

The Treatment of Seed and Seedling Collections

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Since 1967, I have been responsible for the correct identification of plants cultivated in the Botanic Garden of the University of Basel. It has become obvious to me that several useful aids to the identification of plants are lacking, namely, a seed and fruit collection and a seedling herbarium covering the life of plants under cultivation in all those phases that are more familiar to gardeners than to scientists.

Invaluable in the progress towards this goal are the seed-lists of other botanic gardens which we have been using intensively over the past ten years, improving our knowledge and our collections. I think it is a waste of time and a loss of scientific information to cultivate plants from seed without retaining some of the original seeds in a housing that occupies little space, and to use up all the surplus seedlings by planting them out, and not taking herbarium specimens of them. After all, we have four different phases of a single species — seed, seedling, flowering plant, and fruiting plant. Our practice now is to arrange seeds with the same indications as is regularly done for herbarium specimens, *i. e.*, to indicate locality, date of collection, and ecological data. If the germinating seeds are available in sufficient quantity, it will be an invaluable improvement on the classical herbarium. Incidentally, in order to make the best use of a botanical garden, it is highly desirable that a wood collection of the dying woody plants in the garden be also made.

The table below shows the desirable steps in the correct identification in a botanic garden of a plant species, be it rare and worthy of conservation or common, but neglected in collections. The time-consuming labour of reidentification is indeed rewarding. It is concerned with the flowering and the fruiting plant, and, at the same time, assures the correct identification of seeds and seedlings by the use of the same registration number.

Each plant cultivated in the Garden and submitted to me for reidentification is accompanied by a work-sheet of all the steps that may need to taken. Here is an example:

1. Latin name
2. Author

3. Family
4. Geographical distribution
5. Registration number
6. Garden of origin
7. Date of reidentification
8. Reidentification correct, incorrect, uncertain, Underline as appropriate
9. Location in Garden
10. Second reidentification on the
11. Registration in general catalogue
12. Registration in central desiderata-list
13. Registration in seed-collection
14. Destruction in seed-collection
15. Registration in seedling herbarium
16. Destruction in seedling herbarium
17. Make herbarium sheet
18. Destruction of plant in Garden
19. Inscribing final identifying label short normal long tag, Underline as appropriate
20. Bibliography

1, 2, 3, 5 and 6 are on the labels of the cultivated plants as indicated in the seed-lists; 2 is often missing, but should be given. 9 helps to find the plant in the Garden. 11 means the book of registration numbers. Failure to germinate is also recorded. 12 is a desiderata-list consisting of the indexes of the first four volumes of the *Flora Europaea* in which we check the material available in our collections, and underline the species correctly identified. 13 and 15 are self-evident: the identity is confirmed in the special collections. 14, 16 and 18 represent the simple method of treating wrongly identified material: any other is a waste of time. 17. We make a herbarium specimen if the species is of interest to us. 19 is the final labelling of a correctly identified species if we wish to grow it on in the Garden. 20. The extent of our library and the herbarium is the limiting factor in the work of reidentification and in the correct treatment of the plants (ecological requirements, geographical distribution, and so on).

Another source of material for the seed-collection is the herbarium itself which often contains fruiting specimens that have already been correctly identified, but this is not true of all our plants since, in certain groups, fruiting specimens are lacking in the herbarium.

Some botanic gardens in their lists of wild seeds give a herbarium reference (as does Geneva), or provide well studied, accurately identified material (Ottawa for the cytotaxonomically studied groups, or Versailles). If so, we put the seeds directly in the collection, growing a seedling or making a herbarium sheet only if time and place permit.

A method of identifying seeds «faute de mieux» is by comparison of several seed samples of the same species. Gross errors may be detected in this way. As a further step in our investigations, it is a good policy to collect several specimens of the same species in order to detect, from differences in seed-size, possible chromosome races.

We usually make an effort to indicate to our corresponding gardens any errors of identification we may discover.

The Seed-collection

Gunn (1972 in Kozlowsky ed.) gives a useful and up-to-date review of seed-collections and seed-collecting methods.

