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Making Cheese on The Farm

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Cottage Cheese Making

By D. H. Jacobsen

Cottage cheese should be used by every farm household because of the low cost of preparation and high food value. Cottage cheese ranks well with meat and eggs in food value, and when it can be made from surplus skim milk it costs practically nothing except the time required for its preparation.

There are two types of cottage cheese which have been widely accepted as an outlet for skim milk both in the dairy plants and on the farm. The older and perhaps simpler type is the **Acid Type Curd** which can be made with raw milk or with pasteurized milk by the addition of sour milk starter. The newer type which is now being used in many localities is the **Low Acid, Rennet Type** of cottage cheese which requires both starter and rennet and can be made in a relatively shorter time. The methods for the preparation of the two types of cottage cheese will be discussed with directions designed for use in the home.

Selection and Care of Milk. The selection and care of the milk to be used for cottage cheese will largely determine the flavor of the finished product. If the milk is not produced in a clean, careful manner the unclean flavors will be carried into the cheese and result in poor off-flavored cheese. As the cream separator is a frequent cause of off flavors, it should be washed and aired thoroughly before the milk is skimmed.

The quantity of skim milk to be used in a batch will vary with the amount of cheese which can be used within two or three days. Cottage cheese is best if used when fresh and even if the milk is pasteurized before it is made into cheese, it loses its fresh flavor quickly. The yield from average skim milk is 14 to 16 pounds of cottage cheese from 100 pounds of milk. Three gallons of milk will make from 3½ to 4 pounds of finished cheese which is perhaps a practical size of batch for home use. With such small scale operations equipment such as that usually found in the farm home can be used.

If larger batches are to be made for sale the equipment must be purchased from dairy equipment concerns. In such a case a cheese vat and regular cheese making equipment must be used.

Acid-Type Curd Cottage Cheese

Acid Type Curd. The first requirement for successful cheese making is the use of a good dairy thermometer. Such a thermometer may be purchased from any of the dairy supply houses. Without control of the temperature it is impossible to get uniform results on different batches.

Cottage cheese may be made from raw milk but it is much safer to pasteurize the milk before it is used for cheese. Pasteurization gives much more uniform results and insures against some of the undesirable flavors which may develop in raw milk. Pasteurization may be carried on in the home by heating in a double boiler arrangement with the pail of milk set in a tub or can of water. The milk should be heated to 145 degrees and held for 30 minutes at this temperature. The milk is then cooled by changing the water in the tub or by the addition of ice until the temperature of setting, about 72 degrees, is obtained.

Setting the Milk. As it requires from 14 to 18 hours for setting, milk should be set at about 5 p. m. The curd should then be ready to cut early the next morning. The milk is warmed to a temperature of about 72 degrees. For a 25 pound batch one-half pint of starter or clean sour milk is added and stirred in thoroughly. The milk is then held overnight or until clabbered. When the milk is pasteurized, twice as much starter must be added to bring about coagulation in the required time. The starter may be made by souring a quart of clean milk at room temperature. It usually requires at least 24 hours to sour milk so it must be set the previous day. This starter must be clabbered and ready before the milk is to be set for cheese. Starters may also be obtained from creameries as the same type of starter is used in buttermaking.

With good starter and the temperature maintained at 72-74 degrees, the curd should be firm enough to cut in from 14 to 18 hours after setting. The condition of the curd may be tested by dipping the thermometer into the curd. When the curd breaks sharply ahead of the instrument and shows clear whey, the curd is ready for cutting.

Cutting the Curd. The process of cutting and cooking determines to a large extent the texture of the finished cheese. Cutting can be done best with a long knife or with a long handled spoon. The curd should be cut carefully to leave the curd particles about one half inch square and as uniform in size as possible. The cutting and heating helps to express the whey which must be completely removed or the curd will be sour and mushy in texture.

Cooking the Curd. The cooking process begins as soon as the curd is cut. The kettle or pail containing the curd is placed in a larger vessel of hot water placed on the stove. This allows for uniform heating as the curd heats from the sides as well as the bottom. The temperature in the curd should rise at the rate of about one degree per minute and the curd should be stirred gently to prevent overheating on the sides and bottom. When the temperature has reached 110 to 130 degrees the heating can usually be stopped. The curd at this stage should be firm enough to hold its shape when pressed in the hand. If the curd particles are soft in the center the heating must be continued. Soft curd particles give a mushy character to the finished curd at draining time. Too rapid heating may cause undesirable texture as the outside surface of each particle becomes tough before the heat has penetrated to the center. Cooking there-

fore should be carried on slowly. The process usually takes from one hour to one hour and a quarter to get the desired firmness in the curd.

