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A Study of South Dakota Butter with Suggestions for Improvements

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South Dakota State College
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DAIRY HUSBANDRY DEPARTMENT

A Study
of
South Dakota Butter
with
Suggestions for Improvements

BROOKINGS, SOUTH DAKOTA

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A Study of South Dakota Butter with Suggestions For Improvements

C. Larsen and J. H. Shepard. *

INTRODUCTION.

At the South Dakota State Dairymen and Buttermakers' convention held at Mitchell in the month of October, 1907, the question of improving the quality of South Dakota butter was discussed from many points of view. It was realized that dairy products from this state, in quality, should be second to none. On eastern markets, in competition with dairy products from various portions of the United States, there should be a special demand, at special high prices, for South Dakota dairy products. This state is favored with all the favorable natural conditions for producing the best possible quality of dairy products. If this state is not doing this now, the fault is with those who produce, handle, and manufacture the raw product, and not due to any unfavorable natural surroundings. Fortunately this is the situation. The former can be regulated, while it is more difficult to control the latter.

All acquainted with the dairy situation in this state realize, that as a whole there is room for much improvement in the quality of butter manufactured. With a view of more definitely locating the specific dairy troubles, suggesting possible remedies, and stimulating additional interest in the making of a larger quantity of improved quality of butter, a co-operative butter contest under the auspices of the State Dairy Association and the Dairy Department of the Experiment Station was instituted.

* The authors are indebted to Mr. A. E. Koch for analytical work in connection with the contest, and to Mr. T. H. Lund for aiding in carrying out the contest and compiling data.

THE PLAN OF THE TEST.

1. Each competitor, representing a creamery, sent at six different times, representing different seasons of the year, a twenty pound tub of butter to the experiment station, at which place the butter was scored by competent judges. Prof. G. L. McKay, W. B. Johnson, J. C. Joslin, and H. Sondergaard, dairy inspectors in Iowa and Minnesota, respectively, acted in this capacity at Brookings. Mr. H. J. Credicot and Thomas Corneliusen, federal butter experts stationed at Chicago, rescored all of the butter. The average of the two scores at Brookings and Chicago constituted the basis of comparative excellence.

2. Each contestant filled out an entry blank. The questions in this entry blank were few but pertinent. Previous experience has demonstrated that a large number of questions requiring many detailed observations, and some rather complex determinations, are seldom answered in a dependable way. The following is a copy of the entry blanks sent out, which were very satisfactorily filled out by the competitors:

ENTRY BLANK FOR SOUTH DAKOTA BUTTER CONTEST.

Please send butter for.....entry.....to arrive in Brookings not later than.....

Please answer the following questions:

Is your creamery a local or a central plant?.....

Do you receive cream, milk or both?.....

About how old is the cream when churned?.....

Do you grade the cream, if so how many grades?..

Do you pasteurize the cream?.....

Do you use starters, what kind?.....

What was the temperature of the cream when churned?.....

What was the temperature of the wash water?...

Did you work or wash the butter in excess for any special purpose?.....

What was the per cent of acidity in cream when churned?.....

What was the per cent of fat in cream when churned?.....

About what is your average daily per cent of overrun?.....

Name .....

Address.....

Please return this entry blank when filled out.

Thirty-seven different creameries were represented in this educational butter contest. Thirty-five of these were local creameries and two were central plants. Twenty-nine of these creameries received cream only, and eight received both milk and cream.

In the January exhibit only one of the contestants graded the cream, in April six, in May three, in June four, in August four, and in the month of September only one graded the cream. Eighty-five and three-tenths per cent of those in the contest did not grade the cream, while fourteen and seven-tenths per cent did.

Fifteen per cent of the contestants pasteurized the cream while the remainder, eighty-five per cent, did not.

Thirty-two and four-tenths per cent of the butter was made from cream in which starters had been used, while sixty-seven and six-tenths per cent was made from cream in which starters were not used.

The average churning temperature for each month was as follows: January 56.6° F.; April 54.5° F.; May 54.2° F.; June 53.5° F.; August 53.3° F. and September 53° F. The total average churning temperature was 54.2° F., which was the same as for the month of May.

The monthly average temperature of wash water was:— January 59.8° F.; April 60.6° F; May 59.9° F.; June 56.4° F.; August 56.5° F. and September 57.7° F.

Total average wash-water temperature was 58.5° F.

The monthly per cent of fat in the cream was:— In January, highest thirty-seven per cent, lowest twenty-one per cent and average twenty-three and nine- tenths per cent; in April, highest thirty-two per cent, lowest eighteen per cent and average twenty-five and nine-tenths per cent; in May, highest thirty-four per cent, lowest twenty per cent and average twenty-five and eight-tenths per cent; in June, highest thirty-eight per cent, lowest eighteen per cent and average twenty-seven and five-tenths per cent; in August, highest forty-two per cent, lowest twenty-one per cent and average twenty-eight and one-tenth per cent; in September, highest thirty per cent, lowest twenty-two per cent and average twenty-eight and nine-tenths per cent. The average of fat contained in all entries was twenty-six and seven-tenths per cent.

The monthly overrun as reported by each competitor was as follows: In January, highest twenty-three per cent, lowest fourteen per cent and average eighteen and one-tenth per cent; in April, highest twenty-two per cent, lowest fourteen per cent and average eighteen per cent; in May, highest twenty-two per cent, lowest sixteen per cent and average eighteen and eight-tenths per cent; in June, highest twenty-one per cent, lowest fourteen per cent and average seventeen and three-tenths per cent; in August, highest twenty per cent, lowest fourteen per cent and average seventeen and three-tenths per cent, and in September, highest twenty per cent, lowest fourteen per cent and average seventeen and seven-tenths per cent. The total average overrun reported was seventeen and nine-tenths per cent.

