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A SOFT CHEESE OF THE BEL PAESE TYPE

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INTRODUCTION

Soft cheeses are becoming increasingly popular in the United States as well as in European countries, and a number of varieties are produced in this country. Apparently, however, there is need for a distinctive, mild-flavored, soft cheese having good slicing and spreading qualities to supplement the varieties already under domestic production. In view of this need, and also because of the numerous inquiries received for information about the manufacture of Bel Paese cheese, the Bureau of Dairy Industry has developed a method of making a soft cheese of the Bel Paese type. Cheese of this type is now being made in this country by the Bureau's procedure, which is presented in this circular.

The name "Bel Paese," which means beautiful country, is a trademark held by an Italian firm. Cheese similar to Bel Paese is also marketed in Europe under other names, such as "Fleur des Alpes," "Königskäse," and "Schönland," the group being known as butter cheese. This type of cheese, which has gained such wide popularity in Europe within a comparatively recent period of years, had its origin in Italy approximately 50 years ago. References in the literature to methods developed in Europe for Bel Paese-type cheese are very limited. Eppensteiner (*1*),[1] however, gives a rather complete and workable description of the manufacturing process, and this process is also reported by Peter (*5*). Some information on the bacteriology and ripening of such cheese has been reported by Fascetti (*2*) and Torre (*6, 7*). Reference to pasteurization of the milk is made by Gorini (*4*). Frühwald (*3*) also mentions pasteurization of the milk, and the use of starters. Weigmann (*8, pp. 176–177*) discusses the use of enzymes other than rennin.

Bel Paese-type cheese, when properly made by the method developed in this Bureau, has a characteristic mild, slightly salty flavor,

[1] Italic numbers in parentheses refer to Literature Cited, p. 18.

and a soft waxy texture that makes it suitable for both slicing and spreading.

BRIEF DESCRIPTION OF CHEESE-MAKING PROCESS

To good quality raw or pasteurized cows' milk is added a small amount of lactic starter, and enough rennet to obtain the desired firmness of coagulation in about 15 minutes when the setting temperature is 104° to 110° F.

When the curd has reached the desired firmness it is cut, and then stirred to prevent matting and insure rapid, uniform expulsion of whey. After the curd particles have firmed sufficiently the whey is drawn off and the curd is dipped into suitable forms placed on reed mats. Draining in the forms requires from 5 to 7 hours, and is best accomplished at a temperature of about 80° F. The cheeses are turned occasionally during this period.

After draining the cheeses are placed in a 16- to 18-percent salt brine that has a temperature of from 54° to 60° F., and are held there 14 to 18 hours. Upon removal from the brine tank they are placed in a curing room that has a temperature of from 38° to 42° and a relative humidity of from 80 to 90 percent.

A brownish or nearly colorless slime appears on the surface of the cheeses soon after they are placed in the curing room. Occasional washing with dilute salt brine keeps this coating thin and the rind firm and clean.

After remaining about 20 days in the curing room, the cheese is wrapped in tinfoil or other suitable material. Each wrapped cheese is then placed in a carton and allowed to cure 2 to 6 weeks longer at the same temperature (38° to 42°).

The yield of cured cheese is from 11 to 15 pounds for each 100 pounds of milk.

In order to produce cheese of uniformly high quality, careful attention must be given to the quality of the milk and to every stage of the manufacturing process. Laboratory supervision to insure accurate control of starters, acidity, and composition is necessary at all times.

EQUIPMENT REQUIRED

CHEESE-MAKING EQUIPMENT

The Bureau's method is particularly adapted to equipment of the type used in making Cheddar cheese, but it is also possible to obtain good results with equipment used in making other varieties of cheese. The European methods utilize round, Swiss-type kettles or wooden tubs, which have a capacity of 400 to 600 pounds of milk; the curd is cut with a cheese harp or scoop; and the whey is taken off with the aid of a pump or with pails.

The following equipment is desirable when the production of cheese is to be 100 pounds a day:

1 jacketed cheese vat (capacity 1,000 pounds).
1 vat strainer.
1 curd rake.
2 flat-side curd pails (capacity 3 gallons each).
1 pair of curd knives (⅜-inch).
24 cheese forms; round, metal; or square, metal or wood.

24 followers.
1 drain table.
Reed matting, enough to cover the drain table.
1 brine tank, of concrete or wood.
Salt, enough to make up a tank of 18-percent solution.
1 salinometer.
1 scale having 1-ounce graduations.
Wrapping and packing materials.

Also the customary dippers, shotgun cans, stirring rods, thermometers, sling psychrometers, steam hose, and other materials usually found in cheese factories should be available. The cheese vat may be an ordinary jacketed cheese vat or the type commonly used for making cottage cheese or Cheddar cheese. This vat should be suitable for use as a holder pasteurizer, unless some other pasteurizing equipment is provided. The curd knives should be three-eighths of an inch between wires, and the frame should preferably be one-half as wide as the vat, to avoid overlapping in cutting.

The cheese forms may either be round, Muenster style, of heavy tinned steel, 7½ inches in diameter by 6 inches high, with six rows of twenty ⅛-inch holes; or they may be square forms made of heavy tinned steel or wood, 8 by 8 inches by 6 inches high, having ⅛-inch holes drilled in rows 1 inch apart and staggered, with 1⅜ inches between centers. Other sizes and shapes of forms may also be used. Followers are especially useful if the drain-room temperature is apt to be below 80° F. The drain table should have a top area large enough to accommodate the forms for 1 day's make. Some means should be provided for collecting the whey as it drains away from the forms.