In a phase of rapid extension of a seed-collection, the best method of filing is alphabetically — families, genera, and species. The filing does not require trained staff, and in Basel we have collected about 20 000 envelopes of seeds in ten years with the cooperation of many botanic gardens.

The problem of housing has been overcome by means of light plastic cases on shelves in conventional office furniture. The labels are placed in the upper half of the transparent envelopes. To prevent insect damage, the cellophane bags are folded over twice to ensure a measure of security. The seeds can always be retrieved from the bag for photographic purposes or for microscopic examination, and returned afterwards.

The labels contain only the usual data for a herbarium sheet. Photographs and notes are filed separately.

The Seedling Herbarium

In the majority of herbaria, the seedlings, as well as the seeds, are included on the same sheet as the adult plant; and it is a time-consuming task to discover how many such items the herbarium contains. So it is advisable and worthwhile to have a separate seedling collection in the herbarium; and we have done so in Basel since 1968. We have about 2 000 specimens mounted as herbarium sheets. In spite of a usual lack of junior staff, the collection increases each year by 500—700 specimens of seedlings cultivated in the Botanic Garden.

It is also proposed to include such information on seedlings as is found scattered in the literature in the herbarium.

Example — the Ochnaceae

From my taxonomical research on the sub-tribe *Ourateinae* (van Tieghem) Kanis from Africa, I can stress the importance of studying seeds and seedlings; and I like to demonstrate this by a concrete example:

Van Tieghem (1902a, 1902b) has shown the importance of seed-embryo morphology in this group. My work (Farroun 1963, 1968, and *Monographie des Ourateinae d'Afrique*, in preparation) demonstrates the correctness of van Tieghem's belief, namely, that the basis of our new classification must be seed-embryo and seedling morphology.

The embryo is straight in the genus *Idertia* Farroun, occurring locally in Africa in a restricted area. The seedling is hypogeal and phanerocotylar (Duke's terminology 1966), and I believe it represents a primitive arrangement (Tables I and II 1).

In all other occurrences of the *Ourateinae* from Africa, the embryo is more or

less bent (Table I, 2—5), and two forms can be distinguished — (a) incumbent to the radicle (Table I, 2—4) and (b) accumbent to the radicle (Table I, 5). The incumbent form is the more complex: it can be isocotylar, with *Campylospermum* van Tieghem sectio *Notocampylum* (van Tieghem) Farron and *Diphyllopodium* (van Tieghem) Farron (Table I, 2), and, with some species of *Rhabdophyllum* (van Tieghem), it can be accompanied by heterocotyly, both with an internal little cotyle (*Rhabdophyllum* van Tieghem (Table I, 3) or an external little cotyle (*Campylospermum* sectio *Monelasmum* (van Tieghem) Farron. The accumbent form, always with isocotyly, occurs in *Campylospermum* sectio *Cercanthemum* (van Tieghem) Farron and sectio *Campylospermum* (Table I, 5).

The seedlings in the incumbent series (Table II, 2—4) are phanerocotylar in the section *Notocampylum* of *Campylospermum* and in the genus *Rhabdophyllum*, and cryptocotylar in the sectio *Monelasmum*. In the accumbent series, they are phanerocotylar in the sectio *Cercanthemum* (Table II, 5) and cryptocotylar in the sectio *Campylospermum* of this genus (Table II, 4).