By closely studying these reports and the chemical and physical qualities of the butter, and by making comparative studies, it was possible to arrive at con-

clusions and to make suggestions and obtain results of mutual benefit. The following is a report blank which in addition to a personal letter, was sent to each competitor after each of the six entries:

REPORT BLANK.

Brookings, S. D.....1908.

Dear Sir:—

Following are the results of your..... entry in the South Dakota butter contest:

	Perfect Score	Brookings Score	Chicago Score	Average Score	Chicago Remarks
Flavor					
Body					
Color					
Salt					
Style					
Total					

Brookings Remarks: _____

	Per Cent Fat	Per Cent Water	Per Cent Salt and Ash	Per Cent Curd
Butter				

Remarks: _____

_____ Analyist
_____ Judge
_____ Judge
_____ Judge

3. As soon as the butter arrived in Brookings, a sample was taken and analyzed chemically.

4. The first tub of butter (20lb) sent by each contestant, was donated to defray expenses and for buying four prizes to be given to those who received the four highest average scores; also for buying certificates to be given to those who received an average score of 90 or above. In addition, the Creamery Journal, Waterloo, Iowa, gave a gold watch to the winner. The win-

ners in the contest were as follows: First, A. P. Ryger, Milbank; second, Fred Madsen, Summit; third, Chris Hansen, Stockholm; fourth, Chris Rognes, Astoria.

SUMMARY OF PHYSICAL OBSERVATIONS WITH SUGGESTED IMPROVEMENTS.

One hundred and fifty-seven samples of butter, representing thirty-five different creameries in different parts of the state, were examined and analyzed. It was hoped that more competitors could have participated. The more samples and the more creameries represented, the greater would be the accuracy of results. However, certain results stand out so prominently that conclusions reached are reasonably justifiable.

FLAVOR OF BUTTER.

The natural declicious flavor of well made butter from fresh pure cream is very pleasing to the taste. It is chiefly this desirable flavor for which butter consumers pay. Butter does not contain more food value than many other animal fats, but its natural unadulterated flavor far excells that of any other fat. It is therefore of great importance that this desirable flavor of butter be preserved and improved.

The results of this butter contest, without a single exception, prove that South Dakota butter, as compared with its other qualities, is weakest in flavor. The results further emphasize that old stale impure cream is the chief cause of the "off" butter flavor. Every sample of butter examined was scored off several points on flavor, and the common remarks by the judges were: "Made from old stale cream." The one hundred and fifty-seven samples were scored off as shown in the following table:

TABLE NO. I.

SHOWING NUMBER AND PER CENT OF POINTS SCORED "OFF"

(No. of Tubs 157.)

	Perfect	Total Points Scored	Points Scored Off	Per Cent Scored Off
Flavor	7065	5599.45	1465.55	20.75
Body	3925	3901.50	23.50	0.6
Color	2355	2327.75	27.25	1.16
Salt	1570	1565.00	5.00	0.33
Style	785	784.25	0.75	0.1
Total	15700	1477.95	1522.05	(Av.) 9.7

The detailed statements of the judges in the latter part of this bulletin show the results.

To further emphasize the great need of improvement in the flavor of our butter, the following letters have been submitted by the Chicago butter commission firm, which handled and sold all of the butter used in this investigation, and by Mr. J. H. Credicot, federal butter expert in the Chicago Market.

Prof. C. Larsen, Chicago, Dec. 10, 1908.
Brookings, S. Dak.

Dear Sir:—

"In regard to your inquiry will state, there are two principal reasons for the large percentage of poor butter shipped from South Dakota. A few years ago, one main fault was in the feeding, which showed traces of the wild grass, that has been eliminated, and it is apparent to us that the creameries are not receiving their cream as often or in as clean condition as it should be.

A butter maker is certainly handicapped no matter how well he knows his business, if his cream is kept back a week at a time and again when that comes in from hand separators which have not been kept in a

thorough cleanly condition.

In our opinion, if the butter makers and managers of creameries could make arrangements to *get their cream hauled in oftener and regularly and look after the cleanliness of the hand separators,* that the average of South Dakota butter would show a decided improvement and they would produce more butter that we would be glad to pay outside prices for and it would cost no more to make the butter that brings the good price than it does the butter that you are selling at a price which means a loss to the creamery.

Sincerely yours,

GEO W. LINN & SON.

(Chicago Butter Com. Co.)"

No. 22 Fifth Ave., Chicago, Dec. 10, 1908.

Prof. C. Larsen,
Brookings, S. D.

Dear Sir:—

"In answer to your question as to the main cause of defective quality of South Dakota butter, I would say that it is *undoubtedly poor cream. The poor quality of the cream is due to holding the cream too long on the farm and to the unsanitary methods of handling the cream.* It has always been recognized that it requires clean, fresh cream to make fine butter, but the creameries, because of strong competition, have been forced to lower their standard and to accept lower grades of cream. This has encouraged the creamery patron to hold the cream on the farm until he finds it convenient to take it to the creamery or shipping station, regardless of the effect on the cream.

There is no doubt a great deal of carelessness in the care of the hand separators which is the cause of much tainted cream. The only way in which the general quality of the South Dakota butter can be raised

is to correct these conditions for it is beyond the pow er of any buttermaker to make a fancy clean flavored butter from old stale cream. Yours truly,

H. J. CREDICOT.

(Chicago Federal Butter Inspector.)"

All evidence, gathered by commission men handling South Dakota butter, obtained in this investigation, and from general observations, proves beyond a doubt, that the "off" flavored butter is due to old stale cream. This places the blame at the door of the producer of the raw material or the dairy farmer. The *stale* flavor is due to impurities and undesirable germs which in one way or another get into the cream. The *old* flavor is due to infrequent delivery, and not keeping the cream cold.

