H6. Harvest of cultivated and wild collected plants

Harvesting procedures for both cultivated and wild collected plants require proper attention in order to ensure botanical quality. Harvest timing, weather conditions, handling of the harvested material, and other factors must be carefully considered. This section recommends good harvesting practices applicable to farms in general; it does not include any specialized requirements established in 21 CFR Part 112 for covered produce farms.

H6.1 Harvest conditions

Harvest season and harvest time are important factors in the collection of good quality plant material. Furthermore, the condition of the plants themselves at the time of harvest has a significant effect on quality, as do ambient weather conditions and the actual practices that are used to conduct the harvest.

i. Crop condition. Schedule the harvest, both in terms of time of year and time of day, when the crop is in the proper condition to meet established quality requirements. Consider such factors as the maturity of the plants or degree of ripeness, size, color, moisture levels, and other characteristics, as well as measured constituent levels if applicable.

ii. Weather conditions.

1. Evaluate weather conditions at the actual time of harvest. Depending on the circumstances, it may be preferable to avoid harvesting when rain, dew, or excessive humidity are present; alternately it may be preferable to expedite the harvest and move the material to a dry area. It may also be preferable to avoid harvesting in hot weather, especially if the crop is susceptible to wilting.

2. Consider weather forecasts for several days immediately following harvest if rain, heat, or other weather could adversely affect the quality of the harvested material.

3. Wet weather may pose greater problems with delicate plant parts such as leaves and flowers and fewer problems for harvest of sturdy plant parts, such as bark or roots. However, splashing from rain or hail may contribute to excessive levels of dirt in the harvested material, which will need to be removed.

4. If harvest must occur under wet conditions, take care where necessary to dry the material promptly and properly to avoid damage and spoilage from mold or soil bacteria.

iii. Harvest timing. The following guidelines may assist in determining the best time to harvest various types of crops. However, these are only general in nature; the actual seasons and life cycles for collecting any particular plant material may vary.

1. Always take into account any harvest season specifications that have been set by the material’s buyer.

2. Review harvest research that has been conducted to evaluate the optimal harvest times for various plants.

3. Consider the timing of harvest in light of other needs, such as allowing seed to mature for the next season’s planting or for regeneration of a wild population after collection.

4. It is often preferable for above-ground parts of plants to be collected early in the day but after any dew has evaporated. (This may be less relevant to harvest of bark.)

5. Leaves. Collect leaves from herbaceous plants before the plant flowers, unless otherwise specified. Collect tree leaves anytime during the growing season, except that leaves from some deciduous species should be harvested in a particular season to maximize desired constituents.

6. Flowers. In general, harvest flowers (or if specified, flowering tops) when they have just opened or shortly enough afterwards to avoid faded or brown blossoms. If harvest specifications require flower buds, collect these before the buds open.

7. Fruits. Harvest fruits when they are mature and ripe, unless specifications require collection of immature fruit.

8. Seeds. In general, harvest seeds just as they are ripening or when they, or the fruit in which they are contained, are fully ripe.

9. Roots. Dig the roots of annual plants when the plants are well developed, but generally before flowering. Harvest roots of perennials late in the fall or early in the spring. Collect biennial roots in either the fall of the first year or spring of the second year.

10. Barks. Where possible, harvest barks in the early spring, prior to any new growth, or in the late fall or winter.

11. Saps and pitches. Collect tree saps and other exudates late in the winter or early in the spring. Leave a protective layer of sap or pitch to provide protection for the tree against infiltration by insects and pathogens.

12. Whole plants. When collecting whole herbaceous plants, or the entire aerial parts of herbaceous plants, harvest prior to any visual decline in any of the plant parts. This is typically at the stage when flowers are emerging.

H6.2 Harvest quality

Harvest and handling practices have a significant impact on the quality of the harvested material.

i. To the extent possible, avoid harvesting plant materials that are broken or moldy, exhibit insect damage or excessive insect infestation, or are otherwise undesirable.

1. Limit the proportion of discolored leaves in any leaf harvest to meet established specifications, if any.

2. Collect only unbruised fruits and pack them carefully if necessary to prevent bruising.

3. Encourage departure of insects from harvested flowers by shaking the material and by allowing it to sit for some time.

4. Handle carefully any delicate plant parts such as flowers, tender leaves, and ripe fruit to avoid bruising and spoilage.

ii. For leaves, flowers, and roots that are rich in essential oils, handle the material carefully to prevent release and degradation of the oils. Essential oils commonly occur in glands on the surface of the plant, and the more the glands are disturbed the more essential oils will be lost.

iii. Conduct the harvest in a manner that minimizes the presence of foreign matter in the harvested crop, such as soil, weeds, insects, bird nests, spider webs, lichen, trash, plant parts other than the desired part, etc.

1. If collection is done by shaking plant material from trees, collect onto a clean tarp to prevent direct contact with soil.

