

Circular 415

A Guide to Processing Kona Coffee Cherries

University of Hawaii Cooperative Extension Service

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A Guide to Processing Kona Coffee Cherries

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For the past several years we have studied the wet fermentation method of demucilaging coffee cherries in Hawaii. While investigating the bacteria responsible for this fermentation, we have also studied other organisms that can spoil coffee cherries before and during processing. Because superior quality should be associated with Kona coffee, we believe that the information obtained from these studies can be helpful to processors in Hawaii.

The purpose of this publication is to point out the steps most crucial in determining the success of demucilaging as well as the steps affecting spoilage, which lowers coffee quality. This circular is intended primarily for commercial processors and for farmers who process their own coffee, so detailed descriptions of procedures and equipment have been omitted. The information is presented as a guide to remind processors of the precautions necessary to improve fermentative demucilaging and, at the same time, decrease the possibility of spoilage. Because these precautions involve all processing steps, we have included the entire sequence from harvest to storage.

Harvesting and Handling

For superior quality coffee, harvest only fully ripe cherries by selective picking. Coffee does not ripen uniformly, so selective picking of ripe cherries requires several rounds of harvesting. Although labor cost is high, from four to eight rounds of picking are necessary during a season, depending upon ripening conditions. Harvested cherries should include (1) green ripe or mature green—those not fully ripe but having a yellowish-green skin and a well-developed mucilage layer; (2) hard ripe—those mature, red, and still firm; and (3) soft ripe—those mature, red or dark red, yet soft and juicy. Green cherries should not be picked because their mucilage is not sufficiently developed to protect them from bruises during pulping. Also, they yield poor quality coffee. Over-ripe and dried cherries lacking mucilage should not be harvested.

Handle harvested cherries carefully to avoid crushing, which increases their susceptibility to spoilage. Overheating from the sun and from stacking bags speed up spoiling also. Do not leave bags of cherries in the sun, and do not stack the bags until shortly before hauling them to the processing plant. To prevent spoilage, leave individual bags of harvested cherries under the coffee trees.

Flotation

Flotation of cherries is useful but not absolutely essential. Most defective beans can be removed later during grading. Flotation separates the lighter cherries—the dried, partly-dried, and under-developed cherries—but not the under-ripe, green cherries, which sink along with the ripe ones. When a farmer has fallen behind in his harvest schedule and has a large portion of dried cherries in his crop, flotation can be used to eliminate the dried cherries present in the picking basket.

Dump harvested fruits into a large tank of water and stir the mass to help float the lighter cherries, the leaves, twigs, and bark. The sound, heavier cherries will sink and can be removed for further processing.

Pulping

If possible, pulp cherries the same day they are picked. Even sound, wholesome cherries deteriorate in a few days. A handful of spoiled cherries can cause spoilage in an otherwise excellent bag. If harvested cherries must be kept for longer than a day, store the bag in a cool, shaded place until they can be processed.

Adjust the pulper carefully to the proper width—not so tight that it will crush the beans or so loose that incompletely pulped beans will be ejected with the pulp. Between uses, clean the pulper thoroughly and repair any broken or faulty parts.

Use a mechanical shaker or rotary screen to remove skin and unpulped cherries from the pulped mass. The unpulped cherries can be repulped separately, then included in the fermentation vat.

Fermentation

The pulped fruits have a mucilage layer that must be removed before the beans can be dried properly. During fermentation, this mucilage layer is decomposed by certain bacteria so that it can easily be washed off with water.

Begin the demucilaging process by filling the fermentation vat about half-full of pulped cherries and add enough water to barely cover the top layer. Allow the beans to ferment until the mucilage layer has decomposed enough to be removed by washing. At this point, fermentation has accomplished its purpose, and the beans should be washed. *Over-fermentation* (“acidic”) should be con-

sidered spoilage. Undesirable bacteria can grow and cause discoloration, off-odors, and off-flavors in the coffee beans. Washing the beans promptly at the correct stage will prevent such spoilage. However, if the beans are washed too soon *before* demucilaging is completed, the remaining mucilage will pick up moisture and interfere with drying.