LABORATORY EQUIPMENT AND TESTS

The successful production of Bel Paese-type cheese presents many difficulties, and requires considerable experience, care, and skill. A well-equipped laboratory, as shown in figure 1, is a valuable aid in the efficient production of a uniformly high quality product.

Equipment should be provided to heat the milk to be used as starter medium, in bottles or in covered pails. Either a steamer or a boiling water bath may be used for this purpose. Flowing steam, as employed in the Arnold-type steamer, is preferable.

The equipment for production of starters should also include an incubator of the hot-air type or the water-bath type which can be maintained at a uniform temperature of from 68° to 72° F.

There are a large number of physical and bacteriological tests available for determination of the quality of the milk. These tests should be selected to meet local conditions, and the necessary equipment and chemicals provided.

For accurate control of composition it will be necessary to provide chemicals and apparatus for the determination of fat in the milk, and fat, moisture, and salt in the cheese.

The titratable acidity of the milk and starters can be determined with an acidimeter (fig. 1, *c*). This equipment is found in dairy plants generally.

A number of types of equipment are available for the determination of hydrogen-ion concentration, or pH value. At the present time there is no suitable colorimetric method for the determination of the pH value in cheese. Electrometric methods, however, are satisfactory. This equipment, with instructions for its use, can be obtained from most

laboratory-supply firms. It is especially desirable to have pH equipment available during the making of the early and more or less experimental batches. Further information on pH equipment and its use is given under Development of Acidity.

It will also be necessary to provide the usual thermometers, beakers, pipettes, sample bottles, glass and rubber tubing, chemicals, and other materials ordinarily found in any well-equipped cheese-factory laboratory.

MILK SUPPLY

Bel Paese-type cheese is made from cow's milk. The milk should be fresh and of good sanitary quality and a fat content of 3.3 to 4.0 per-

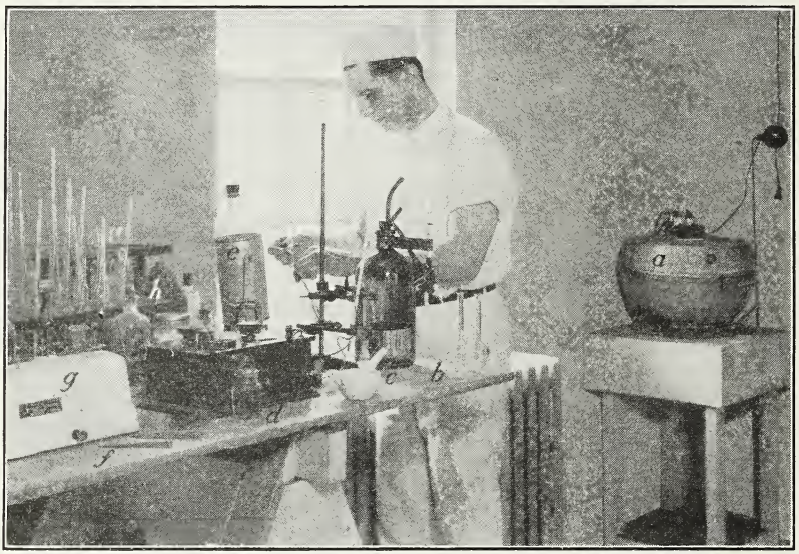

FIGURE 1.—Part of a well-equipped laboratory in a factory making Bel Paese-type cheese: *a*, Babcock tester and, *b*, test bottles, for determination of fat; *c*, equipment for determination of titratable acidity; *d*, pH apparatus; *e*, acid-supply bottle; *f*, dividers for reading fat test; *g*, balance; *h*, rack with pipettes.

cent is preferred. The resulting cheese should contain about 50 percent of fat in the dry matter. Ripe milk, high-acid milk, or milk containing undesirable flavors should be rejected.

The cheese should preferably be made from pasteurized milk. Pasteurization is recommended because it is desirable from both a public-health and a cheese-making standpoint. With pasteurized milk the cheese-making process is more uniform from day to day, resulting in cheese which is more uniform in quality and which will keep better than if the milk were not pasteurized. Difficulties due to development of gas, yeast, and bitterness, will be practically eliminated by pasteurization.

Pasteurization is accomplished by holding the milk at a temperature of not less than 142° F. for not less than 30 minutes, or by the high-temperature short-time method using a temperature of 160° for not less than 15 seconds.

It may be found that heating to somewhat lower temperatures or using shorter holding periods may be sufficient to control organisms

detrimental to the cheese-making process. However, such cheese cannot be sold as being made from pasteurized milk.

Raw milk may be used also for making this cheese.

The quality of the milk should be determined regularly by suitable tests, such as the methylene-blue reduction test, acidity determination, and sediment test.

If desired, cheese color may be added to the milk.