2. Remove foreign matter at the time of harvest or prior to transporting the harvest from the field, if practical.

iv. Examine the harvest carefully and remove damaged, degraded, moldy, off-color, improperly sized, or otherwise undesirable plant material, and remove non-target plant parts where they occur (as by separating berries or flowers from stems).[[1]](#footnote-1) Also remove any contaminant species that may have been inadvertently collected with the harvested crop, with special attention to any local species that are toxic or potentially toxic. During this inspection, remove as much dirt as possible.

v. Ensure that harvested materials are kept clean and isolated from contaminants such as dirt, dung, smoke, and exhaust.[[2]](#footnote-2) Where the harvest is stored on the ground temporarily, consider using plastic sheeting or another clean material between the harvest and the soil; however, this is not appropriate for all crops, especially large-volume crops that are cut and left in the field to dry (e.g., alfalfa).

vi. In general, avoid compaction of the harvested material as this may cause physical damage as well as temperature build-up and overheating.

vii. Protect the harvested crop from moisture where necessary to minimize growth of bacteria, yeast, and mold. Unless fermentation is desired, ensure adequate air circulation around the harvested material, especially if stored in containers or under a cover.[[3]](#footnote-3)

viii. Protect the harvested crop from contact with birds, rodents, insects, and other animals.

ix. Control exposure of the harvest to the elements (sunlight, heat, wind, etc.) as appropriate. In many cases, the harvested material should be protected from the elements in order to preserve freshness. In other cases (e.g., where sun-drying is desired) such exposure may be beneficial.

x. Transfer the crop to an appropriate receiving station. Ensure that the harvest is not inappropriately fumigated during transport.

H6.3 Harvest documentation and samples

i. A lot number should be assigned to harvested materials on an appropriate basis (e.g., one day’s harvest is one lot; one field’s harvest is one lot; or one collector’s harvest is one lot).[[4]](#footnote-4) Whichever criteria are used, ensure the material in one lot can reasonably be expected to be uniform and consistent.

ii. Records.

1. Records should be kept of the following:

* Botanical identity of the harvested crop, including plant part.
* Lot number(s).
* Harvest date(s).
* Harvest quantity(s).
* Harvest location(s) (e.g., field numbers or collection sites).
* The identity of personnel involved (e.g., collectors and harvesters; supervisors and managers).
* The age and/or life stage of the crop at the time it is harvested, where necessary for clarity.
* Field conditions at the time of harvest, where relevant.
* Other information as needed.

2. Consider making a photographic or videographic record of the cultivation or collection site and of the plant population(s) and individual plant specimens.

3. All records with relevance to a particular cycle of harvest should preferably be retained past the time when the harvested crop is no longer in the marketplace, which may be several years or more.[[5]](#footnote-5)

iii. Labeling. Label harvested materials as appropriate to prevent the possibility of mix-ups. Include the lot number. Include the presence of any allergens and the grade such as organic or non-GMO, especially when needed to distinguish between similar crops on the same farm.

iv. Voucher specimens. Consider preparing appropriate voucher specimens of the harvested plants. This may be particularly important for wild harvested plants.[[6]](#footnote-6)

1. For wild harvest, it may be appropriate for each collector to submit a voucher that is representative of the plants harvested by that collector.

2. Vouchers should be labeled with the botanical identity, date of preparation, person who prepared the voucher, and person who harvested the plant. Details such as the harvest/collection date, harvest/collection site (e.g., country and latitude/longitude), and general descriptions of the plant and habitat at the time of harvest should be annotated on the voucher or maintained in associated documentation.

3. Each voucher should be assigned a voucher number and records should be kept of which harvest lot numbers are represented by a given voucher.

v. Keep a retention sample of each lot of harvested material.

1. The sample may be taken either immediately after harvest, after washing and cleaning the harvest (if performed), and/or after dehydration (if performed). In any case, at least one retention sample should be taken before the harvested material is subject to any size reduction steps.

2. Label the retention sample with the botanical identity, lot number, and any other relevant information.

3. Store the sample in a manner to protect against insects, microbial growth, moisture, excessive heat, and other sources of degradation. If the sample consists of fresh plant material, store the samples in a frozen or dried state.

4. Maintain the retention sample in storage for several years or as long as the records associated with the lot are retained.

1. The process of separating the target plant material from unusable or undesirable material is knowns as “garbling.” [↑](#footnote-ref-1)
2. Smoke and exhaust contain polycyclic aromatic hydrocarbons (PAHs), which are known carcinogens. Many governments have imposed limits on the permissible content of PAHs in foods and other products. [↑](#footnote-ref-2)
3. Some crops are fermented after harvest in order to prepare the material for use (e.g., vanilla, cocoa, and other spices); in such cases, post-harvest storage conditions should be appropriately chosen to stimulate the necessary fermentative enzymes and/or microorganisms. [↑](#footnote-ref-3)
4. AHPA strongly recommends use of lot numbers for both food and non-food crops in order to facilitate quality assurance. [↑](#footnote-ref-4)
5. Even when the harvested crop is sold in fresh form (i.e., a perishable form that might be expected to leave the marketplace quickly), downstream companies may process (e.g., by drying or extracting) the material into a shelf stable form that remains in the marketplace for years. [↑](#footnote-ref-5)
6. See Appendix 7 for detailed information about preparing voucher specimens. [↑](#footnote-ref-6)