two **expandable straps** that are strong and easy to open, close, and tighten. (We suggest webbing with round or D-rings.) As the plant material flattens and loses moisture, the straps must be tightened regularly to ensure that the plants are pressed flat.
- **Drying paper** with good absorbing properties. The dimensions should be 280×450 mm, slightly larger than the standard mounting board. You can use newspaper cut to size as a substitute. Drying paper must be changed regularly during the first few days of pressing. This is even more important if the specimen has a high moisture content or the atmosphere is very humid.
- **Flimsies** should be of thin, strong, slightly absorbent paper. (The plant specimen is placed in the flimsy before pressing and kept in it until mounting). We recommend unprinted newspaper, but you can also use printed newspaper. Fold the paper from both sides with the opening in the centre to prevent material from slipping out. When folded, the flimsy should be the size of a standard herbarium mounting board (270×420 mm). The collector's name and number must appear on the outside in the lower right-hand corner. (Some herbaria prefer this to be in the upper right-hand corner.)
- **Corrugated cardboard sheets** are used as ventilators or spacers and must be the same size as the drying paper (280×450 mm), or slightly larger. To allow airflow to speed up the

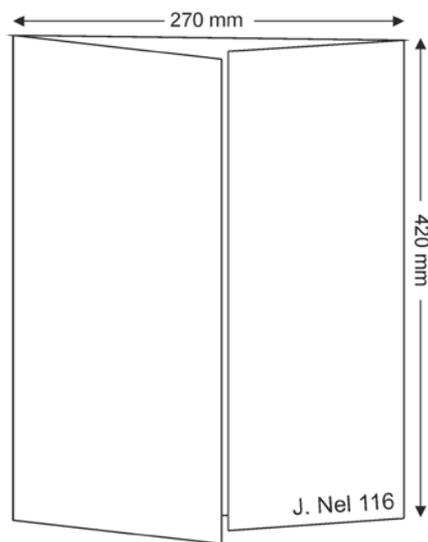
drying process, the corrugations in the ventilators must run parallel to the short sides. The ventilators also prevent bulky specimens from damaging ones that are more delicate.



A packed plant press, with straps tightened.



A close-up of the straps and D-rings.



Flimsies correctly folded to show collector's name and number.



Cardboard ventilators are most effective when the corrugations run parallel to the short sides.

How to pack a plant press step by step

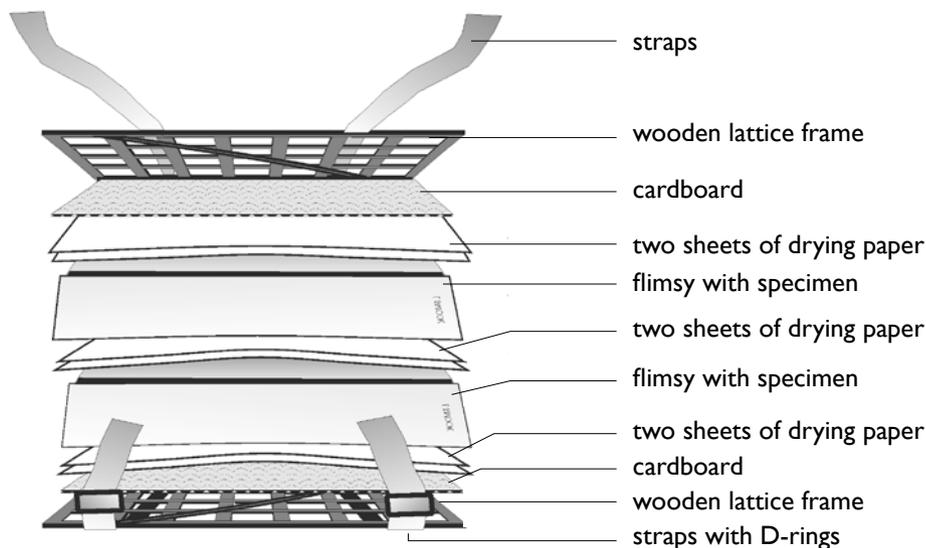
A plant press is packed in the following sequence:

1. Wooden lattice frame.
2. Cardboard.
3. Two sheets of drying paper.
4. Flimsy with specimen.
5. Two drying papers, followed by another flimsy with a specimen and so forth.
6. Use a cardboard ventilator after every five to eight specimens.
7. Finish with a cardboard ventilator and the second wooden lattice frame and then pull the straps tight.