DEVELOPMENT OF ACIDITY

The proper development of the desired acidity is very important. The acid development, to a large extent, controls both drainage and texture, and it also materially affects the curing and the flavor of the

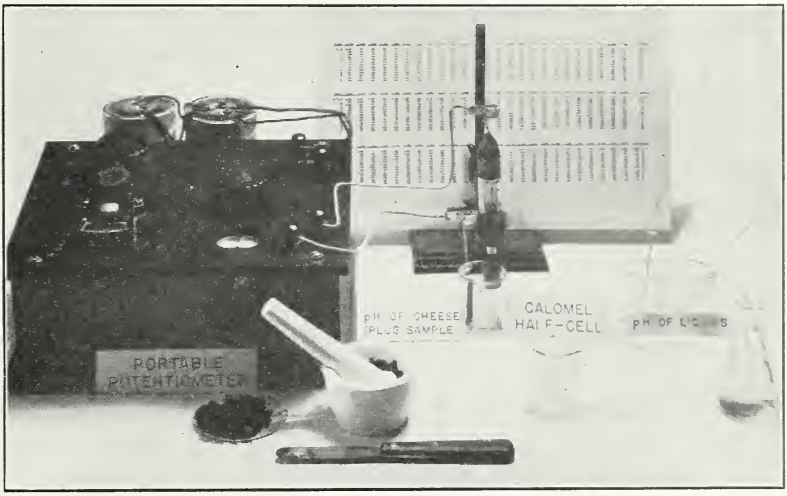

FIGURE 2.—A type of equipment for determining the pH value of cheese. This equipment consists of a portable potentiometer, a calomel half-cell, one or more dry cells, and some gold-plated platinum electrodes, and employs the quinhydrone method. The sample of cheese is ground up with a quantity of quinhydrone, placed in a short glass tube with an electrode which is connected in series with the calomel half-cell, and the potential is read in millivolts. This reading is converted to pH units by using a formula or table as illustrated. A correction for temperature is necessary. Other equipment that reads directly in pH units is available.

cheese. For these reasons the development of acidity must be carefully controlled, particularly during the first 24 hours of the cheese-making process.

The most satsfactory method of following the rate and degree of acidity development in the cheese is by the determination of pH values at various intervals. One type of equipment for measuring pH values is illustrated in figure 2.

With a knowledge of the pH values of the cheese it is possible to manipulate the starter, temperature, and other factors, so as to obtain uniform results. Accurate data on the acid development obtained in one batch, as measured in pH units, may be used as a guide for subsequent batches.

The beneficial effects of proper acid development on the resulting cheese are graphically illustrated in figure 3, by the pH curves obtained

when good and when poor cheese was made. These pH curves also bring out the need for adding the proper amount of active starter to get the desired results. The pH values at 1, 2, 5, and 10 days after dipping, and then by 10-day intervals up to 80 days, are shown for each cheese. The lower curve is quite typical of high-moisture Bel Paese-type cheese of good quality.[2] It will be noted that the greatest increase in acidity (decrease in pH values) took place in the first 24 hours, and that there was relatively little change thereafter. If practically all the increase does not take place in the first 24 hours, poor cheese will result. The upper curve for cheese made without starter shows an increase in acidity to about pH 5.2 at 30 days. In this case,

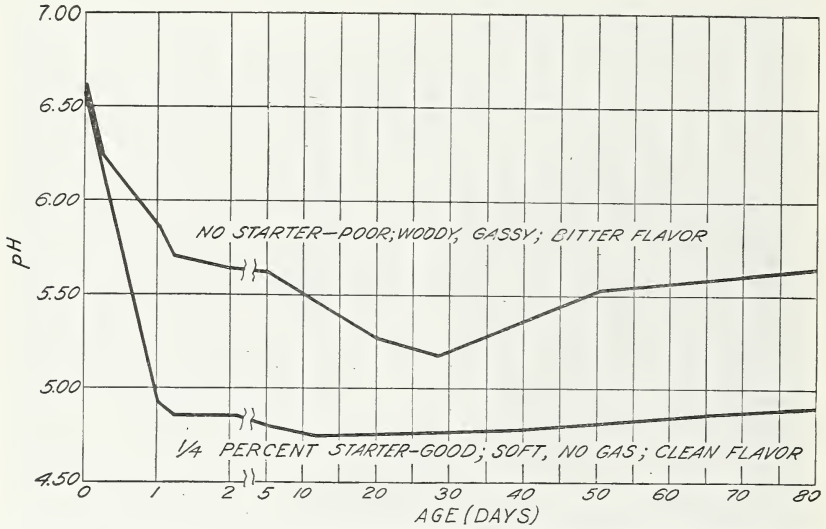

FIGURE 3.—Proper development of acidity in good cheese made with starter added (lower curve), and improper acid development in poor cheese made without starter (upper curve).

acid development had proceeded too slowly and the cheese was of poor quality. A typical pH curve for good low-moisture cheese would parallel the lower curve shown in figure 3, but would not drop quite so low. Table 1 gives pH values that have proved desirable. It will be found, however, that under different conditions somewhat different values may prove more satisfactory.

TABLE 1.—*Typical pH values at various periods for cheese of high and low moisture contents*

Moisture content of cheese	At time of dipping	3 hours after dipping	5 hours after dipping	21 hours after dipping	When cured
	pH	*pH*	*pH*	*pH*	*pH*
High	6.50	6.30	6.10	4.80	4.90
Low	6.50	6.35	6.20	4.95	5.10

[2] Typical moisture contents are given in table 3, under Composition.

STARTERS

It has been found necessary to use starters to obtain proper acid development and texture, and to insure a predominance of desirable organisms in the cheese.

The milk for mother starters may be whole or skim milk, but the latter is preferred. The milk for mother starters may be sterilized in an autoclave. It may also be prepared in the same manner as the milk for the bulk starter; that is, by heating the milk in a closed container, using steam or a boiling water bath, to at least 180° F. and holding it at this temperature for a minimum of 30 minutes. This treatment does not discolor the milk as does sterilization.