As will be seen from the table, the physical defects in body, color, salt and style, were relatively few. Defects along these lines would be caused chiefly by the butter-maker. They are, however, so few that they may be regarded as accidental and shall not at this time be elaborated upon. The all important subject is "Improvement of Flavor."

IMPROVEMENT IN QUALITY OF BUTTER.

The following outline and discussion include suggestions in the improvement of cream and butter.

I. Improvements before the cream reaches the factory.
   1. Healthy cows in healthful surroundings, and fed on desirable feeds.
   2. Sanitary and clean utensils in desirable surroundings.
   3. Rich cream.
   4. Cooling the cream immediately after separating.

5. Frequent delivery of cream to creamery.

II. Improvements after the cream reaches the factory.

1. Use of good starters.
2. Pasteurization under proper conditions.
3. Composition of butter.
4. Grading the cream.

IMPROVEMENTS OF CREAM ON THE FARM.

No one would consciously practice uncleanliness in handling milk and cream. These raw products are foods and, also constitute the raw product from which butter is made, the most delicious fat-food known. Dairy products are very perishable and those who produce milk and cream should be especially prepared to handle them in a sanitary way. Many are in the dairy business, but few are prepared to properly handle the raw milk and cream. This is due chiefly to wrong conceptions of what is understood by cleanliness and dairy sanitation.

DAIRY COWS AND SURROUNDINGS.

Milk to be sanitary should first come from healthy cows, kept in a well ventilated and sanitary barn, and fed on desirable feeds. The milk will then come from the cow in an ideal condition, and when drawn, is the best of all natural foods. On an average, this stage of milk production is in a much better condition than is the handling of the milk and cream after it leaves the cow.

If the cream were delivered at the factories in as good a condition as when it came from the cow, the butter price would range at least three cents higher per pound, which would mean an annual additional profit of about $15,000 to the dairy farmers in South Dakota.

Dust from feeds and from sweeping the barn, dirt from the cows' udder and sides, and from the milker's

hands, and filth from improperly cleaned milk utensils, separator, etc., are laden with multitudes of undesirable germs. Germs are the cause of spoiled cream and of poor butter. If it were possible to keep out all germs, milk and cream would keep almost indefinitely. This, under practical conditions, is not possible.

By great care in cleanliness, many germs can be excluded from the milk and cream, and therefore the quality and keeping property of them will be improved.

Feeding the cows hay, cleaning and bedding the barn, or any other act, which would raise dust and create filthy air in the barn, should not be done just previous to nor during the milking time. When milking is in progress the air in the barn should be as pure and fresh as possible and free from foreign obnoxious odors.

Milk and cream very quickly absorb foreign odors. The butter made from such impure cream is sure to be tainted and thus robbed of its delicious flavor. Milk may become tainted before it is drawn from the cow due to certain undesirable feeds eaten by the cow. Such feeds as cabbage, garlic, and wild onions when eaten by the cow, are sure to taint the milk. Milk and cream may also be tainted by letting them stand in the barn, by separating the cream in a foul, poorly ventilated room near the barn, and by exposing it to an impure atmosphere.

HANDLING CREAM UNDER SANITARY CONDITIONS.

The cream should not only be produced in clean and pure surroundings, but it should be separated and kept until time of delivery in a similar place. Some dairy farmers keep the cream in the barn with the cows—a practice which is not conducive to the best quality of cream. The separator should be stationed in a well lighted, ventilated, and sanitary milk room, separate from the more or less impure barn air.

The cream separator itself is another very common source of foul cream. If not taken apart and thoroughly cleaned each time, immediately after separation, the cream subsequently separated will be charged with foul odors and with multitudes of undesirable germs. These germs rapidly multiply in cream and produce bad gases and flavors. They cause ordinary decay.

The separator should be taken apart each time after separation, rinse the milky part off with luke-warm water, then wash each part in another set of luke-warm water containing some washing powder, then rinse all parts in scalding hot water and let them remain in it a few minutes. Steaming is still better than scalding but few dairy farmers have steam on the place. Scalding or steaming kills the germs and heats the separator parts, so when put away to drain, they quickly dry, which prevents rusting and keeps them in good condition. The separator-parts should be in the fresh air and exposed during the day to the sun. A good practice is to hang them on the wall on the south side of the milk house.

This same degree of cleanliness and methods of cleaning applies to all milk and cream utensils, such as pails, cans, strainers, etc.

By observing the above, (1. Healthy cows fed on good feed and kept in healthy surroundings. 2. Handling the milk and rich cream under sanitary methods and surroundings) two great fundamental steps have been taken towards producing a good quality of cream from which an improved quality of butter can be made. With the greatest of care some germs will get into the milk and cream. These germs, if not restricted will multiply and cause the cream to decay and become foul and stale.

RICH CREAM.

These undesirable germs thrive chiefly on the

curdy part of the cream. The butter-fat itself is not a desirable food for the germs. Most dairy farmers have observed that rich cream keeps better than does thin cream, butter keeps still better than cream, and pure butter-fat will keep a very long time without becoming rancid. Therefore, separate as thick cream as the separator will handle, and as is consistent with the season, about 35 per cent in winter and about 40 per cent in summer. Skimming rich cream also saves more skim milk for feeding purposes, and gives less bulk to be handled, and the buttermaker can make a higher grade of butter from it than from the thin cream.

COOLING CREAM NECESSARY.

By cooling the cream thoroughly at once after separation, the growth of germs is checked. In twenty-four hours at about 70° F., or about summer temperature, the growth of germs is about one hundred fifty times as rapid as when cooled to about 50° F., or to well water temperature. Cooling the cream at once as low as possible without freezing, will retard the growth of germs in a marked degree, and thus preserve the quality of the cream. Germs are like the plants we see, cold retards their growth, extreme cold entirely stops their growth.