Draining, Washing, and Salting. When the curd has reached the proper degree of firmness the whey is drained by pouring off as much as possible with the aid of a collander or strainer. Cold water is then added to replace the whey removed. The curd is stirred gently in the cooling water and then this water is drained. This washing is repeated two or three times depending on the acidity or sourness of the curd. With a very sour curd three or four washings will remove the acid and make a milder flavored cheese.

The washed curd is then drained in a cool place for about 30 minutes after which it is ready for salting. Salt is added at the rate of $1\frac{1}{2}$ percent or one ounce of salt for the cheese from 25 pounds of milk. If a creamed cottage cheese is desired, cream can be added at the rate of about one pint of cream to four pounds of curd. Separated cream is usually too rich and should be diluted by mixing with equal parts of milk.

Creaming, of course, is not necessary and many prefer the plain salted cheese. If cream is added the cheese will not keep as long and any unused cottage cheese will of course mean a loss of butterfat.

The finished cottage cheese must be kept in a glass, crockery, or enameled container as the acid will attack metal especially if the cheese is not kept very cold. Keeping the cheese cold will prevent souring and will help preserve the fresh flavor.

Summary

1. Select clean skimmilk of good flavor.
2. Add 1 percent starter or sour milk culture and stir in well. Set at 72 to 74 degrees for 14 to 16 hours.
3. When curd is firm, cut into squares and stir gently to break curd and expel whey.
4. Raise the temperature slowly to 110 to 130 degrees or until curd is firm.
5. Drain and wash with cold water. Repeat the washings to help remove acid.
6. Drain and chill for 30 minutes.
7. Add salt and cream to taste.
8. Store in jars in cold room until used.

Equipment Required

Measuring cup graduated in ounces.
Dairy thermometer.
Sour milk starter.
Large kettle or can (3 gal. capacity).
Metal tub or boiler.
Long knife or large spoon for cutting the curd.
Stove or other means of heating.
Can with perforated bottom for draining and storing.

Low Acid Rennet Type Cottage Cheese*

Low-acid rennet type cottage cheese is usually more widely accepted than the more sour fine grain curd because of its sweeter flavor, greater smoothness and better keeping quality. It is, however, more difficult to make because more equipment is required and the making process requires more attention.

Setting the Milk. The milk for this type of cottage cheese must be selected and handled carefully and then pasteurized (heated to 145 degrees and held for 30 minutes). This may be done by placing the can of milk in a tub or boiler of water and heating the water as in a double boiler. The milk is then cooled and held cold until the next morning before setting. As the setting process takes from 6 to 10 hours, it is best to set the batch early in the morning for afternoon cutting and cooking.

At setting time the milk is heated to 72 degrees and about 5 percent of clean sour milk starter is added, or about one pint of starter to a 24 pound batch of milk. The starter should be strained and then stirred into the milk very thoroughly. Rennet† is added at the rate of only two drops for 100 pounds of milk. The rennet must be diluted before it is added to the milk. Four drops of rennet may be diluted with one-half pint of water (8 oz.) and one ounce of this solution stirred into the 25 pound batch of milk. The diluted rennet cannot be saved from one time to the next as it deteriorates rapidly when diluted. It is important that the correct amount of rennet be added and that it be mixed well with the milk at setting time. Too much rennet will result in a tough rubbery curd which cannot be cooked properly, while not enough rennet will cause the curd to lack firmness. The use of more starter and more rennet will cause earlier coagulation; however, it is best to vary the amount of starter and keep the rennet at a fixed amount.

The setting temperature should be from 72 to 80 degrees varying with the season of the year. In winter it is often necessary to raise the setting temperature to obtain a curd in the required length of time. In summer lower temperatures give a more desirable curd. The curd should not be disturbed from the time of setting until time for cutting. The temperature can be maintained during this time by setting the pail containing the curd in a large vessel in which the temperature of the water can be adjusted to the setting temperature.

