



Curing and Aging Country-Style Hams Under Controlled Conditions

Circular 617 • By W.Y. Varney

UNIVERSITY OF KENTUCKY
COOPERATIVE EXTENSION SERVICE
AGRICULTURE AND HOME ECONOMICS

Curing and Aging Country-Style Hams Under Controlled Conditions

By W. Y. VARNEY

The flavor of country-style (dry-cured) ham is much preferred by many people over that of the conventional pumped ham. Production of this type of ham can be a profitable business, if it is done systematically. There is little doubt that consumption of this product will increase substantially as uniformity of product is attained. This is done by curing and aging the hams under controlled conditions.

"Controlled conditions" means curing under refrigeration and mechanically controlling the temperature and humidity of the aging room. Controlling humidity requires installation of a heating unit (installed in such a manner as to avoid the consumption of the oxygen of the room), a humidifying unit to add moisture when needed, and a cooling and dehumidifying unit to remove moisture when needed. An exhaust fan is needed for use after fumigation and a number of circulating fans are needed to provide good air movement in all parts of the room at all times.

The required equipment and proper insulation and moisture-proofing of the building are expenses that you would not have in aging hams under natural conditions. However, when you consider that shrinkage is reduced and loss through spoilage is minimized, the added expense does not seem so much. Furthermore, the inventory is turned about three times as fast under controlled conditions as under natural conditions.

Although building plans are available, it is felt that construction arrangements should be worked out on an individual basis because needs vary, depending upon the size of operation, individual preferences, and existing facilities.

It is strongly urged that a sound program be developed and followed to minimize the risk of loss and to insure a uniform product. In this, as in most enterprises, experience is invaluable in assuring success. Therefore, do not make an extensive investment until you have gained some experience.

Selection and Delivery of Hams

1. Select meaty, short-cut hams. The short-cut ham is much preferred over the old fashioned long-cut ham because it allows the consumer more edible meat per dollar spent and is easier to handle in curing and aging. Regular (skin on) hams should be used if they are to be sold whole, while skinned hams may be preferable if they are to be sliced and packaged.
2. Hams should be sufficiently chilled but fresh. They should be placed in cure not later than three days after kill. Spot-check the internal temperature of the hams when they are received from the packer. The temperature should be 38°-40°F. Do not pack or stack them if the internal temperature is above 42°F and do not accept them if it is above 45°F.

Curing Mixture and Application

The basic curing ingredient, of course, is salt. To this, sugar is added for enhanced flavor and a softening effect, and saltpeter as a color fixing agent. The latter may be either potassium nitrate (KNO_3) or sodium nitrate (NaNO_3). Other ingredients such as pepper, molasses, etc. are sometimes used, but these represent an additional expense and are of questionable value. In fact, many people feel that they detract from the appearance of the hams.

It is suggested that at least 6½ but no more than 7 pounds of salt be used per 100 pounds of hams in shelf-curing. It is important that spoilage be avoided, of course, but it is also quite important that excessive saltiness be avoided. Keep in mind that too much sugar tends toward slime production. It is suggested that 1½ pounds of sugar per 100 pounds of hams be the upper limit. At least 2 but no more than 3 ounces of saltpeter should be used per 100 pounds of hams.

Suggested Mixture

100 lb salt (medium flake)
20 lb sugar (white)
2 lb saltpeter (granulated)

Use 8½ pounds of the mixture for each 100 pounds of hams. Use 60 percent for the first application and the remaining 40 percent 10 to 14 days later, depending upon the penetration of the initial application.

Alternate Mixture

100 lb salt (medium flake)
10 lb sugar (white)
2 lb saltpeter (granulated)

Use 7 pounds of the mixture for each 100 pounds of hams. Use 60 percent for the first application and the remaining 40 percent 10 to 14 days later, depending upon the penetration of the initial application. More even distribution of salt may be attained and slime development retarded by rubbing the remaining pockets of the curing mixture over the hams about 10 days after the last application.