In certain localities in this state the temperature of the well water is higher than that of the atmosphere. Under such conditions, it is impossible, during the summer, to properly cool the milk without the use of ice. A small combined milk and ice house may be built at small cost.

Such a milk room should be well lighted and well ventilated and of convenient size. The latter depending upon the amount of milk and cream to be handled. There should be room for the separator. On one side of the room there should be a cooling tank, high

enough to permit nearly the full depth of the can to be immersed in water and wide and long enough to permit a certain number of cans to stand beside each other sideways as well as lengthwise in the tank. This will prevent tipping and the spilling of milk and of cream will be obviated.

All of the water pumped for the stock should be made to first run through this milk cooling tank. The inlet of the water pipe should be at one end of the tank and the outlet to the stock tank at the other.

Milk and cream should be put into this water in the winter as well as in the summer. This quickly cools the milk and prevents it from freezing. The can may be weighted down so that the surface of the milk in the can is a few inches below the surface of the water in the tank.

By stirring the cream occasionally, with a cream stirrer, quick cooling will be facilitated and the cream will be more uniform in its consistency.

Warm cream and cold cream should never be mixed until the former has been cooled. If the two are mixed together the temperature of the cold cream is raised to a point when germs, already there, will multiply with great rapidity and thus cause the cream to spoil.

FREQUENT DELIVERY OF CREAM IMPORTANT.

One of the greatest causes of poor butter is infrequent delivery of the cream. Many patrons deliver cream only once a week. Infrequent delivery is especially practiced during the winter when the cows give less milk. In some instances, especially when taken to a cream receiving station and shipped, it often is much older than this before the cream reaches the central churning point. The cream from which the butter was made in this investigation was on an average five days old. Some of this cream was as much as fifteen

days old. It is impossible to keep cream under farm conditions so long a time as this without getting a very inferior quality of butter.

It should be borne in mind, that butter will at all times keep better than cream. Every hour that milk and cream are kept after milking and separation, will cause it to deteriorate in quality. In most instances under present conditions in South Dakota it is not practicable to deliver the cream to the creamery immediately after milking. Good cream can be cooled and kept a short time with only a reasonably small amount of deterioration.

Cream should be delivered to the creamery every day if possible. If this is not consistent with the time and quantity of cream, once every other day during the summer and every third day in winter, will facilitate the making of good butter when compared with present conditions. Providing the cream is properly produced and cared for, this will mean a a great improvement in the quality of raw material.

SUGGESTIONS FOR IMPROVEMENTS AT FACTORY.

No creamery operator can make the highest quality of butter from old stale cream. To obtain the best results, the raw material should be fresh and pure. However, the fact remains that much inferior cream is being delivered at the factories and while hoping for improvements in the quality of cream, the buttermaker must handle this cream to best advantage.

USE OF GOOD STARTERS.

One way in which inferior cream may be improved is to use a good starter. Old stale cream contains a preponderence of undesirable germs. A good starter is a pure culture of desirable germs. By adding a good

starter to such cream, the desirable germs are increased to the extent of counteracting, at least in a measure, the bad results of the undesirable ones. In addition there is a physical improvement due to mixing the starter with the cream. The amount of starter to add depends upon several conditions, viz., richness of the cream, and the amount of good skim milk obtainable.

In this investigation only forty-seven lots out of the one hundred fifty-seven were made by using commercial starters. Those who used starters manufactured butter which averaged one and three-tenths points higher in flavor. The three prize winners all used starters regularly. In addition to this, much experimental evidence proves that the addition of a good starter improves the quality of butter.

Some of the contestants stated that it was impossible to obtain the skim milk from which to make a starter. No doubt many are operating under such conditions. It is also true, undoubtedly, that a certain percentage of the operators who are not now using starters could by little extra efforts obtain milk for starter-making, and thereby improve the quality of the butter by several points.

PASTEURIZATION OF CREAM.

By pasteurization is meant the heating of cream to a temperature at which most of the germs are destroyed. This range of temperature may be from 140° F to 190° F. The cooling temperature may range from 40° F. to 80° F. according to subsequent treatment of cream. In addition to destroying germs, pasteurization drives off many undesirable taints.

Pasteurization, under all conditions, cannot be said to be an unqualified success. Under average creamery conditions it will improve the quality of but-

ter if properly carried out. If pasteurization of cream (especially sour cream) is to be successfully practiced, the following brief points should be observed:

1. The use of a good starter in the cream subsequent to pasteurization, is essential.

2. Churn the pasteurized cream containing the starter as soon as possible after pasteurization. Do not let it stand over night as the butter is apt to assume an "off" flavor, (metallic). Allow the sour cream to cool two or three hours after pasteurization and then churn.

3. Thin sour cream containing less than twenty-five or thirty per cent fat does not pasteurize successfully.

4. If the butter made from pasteurized sour cream assumes an undesirable flavor (metallic), heat only to a low temperature (120° F. to 140° F.). This will drive off many of the undesirable taints, but destroys few or none of the germs.

If these chief points are borne in mind, pasteurization will improve the butter. Butter made from pasteurized cream is also more sanitary. Pathogenic germs are destroyed at a temperature of about 180° F. Pasteurization should be employed only for the purpose of destroying germs, but recently, in addition, it has been practiced from a standpoint of renovating aged cream.

COMPOSITION OF BUTTER.

The composition of butter depends to some extent upon the market, especially is this true with the salt content. The average composition of all samples analyzed (157) is as follows: Fat, eighty-four and sixty-five hundredths per cent; water, twelve and twenty-nine hundredths per cent; salt and ash, one and seventy-seven hundredths per cent and casein or curd one and three-tenths per cent. The following table shows the

per cent of samples having different amounts of each constituent.

TABLE NO. II.

