THE SALTING AND COOKING OF CURDS IN THE MANUFACTURE OF SEVERAL VARIETIES OF CHEESES

J. C. MARQUARDT
ABSTRACT

A study has been completed associating the composition and quality of five varieties of cheese with variations in salting and cooking methods.

The study revealed that cheese curds should be salted at a rate based upon the milk fat content of the milk used.

Cook variation studies added fundamental knowledge useful for further investigations dealing with cheese improvement.

The study indicated that comparable milks made into cheese produced quality cheeses upon the basis of the cheese variety made, with Cheddar first followed in order by granular, Monterey, and brick.

The study indicated that quality and uniformity could not be regularly expected when making cheese by the Camosun method from the type of milk generally available.
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THE MANUFACTURE OF SEVERAL
VARIETIES OF CHEESES

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INTRODUCTION

Certain physical conditions of the curds are the factors during the
manufacture of cheese which affect mainly the character of the resulting
product. With these the cheesemaker is familiar. The results of vari-
ations in the physical properties of curds produced mainly by salt and
heating variations are worthy of study. A better knowledge of these
variations appears to be of paramount importance before further pro-
gress can be achieved in cheese research.

Additional knowledge of the effect of salting methods and rates is
also important to a better understanding of the fundamentals involved.
The effect of different curing temperatures for these variations needs
further study but is not included here.

This study deals entirely with the flavor and texture of cheese as
affected by the method and rate of salting and the temperature of cook-
ing the curd. Facts dealing with cooking and salting variations have
been summarized extensively. Excellent references on these subjects
are to be found in the book citations of this publication. No endeavor
has been made to follow the microbiology of the cheese beyond that
required to produce them.

PROCEDURE

For a period of 30 days cheeses were made at regular intervals from
200 pounds of milk. This preliminary effort was expended so as to
reduce to a minimum variations in the experimental cheese made at a
later date. It was imperative in obtaining the data desired to introduce one variable only for each point studied on a given lot of milk.

Cheddar, granular, Camosun, Monterey, and brick cheese varieties were made for the salt and cook variation studies. All cheeses were scored at three consecutive periods and were analyzed for fat, moisture, and salt at the first scoring period.

All cheeses were first cured at 60°F and at a relative humidity of 85. After the first scoring period the cheeses were stored at 32°F. The first curing temperature was used to develop differences which might be less apparent at a lower temperature. The 60°F room was held to a range of 58° to 62°F. The relative humidity seldom fluctuated; the greatest changes being less than 2 per cent. The 32°F room fluctuated from 28° to 40°F, but remained within a few degrees of 32° through the major portion of the curing period. This temperature range for storage was selected since it represents practices which are now common and which may produce results differing from those previously obtained with 40° and 50°F storage. Changes in milk quality also necessitate a re-check on the items of curing since there has been, in many cases, a marked improvement in the quality of milk used for cheese making.

The first experimental cheeses were made for the salt variation studies. Three separate batches were made of each type of cheese studied. The procedures listed below are averages for the three batches. The cheddar cheeses were made from milk containing 4.6 per cent of milk fat. The milk titrated 0.185 expressed as lactic acid when titrating with n/10 NaOH using phenolphthalein as an indicator. Standard cheese color was used at the rate of 1 ounce per 1,000 pounds of milk. One per cent of *Streptococcus lactis* commercial culture titrating 0.73 was added. This culture contained lactic acid organisms and is referred to as a *Streptococcus lactis* culture, as these organisms predominated. When the milk heated to 86°F titrated 0.19 with a Marschall cup reading of 3, the rennet was added at the rate of 3 ounces per 1,000 pounds of milk. The average increase in titration from 0.185 to 0.19 required 20 minutes. In one batch there was no increase in titration.

The curd was cut after setting 23 minutes. It was stirred for 10 minutes and then heated to 102 ½°F in 1 hour. The whey titration at cutting time and after heating was 0.125. The curd was sufficiently firm in 1½ hours after the completion of the heating period. The whey titrated 0.14 at this time, and the curd was matted. The curd was matted for 3½ hours, the titration of the whey at that time being 0.22, and then the curd was milled, salted, and pressed. Salt was added at the
rate of 1½, 2½, and 3 per cent to three lots of curd. Accurate weigh-
ings of the green and curd cheeses were recorded. The cheeses were
paraffined and placed in the curing rooms in accordance with previously
described procedures.