Cutting the Curd. The curd should be firm enough to cut within 6 to 10 hours after setting. The time of cutting may be determined by dipping the thermometer into the curd and observing the break ahead of the instrument. If the break in the curd is sharp and shows clear whey the curd is ready to be cut. Cutting may be done with a long thin knife by passing the knife back and forth making small squares of about one-half inch on a side. The curd is then left undisturbed for 15 minutes during which time the water around the curd pail is heated to 115 to 120 degrees. Immediately after cutting, the curd is covered with two inches of water at 115 degrees. This helps to heat the curd and also causes gentle agitation.

Cooking the Curd. The time required for cooking should be from 1 to 1½ hours depending upon the firmness of the curd and the sourness of

* Complete information on the process for factory scale operations may be secured by writing to "Superintendent of Documents," Washington, D.C. for "Miscellaneous Publications" No. 119. Price 5c.

† Junket tablets may be used in place of rennet. The directions for use accompany each package.

the whey at cutting time. The water in the outside container should be kept 25 to 30 degrees above temperature of the curd during the cooking period. Stirring, which should begin after 15 minutes should be gentle and just enough to insure uniform heating. Too rapid or vigorous stirring will break the curd into fine pieces which will result in a fine grainy curd which is not desired.

When the temperature in the curd has reached 118 to 120 degrees the curd should be firm enough for draining. This may be tested by pressing a handful of curd to determine its firmness. It should hold its shape with gentle pressure. Or a handful of curd when placed in cold water should be fairly firm and hold its shape.

Draining and Washing. As soon as the curd has reached the desired firmness the whey is drained and replaced with cold water. The colder the water the better for the curd, as rapid chilling helps to keep the curd from breaking into fine pieces. The washing process may be repeated two or three times depending on the sourness of the curd. Repeated washings will help to take out the sour flavor and will slightly increase the keeping time.

After washing, the curd should be thoroughly drained and then stored in a cold place over night. If the curd can be chilled at a temperature of 30 to 40 degrees for at least 12 hours the texture will be much better for creaming. The curd should be stored during this period in a pan with a perforated bottom to allow for more nearly complete draining.

Salting and Creaming. The chilled curd must be broken up before salting and creaming. With a small batch such as the cheese from 25 pounds of milk it is more practicable to add salt to taste and cream according to the richness desired. With large batches 1 to 1½ percent of salt is added and cream is added at the rate of 1 to 2 quarts of 10 percent cream for each 10 pounds of curd as desired.

When this creamed, salted cheese is kept in a cold place it will remain fresh for several days. It is mild enough to please those who do not like sour milk flavor and yet it has a real cottage cheese flavor.

Summary

1. Select clean raw milk and separate in a well cleaned separator.
2. Pasteurize at 142-145 degrees and hold 30 minutes. Cool to the setting temperature.
3. Add 5 to 6 percent milk starter or about ¾ quart for the 25 pound batch.
4. Add diluted rennet and stir thoroughly into the milk. (Mix 4 drops of rennet in ½ pint of cold water, add 1 oz. of this solution.)
5. Hold the milk undisturbed at 72 to 80 degrees for 6 to 10 hours or until the curd is formed.
6. Cut the curd when it is firm enough to break clean with clear whey.
7. Heat slowly with water 25 to 30 degrees warmer than the curd until the curd temperature reaches 115-120 degrees.
8. Cook until the curd is firm by test.
9. Drain the whey and wash with cold water to chill and firm the curd.
10. Drain the curd and store overnight in a cold room or packed with ice.
11. Add salt and cream to taste.
12. Pack in crockery, glass or other nonmetal containers and store in a cold place (30 to 40 degrees) until used.

NOTE: The equipment needed is the same as for Acid Type Cottage Cheese with the addition of rennet or junket tablets.

Cheddar or American Cheese Making

By C. C. Totman

Reasons for Making Cheese on the Farm. When the milk and butterfat prices are low, thought may be given to some means of realizing more for these products. Cheese is an excellent food. Cheddar or American cheese, sometimes called cream cheese, is not difficult to make. Simple outlined directions may be followed and if attention is given to cleanliness in all operations a good grade of cheese will result. It is possible that some marketable surplus may be made and sold to neighbors or to outlets in small towns where the maker is well known or soon gains a reputation for the quality of his product and the general conditions surrounding the production of the milk and cheese.