SHOWING NUMBER AND PER CENT OF SAMPLES CONTAINING DIFFERENT AMOUNTS OF EACH BUTTER CONSTITUENT

WATER			FAT			SALT AND ASH			CURD		
Amount in Per Cent	No. of Samples	Per Ct. of total entries.	Amount in Per Cent	No. of Samples	Per Ct of total entries	Amount in Per Ct.	No. of Samples	Per Ct. of total entries	Amount in Per Cent	No. of Samples	Per Ct. of total entries
9-10 Per Cent	4	2.55	Below 80 Per Cent	2	1.27	B'w. 0.5 Per Ct.	6	3.82	0 5-1 Per Cent	34	21.66
10-11 Per Cent	26	16.56	80-81 Per Cent	2	1.27	0 5-1.0 Per Ct.	29	18.47	1.0-1.5 Per Cent	83	52.87
11-12 Per Cent	41	26.12	81-82 Per Cent	11	7.00	1.0-1.5 Per Ct.	37	23.57	1.5-2 Per Cent	34	21.66
12-13 Per Cent	40	25.48	82-83 Per Cent	10	6.37	1.5-2.0 Per Ct.	7	23.57	2.0-2 5 Per Cent	4	2 55
13-14 Per Cent	28	17.81	83-84 Per Cent	28	17.81	2.0-2.5 Per Ct	17	10.83	Above 2.5 Per Cent	2	1.27
14-15 Per Cent	11	7.00	84-85 Per Cent	29	18.47	2.5-3.0 Per Ct.	13	8.28			
15-16 Per Cent	4	2.55	85-86 Per Cent	36	22-93	3.0-3.5 Per Ct.	7	4.49			
Above 16 Per Cent	3	1.91	86-87 Per Cent	24	15.29	3.5-4.0 Per Ct.	5	3.18			
			87-88 Per Cent	11	7.00	4.0-4.5 Per Ct.	5	3.18			
			Above 88 Per Cent	4	2.55	Ab'e 4.5 Per Ct.	1	0.64			

From the foregoing table it will be seen that the salt content runs low and the curd content high. Small quantities of each of these constituents effect the quality in a marked degree. Especially is this true in dealing with butter of such quality as included in this investigation.

Experiments indicate that butter made from good rich cream and ripened in the most ideal manner may contain a relative high curd content without affecting the quality of the butter. When dealing with old cream, and butter made from it, the question of eliminating the curd from the butter becomes of much

greater importance. The curd content of such quality of butter as handled in this investigation should not exceed one per cent. The curd furnishes food for undesirable germs, and secondly it is in a stage of partial decomposition and charged with objectionable flavors.

The curd may be eliminated from butter to the extent mentioned above by first churning it at such a temperature as will cause the butter to "break" in a medium firm flaky or granulated condition. Too high churning temperature causes the butter to break in masses, in which form too much curd is incorporated. When once incorporated, it is difficult to remove. Secondly, the excess of butter-milk may be rinsed off the butter and inside of churn with water at the same temperature as that of the butter-milk and allowed to drain from the churn. Thirdly, the butter may be washed in another set of water at about the same temperature, depending some upon the condition of the butter. The churn should be turned only a few revolutions so as not to cause the butter to gather in lumps. Fourth, drain, and wash in another set of water. The temperature of this wash water may be a few degrees higher than that used in the preceding washing. Wash thoroughly. This extra washing will remove curd, many undesirable flavors, and tend to help the overrun.

About sixty-nine per cent or one hundred nine tubs out of one hundred fifty-seven, contained less than two per cent of salt and forty-six per cent of the total samples contained less than one and five-tenths per cent of salt. Such light salting may be desirable when the butter is of high quality as to flavor. When the butter is of a less better grade, a little higher salting (between two per cent and three per cent) will on an average undoubtedly produce better results. A small increase in salt would aid the keeping property, and secondly increase the salty flavor, which would in a

measure cover up some of the old and undesirable cream flavors. The overrun would also be increased a trifle. Most markets demand butter containing as much salt as will dissolve. "Gritty" salt in butter is objectionable.

GRADING CREAM.

By grading the cream at the creamery the bulk of the butter can be improved. This would also cause a certain percentage of poorer butter. In most creameries, the real poor butter, is but a small part of the whole. Yet the relative small amount of real inferior cream is sufficient to reduce the quality of all when mixed with the larger amount of good cream. This poor cream is in a stage of decomposition and contains multitudes of undesirable germs which, when added to the better cream, cause it to assume similar bad properties.

In many creameries the cream supply is not large enough to make it practicable to handle and churn two or three grades of cream. Competition is usually keen, which restricts the dealings of the creamery operator with his patrons. Strictly speaking, cream, from which cannot be made a good quality of butter, should never be accepted. If the dairy farmers continue to produce, and manufacturers continue to compete for such a poor quality of cream, the laws of the land should condemn and destroy it.

Where competition permits, the cream should be bought on quality. The creamery should pay several cents more per pound for butter-fat in good condition, (grade No. 1.) and churn it separate, than for fat brought in the form of old stale putrid cream, not suitable to be put into any grade. This would encourage the production of an improved quality of cream and at the same time the bulk of butter manufactured would be improved.

The practicability of grading cream depends on so many factors and conditions that each creamery needs to determine this for itself. Wherever, the system is practicable, improvements of cream and butter is the result.