The granular type cheeses were also made from milk containing 4.6
per cent of milk fat. This milk titrated 0.20. Regardless of the change
in titration, all milks used for the cheddar, granular, Monterey, and
brick series were equal in quality. The milks used were of good flavor
and odor. All cheeses were made before the milks were 24 hours old.
The milk was from a supply that was cooled immediately after milking.
Color was added as in the cheddar, and a culture of *Streptococcus lactis*
titrating 0.62 was added at the rate of 1.5 per cent. With this addition
of culture at 86°F, 15 minutes were required to give a Marschall cup
reading of 3 and a titration of 0.21. At this point rennet was added at
the rate of 3 ounces per 1,000 pounds of milk. Thirty minutes were
required to obtain the proper set. The curd was stirred for 10 minutes
and heated to 104½° in 1½ hours. Twenty minutes after the com-
pletion of the heating the curd was properly firmed and the whey was
drawn. During this period of heating and holding the whey titration
changed from 0.135 to 0.15. The curd was split into three lots and salt
added at the rate of 1½, 2½, and 3 per cent. One granular cheese was
not curd salted but was soaked in 20 per cent brine for 30 hours at
60°F. Sufficient curd to produce one cheese was matted and made into
a Cheddar type. This was practiced for all varieties studied.

Camosun type cheese was made from 3.9 per cent milk fat content,
the milk titrating 0.18. Standard cheese color was added at the rate of
½ ounce per 1,000 pounds of milk. A culture of *Streptococcus lactis*
titrating 0.6 was added at the rate of ½ per cent. The milk was im-
mediately set at 90°F with rennet at the 3 ounces per 1,000 pounds
rate. The Marschall cup reading was 3½ and the titration remained
at 0.18. This milk was from a different source than that used previous-
ly. The reason for using a lower grade milk was that this type of cheese
is generally made on the farm, and milk typical of the kind used on the
farm was desired. The flavor and odor of this milk were below the
quality of that previously used. The Camosun cheeses were made from
milks that had been given an opportunity for an increase in bacterial
content. The milks used for the other varieties contained less than
20,000 bacteria per cc according to the standard plate count.

The curd was cut after setting 25 minutes, and after a stirring period
of 10 minutes was heated to 102° in 15 minutes. The whey was drawn
out at once and the cheese hooped. Camosun cheese is pressed lightly. The initial pressure is 14 pounds, increasing to 21 pounds and after 45 minutes to 28 pounds. This pressure is held for 4 hours. The cheese can be pressed by placing weights on the followers of the hoops which may be of the young America or brick type. It is desirable to bandage the cheese after pressing altho press cloths can be used to advantage during pressing and removed later, but this is not recommended. After 24 hours three cheese were placed in 20 per cent brine at 60°F for 10-, 30-, and 90-hour periods, respectively. Another cheese was rubbed in salt.

Monterey cheeses for the salt trials were made from milk with 4.5 per cent fat with an initial titration of 0.175. The milk was of good quality. Color was added at the rate of ½ ounce per 1,000 pounds of milk. A Streptococcus lactis culture titrating 0.75 was added at a ½ per cent rate. Rennet was added at the rate of 5 ounces per 1,000 pounds of milk at 86°F, when after a period of 45 minutes, the milk titration had advanced to 0.18 from 0.175. The curd was allowed to set for 20 minutes, was then stirred 10 minutes, and heated to 108° in 35 minutes. One hour after the close of the heating period the curd was ready to dip and the whey acidity had advanced from 0.13 to 0.14. Curds were salted at the 1½, 2¼, and 3 per cent rates. Unsalted cheeses were soaked in brine for 30 hours and one cheese was soaked in brine for 20 hours after being rubbed on 2 consecutive days with salt. The cheeses were hooped in young America hoops and not in cloths as is generally done.

Brick cheeses were made from 4.2 per cent fat content milk which titrated 0.19. Standard color was added at the rate of 1 ounce per 1,000 pounds of milk. A Streptococcus lactis culture was used at the rate of ¼ per cent, and the titration of the milk advanced to 0.20. Rennet was added at the 3-ounce rate. The curd was cut after 25 minutes, and the titration of the whey was 0.14 following the 10-minute stirring period. The curd was heated to 108° in 30 minutes. At this point approximately 50 per cent of the whey was removed, and 30 minutes later the curd was dipped into brick molds. The individual bricks weighing 4½ pounds each after pressing were soaked in brine for 30 and 48 hours, respectively. One brick was salt rubbed on 3 consecutive days, while an attempt was made to curd salt one brick at the 2¼ per cent rate. The curd remaining was used for another experiment.

