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1. Assessing a potential collection.

Before a single seed is collected, the seed collector will need to make an assessment of the plant population he/she intends to collect seed from. The following steps should be followed:

1.1. Is the population a target species?

The seed collector will usually be targeting certain plant species for seed collection, and will ideally have a list of species to collect. The first question to ask is whether the plant population is of a target species. Examples of species that might be targeted are: endangered species; endemic (rare) species; economically important species; species with orthodox (dessication tolerant) seed behaviour; species for research etc.

1.2. The genetic diversity of the population

The seed collector will need to establish that there are enough individual plants producing seed to enable a thorough sampling of the genetic diversity of the population. It can be assumed that the majority of the genetic variability of a particular species is present in a single population. However, to sample 95% of the genetic diversity in a population, it is necessary to collect seed from at least:

- 30 randomly chosen individuals in a fully outbreeding sexual species, or
- 59 random individuals in a self-fertilizing species

i.e. from at least 50 individuals per population.

The seed collector will also need to decide on a sampling strategy, depending on the aims of the collection. Random, stratified random or systematic sampling methods are usually employed. However, biased sampling can take place if the collector wants to capture a particular characteristic of a plant, (e.g. flower colour for horticulture).

1.3. The physiological quality of the seed

The next step for the collector is to assess the physiological quality of the available seed. The optimum time to collect seed is when the seed is on the point of natural dispersal. The indicators for natural dispersal include: changes in fruit colour; changes in seed coat colour; fruits splitting or breaking open; seeds rattling; seeds that are hard and dry; and some seeds already dispersed.

1.4. The physical quality of the seed

The collector should also assess the physical quality of the seed. Is the seed empty? Is there insect damage? Are the seeds malformed? The most useful way of testing physical quality is by cutting a sub-sample of the seeds in half, and examining them for damage with a hand lens.

1.5. The availability of seed

The final assessment that the collector needs to make before collecting the seed is whether enough high quality seed is available for his/her purpose. Reasons for collecting seed may include: long term conservation; elucidation of germination protocols; storage behaviour studies; other research. In all cases, the aim should be to achieve a large sample of high quality seed.

2. Collection of seeds, herbarium specimens and associated data.

Once the collector has made the decision to collect seed from the target population, the following steps should be followed:

2.1. Health and safety

The seed collector should first consider issues of health and safety, and discuss these with the team. Are there risks associated with the terrain, or accessibility to the population? Is the population vulnerable to seed collecting? Are there dangerous animals in the vicinity? Are the plants/seeds toxic? If any such risks apply, then strategies should be agreed to minimise them.

2.2. Team work

It is always advisable that seed collectors work in teams. In these cases it is essential that a team plan is discussed and agreed before collecting begins. It is particularly important that all team members agree on which species is to be collected first, and that all have a sample of the plant, to avoid making mixed collections. Once the plant has been identified, then the team will need to agree a collecting pattern (see 1.2 above). Examples of an agreed collecting pattern are as follows:

- Remove 5 mature fruits from each individual across the whole population
- Shake an accessible branch from every third bush alongside the road
- Every 2m across a transect, remove one seed head from the target grass

2.3. Seed collection

Once all the above preparation has taken place, seed collection can begin. Some general rules for seed collecting are as follows:

- Sample initially from the most accessible population
- Use random/stratified/systematic sampling (record which)
- Sample from >50 individuals per population
- Aim for at least 10,000 seeds
- Collect a maximum of 20% of available seed

The seeds should be collected at the point of natural dispersal, kept cool/aerated in the field, and transferred to a seed bank as quickly as possible where they can be dried to safe moisture levels. Physical damage should be minimised at all stages.

2.4. Post-collection treatment

Drying is the most important step after collection, and can be achieved through aeration, the use of silica gel, spreading out the seeds on newspaper in an air conditioned room etc. Seeds in fruits should ideally be removed prior to drying. For every 1% reduction in seed moisture content, the life of the seed is doubled. Poor handling of seeds after collection can greatly reduce their quality.

2.5. Collection of herbarium specimens

The second essential element of seed collecting is the collection of herbarium voucher specimens. Herbarium specimens are essential for the following reasons:

- They enable specialist identification of the collection
- They enable nomenclature updates / taxonomic research
- They assist in the event of labelling problems
- They assist in the event of mixed collections
- They are a biological record in own right

When collecting a herbarium specimen, the collector should collect as many organs and reproductive stages represented on the plant as possible, from roots to growing tips. For large perennial plants (e.g. trees) all the voucher material should be collected from one plant, and a typical individual should be chosen from the population. For smaller, annual plants several complete individuals should be collected. Herbarium specimens should be pressed

with care and labelled *immediately* to avoid future confusion. We recommend that multiple duplicates are made.

2.6. Collection of data

The third essential element of seed collecting is data collection. Seeds are useless without their associated provenance data. The general rules for data collection are as follows:

- Record as much potentially useful information as possible
- Record data during and immediately after the collection
- Use a single collection number, and a single data sheet per collection
- Check for missing data at the end of the day

Data collection can be achieved on paper or via electronic means. Both methodologies have advantages and disadvantages. Data collection should be as comprehensive as possible. The following information is important: date, personnel, taxon, locality (lat/long), habitat, associated species, land form, land use, geology, soil, slope, aspect, population size, threats, plant description, approx. number of seeds collected, number of plants sampled, uses etc. Bad data makes a bad collection.

3. References

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