TABLE NO. III

SHOWING SCORES, COMPOSITION OF BUTTER AND CHIEF REMARKS BY JUDGES IN EACH INVESTIGATION

Exhibitor's No.	Entry Month	SCORE			COMPOSITION				CHIEF REMARKS BY JUDGES
		Brookings	Chicago	Average	Per Cent Fat	Per Cent Water	Per Cent Salt and Ash	Per Cent Casein (Curd)	
	Jan. 17	95.	92.	93.5	84.9	13.10	1.08	1.91	Old flavor and smell, due to old cream. Well made.
	April 2	91.75	93.	92.37	84.41	12.12	1.73	1.74	Fairly clean. Greasy, probably overworked. Little stale.
3	May 12	83.	85.	89.	83.84	12.08	2.79	1.29	Old, rank and stale flavor, due to poor cream. Workmanship good.
	June 16	94.	89.	91.5	84.16	13.21	1.41	1.22	Trifle old in flavor.
	Aug. 18	89.	89.	89.	83.58	12.41	2.71	1.30	Unclean fermented flavor. Due to old cream, gritty.
	Av'ge	92.55	89.60	91.07	84.18	12.58	1.94	1.49	
	Jan. 17	90.	85.	87.5	83.30	12.01	3.43	1.26	Very rank and old flavor. Color little high.
	April 2	88.	88.	88.	81.97	14.12	2.38	1.53	Stale old cream flavor. A good starter would improve. Workmanship good.
4	May 12	89.	85.	87.	82.15	14.66	1.88	1.31	Uncommon rank old cream flavor.
	June 16	91.	87.	89.	79.51	16.65	2.24	1.60	Fishy and greasy flavor. Workmanship good.
	Av'ge	89.50	86.25	87.88	81.73	14.38	2.48	1.42	
	Jan. 17	90.	86.	88.	87.34	10.00	1.46	1.20	Musty, cheesy and tallowy flavor. Neat package.
	April 2	93.	88.	90.5	85.04	12.24	1.75	.97	Barny old stale cream flavor. Workmanship good.
5	May 12	92.5	87.	89.75	86.90	9.97	1.19	1.94	Unclean, lingering old flavor.
	June 16	90.5	87.	88.75	85.16	12.09	1.54	1.21	Sourish old flavor. Mottled.
	Av'ge	91.50	87.00	89.25	86.11	11.07	1.48	1.33	

TABLE III—(Continued.)

	Jan. 16	93.	89.	91.	83.96	11.27	3.43	1.34	Old and oily flavor. Salt gritty and little high.
	April 2	94.5	91.	92.75	84.38	13.40	1.13	1.09	Fairly clean but greasy. Little flat.
	May 12	92.5	88.	90.25	83.29	11.55	3.64	1.52	Unclean and musty flavor. due to old cream.
6	June 16	92.	89.	90.5	84.21	12.88	1.78	1.13	Trifle fishy flavor. Color little wavy.
	Aug. 18	91.	91.	91.	82.26	13.74	2.51	1.49	Oily and coarse flavor. Workmanship good.
	Sept. 5	93.5	92.5	93.	82.61	13.53	2.19	1.67	Trifle unclean and old flavor. Well made.
	Av'ge	92.75	90.08	91.42	83.45	12.73	2.45	1.37	
	Jan. 16	89.	89.	89.	86.46	11.27	1.11	1.16	Unclean and scorched flavor. Little streaky.
	April 2	93.25	93.5	93.37	83.38	12.38	2.28	1.96	Little old creamy flavor. Lacks good starter flavor.
	May 12	88.	90.	89.	72.12	21.77	5.20	.91	Flavor fairly clean. Lacks butter flavor. Body dead. Color dull.
7	June 16	92.5	90.	91.25	82.34	14.83	1.61	1.22	Old and overripe cream flavor.
	Aug. 18	90.	90.	90.	83.57	13.73	1.30	1.40	Unclean old flavor. Body greasy.
	Sept. 5	91.5	91.	91.25	84.81	12.17	1.48	1.54	Old greasy flavor.
	Av'ge	90.71	90.58	90.65	82.11	14.36	2.16	1.36	
	Jan. 16	92.	86.	89.	87.37	10.40	.84	1.39	Rank old flavor. Flat. Old cream mottled.
	April 2	91.5	89.	90.25	84.62	12.45	1.44	1.39	Stale old cream flavor. Well made.
8	May 12	93.	90.	91.5	83.53	12.34	3.08	1.05	Old over-ripe flavor. Well made.
	June 16	90.5	90.	90.25	81.33	14.05	2.52	2.10	Unclean old cream flavor. Trifle leaky.
	Aug. 18	87.5	86.	86.75	84.60	13.06	.90	1.44	Fermented stale flavor. Weak body. Mottled.
	Av'ge	90.90	88.20	89.55	84.29	12.48	1.75	1.47	
	Jan. 16	94.75	89.	91.37	86.61	11.45	.88	1.06	Unclean and old. Trifle mottled.
	April 2	91.	87.	89.	84.90	11.25	2.09	1.76	Old rancid rank flavor. Good workmanship.
9	May 12	90.5	88.	89.25	81.59	13.28	4.15	.98	Overripe and unclean. High salt and gritty.
	June 16	90.5	89.	89.75	82.83	12.59	2.87	1.71	Oily fermented flavor.
	Aug. 18	90.	88.	89.	85.64	11.11	1.93	1.32	Flavor very unclean and stale.
	Av'ge	91.35	88.20	89.77	84.31	11.93	2.38	1.36	

TABLE III—(Continued.)