Quality of Milk for Cheese. Only clean, fresh milk should be used. Sanitary precautions in the production and handling of milk must be observed. Poor quality milk will not make good cheese and much time and effort may be lost as well as the market price of the milk if inedible or unmarketable cheese results after a 30 to 60 day curing period. (Those desiring details on the production of quality milk may write to the South Dakota Experiment Station for Circular 22.)

Equipment Needed. It is assumed in this discussion that home made or locally obtained equipment will be used. To buy standard cheese making equipment even for small scale factory operation would mean too great an investment.

List of Equipment

1. One well tinned or copper wash boiler—capacity 10 to 12 gallons (about 100 pounds milk). For larger amounts it may be necessary to have a local tinner make a vat or tank of 20 to 50 gallons capacity as desired.
2. Knife, wood paddle or wire bread toaster or other device to cut curd. Select a device which will cut the curd into half-inch cubes or strips and which is easily kept clean. Regular curd knives are best and should be bought if 30 gallons or more of milk is used.
3. One floating thermometer about 75 cents.
4. One wood paddle for stirring curd.
5. Cheese hoops, purchased at \$3.50 each or made locally from heavy well tinned metal. Make slightly conical or pail shaped. Use a metal "follower" or circular plate and one or more wood followers as required for placing filled hoops in the press. Note: A 3-gallon pail holds about 25 pounds of curd—25 pounds of milk will be required for this curd or 100 pounds of milk yields about 10 pounds of cheese.
6. One cheese press—a press may be made by using a lever about 8 feet long. One end may be placed under a block on the wall and the other end weighted. A screw such as an automobile jack may also be used.
7. Source of heat—an oil stove may be used or a range with a low fire. Heat must be applied slowly.

Supplies Needed

Rennet extract—Rennet tablets or liquid rennet extract may be used. The tablets can be bought at most drug stores and are called "junket tablets." Liquid extract can be bought from creamery supply houses. One pint is enough for a single purchase because liquid extract deteriorates with age. It must be kept cool and in a dark place.

Cheese color—Color tablets or liquid color can be bought where rennet extract or junket tablets are sold.

Cheese bandages—or cheese cloth properly cut is fitted to each cheese.

Salt—table salt can be used.

Paraffine—for coating cheese after a day or two, to prevent molds and drying out and cracking of the cheese surface.

Starter—cultures may be obtained at local creameries or cheese factories.

Making and Caring for Starter. Clean fresh milk must be used in making starter. Heat one quart to near boiling for 30 minutes. Cool to 72 degrees and add about one-third teaspoonful of the starter culture. Replace the cover carefully avoiding all contact with the under side and with the top of the glass bottle or fruit jar. All apparatus used or coming in contact with the starter or the starter milk after heating and cooling, must be held

in boiling water for 10-15 minutes. All apparatus must be as nearly sterile as possible if good starter is made. Give the bottle a rotary motion to distribute the starter in the newly prepared milk.

Hold the starter at 72 degrees until curdled, then transfer to a cool place. For best results a bottle of culture or starter must be made daily. The starter is used to inoculate the milk before beginning cheese making. If three or four quarts are required (as for 500 or 600 pounds of milk for cheese) more quart containers may be used.

Outline of Procedure
(for 100 pounds of milk)