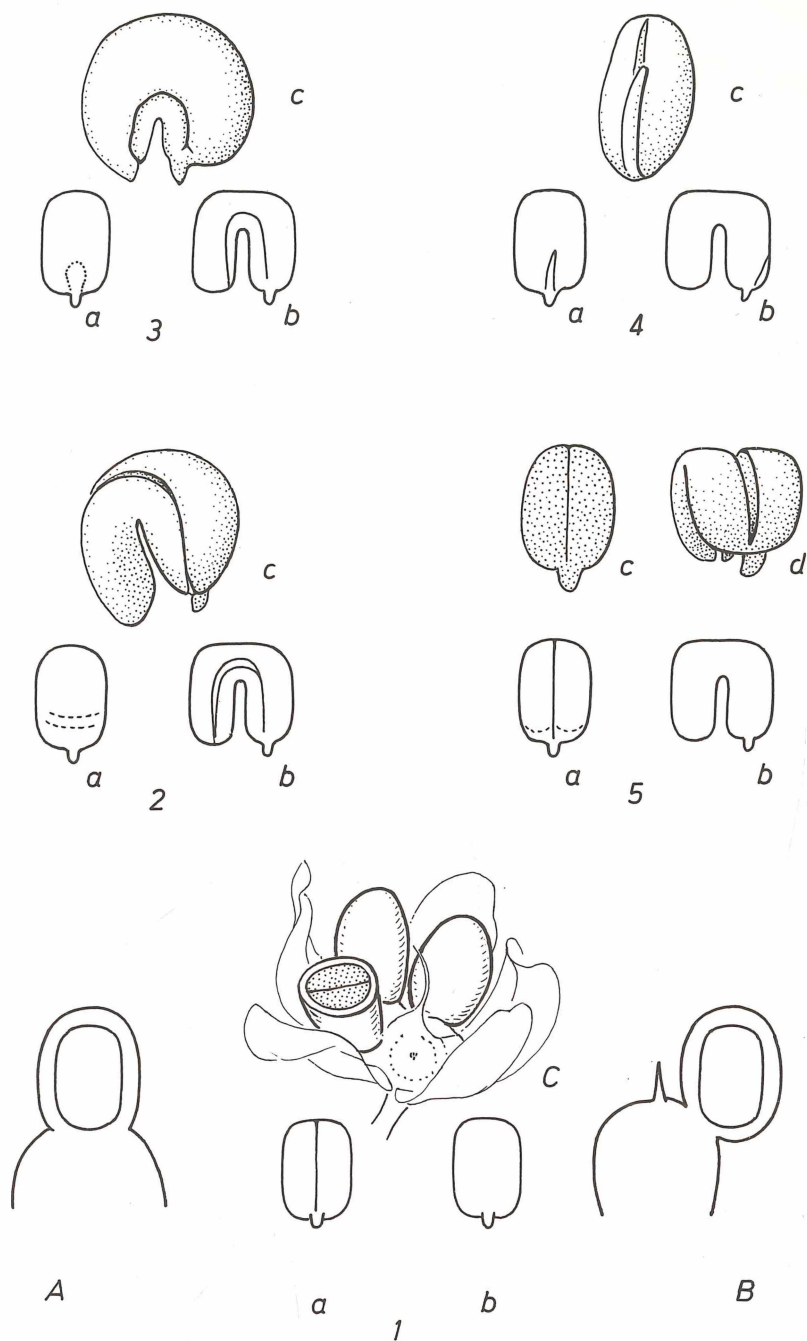


Table I
A, a: tangential optical view
B, b: radial optical view

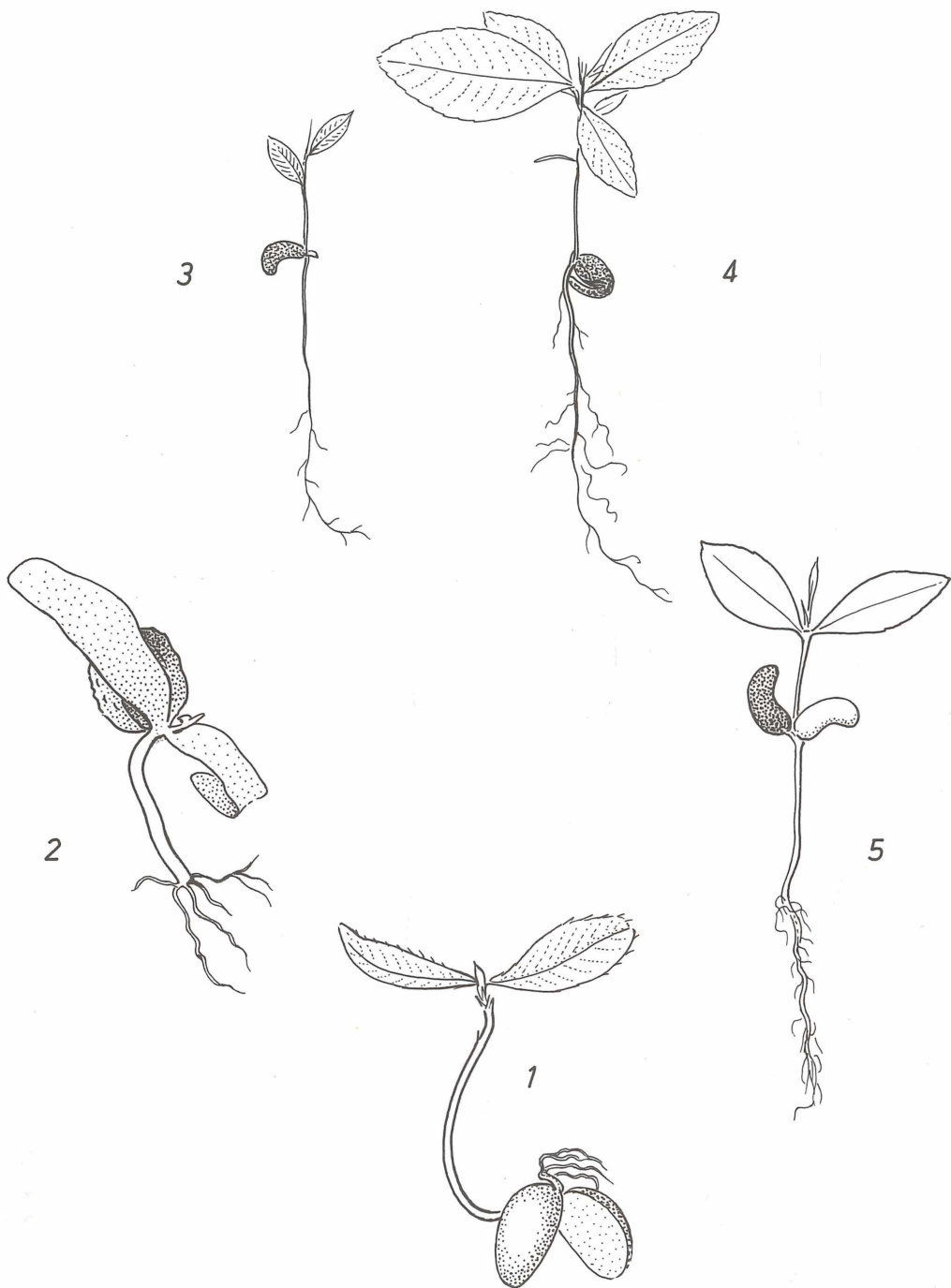


Table II
Explanation in text

International Cooperation

G u n n (1972) cites the lack of a list of or an organization for the few seed-identification specialists who work in museums, botanic gardens, universities, or government agencies. The disciplines concerned are archaeology, palaeobotany, taxonomy, ethology, ethnobotany, and so on. It is proposed to make here an inventory of all existing seed and seedling collections in the world. This should prove useful to all botanists. A questionnaire about the occurrence of seed-collections has been sent out to over 600 botanic gardens and seed-testing stations with which we exchange seeds. It is also proposed to encourage exchanges of accurately named seeds and seedlings in order to insure against irreparable loss in the event of a catastrophe such as a fire.

Zusammenfassung

Der Botanische Garten der Universität Basel legt die Problematik einer Samen- und Keimlingssammlung aus Pflanzen, deren Nachbestimmung im Botanischen Garten erfolgt, dar. Der Autor zeigt eine Anwendung von Samen- und Keimlingsmorphologie in seinen Studien über Ochnaceae. Zuletzt wünscht der Autor eine Zusammenarbeit mit den wenigen Spezialisten, die Samen und Keimlinge studieren.

Resumé

Le jardin botanique de l'Université de Bâle présente la problématique d'une collection de graines et de plantules appuyées par la vérification de l'identité de la plante mère par la culture au jardin botanique. L'auteur montre le parti que l'on peut tirer de la morphologie de la graine et de la plantule dans ses études personnelles sur les Ochnaceae. Il s'adresse enfin à l'opinion internationale des botanistes pour promouvoir une coopération entre les spécialistes de l'identification des graines et des plantules.

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