Without certain factual material for the various series, this presentation would lose much of its value. It is for this reason that certain steps in the cook variations are also given. It is not proposed, however, to
give a dissertation or make sheet directions for the varieties used. Excellent references\(^1\) on the manufacture of these varieties are available.

For the cook variation, the cheddar cheese series was the only one in which three different lots of milk were used to obtain each single cook variation series. This was deemed necessary to eliminate variations which might be introduced in attempting to cheddar three lots of curd from the same vat of milk cooked to different temperatures.

The cook variation cheeses were made in a manner very similar to that employed in making the salt variation cheeses. The slight differences were not significant and will not be recorded. In all cases the cooking temperatures of 96°, 102°, and 108°F were used for the comparisons. Special technic developed to reduce to a minimum influences other than the cook temperature was employed.

### CURD SALTING

The results of splitting the curds and adding 1½, 2¼, and 3 per cent of salt on the curd basis are given in Table 1. The score values represent the mean of three lots each of Cheddar, granular, and Monterey cheeses. Analyses were made of each cheese but the means for scores and analyses are grouped since there was no deviation from the trend observed for each type of cheese.

**Table 1.—Effects upon Composition and Quality of Cheddar, Granular, and Monterey Cheeses Resulting from the Addition of Varying Amounts of Salt.**

<table>
<thead>
<tr>
<th>Salt added, per cent</th>
<th>Composition, per cent</th>
<th>Score, per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Salt</td>
<td>Moisture</td>
</tr>
<tr>
<td>1.50</td>
<td>1.25</td>
<td>38.86</td>
</tr>
<tr>
<td>2.25</td>
<td>1.63</td>
<td>37.26</td>
</tr>
<tr>
<td>3.00</td>
<td>2.00</td>
<td>36.40</td>
</tr>
</tbody>
</table>

It is noteworthy to observe that in adding 1½ per cent of salt 83 1/3 per cent of it is retained in the cheese. Where 2¼ per cent is added, 72.4 per cent is retained; and with the addition of 3 per cent, 66 2/3

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per cent is retained. This ratio of losses is not unusual as the salt is lost in the briny whey pressed from the cheese.

The salt range studied did not affect the body of the cheeses, but cheeses to which 3 per cent of salt was added scored 1 point lower on flavor than the cheeses to which 1½ and 2½ per cent of salt were added.

The salt losses cannot be applied to all types of curd with various methods of making and salting; nevertheless, the controlled batches establish the definiteness of the trend for salt losses in the types of cheeses studied when they are made in the generally accepted manner. From this angle the results obtained can be applied to all types of salting rates.

It has been indicated that these studies, being regarded as steps in fundamental cheese research, may have mainly an academic interest. Practical deductions from these studied, however, exceeded those of academic interest as the work advanced and in the salting rate trials a practical application is presented. It has always been the practice to add salt on the basis of 1,000 pounds of milk. This is logical as it would be exceedingly difficult and inconvenient to weigh the curd for salting when converting 20,000 pounds or more of milk into cheese. The amount of salt added, however, has not been varied properly as changes in fat content of the milk occurred.

**Table 2.—Amount of Salt to Add Per 1,000 Pounds of Milk Varying in Fat Content to Approach a Desired Percentage of Salt in Cheddar, Granular, and Monterey Cheeses.**

<table>
<thead>
<tr>
<th>FAT CONTENT OF MILK, PER CENT</th>
<th>CHEESE YIELD PER 100 POUNDS OF MILK, POUNDS</th>
<th>POUNDS OF SALT TO BE ADDED PER 1,000 POUNDS OF MILK FOR A DESIRED SALT CONTENT OF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1¾ per cent</td>
</tr>
<tr>
<td>3.0</td>
<td>8.3</td>
<td>1.3</td>
</tr>
<tr>
<td>3.5</td>
<td>9.5</td>
<td>1.4</td>
</tr>
<tr>
<td>4.0</td>
<td>10.6</td>
<td>1.6</td>
</tr>
<tr>
<td>4.5</td>
<td>11.7</td>
<td>1.8</td>
</tr>
<tr>
<td>5.0</td>
<td>12.9</td>
<td>1.9</td>
</tr>
<tr>
<td>5.5</td>
<td>14.2</td>
<td>2.1</td>
</tr>
</tbody>
</table>

For this reason Table 2 has been prepared to guide the cheesemaker in determining how much salt to add to the curd per 1,000 pounds of milk when the fat test varies and when a given percentage of salt in the
cheese is desired. This table can be used in making types of cheese of the Cheddar group in the normal way with an average moisture content of 36.8 per cent with the upper limit of 39 per cent.