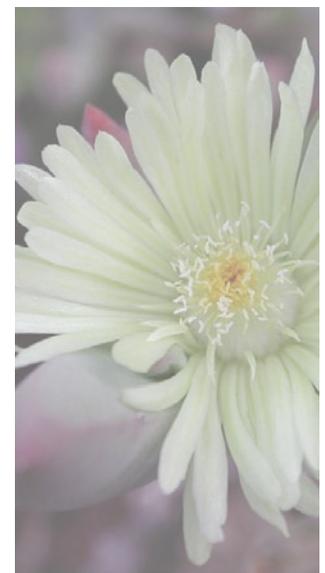
Standard pressing methods

Correct pressing of specimens is very important: once a specimen has been pressed and dried, its overall shape cannot be altered without some damage.

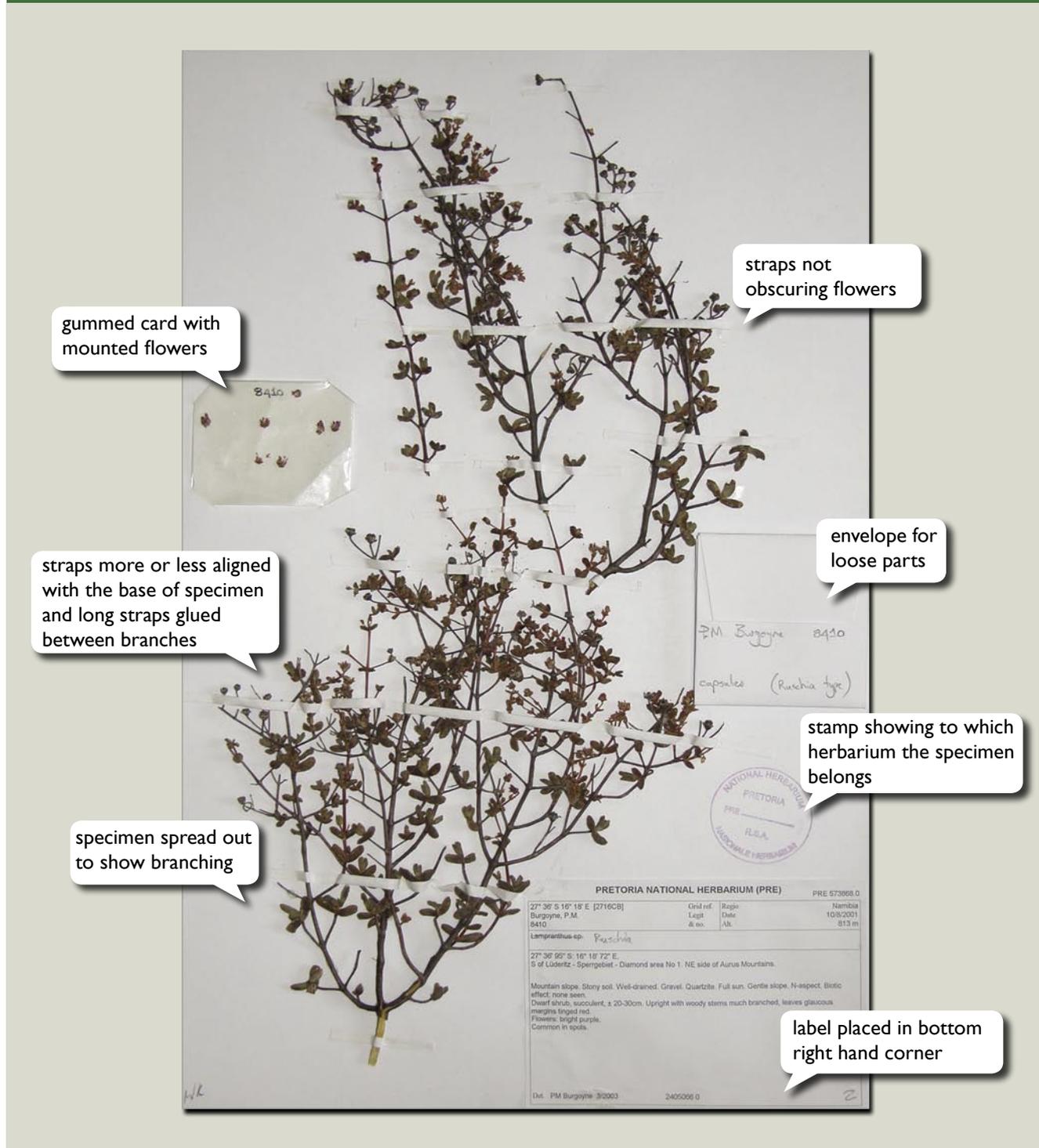
- The shorter the time between collecting and pressing, the better.
- Always keep mounting in mind. Remember the size of a standard mounting board (270 × 420 mm), the position of the label, and the orientation of the specimen.
- Remove mud and soil from roots and other basal parts.
- Spread the specimen out to show all the parts.
- Open some flowers and turn others over to show both inside and outside surfaces. A side view is also useful.
- Spread ferns out to show the shape and size of the individual pinnae—these can be different on the same frond, especially the basal pinnae.
- Leaves, especially those of ferns, should show both surfaces.
- Arrange specimens too large for the herbarium mounting board by bending or breaking them while still fresh, preferably without entirely severing the parts, to fit the board. If cut into different segments, they might become separated and cause confusion.
- Collect representative pieces of plant parts too large for standard mounting boards, for example, cycad leaves and fern fronds. The base, middle, and apex are usually adequate for most taxa.
- If the pieces are too large to fit into a single flimsy, label each piece sequentially (Sheet I, Sheet II, Sheet III, and so on) and press in a separate flimsy with the collector's name and the