Curing Schedule

The temperature of the curing cooler should be maintained at as near 38°F as possible. It should not be below 36°F nor above 40°F. The relative humidity should be 75 to 80 percent.

The hams may be cured on wooden shelves, but it is advisable to cover each shelf with a sheet of polyethylene. Stacking should be done so as to provide the greatest utilization of space. Hocks should be covered by other hams as much as possible. This keeps them moist, which provides better salt penetration and therefore is an aid in preventing spoilage.

One side of the shelves should be elevated slightly to allow drainage. It is advisable to arrange the shelves so that the hams on higher shelves do not drain on those below.

The hams should remain in cure approximately 40 days. They should then be washed thoroughly. Use a scrub brush and change the water often enough to keep it clean. They probably should be soaked 2 to 4 hours if smoking is to be done.

After washing, and soaking if this is to be done, place the hams in stockinette. The hock-ends may be up or down. There are advantages and disadvantages both ways. Be sure that no water remains in the hocks if they are to be turned up. It may be advisable to hang the hams on a rack and dry the surfaces with a fan before placing them in the salt equalization room.

The temperature in the salt equalization room should be maintained at 50°-55°F and the relative humidity at 60-65 percent. Some air movement should be provided in all parts of the room.

The hams should be hung on racks so that they do not touch each other. They should remain in this room at least two weeks.

When considering the refrigeration and dehumidification equipment requirements for the salt equalization room, it should be noted that water equivalent to approximately 10 percent of the weight of the hams must be removed from the room. The need for a good vapor barrier for walls, ceiling, and floor is also emphasized.

Smoking

It is not essential to smoke your hams. However, most people feel that smoking adds substantially to the attractiveness of a ham and it also serves as an anti-oxidant (prevention of excessive rancidity).

If hams are to be smoked, this may be done immediately after removal from the salt equalization room. However, they may be moved directly to the aging room and held a few days or even a few weeks prior to smoking if this is more convenient or desirable for you. Smoke at a cool temperature (80° if possible and certainly not to exceed 90°) until a pecan-like color is developed. Do not smoke the hams to an excessively dark color.

Aging

The temperature in the aging room should be maintained at 70°-75°F and the relative humidity at approximately 65 percent. Heating, cooling, and dehumidifying equipment is needed. Humidifying (moisture adding) equipment may be desirable in winter. Do not install heating equipment that would consume the oxygen in the room.

An exhaust fan should be installed at an end or on a side of the room for use after fumigation. Air intake openings near the floor are also needed for this. A sufficient number of circulating fans should be used to provide some air movement in all parts of the room. This helps to prevent mold growth.

The hams should be hung on racks so that they do not touch each other. It is recommended that they remain in the aging room at least three months but not more than four months before sale.

Summary of Conditions and Times in Curing and Aging

	<i>Temperature</i>	<i>Relative Humidity</i>	<i>Time</i>
Curing cooler	38°F	75-80%	40 days
Salt equalization room	50°-55°F	60-65%	2 weeks
Aging room	70°-75°F	65%	3-4 months

Sanitation

Cleanliness is the first line of defense against spoilage, slime development, etc., so a good sanitation program *must* be followed consistently.

Wash bins, shelves, etc. thoroughly with a good detergent and water and rinse thoroughly with clean water before placing a fresh batch of hams in cure. Practice periodic cleaning of curing room walls and floor. Use clean utensils. If there is any doubt at any time about the cleanliness of any item, wash it!

Protection from Insects

Insect infestation can be very costly and may be disastrous if proper control measures are not used consistently. The most common pests are given below:

Skipper (*Piophilha casei* L.)

The eggs are laid by a small, two-winged fly which is about half the size of the housefly. The eggs hatch in about 36 hours into small, cylindrical, white maggots which are called "skippers" because of their leaping power. The larva completes its growth, under favorable conditions, in 7 to 10 days. Then it moves to some dry spot, contracts in length, and becomes yellowish. The outer skin separates from the body and gradually hardens and darkens into a golden brown. This resting stage lasts about 10 days, when the adult insect, the fly, emerges. The fly lives about 10 days in the summer. Its entire life cycle may be concluded within 3 weeks, under favorable conditions.