To test if demucilaging is completed, remove a handful of beans from the fermentation tank and rub them together in the palm of your hand. If the beans are no longer slippery, fermentation is completed. With experience, you can predict the approximate time needed to ferment a batch of beans under existing conditions. It is still wise to test each batch of beans to be sure that the process has gone properly.

Wooden vats are preferred to concrete because they hold the heat generated during fermentation, helping to speed up the process. A roof should be built over the vats to protect the beans from rain and from overheating due to excessive sunlight.

Vats should be emptied and thoroughly cleaned immediately after each fermentation. Beans and fermentation liquor left in the vats will allow undesirable organisms to continue growing. These residual organisms can cause unpleasant flavors, odors, and discoloration in subsequent batches of cherries, lowering coffee quality.

The speed of demucilaging is greatly influenced by temperature. Fermentation proceeds best at about 80 to 90° F. In warm climates, fermentation can be completed in less than 12 hours; in cooler regions, it may take 2 days or even more. For overnight fermentation, the ideal temperature is between 60 to 70° F. Too much heat harms the beans; too little heat slows down fermentation.

Washing

Immediately after fermentation, wash the beans with *clean* water. Agitate the water and beans for more efficient removal of the mucilage layer. Use a mechanical shaker to help drain excess water from the washed beans before drying. It is especially important to remove excess water from beans that will be dried exclusively with artificial driers.

Drying

Washed coffee beans (parchment) are dried to the proper level of about 11.5- to 13.0-percent moisture content by sun-drying or mechanical dehydration. Regardless of the method used, it is important to handle coffee beans gently during drying. If the parchment is broken before the beans are dry, the resulting green coffee will be bleached and poor in cup quality. Guard against over-drying as well as under-drying. If coffee is *over*-dried, its color fades, weight is reduced unnecessarily, and the bean shrinks. When coffee is *under*-dried, mold infections can cause flavor deterioration.

To test if drying is complete, rub several beans between the palms of both hands. The best time for testing is *during* the drying process when the parchment is brittle. If the bean is not too moist, the parchment will rub off easily. Since testing requires some experience, beginners should learn by first rubbing individual beans between the thumb and forefinger before attempting to test a handful at a time. Dryness can also be determined by the color and hardness of the beans. A moist bean is light-colored, but darkens as it dries, becoming almost a translucent black. As the bean approaches final dryness, it becomes light green. After storage for a few days, the bean becomes

darker green. Insufficiently dried beans will bleach during storage. Usually, it is sufficient to judge dryness by bean color, but some processors also bite the bean to test dryness.

Sun-drying may be done on paved grounds, wooden platforms, or movable trays. During sun-drying, the beans should be turned over frequently. They should be protected from rain, which not only disrupts the drying schedule but also causes a color loss that gives the beans a spotty appearance. A movable roof should be installed over the platform to shield the beans from rain. Keep the drying area clean, and do not use it to dry other products which may contribute tainted odors to the coffee. Drying on elevated platforms is advisable because it prevents absorption of odors from the soil.

While apparently simple and inexpensive, sun-drying requires considerable time, a large drying area, and much hand labor. During sunny weather, drying takes from 4 to 6 days; in cloudy weather, it takes longer. Serious problems can occur during rainy weather because the processor must store the partly dried beans. These beans are extremely susceptible to mold spoilage and can become musty, lose their color, and undergo a general loss of cup quality. Since coffee is harvested daily, the cherries must be pulped daily, or at least once every 2 days. When coffee is dried by the sun only, the processor should have sufficient space to accommodate the harvested coffee for 8 days or longer. Hence, all processors should also have facilities for drying coffee artificially.

Temperature is very important in mechanical drying because coffee heated above 150° F. loses its aroma. If wet beans are exposed to excessive heat, "case-hardening" can occur. The surface dries too fast, and a hard, dry, outer shell forms. Although these beans *look* dry, their centers are moist and soft. The inner portion of the beans will dry slowly because moisture has difficulty passing through the

outer shell. These beans will bleach rapidly during storage, and their cup flavor will be damaged because of improper roasting.

In Kona, wet coffee is dried in rotary or columnar hot air driers at 135 to 140° F. for about 10 to 12 hours. The beans are cooled and then kept for at least 24 hours in resting bins before being redried to the proper moisture level. If possible, the drying schedule should be adjusted to permit two resting periods between dryings.