The sequence in which a plant press is packed.



characteristics of a good specimen



TIP

After 12 to 24 hours in the press, you can rearrange unmanageable specimens in their flimsies—they will still be partially damp and easier to handle.

same number. (These are not duplicates, but sheets of the same specimen.)

- To reduce bulk, split or cut large specimens with thick stems, roots, corms, or bulbs. Even flowers, seeds, and fruits can be split or cut. This saves space and prevents damage to other specimens in the herbarium cupboard.
- Pad specimens that have parts which are much thicker than others: place absorbent paper over the thin parts, bypassing the thicker parts, to even out the pressure within the press and to prevent wilting of the thinner parts. A quicker method is to use sheets of foam rubber, cut to the same size as the drying paper.
- Remove excess leaves or flowers that obscure each other or other organs; leave part of the petiole or flower stalk to show that something has been removed.
- With delicate or short-lived flowers, it is best to take extra ones and place them in wax or tissue paper and press them separately. You can also use small, gummed cards, especially if the pressed flowers have to be dissected. See “Fragile flowers”.
- Place small seeds in an envelope with the collector’s name and number written on it; this is pressed with the specimen.
- Place the thick parts of specimens alternately at different positions in the flimsies to keep the press even and level and to ensure that all parts, especially thinner ones, are being pressed properly.

Special pressing methods

Not all plants can be pressed using the standard methods. Some plants, such as succulents, bulbs, spiny plants, and delicate flowers, need special handling.

Succulent and fleshy plants

Succulent and fleshy plants usually have a very high water content, which makes drying difficult. Some also tend to remain alive—even in the press! There are a number of techniques to overcome this problem:

- Plant material can be cut longitudinally or transversely, and the fleshy inner tissue can be cut or scraped out before pressing. This method works well for leaves of *Aloe* species.
- You can kill plants by submerging them in very hot water or in a liquid such as methylated spirits (denatured alcohol), petrol, or even household vinegar. Pierce the material with a

needle to allow penetration of the liquid.