A commercial, mixed-lactic cheese culture is used. A transfer of the mother culture is made daily. The starters are incubated 12 to 18 hours at from 68° to 72° F. After the mother starter has coagulated or set, it is good practice to hold it at a temperature lower than 68° until needed. It should not, however, be cooled below 40°.

Bulk starters are preferably made with skim milk. Enough mother culture is added to the bulk culture so that the latter will develop a titratable acidity of about 0.72- to 0.76-percent acid when used. The bulk starters are incubated at the same temperatures and for the same time as the mother starter. Inoculation of several batches of bulk-starter medium with different amounts of mother culture or at different intervals will make it possible to have a good starter available when it is needed.

Before the starter is added to the milk, it should be poured through a sieve or strainer to break up lumps. More thorough mixing with the milk will result if the starter is diluted with an equal volume of water.

The starter is added to the milk in the vat immediately before the rennet.

CHEESE-MAKING PROCESS

SETTING

Bring the contents of the vat (fig. 4) to a setting temperature of from 104° to 110° F. Then add the starter, as described under Starters, and the rennet. Enough commercial liquid rennet extract is used to obtain the desired "break" in 15 to 20 minutes. Ten to twenty cubic centimeters of rennet for each 100 pounds of milk is usually sufficient. The rennet is diluted by adding about 20 times its volume of cold water and then mixed thoroughly with the milk by stirring for approximately 1 minute. The motion of the milk is then arrested.

CUTTING THE CURD

The point at which the curd has firmed sufficiently and is ready to cut is determined by the break test. This test (fig. 5) is accomplished as follows: Insert a finger obliquely into the curd, then start the curd to splitting with the thumb, and slowly raise the finger. If the curd is ready to cut, it will break smoothly well ahead of the finger.

When the curd breaks satisfactorily, begin at once to cut it into cubes, first cutting lengthwise of the vat with the horizontal knife, then lengthwise and crosswise with the vertical knife (fig. 6). The knives should be handled so that they will cut their way into and out

of the curd. Care should be exercised to obtain as uniform a cut as possible.

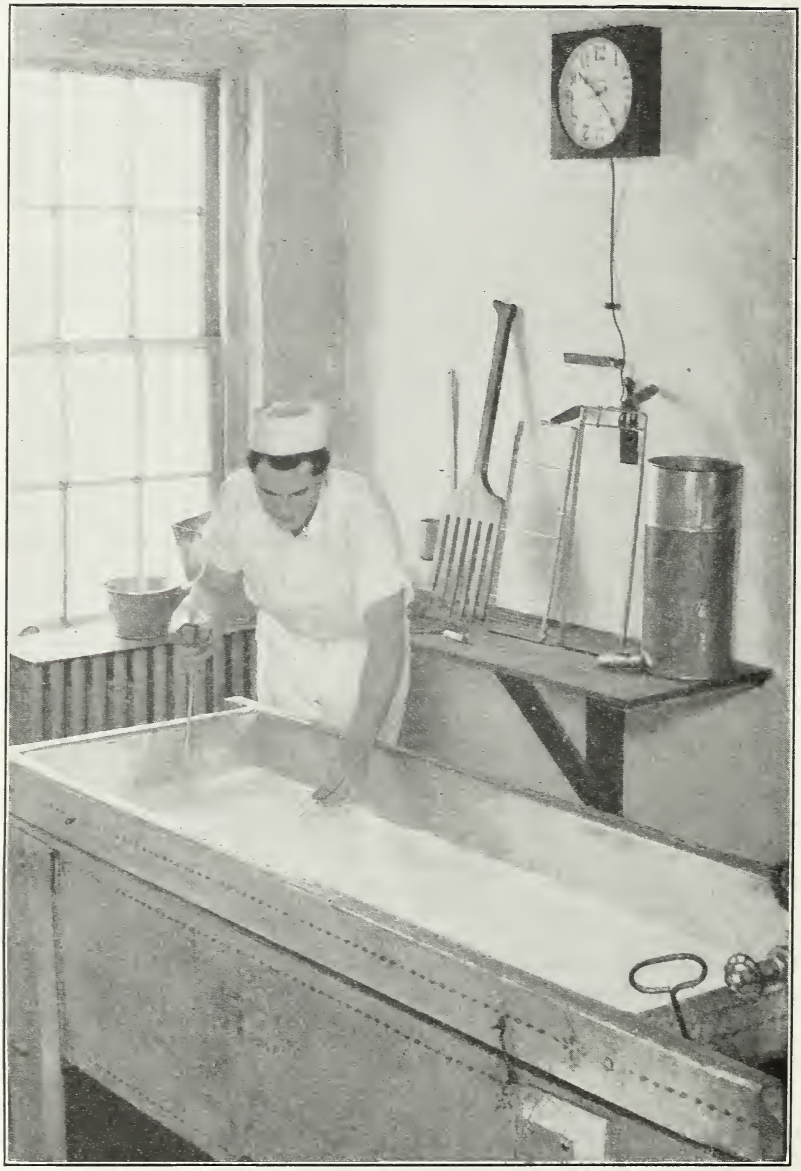

FIGURE 4.—Taking temperature of vat of milk being heated to setting temperature.

Knives having ⅜-inch spaces between wires are usually preferred. However, ¼- or ½-inch knives may be used. The curd, however, is usually too firm to cut with ¼-inch knives.