In some areas of Latin America, washed coffee is sun-dried for at least 2 days in sunny weather before the drying is finished with rotary or columnar driers. Drying wet beans exclusively with stationary driers is not desirable.

After drying, allow the parchment coffee to cool for at least 10 days in "resting bins" or in bags. During storage the moisture will equilibrate, and the beans will regain the small amount of moisture needed to prevent shattering during the hulling operation. If the moisture content is still too high after "resting," additional drying is needed to reduce moisture to the proper level.

Besides temperature, air capacity is very important to the efficiency of artificial drying. The volume of air forced through the coffee should be sufficient to prevent moisture condensation within the drier, particularly during the initial stages of drying.

Hulling

If hulling is attempted too soon after drying, many beans may break into pieces that do not roast properly and thus affect the overall coffee quality.

Hullers used to remove the dry parchment coverings operate either by cutting or by rubbing off the membranes through friction. If friction is used, guard against overheating by cooling the beans in an air blast.

Sorting and Grading

Coffee beans should be separated mechanically by size and specific gravity. Size sorting can indirectly determine bean quality by separating the smaller beans which usually have more imperfections than larger ones. Similarly, mechanical sorting by specific gravity eliminates defective beans, shells, and stones, which have different specific gravities from sound beans. Hand-sorting still is the most reliable method because beans with blemishes, cracks, uneven color, and damage spots can only be detected visually. Hand-sorting is economically impractical for most processors in Hawaii because labor cost is high.

High-quality green coffee consists of clean beans, reasonably free of visible imperfections, with uniform green color, good roasting quality, good aroma and flavor when brewed, and a final moisture content between 9.5 to 11.0 percent.

Packing and Storing

Pack the beans in clean bags. It is pointless to maintain strict cleanliness during processing and then store the beans in dirty bags. Green coffee that must be stored before shipping should be kept in a clean, cool, dry place with ample ventilation. Do not store bags of green coffee near pesticides, fertilizers, or weed killers, because coffee can readily absorb unpleasant odors.

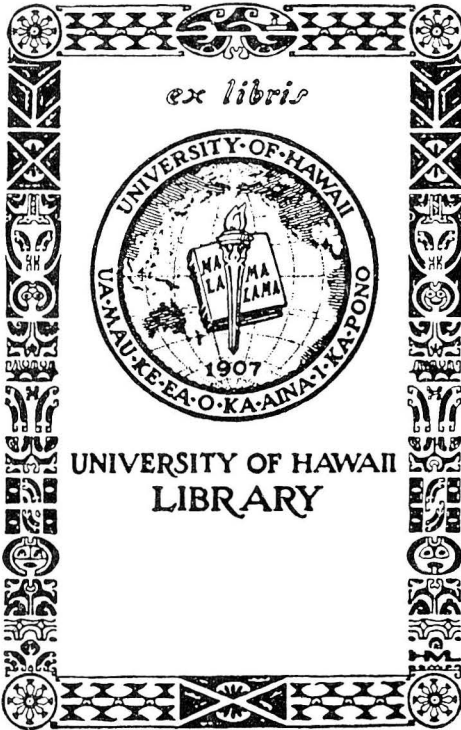
Reminders

Things to Do

1. Harvest only mature cherries.
2. Process the cherries soon after harvest, preferably within 24 hours.
3. Use plenty of water to clean equipment and utensil surfaces that touch the coffee during processing.
4. Use only clean water for all stages of processing.
5. Keep all machinery and equipment in good operating condition.
6. End the fermentation as soon as the mucilage can be washed off with water.
7. Dry the beans evenly and thoroughly.
8. Use only clean bags to pack the beans.

Things to Avoid

1. Do not harvest immature or over-mature (dried) cherries.
2. Do not allow bags of cherries to lie unprocessed for longer than 2 days.
3. Do not wash the beans either before demucilaging is over or too long after fermentation is completed.
4. Do not dry the beans excessively or insufficiently.
5. When sun-drying, do not spread the beans in layers that are too deep. Stir often.
6. When drying mechanically, do not heat beans above 150° F.
7. Do not hull the beans too soon after drying.
8. Do not handle the beans roughly at any stage in the processing.



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