- Place plant material—unpressed—in a freezer for two days, then microwave.
- Prepare flowers of the Stapelieae (Asclepiadoideae) and Mesembryanthemaceae using the gummed card method to improve the quality of the specimens. See “Fragile flowers”.



Graminoid that has been bent to fit the sheet.

Graminoids

Graminoids include plants from the Poaceae, Cyperaceae, Restionaceae, and Xyridaceae. They are often tall and difficult to fit onto a herbarium sheet. Bend the stems by bruising them with a fingernail. Do not cut unless absolutely necessary.

Fleshy underground organs

Bulbs, corms, and other fleshy underground organs are too bulky to press whole. Slice these parts longitudinally into thinner segments. In addition, these organs tend to remain alive, sometimes even after they have been cut. To kill the tissues before



Bulbs sliced for pressing.

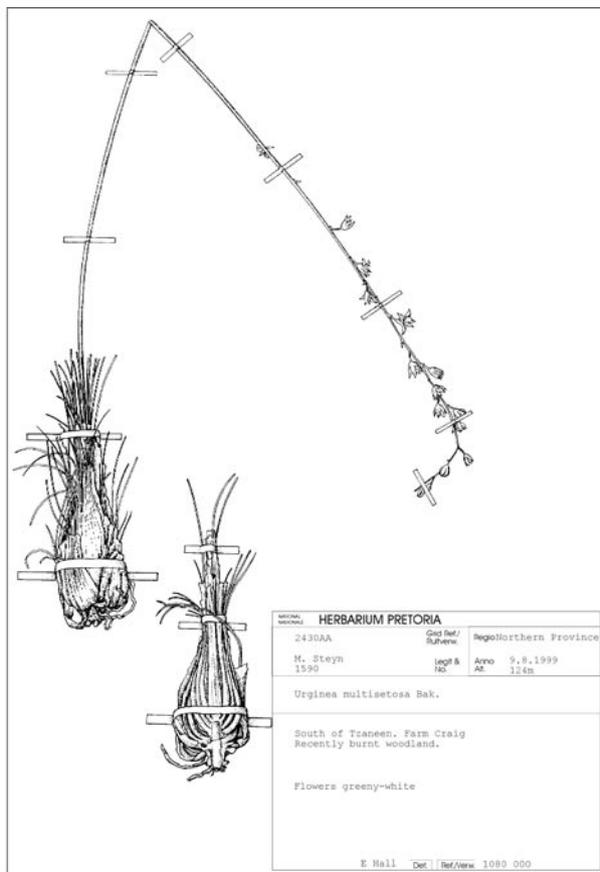
pressing, use hot water, methylated spirits, petrol, or vinegar as described under “Succulent and fleshy plants” above.

Spiny plants

Place the spiny plant in its flimsy in the press with a number of cardboard ventilators below and above the specimen (enough to prevent thorns from piercing through). Press down firmly. It should be possible to bend many of the thorns so that the specimen can be pressed in the usual way. Remove long or rigid spines and thorns that protrude along the upper or lower surface of a specimen if you cannot bend them easily.

Fragile flowers

Usually, flowers from dried specimens are rehydrated for microscopic examination of floral parts. The dried flowers of families like Iridaceae, however, disintegrate easily and are therefore too fragile to rehydrate. In other families, such as Acanthaceae, the



Well pressed bulbous specimen.

flowers often fall off the dried specimen. In such cases, you can dissect and preserve fresh flowers in another way to allow detailed studies later. This is also important for families, such as Mesembryanthemaceae, where taxonomically important characters are found inside the flowers.