The calculations in Table 2 are based upon the observed salt losses in cheese made under the conditions of this experiment and the yields are based upon the author’s records and also the values presented by Van Slyke and Price.²

It is of interest to note that the author’s results and those reported previously by Riddet, et al.³ are in close agreement. They report the relationship of the salt content to quality in Cheddar cheese based upon numerous scorings and analyses of commercial cheeses. The studies reported here are based upon salt-quality relationships in cheeses made under controlled experimental conditions. The results arrived at by different methods are strikingly similar.

Furthermore, the results secured at this Station, together with those obtained by Riddet, et al., indicate that cheeses of the Cheddar type should contain salt preferably within the 1½ to 1¾ per cent range. Both studies emphasize the importance of following more closely the actual salt content of the cheese rather than a standard method of calculating the percentage to use. In the past very little attention has been given to analyzing cheese for its salt content, the assumption being that commonly adopted methods for calculating the amount produced the desired salt content in the cheese. With the facts presented in Table 2 plus a method for determining the salt content of cheese, it should not be difficult, under average conditions, to standardize closely the salt content of cheese.

CURD SALTING, SALT RUBBING, AND BRINING COMPARISONS

An attempt was made to compare salting methods with quality and composition relationships. For this purpose the granular, Monterey, and Camosun varieties were used. The obviousness of only curd salting Cheddar cheese was so apparent that this variety was eliminated from the study. It was not attempted to curd salt brick cheeses. The results are presented in Table 3.

The tabulations clearly indicate that curd salting the stirred curd

type of cheeses has an advantage over brine salting or salt rubbing. Brine salting and rubbing produced like results in flavor and texture.

Data were available showing relationships between brine salting and salt rubbing brick cheeses. Like results were obtained in salting by the two methods. Texture scores on three batches of cheese were equal, and the brine salting flavor score averaged 36.0 against a score of 36.3 for the salt-rubbed cheeses. These values were not tabulated because of the limited number of comparisons and also because there were no curd-salted cheeses in the brick series.

In another series of six comparisons with stirred curd cheeses, curd salting produced better quality than brine salting. The texture scores

<table>
<thead>
<tr>
<th>Table 3.—The Relationship to Composition and Quality of Cheese of the Method of Salting Granular, Monterey, and Camosun Curds.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salting Method</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Curd...</td>
</tr>
<tr>
<td>Brine...</td>
</tr>
<tr>
<td>Rub...</td>
</tr>
</tbody>
</table>

in this series were comparable. The curd-salted cheeses were given an average flavor score of 38.9, and the brine-salted cheeses 38.0.

COOK VARIATION COMPARISONS

Table 4 presents a detailed account of the cook variation results. An increase in fat and a decrease in moisture content of the cheeses was associated with an increase in the cooking temperatures. Altho this information is not new, it has never been previously recorded in the manner that it appears in Table 4. To the author's knowledge, five cheese varieties have never been directly compared in this way. The comparison was possible since quality in all cases was measured in the same terms; namely, numerical values representing the relative conditions of flavor and texture.

Quality in Cheddar cheese did not vary markedly with a cooking temperature change. The Cheddar flavor was not significantly affected by a change in cooking temperature. Texture scores were identical for the three cooking temperatures employed in making the Cheddar cheeses. The granular and Monterey cheeses, however, were improved
in flavor and texture with an increase in cooking temperature within the range of 96° to 108°F. The same condition applied to the Camosun cheeses, but they were omitted from the comparisons because they were made from a different grade of milk: Low quality and variations in both flavor and texture were noted in studying the brick cheeses. It appeared that quality control was difficult in cheeses which varied widely from the Cheddar process. This point is better comprehended by an examination of Fig. 1.