The smallness of the fly requires that the room be screened with 30 to 32 mesh screen. The fly is not active at night but is able to perform its life work in a partially darkened room. It does not often attack fresh meat or meat that has been salted and not smoked

but the odor of smoked meat attracts it. The larvae feed on the soft, lean tissue of the meat and are referred to as deep feeders.

Red-Legged Ham Beetle (*Necrobis rufipes* De G.)

This beetle is rather slender and of a dark bluish color, with reddish legs. The larva is a slender grub, covered with scattered hairs. At first, it is white with a brown head and two small hooks at the end of the body. As it matures it becomes darker, and when full-grown it is grayish white with a series of brown patches above. The life cycle may be completed in 45 to 50 days. This beetle appears about the first of May. The larvae usually eat the fat near the surface and so are referred to as surface-feeders.

Larder Beetle (*Dermestes lardarine*)

This beetle is dark brown with a yellowish-brown band across the front half of its wing covers. On the band are six black dots, three on each side of the middle line. The larva is small, brown, hairy, and has two short, curved spines on the top of the last abdominal segment. Its habits are similar to those of the red-legged ham beetle.

Cheese or Ham Mite

This mite is whitish at first, with six legs, but the adult has eight. It is so small that it can barely be seen by the naked eye. It frequently attacks hams, eating great holes in them and leaving material of a powdery consistency. Infestation may be detected by the presence of this material on the surface around the aitch bone. It is sometimes mistaken for mold. It seems that the longer hams are aged, the more susceptible they become to infestation by this pest.

Blow Fly (*Calliphoridae*)

There are several species of this fly and they vary in size from that of a housefly to two or three times as large. The adult fly is metallic blue, metallic green, coppery green, or greenish black according to the species. The larva (maggot) is white and varies in length from extremely small to one-half inch or longer. The egg hatches in one to two days. The developmental stage, from egg to adult, is 16 to 35 days and averages about 22 days. The adult fly lives about 35 days.

This pest lays its eggs on hams and seems to prefer those that

are fresh or nonaged. However, the possibility of infestation in aged hams should not be ruled out. The larva feeds for three to nine days, eating large holes in the ham and creating a disagreeable odor.

Control Measure

Screen all openings with 32-mesh screen. Follow a regular schedule of fumigation. Methyl bromide is a good fumigant for this purpose. It is available in one-pound cans or larger units. Use the application apparatus prescribed by the methyl bromide supplier. This is a "must" for safety.

Mount the part of the apparatus in which the methyl bromide can is seated and opened on a wall outside the aging room. Extend a plastic tube through the wall to a point near the center of the room and about two feet from the ceiling. Connect the tube to a piece of $\frac{3}{8}$ -inch x 4-foot perforated copper tubing with the terminal end closed. The copper tubing should be placed in a 4" x 4" x 4' galvanized pan. The perforated copper tubing and the galvanized pan prevent liquid methyl bromide from dripping on the hams. The tubing and pan will not come with the other part of the apparatus and will need to be made to order.

Before beginning the fumigation, close all openings tightly. This should be done from the outside to avoid the necessity of entering the room while it is filled with gas. Lock the doors and post warning signs. Have an exhaust fan switch located outside the room. Have one or more circulating fans located on the floor and turned upward during fumigation as methyl bromide is heavier than air and will settle too quickly without mechanical circulation.

Use two pounds of methyl bromide per 1,000 cubic feet of space. Allow ample time for dispersion of the material from the can before another can is used. The chemical changes from a liquid state in the can to a gas in the room. Allow the gas to remain in the room approximately 24 hours, then open the vents near the floor and turn on the exhaust fan. Run the fan at least one hour before entering the room.

If infestation is discovered, fumigate three times at 5-day intervals. Do not fumigate if the temperature of the room is below 65°F.