One such method, devised by Dr Louisa Bolus, uses gummed cards. Cards are covered with gum Arabic, allowed to dry, and placed in an airtight container until needed. After dissecting the flowers, you place the fresh material on the lightly moistened gummed card, cover it with cellophane, and place it in a mini-press until dry. The card can then be mounted with the specimen. Burgoyne & Smith (1998) describe an alternative method using archival, acid-free gummed paper; the specimens are covered with wax paper and then dried in a plant dryer. This method is less messy than the gum Arabic method and gives very good results.

preparing a succulent flower for pressing



1. Remove a flower.



2. Cut longitudinally through centre.



3. Separate halves.



4. Place onto moistened gummed paper; cut surface uppermost.



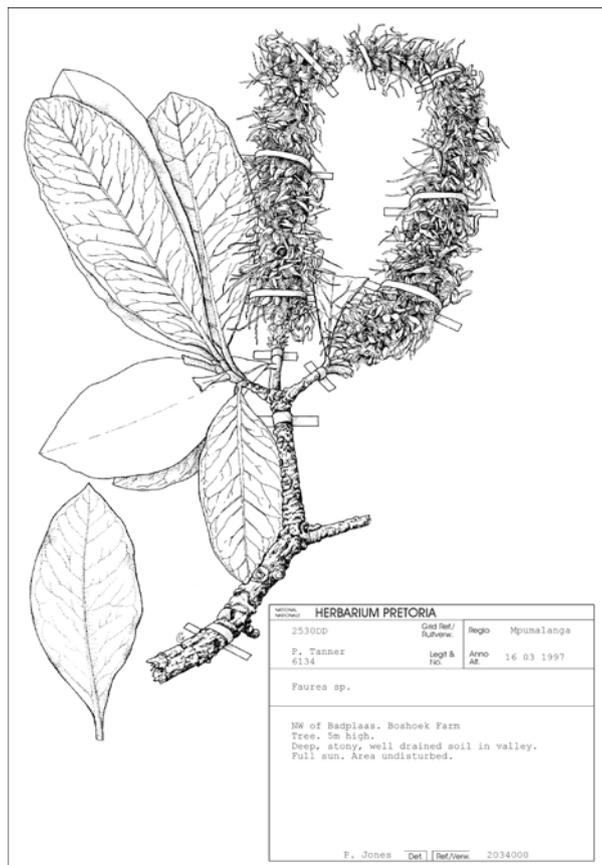
5. Cover with wax paper.



6. Write collector's number and name onto gummed paper.



7. Press mounted flower with the rest of the specimen.



Bulky specimen with some leaves removed.



Preserved specimens in bottles.

TIP

Write the type of preservative clearly on the airtight glass or plastic jar used for preservation.

Fixatives and preservatives

Parts of some plants, for example, *Stapelia* flowers, are often best preserved by placing them in a preserving liquid or fixative. This method of preservation retains the shape of parts and organs important for identification.

WARNING

Formaldehyde is carcinogenic

Fixatives and preservatives

Constituents and uses of the most commonly used herbarium fixatives and preservatives

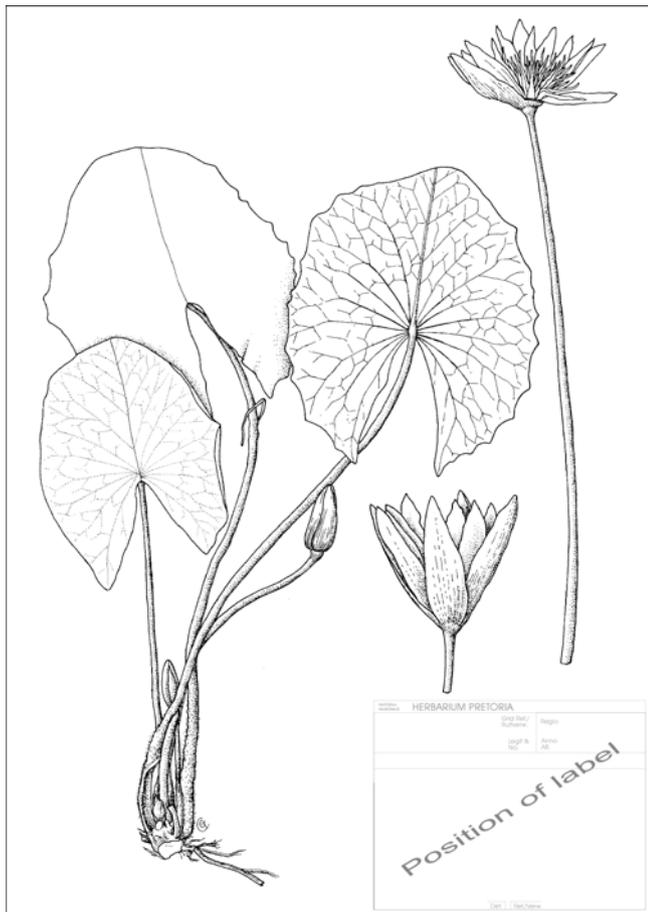
Alcohol or IMS	Industrial Methylated Spirits (IMS), ethanol, or ethyl alcohol	Use only if no good fixative is available; can be used for storage but has a limited shelf life.
FAA	1:1:18 mixture of 40% formaldehyde, glacial acetic acid and 70% ethanol	Fixative for histological use; indefinite shelf life. Remember: formaldehyde is carcinogenic.
Kew mixture	10:1:1:8 mixture of IMS, formalin, glycerol and water	Very good fixative for histological use.
Carnoy's fluid	3:1 mixture of 96% absolute alcohol and glacial acetic acid	Fixative for cytology; replace with 70% ethanol after fixing for 24–48 hours.
Copenhagen mixture	10:1:8 mixture of IMS, glycerol and water	Very good for storage, but not a good fixative.