FIRMING THE CURD

When the cutting is complete, the contents of the vat are stirred gently by hand to prevent matting. At this time any curd sticking to the sides or bottom of the vat should be rubbed off. After the

FIGURE 5.—Break test to determine when curd is ready to cut.

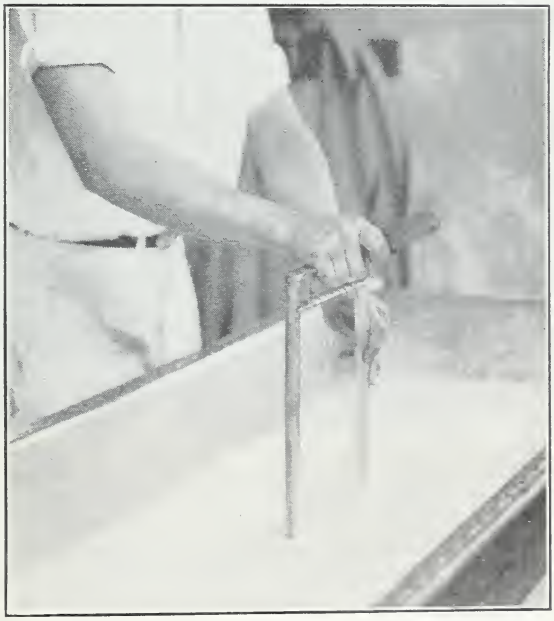

FIGURE 6.—Cutting the curd into cubes.

curd has lost its initial tenderness, it may be stirred with a rake. Stirring is continued until the curd has attained the desired firmness or dryness. This point is difficult to describe and is best learned by experience. It varies somewhat with seasonal and other factors, and the percentage of moisture desired in the finished cheese. The mois-

ture content may also be affected by the size of cut, the amount of stirring in the whey, and the rate of acid development.

During the firming period the curd is held at the setting temperature. However, in the case of curd from pasteurized milk it may be necessary to apply additional heat or hold for a longer period.

When the curd has reached the desired firmness, whey is drained from the vat through a gate strainer until the curd begins to appear above the surface of the whey in the vat as shown in figure 7.

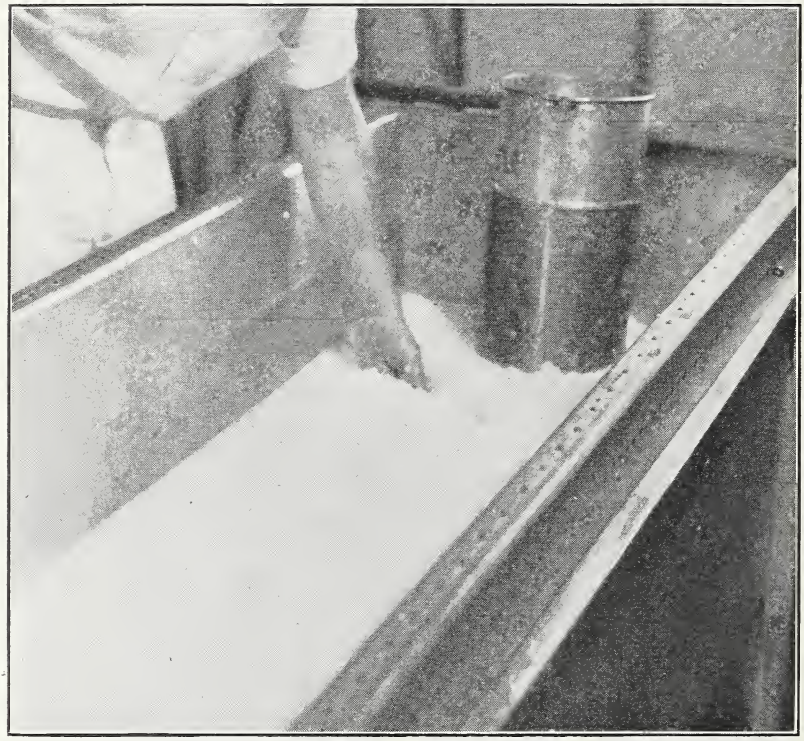

FIGURE 7.—Draining whey from the vat.

DIPPING THE CURD

When the right amount of whey has been drawn off, the contents of the vat are thoroughly stirred. Then the curd and whey remaining in the vat are dipped with the aid of a flat-sided curd pail into the forms which have been placed on reed matting on the drain table (fig. 8). Care must be exercised in filling the forms so as to obtain cheese of uniform thickness.

DRAINING

The cheeses are drained until properly firmed, which usually requires 5 to 7 hours. The temperature of the draining room should be maintained at about 80° F.

The cheese while draining may be covered with burlap cloth to prevent too rapid cooling. Followers may be used if desired.

During draining the cheeses are turned frequently enough to keep the top edges from shrinking away from the forms. Four to six turnings are usually sufficient.