The increase in quality of cheeses of the stirred curd types with an increase in cooking temperature is at least partly associated with a decrease in moisture content. The granular cheeses cooked to 96°F had

### Table 4.—Influence of Cooking Temperatures Upon the Composition and Quality of Several Varieties of Cheese.

<table>
<thead>
<tr>
<th>Cooking temperature, °F</th>
<th>Composition, per cent</th>
<th>Quality score*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fat</td>
<td>Moisture</td>
</tr>
<tr>
<td>Cheddar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96°</td>
<td>33.7</td>
<td>39.0</td>
</tr>
<tr>
<td>102°</td>
<td>34.0</td>
<td>36.8</td>
</tr>
<tr>
<td>108°</td>
<td>39.0</td>
<td>31.2</td>
</tr>
<tr>
<td>Granular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96°</td>
<td>30.0</td>
<td>44.2</td>
</tr>
<tr>
<td>102°</td>
<td>31.5</td>
<td>39.8</td>
</tr>
<tr>
<td>108°</td>
<td>32.2</td>
<td>36.0</td>
</tr>
<tr>
<td>108°†</td>
<td>37.5</td>
<td>32.6</td>
</tr>
<tr>
<td>Camosun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96°</td>
<td>30.7</td>
<td>40.8</td>
</tr>
<tr>
<td>102°</td>
<td>31.5</td>
<td>39.8</td>
</tr>
<tr>
<td>108°</td>
<td>31.7</td>
<td>37.4</td>
</tr>
<tr>
<td>108°†</td>
<td>32.1</td>
<td>36.4</td>
</tr>
<tr>
<td>Monterey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96°</td>
<td>26.2</td>
<td>47.2</td>
</tr>
<tr>
<td>102°</td>
<td>27.0</td>
<td>43.8</td>
</tr>
<tr>
<td>108°</td>
<td>27.7</td>
<td>43.2</td>
</tr>
<tr>
<td>108°†</td>
<td>28.5</td>
<td>38.2</td>
</tr>
<tr>
<td>Brick</td>
<td></td>
<td></td>
</tr>
<tr>
<td>92°</td>
<td>30.0</td>
<td>47.6</td>
</tr>
<tr>
<td>102°</td>
<td>30.0</td>
<td>47.5</td>
</tr>
<tr>
<td>108°</td>
<td>30.00</td>
<td>43.2</td>
</tr>
<tr>
<td>116°</td>
<td>32.0</td>
<td>42.4</td>
</tr>
</tbody>
</table>

*Each entry represents six scorings by two judges at three periods.
†These cheeses were cheddared.
‡Indicates that at one or more scoring periods cheeses were criticized as being sour.
an average combined flavor and texture score of 67.1 with an average moisture percentage of 44.2. Cooking the granular cheeses to 102°F increased the average quality score to 68.2 with an average moisture percentage of 39.8, whereas cooking to 108°F resulted in a quality score of 69.2 with an average moisture percentage of 36.0.

![Graph](image)

**Fig. 1.— Flavor and Texture Variations in Four Varieties of Cheeses Made from Comparable Milks and the Influence of Variations in Cooking Methods on Quality.**

The Camosun values are presented but eliminated from the comparison since the milk used for making this variety was not comparable to the other milks.

The Monterey types followed the trend of the granular cheeses. Cooking temperatures of 96°, 102°, and 108° produced relative average quality scores of 66.8, 67.9, and 68.7, with corresponding moisture percentages of 43.8, 43.2, and 38.2.

Camosun cheeses cooked to 96°, 102°, and 108° produced average quality scores of 64.5, 64.8, and 66.3, with average moisture percentages of 40.8, 39.8, and 37.4.
Cooking temperatures did not materially affect the quality of Cheddar cheeses. There was, however, a definite moisture decrease with an increase in cooking temperatures. Varying the Cheddar cooking temperature from 96° to 108° decreased the moisture content from 39.0 to 31.2 per cent, a value far below the moisture content of normal cheese, without significantly affecting quality. These points will be better understood by a study of Fig. 2.

![Graph showing the influence of variations in cooking methods on the combined flavor and texture score and moisture content of Cheddar and stirred curd type cheeses.](image)

**Fig. 2.**—Influence of Variations in Cooking Methods on the Combined Flavor and Texture Score and Moisture Content of Cheddar and Stirred Curd Type Cheeses.

It was possible to make a comparison of the composition and quality of cheeses made by the five different methods studied, since all cheeses with one exception were made from milk that was comparable in composition and quality. This comparison was made since in each case cheddaring the curds of the other varieties of cheese markedly im-
proved the quality scores. The scores of the cheddared varieties included in the quality-variety comparisons are presented in Table 4.