Working with poisonous and hazardous chemicals

When handling hazardous chemicals, or specimens treated with poisons, you should always take appropriate protective measures and be familiar with emergency procedures.

- Know how to use respirators correctly.
- Work in a well ventilated area.
- Make use of personal protective equipment, such as chemical safety goggles, impervious gloves, overalls, and aprons.
- Wash hands after working with poisonous or hazardous chemicals.
- Do not eat, drink, or smoke in work areas.
- Ensure that there is an easily accessible shower and eye wash fountain available in the immediate work area.





A well laid out *Nymphaea* specimen showing the different features of the plant.

Fungi

Fleshy macrofungi are not pressed, but dried as rapidly as possible after collection. Very large fruiting bodies can be cut lengthwise into two or more slices.

Rusts and other plant pathogenic fungi are collected on the host plant and pressed and dried in the same way as vascular plants. See "Standard pressing methods".

Aquatic plants

The procedure for pressing aquatics is similar to that for terrestrial plants, except for a few specialised techniques.

TIP If plants appear to be drying too slowly, put the press in a freezer for a day or two and then return it to the dryer. Freezing breaks the cell walls and makes it easier for the moisture in the plant to be drawn out by the drying process.

- Because aquatic plants are wet, they need several sheets of drying paper and a cardboard ventilator between all specimens; these must be changed frequently.
- Place small, free-floating plants, such as *Lemna*, individually on small pieces of archival-quality acid-free paper. Place all the squares in a flimsy before pressing them. When the plants are dry, you can mount the individual squares.
- Make notes on the growth form, the form of the rootstock, and the number and arrangement of emerging leaves, as these are essential characters used in the identification of aquatic plants.
- Flowers—those of *Nymphaea* species, for example—should be cut in half and some of the petals and stamens folded forward to show the number and arrangement of the stamens.
- Venation of the upper and lower surface of the leaf and the way the veins join the petiole are important diagnostic characters in many groups; in such specimens, cut the leaves (especially large leaves) in half, slightly off-centre, and mount to show these characters.
- The mucilaginous layer of leaves of some aquatics acts as an adhesive, sticking the specimen to the flimsy. Petals are often thin and delicate and tend to stick to the flimsy. To prevent this from happening, spread the plant out on a sheet of acid-free paper in the position in which it will be mounted on the herbarium sheet. Cover it with a protective layer of ordinary wax paper, the waxed side against the plant. Prick several holes in the paper so that the drying paper can absorb the moisture on the plant. You can also use thin perforated plastic, although this is not recommended in tropical areas. The preferred method in these areas is to press the plant between two pieces of thin cotton cloth (cheesecloth) or dressmaker's non-fusible interfacing. When the drying papers are changed, gently loosen the plants from the protective layer.
- You can attach flowers to a piece of gummed paper and cover them with a piece of wax paper, before placing them in the press. See "Fragile flowers".