1. Use clean fresh milk.
2. Heat to 86 degrees.
3. Add 1 to 1½ pints of starter, straining to avoid lumps.
4. Add 3 to 5 cc. of cheese color (about 1 teaspoonful depending on season of year).
5. Add 12 cc. of rennet extract (diluted with 20 parts of cold water) and stir in thoroughly at once. Do not stir longer than one minute. If junket tablets are used, follow directions on the package.
6. First signs of coagulation should occur in 10 minutes. A longer period indicates: (a) weak rennet; (b) temperature below 86 degrees; (c) watered or abnormal milk.
7. Cut curd at 2½ times the period required for first signs of coagulation. Use three-eighths inch knife, or not greater than one-half inch.
8. After 10 minutes in which curd is undisturbed, begin stirring and stir gently for about 5 minutes before heat is applied.
9. Start heating—raise 1 degree in 3 minutes up to 96 degrees, then raise 1 degree in 2 minutes up to final temperature of 102-104 degrees. (Stir continuously through temperature rise.)
10. Let stand in whey 30 minutes (no stirring) until the curd is firm.
11. Draw whey and pile curd to help drain.
12. Keep at 90 to 100 degrees for 2 to 3 hrs. or until whey drippings reach 0.40 to 0.50 per cent acidity. (Curd should be turned 2 or 3 times and may be piled to 4 or 5 inch depth if necessary to retain heat.) Hot iron test may be used instead of acidity test—see discussion.
13. Mill and salt the curd at the rate of 2 percent. For example 10 pounds of curd, (160 oz.) will require 0.02 x 160 or 3.2 ounces. Mix salt and curd and after 5 or 10 minutes place in cheese form and press.
14. Press overnight. (Cheese bandages must be used for a smooth surface.)
15. Allow cheese to dry in cool room 1 or 2 days then dip for 15 seconds in paraffine at 220-230 degrees. (Dipping in paraffine kills mold spores on cheese surface.)
16. Place on clean shelves in curing room at 50-65 degrees.
17. Turn every two or three days on shelves—this helps to prevent molds.
18. If mold develops, use solution of one-half formaldehyde and one-half water—paint on with brush—avoid contact with hands.
19. Cheese should be cured in 30 to 60 days.

NOTE: Cheese may be made without the use of the starter but results are very uncertain and the quality of cheese will be variable. The use of clean sour milk might be a substitute for starter. The kind of cheese made from such substitute is rather unpredictable.

The Hot Iron Test. The farm cheese maker is not likely to have an acidity test apparatus. He may determine when to mill the cheese by using a hot iron test. Heat one end of an iron rod or bolt until the curd sears slightly but clings to it. Pull the curd gently from the rod and strings of 1 to 1¼ inches should form if the curd is ready to mill and salt. If the strings of curd break sooner, allow the warm curd to remain in the vat until such curd strings form when the test is made.

Milling The Curd. Cut the curd into cubes one-half to three-fourths inches in dimensions. This may be done by using a long sharp knife, cutting the curd in at least two directions. No serious harm will come if the curd is cut into strips if the half-inch dimension is maintained. Do not break the curd by hand—too much fat will be lost. Keep the curd warm until ready to place in the mold and press. Cold curd will not unite well when pressed.

Dressing The Cheese. The use of bandages or cheese cloth on the surface of the cheese in the press is essential. If no cloth were used the cheese surface would contain grooves and dents no matter how hard the curd was pressed. These surface irregularities open the way for molds to enter the cheese and affect its quality.

It is necessary to readjust the bandages after the cheese has been in the press for 5 to 10 minutes. Remove the cheese from the press. Pull the bandage up firmly to remove the wrinkles which are caused by forcing the curd and bandage downward when pressing. Replace all parts of the cheese form and again set under the press.

Curing or Ripening of Cheese. Three main factors in cheese curing are (a) kind of milk used for the cheese (b) temperature of curing (c) the moisture content of the cheese. Many other minor factors have some influence but inattention to them is usually not disastrous.

Cheddar or American cheese should not contain more than 38 percent of water. Most laws state that one half the dry matter in cheese must be milk fat and do not refer to moisture content. If cheese contains moisture in amounts of 40 percent or more, curing room conditions must be different, because the cheese ferments more readily and lower temperatures must be maintained, perhaps as low as 40 to 50 degrees. Under such conditions cheese would not cure well in less than three months. On the other hand cheese from good milk with 36 to 38 percent moisture may be cured at 60 to 65 degrees and be ready for the table in three to four weeks.

It is better to make cheese with less moisture. The moisture content of curd may be reduced by cutting the curd into smaller pieces before heating. Heating to a maximum temperature of 104 to 107 degrees may be used to help reduce the percentage of moisture. This temperature may be maintained for a longer time before the whey is drawn. It is unlikely that more than 30 minutes will be required after the maximum temperature is reached.

Salting at the rate of three percent is an additional precaution if high moisture is anticipated. This will tend to draw some whey from the curd and in addition, will slow down the rate of curing. There will be less danger of excessive gas formation and bulging cheese.