Cheddaring part of the granular cheese curds improved the score 2.4 points over the lowest scoring granular type cheese and 0.3 point over the best granular type cheese. For the cheddared Monterey type cheese, the comparable score increases on the above basis were 2.7 and 0.8 points respectively, in favor of the cheddared curds. For the Camosun type cheese, the values were increased 5.0 and 3.2 points respectively.

The data presented in Table 5 indicate clearly that the methods of producing certain varieties of cheese resulted in a better product. Altho this point has frequently been stated, supporting evidence does not appear in the literature. As indicated in Table 5, variety and quality relationships were not associated with composition when variety comparisons were made with liberal mean value ranges in moisture.

<table>
<thead>
<tr>
<th>Cheese Variety</th>
<th>Composition, per cent</th>
<th>Quality score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fat</td>
<td>Moisture</td>
</tr>
<tr>
<td>Cheddar</td>
<td>35.6</td>
<td>35.7</td>
</tr>
<tr>
<td>Granular</td>
<td>31.2</td>
<td>40.0</td>
</tr>
<tr>
<td>Camosun*</td>
<td>31.3</td>
<td>39.3</td>
</tr>
<tr>
<td>Monterey</td>
<td>26.9</td>
<td>44.7</td>
</tr>
<tr>
<td>Brick</td>
<td>30.0</td>
<td>46.1</td>
</tr>
</tbody>
</table>

*The value for the Camosun cheeses are eliminated from the comparisons since special milk was used in making them. All other varieties were made from like milks.

The data support the previously established point that cheddaring curds produces the highest quality cheese. They indicate further that granular and Monterey cheeses made from comparable milks were about equal in quality, altho the moisture contents were not alike. This was unique since in both varieties reduced moisture contents result in better quality in the cheeses. The results obtained with Camosun cheese are recorded, but they are not used in the comparisons since the milk was unlike that used for the other varieties.

The brick cheese results indicate that quality control in this variety was difficult. This is common knowledge and requires no further exposition.

It is possible to challenge the statistical accuracy of the deductions made from the data presented in Table 5, however common logic clearly indicates the correctness of the deductions. To establish the points statistically would require the making of five batches of cheese at the
same time from the same milk and on a given number of days. The physical impossibility of doing this is apparent. The cheeses reported upon in Table 5 were made from like milks with the single exception noted. Delving into the reasons for the differences recorded in Table 5 is beyond the scope of this study; it offers, however, an excellent problem for further investigation.

DISCUSSION

As previously stated, this investigation was conducted to study experimentally the influences of salt and variations in cooking upon the composition and quality of five varieties of cheese.

The study developed a schedule rate for salting cheese curds on the milk fat content basis. The desirability of following a schedule of this type was very apparent from the results obtained.

Studies of salting methods revealed that curd salting, brine salting, or salt rubbing could be practiced with success. Curd salting, however, produced a higher quality cheese than brine or rub salting. Brine salting and salt rubbing produced comparable results. Rubbing and brine salting combined was also practiced successfully.

Salt control within a rather limited range was possible by following the procedures outlined in this work. The study clearly indicated the desirability of analyzing cheeses for their salt, fat, and moisture contents.

The cook variation studies revealed that in experimental cheeses higher cooking temperatures were generally associated with a decrease in moisture and an improvement in quality in the cheese.

The study revealed further that uniform and higher quality could be produced by cheddaring than by any of the other processes followed. Variations in cooking produced less variation in the quality of Cheddar cheeses than in the other varieties studied. There was a relationship to quality associated with the methods of making the cheeses. Cheeses which were made by a method more like the Cheddar method than other methods scored higher than the other cheeses. For example, the granular and Monterey methods are more like the Cheddar method than are the methods used for making brick and Camosun. The granular and Monterey methods scored higher than the brick and Camosun cheeses. The reasons for this should be studied further. Without doubt the time element with the subsequent acid development in making cheeses of the Cheddar type is a factor to be dealt with in a future study of this point.
CONCLUSIONS

1. Cheese curds should be salted upon a rate basis calculated from the milk fat per cent of the milk used.

2. Curd salting stirred curd cheese varieties produced better cheese than brine salting or rubbing. Comparable results were produced with all varieties when brine salting and rubbing were compared.

3. Cook variations produced less difference in the quality of Cheddar cheese than in the other varieties studied.

4. The quality of cheeses made from comparable milks was dependent upon the cheese variety made. The quality order was as follows: Cheddar, granular, Monterey, and brick.

5. It was not possible to make a high quality and uniform cheese by the Camosun method with milk comparable to that available when this variety is made on the farm.