Submerged plants

When submerged plants are removed from the water, the leaves adhere to each other. Prepare such specimens for pressing in one of the following ways:

- **Floating** Immerse a clean sheet of acid-free white paper in water in a flat, shallow dish; spread the plant out on the paper and slowly lift the sheet and plant out of the water. A thin sheet of polystyrene under the paper helps to support both plant and paper during the lifting process. This method works well for plants such as *Potamogeton pectinatus*.

preparation of submerged aquatic plants



1. Place a sheet of white paper on a rigid board into a shallow dish, then add the plants.



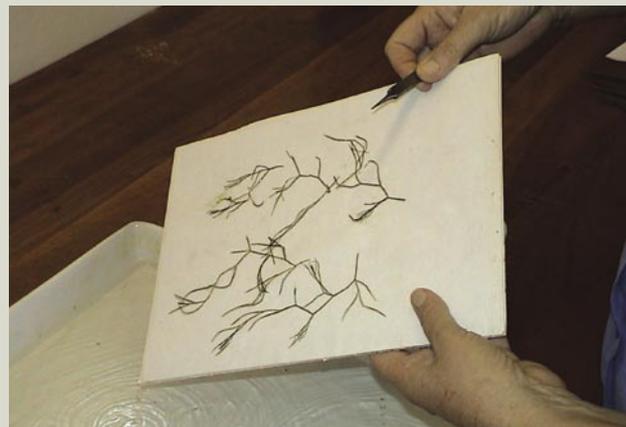
2. Gently move the floating plants onto the sheet.



3. Lay out to show all characters.



4. Start lifting the board while holding the board and specimen in position.



5. Tilt the board while lifting it out of the water to remove excess water.



6. A mounted specimen.

- **Air-drying** Place delicate plants in a cotton bag and swing the bag around a few times, shake it gently, and then spread the plant out on a sheet of acid-free white paper; more robust plants can be shaken dry without a bag. This method works well for plants such as *Potamogeton pusillus* and *Potamogeton crispus*.

In both methods, the plants will adhere to the paper, which you can mount straight onto the herbarium mounting board after pressing and drying. If the plant does not adhere to the paper, secure it with a few gummed paper straps. (See “Strapping”.)

Drying specimens

We are lucky to have the hot African sun to help us with specimen drying—it is easy, as well as free!

- The drying process should take place in a warm, dry location. The ideal drying temperature is 45°C. Very high temperatures cause plants to become brittle.
- Plants must dry out fast, otherwise the flowers and leaves tend to drop off the specimen.
- Change the layers of drying paper in the press regularly; they become damp from the moisture absorbed from the plants. Repeat this process daily, especially during the first few days. After the first week, longer intervals can be allowed between changes, unless the atmospheric humidity is very high. Cardboard ventilators must be changed as well, especially during the first few days.
- It is not necessary to remove specimens from their flimsies when changing the drying paper.
- Loosen the specimens from the flimsies before they are completely dry. This is important, as many plant parts tend to adhere to the flimsies during the drying process and are then difficult to remove later without some damage to the delicate parts.
- The tissues of succulents and bulbous plants often have to be killed before the drying process will proceed. For more information on killing tissues, see “Succulent and fleshy plants”.
- Check regularly for live insects eating the flowers and leaves while the specimens are in the press.
- A specimen is dry when a white mark is left behind when you run your fingernail along the surface of a leaf.
- Air-dry bryophyte specimens as soon as possible after collecting to avoid fungal and abnormal shoot growth, and to discourage attack by insects. Open the paper bags in a dry place with good ventilation. Artificial drying procedures should be avoided.
- Fleshy fungi should be dried rapidly at approximately 40°C; take care not to overheat and cook the specimens! Too low a

temperature will result in insect larvae hatching and eating the specimen. Small fungi can be air-dried. ▲

TIP

For detailed information on pressing and drying, see the book *Preparing herbarium specimens* (Fish 1999).



Specimen with extra padding around bulky inflorescence.



It is always best to press in the field.