	Jan. 17	95.	89.	92.	85.33	12.17	1.06	1.44	Flat and greasy flavor.
	April 2	94.	94.	94.	84.25	13.14	1.11	1.5	A smothering flat flavor. Light salt.
	May 12	92.75	89.	90.87	85.92	12.64	.001	1.44	Little stale and unclean. Low in salt.
10	June 16	92.	94.	93.	83.77	14.11	1.00	1.12	Little flat in flavor. Low in salt.
	Aug. 18	93.	91.	92.	83.29	13.34	1.75	1.62	Little coarse in flavor.
	Sept. 5	94.	93.5	93.75	88.33	13.24	1.89	1.54	Fairly clean; little old cream flavor.
	Av'ge	93.46	91.75	92.60	84.31	13.11	1.14	1.44	
	Jan. 17	88.5	85.	86.75	87.02	10.72	1.14	1.12	Rancid and old flavor. Tub shou'd be wrapped.
	April 2	92.	88.	90.	86.03	10.88	1.89	1.20	Strong old cream flavor
	May 12	90.5	87.	88.75	84.82	11.84	2.28	1.06	Rank old cream flavor Workmanship good.
11	June 16	93.5	87.	90.25	81.36	15.12	2.08	1.44	Little fishy. Well made.
	Aug. 18	87.5	86.	86.75	84.44	13.53	.50	1.53	Unclean old cream flavor. Milky brine. Low salt.
	Sept. 5	92.	88.	90.	83.62	13.53	0.98	1.87	Sour old cream flavor. Well made.
	Av'ge	90.66	86.83	88.75	84.55	82.60	1.48	1.37	
	Jan. 17	93.	89.	91.	86.23	11.78	0.39	1.60	Flat and trifle old flavor. Mott'ed.
	April 2	93.	94.	93.5	85.19	12.22	1.11	1.48	Clean flavor. Very fine body. Well made.
	May 12	93.5	92.	92.75	85.43	12.58	0.70	1.29	Flat but clean flavor. Little mottled.
12	June 16	91.5	92.	91.75	86.11	11.20	1.77	.92	Trifle unclean. Little wavy.
	Aug. 18	86.5	88.	87.25	83.62	11.38	3.65	1.35	Unclean and coarse flavor. Salt gritty.
	Sept. 5	93.5	88.	90.75	86.44	11.70	0.65	1.21	Oily unc'ean flavor. Mottled.
	Av'ge	91.83	90.50	91.17	85.50	11.81	1.38	1.31	
	Jan. 17	93.	87.	90.	85.53	11.96	1.29	1.22	Unclean old cream flavor. Little leaky.
	April 2	93.	88.	90.5	83.23	13.34	1.76	1.67	Old stale cream flavor.
	May 12	92.5	88.	90.25	85.8	11.70	1.57	.93	Very stale and unclean flavor. Well made.
13	June 16	94.5	93.	93.75	83.77	13.27	1.02	1.94	Little flat and unclean flavor.
	Aug. 18	91.	92.	91.5	84.05	13.11	1.51	1.33	Little unclean. Well made.
	Sept. 5	93.	92.	92.5	86.03	10.50	0.85	2.62	Trifle fermented. Flat.
	Av'ge	92.83	90.00	91.42	84.73	12.31	1.33	1.62	

TABLE III—(Continued.)

	Jan. 17	94.5	88.	91.25	85.51	10.22	2.56	1.71	Peculiar old smell similar to old butter color. Well made.
14	Sept. 5	91.5	91.5	91.5	84.47	12.87	0.78	1.88	Fairly clean in flavor. Mottled.
	Av'ge	93.00	89.75	91.38	84.99	11.50	1.67	1.79	
	Jan. 17	94.	86.	90.	83.96	12.52	3.07	0.45	Rank old cheesy flavor. Old cream.
15	April 2	88.	87.	87.5	86.68	10.96	1.04	1.32	Very poor flavor. Suggests old cream.
	Av'ge	91.00	86.50	88.75	85.32	11.74	2.05	0.88	
	Jan. 17	88.5	87.	87.75	83.25	11.80	4.04	0.91	Overripe old cream flavor. Gritty, salt high, mottled.
16	Sept. 5	93.	88.	90.5	87.07	10.49	0.67	1.77	Flat in flavor. Old. Salt low.
	Av'ge	90.75	87.50	88.13	85.16	11.14	2.35	1.34	
	Jan. 17	96.	88.	92.	84.30	12.89	1.56	1.25	Unclean flavor, trifle light in color. Little greasy
	April 2	95.	94.5	94.75	85.57	12.32	1.4	0.71	Good piece of butter.
	May 12	93.	89.	91.	83.75	13.11	1.31	1.83	Lingering old cream flavor
17	June 16	91.	93.5	92.25	85.94	11.29	1.56	1.21	Musty after taste.
	Aug. 18	91.5	94.	92.75	83.82	12.87	1.97	1.34	Little coarse flavor. Well made.
	Sept. 5	95.	95.5	95.25	86.93	10.28	1.01	1.78	Good butter.
	Av'ge	93.58	92.41	93.00	85.05	12.13	1.47	1.35	
	Jan. 17	92.	86.	89.	84.20	13.56	1.12	1.12	Tallowy old cream flavor. Salt light.
	April 2	91.	92.5	91.75	87.46	10.57	0.82	1.15	Old cream flavor. Light in salt.
	May 12	92.5	87.	89.75	86.41	11.23	1.28	1.08	Very unclean flavor. Well made.
18	June 16	93.	88.	90.5	83.75	12.59	2.45	1.21	Coarse old cream flavor. Mottled.
	Aug. 18	90.	89.	89.5	81.29	13.08	4.22	1.41	Coarse salt flavor. Gritty. Mottled.
	Sept. 5	90.5	88.	89.25	85.20	12.12	0.92	1.76	Flavor unclean. Old cream. Salt light.
	Av'ge	91.50	88.41	89.96	84.72	12.19	1.80	1.29	

TABLE III—(Continued.)