SALTING

At the end of the draining period the cheeses are placed in brine containing 17 to 19 percent of sodium chloride (common salt). They are kept in this brine at from 54° to 60° F. for 14 to 18 hours. The

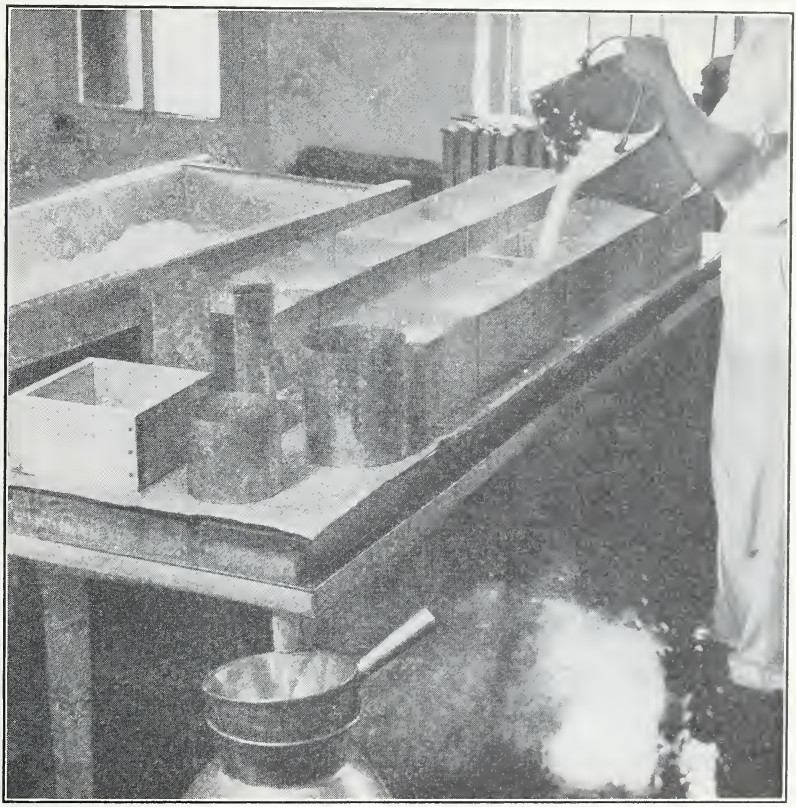

FIGURE 8.—Filling the forms, of which various sizes and shapes are shown, as well as the reed matting and drain table. An open-weave linen cloth such as a Swiss-cheese press cloth may be substituted for the reed matting.

length of time in the salt bath will be governed by the number of cheeses placed directly over each other, by the size of the cheeses, and by the amount of salt desired in the cheese. Typical salt contents are shown under Composition. Placing the cheeses more than two layers deep in the brine is not recommended. The unsubmerged tops of the cheeses should be sprinkled lightly with salt. It is desirable to turn the cheeses at least once while in the brine. Table 2 gives specific gravity and salinometer readings for sodium chloride brines (17 to 19 percent).

Dry salting may be practiced, but it does not give as uniform or satisfactory results as brine salting.

TABLE 2.—*Specific gravities and corresponding salinometer readings for sodium chloride brines (at 60° F.) containing 17 to 19 percent salt*

Salt (percent)	Specific gravity	Salinometer reading [1]
		Degrees
17	1.127	64.4
18	1.135	68.2
19	1.143	71.9

[1] Correction of salinometer readings for temperature: Add 1° to the salinometer reading for each 7.5° the brine temperature is above 60° F. If the brine temperature is below 60°, subtract 1° from the salinometer reading for each 7.5° below 60°.

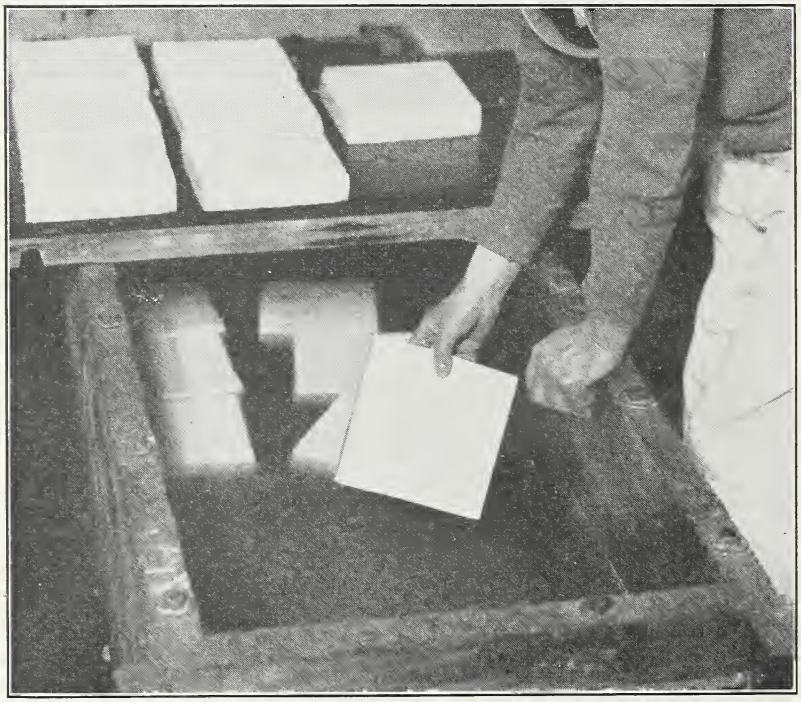

FIGURE 9.—Removing cheese from the brine tank. Tanks may be of cement, brick, tile, or wood construction.

CURING

After the cheeses are removed from the brine tank (fig. 9) they are allowed to drain a short time. When the excess brine has run off, they are placed in a curing room having a temperature of 38° to 42° F. and a relative humidity of about 85 percent.

When the cheeses have been in the curing room 3 or 4 days the rinds may be colored with cheese color to improve the appearance. The color is applied with a long-bristled brush, coloring one side one day and the other side the next day.

The shelves in the curing room may be made of smooth knot-free boards, or may be made of slats and covered with reed matting. Whatever shelving material is used, provision should be made for

frequent washing. Boards should be short enough to permit ready removal. New boards should be thoroughly scrubbed and new matting should be sterilized by boiling before use.

A desirable brownish or colorless slime growth develops on the rind of the cheeses shortly after they are placed in the curing room. In new curing rooms it may be necessary to introduce this growth by rubbing the rinds with slime secured from suitable cheese. This slime should be as nearly yeast-free as possible. Its development is desirable and is indicative of proper conditions in the curing room.

Considerable work must be done in the curing room to keep the

FIGURE 10.—Washing the cheese to control slime development, prevent mold growth, and to keep the rind firm.

cheeses in satisfactory condition. Most of this work does not lend itself readily to machine operation but must be done by hand. The slime is kept thin, mold growth prevented, and the rind kept firm by occasional washing with dilute salt brine (fig. 10).

When the cheeses are washed, they are placed on clean boards or mats. The addition of vinegar to the dilute salt brine used in washing the cheeses may be helpful in controlling surface growths.

Between washings the cheeses should be frequently rubbed by hand and turned on the shelves as shown in figure 11.

WRAPPING

When the cheeses have been in the curing room for about 20 days they are wrapped or paraffined. They are prepared for wrapping or paraffining by cleaning and drying the rinds. The rind is washed

clean and rubbed with a cloth or by hand to get a smooth dry surface. As an additional aid in preparing the cheeses for wrapping, they may be held for several days in a separate room that has the same temperature as the curing room, but with low relative humidity.

Paraffining is accomplished by immersing the cheese for about 6 seconds in colored or colorless paraffin or cheese wax which has been heated to a temperature of from 210° to 220° F. If the equipment is available, several cheeses can be dipped at once or they may be dipped individually by hand. If they are dipped by hand, dip to the midline, then reverse and dip the other half so as to overlap the midline.

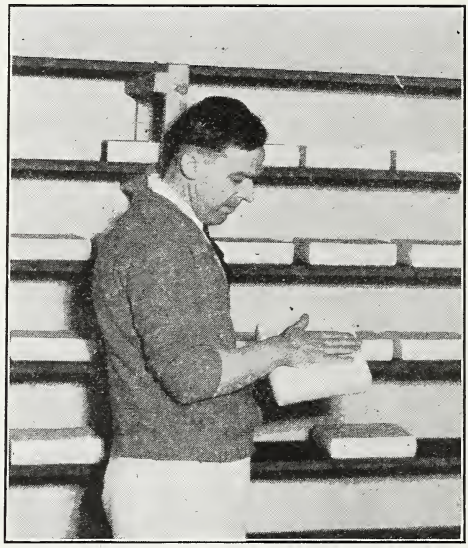

FIGURE 11.—Rubbing the cheese by hand. This rubbing improves the rind, distributes the slime evenly, and improves the appearance.

The method of wrapping is shown in figure 12. A number of materials, such as cellophane, parchment paper, waxed paper, aluminum foil, and tinfoil, can be used.

The paraffined or wrapped cheeses are then placed in individual cartons or wrapped in heavy wrapping paper, replaced in the curing room (fig. 13), and allowed to cure further at the same temperature. This additional ripening requires 2 to 6 weeks, depending on the composition of the cheese and the degree of ripeness desired.

COMPOSITION

Table 3 shows composition figures for imported and for domestic high- and low-moisture Bel Paese-type cheese.

The high-moisture cheese ripens more rapidly and it generally has a more desirable flavor and better spreading qualities than the low-moisture cheese. However, it is more difficult to care for in the curing rooms, and does not have as good handling and keeping qualities. Bitter flavor is frequently associated with high moisture and high acidity.

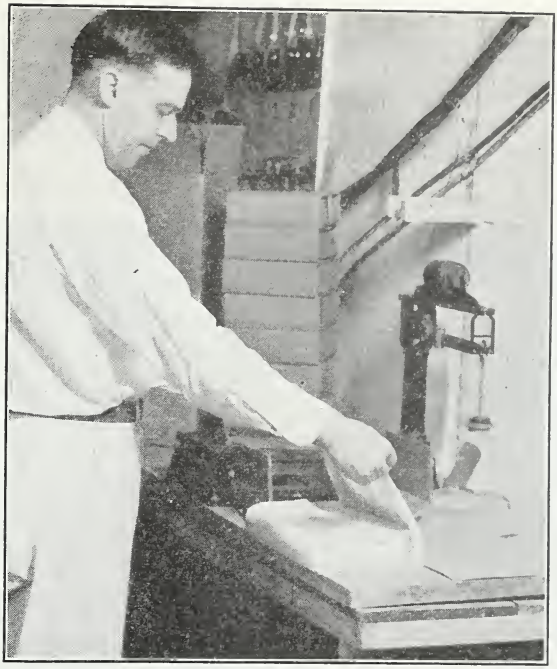

FIGURE 12.—Wrapping square cheeses of the Bel Paese type. Tinfoil is being used as wrapping material. Individual boxes and a shipping carton are also shown.

TABLE 3.—*Composition of cured Bel Paese-type cheese* [1]

Source of sample	Total solids	Moisture	Salt [2]	Fat [3]	Fat of total solids	pH
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	
Imported commercial cheese	52.81	47.19	2.29	28.80	54.53	
	57.02	42.98	2.64	29.00	50.86	4.91
	56.71	43.29	1.97	28.50	50.26	5.00
	56.98	43.02	1.95	28.50	50.02	4.96
Average	55.88	44.12	2.21	28.70	51.42	4.96
High-moisture, experimental cheese	47.88	52.12	2.25	24.00	50.12	4.85
	49.27	50.73	2.80	23.50	47.70	4.96
	50.52	49.48	2.41	23.75	47.01	4.90
	47.02	52.98	2.88	23.50	49.98	4.82
Average	48.67	51.33	2.59	23.69	48.70	4.88
Low-moisture, domestic commercial cheese	51.52	48.48	2.11	26.00	50.47	5.15
	54.48	45.52	2.09	28.50	52.31	5.05
	55.97	44.03	2.33	28.50	50.92	5.02
	53.82	46.18	2.62	29.50	54.81	5.15
Average	53.95	46.05	2.29	28.13	52.13	5.09

[1] All analyses made in these laboratories.
[2] Salt determined by modified Volhard method.
[3] Fat determined by Babcock method.

KEEPING QUALITY, APPEARANCE, AND CHARACTERISTICS

When held at a low temperature Bel Paese-type cheese retains its desirable characteristics an unusually long time for a soft cheese. This is especially true of cheese made from pasteurized milk. Low-

moisture cheeses will keep longer than high-moisture cheeses and is the type usually made commercially. Low-moisture cheeses have been successfully stored at a temperature of 33° to 35° F. for 6 months. However, holding for more than 2 months after curing is not recommended.

Bel Paese-type cheese, when ready for consumption, should have the following characteristics: The rind should be thin, clean, smooth, and practically odorless, and should be free from cracks and openings. The sides of the cheese should be straight or only slightly bulged.

FIGURE 13.—Part of curing room, showing cheeses partly cured before wrapping, and individual cartons each containing a wrapped cheese which ripens 2 to 6 weeks more. Also shows refrigeration unit (of direct-expansion type).

The body should be smooth and waxy and possess good spreading and slicing qualities. The texture may be closed or open, but it should be free from gas holes. Low-moisture cheese is more apt to have an open texture than high-moisture cheese. It is important that the color and ripening be uniform.

A characteristic mild, clean, slightly salty, lactic flavor should prevail. Bel Paese-type cheese is considered too mild in flavor for processing into a blend.

Figure 14 illustrates some of the above characteristics.

YIELD

The yield of cured cheese will vary with the composition of the milk used, the moisture content of the cheese, and mechanical losses during manufacture. Under ordinary conditions a yield of from 11 to 15 pounds per 100 pounds of milk can be expected.

The loss of fat in the whey, as measured by the Babcock test, varies from 0.4 to 0.9 percent.

MARKETING

The market for Bel Paese-type cheese in this country is, as yet, largely undeveloped. Sales have been confined principally to areas

FIGURE 14.—Cured Bel Paese-type cheese; shows texture, and slicing and spreading qualities.

where the population is principally of southern European extraction. Imports amount to about 200,000 (1936) pounds annually and the imported cheese retails at 60 to 85 cents a pound.

The development of a general market for this type of cheese can be expected to take considerable time and advertising. Improvement in facilities of dealers and consumers, particularly refrigeration, make possible a wider distribution of soft cheeses. It is suggested that Bel Paese-type cheese be developed as a side line along with other products, and that expansion be based on repeat orders.

As with other soft cheeses, sales can be expected to fall off during the warm months.

Wrapped portions in various sizes can be prepared. An attractive package is helpful in building both dealer and consumer acceptance.

LITERATURE CITED

(1) Eppensteiner, Andrä.
1932. über die erzeugung von käse nach art des italienischen bel paëse. Österr. Milchw. Ztg. 39: 47–48.

(2) Fascetti, Giuseppe.
1930. azione del freddo nel formaggio belpaese. Ann. Ist. Sper. Caseif. Lodi (1928–29) 5: 86–92.

(3) Frühwald, H.
1937. die erzeugung von bel-paese-käse (butterkäse) aus pasteurisierter milch. 11th Milchw. Weltkongress, Berlin, 1937, Wiss. Ber. 2 (2): 186–189. Leipzig.

(4) Gorini, C.
1934. the acidoproteolytes in the pasteurization of milk for the manufacture of soft cheeses of "bel paese" type. 10th World's Dairy Cong. Rome-Milan, 1934, Sect. 3: 7–9.

(5) Peter, A.
1931. die herstellung einiger wichtiger typen von weichkäse. 5. der "schönland"-käse (bel paese). *In* his Praktische Anleitung zur Weichkäserei und für die Herstellung der Kleineren Alpenländischen Hartkäsesorten . . ., Aufl. 2, neubearb., pp. 56–57. Bern.

(6) Torre, G. Dalla.
1928. on the microbial flora of belpaese. 8th World's Dairy Cong. Gt. Brit. 1928, Rept. Proc., pp. 462–463. London.

(7) Torre, Giulio Dalla.
1930. ricerche microbiologiche sul formaggio belpaese. Ann. Ist. Sper. Caseif. Lodi (1928–29) 5: 116–123.

(8) Weigmann, H.
1933. handbuch der praktischen käserei. Aufl. 4, gänzlich neubearb., 422 pp., illus. Berlin.

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