	Jan. 17	94.	87.	90.5	81.06	15.76	2.44	0.74	Lingering old cream flavor
	April 2	89.	88.	88.5	82.05	14.	2.66	1.29	Stale cream flavor. Well made.
	May 12	90.5	87.	88.75	83.26	12.61	1.84	2.29	Very unclean. Has sand in it. Brine milky.
19	June 16	90.	87.	88.5	84.05	11.66	3.18	1.11	Weedy old flavor.
	Aug. 18	87.	87.	87.	90.95	16.18	1.57	1.30	Unclean old cream flavor. Mottled.
	Sept. 5	90.	88.5	89.25	81.64	13.28	3.43	1.65	Old stale cream flavor. Wavy.
	Av'ge	90.08	87.41	88.75	82.17	13.91	2.52	1.39	
	Jan. 17	94.	91.	92.5	85.36	11.95	1.85	0.84	Trifle oily in flavor. Well made.
	April 2	90.5	86.	88.25	84.53	13.06	1.54	0.87	Unclean old cream flavor. Well made.
	May 12	93.5	90.	91.75	86.12	12.27	0.76	0.85	Flavor old and musty, flat. Low in salt.
20	June 16	89.	85.	87.	84.93	13.44	0.55	1.08	Old flat flavor. Mottled. Low salt.
	Aug. 18	89.5	89.	89.25	20.81	14.10	4.25	0.84	Unclean old cream flavor. Trifle mottled.
	Sept. 5	94.	92.	93.	86.45	11.00	1.08	1.47	Trifle coarse. Good butter. Mottled.
	Av'ge	9.75	88.83	90.29	84.70	12.64	1.67	0.99	
	Jan. 17	88.5	85.	86.75	84.59	11.25	3.27	0.89	Strong, cheesy, old cream flavor. Mottled.
21	April 2	89.5	88.	88.75	86.38	10.81	1.97	0.84	The fresh butter flavor lacking. Mottled.
	May 12	87.	87.	87.	84.59	11.42	1.95	2.04	Sour fermented flavor. Leaky body.
	Av'ge	88.33	86.66	87.50	85.18	11.16	2.39	1.59	
	Jan. 17	93.	89.	91.	87.95	10.71	0.35	0.99	Flat and fairly clean. Salt low.
	April 2	93.25	93.	93.13	85.26	12.09	2.09	0.56	Trifle unclean. Mottled.
22	May 12	93.	88.	90.5	85.46	11.61	1.53	1.40	Unclean in flavor. Shows old cream.
	June 16	92.	92.	92.	87.11	11.30	0.74	0.85	Greasy old flavor. Low salt.
	Aug. 18	89.	85.	87.	85.09	11.46	2.44	1.01	Strong oily flavor. Mottled.
	Av'ge	92.05	89.40	90.72	86.17	11.43	1.43	0.96	

TABLE III—(Continued.)

	Jan. 17	95.	87.5	91.25	85.03	11.99	1.48	1.50	Cowy unclean flavor.
	April 2	89.	89.	89.	86.07	11.82	0.88	1.23	Musty flat flavor. Low in salt.
23	June 16	94.5	92.	93.25	86.48	11.72	0.68	1.12	Trifle old flavor. Good butter.
	Aug. 18	90.5	87.	88.75	86.89	11.81	0.60	1.70	Greasy old flavor. Mottled.
	Sept. 5	90.	87.	88.5	87.67	10.13	0.67	1.53	Flavor unclean. Mottled.
	Av'ge	91.80	88.50	90.15	86.43	11.49	0.86	1.21	
	Jan. 17	92.	87.	89.5	84.25	13.38	1.91	0.46	Stale old cream flavor. Well made.
24	April 2	93.25	90.	91.62	86.65	11.11	1.48	0.76	Bitter old cream flavor.
	Av'ge	92.62	88.50	90.06	85.45	12.24	1.69	0.61	
	Jan. 17	95.	88.	91.5	88.12	9.69	1.08	1.11	Unclean old cream flavor. Salt low.
25	April 2	91.5	88.	89.75	84.97	12.29	0.87	1.87	Old cream, stale, flavor. Well made.
	Sept. 5	89.	87.	88.	85.98	10.50	2.02	1.50	Sour, unclean old flavor
	Av'ge	91.83	87.66	89.75	86.36	10.82	1.32	1.49	
	Jan. 17	93.	88.	90.5	85.96	12.01	0.87	1.16	Lingering old cream flavor Low in salt.
	April 2	91.5	90.	90.75	86.57	10.10	2.75	0.59	Trifle old and coarse. Salt gritty.
26	May 12	88.	85.	86.5	85.19	10.28	2.85	1.68	Rank old cream flavor. Well made.
	Sept. 5	91.5	89.	90.25	84.39	10.12	3.72	1.77	Coarse old cream flavor Salt gritty and high.
	Av'ge	91.00	88.00	89.50	85.53	10.63	2.55	1.30	
	Jan. 17	92.	91.	91.5	86.17	10.90	1.47	1.46	Cowy old cream flavor. Mottled.
	April 2	91.	88.	89.5	85.29	11.31	2.42	0.98	Rancid old cream flavor.
	May 12	89.	88.	88.50	83.82	11.15	3.64	1.39	Overripe old cream flavor. Well made.
27	June 16	90.	89.	89.5	87.35	10.16	1.47	1.02	Unclean metallic flavor. Well made.
	Aug. 18	92.	93	92.5	83.01	13.02	2.50	1.47	Unclean old flavor. Well made.
	Sept. 5	93.	92.5	92.75	82.79	13.04	2.93	1.24	Trifle oily. Good butter.
	Av'ge	91.16	90.25	90.71	84.74	11.60	2.40	1.26	

TABLE III—(Continued.)

	Jan. 17	93.	92.	92.5	85.55	11.59	1.43	1.43	Fairly good flavor. Mottled.
28	May 12	89.	89.	89.	83.16	14.17	1.61	1.06	Unclean old cream flavor.
28	May 12	89.	29.	89.	83.16	14.17	1.61	1.06	Old and unclean flavor.
	June 16	91.	92.	91.5	86.62	10.22	2.13	1.03	Slight old cream flavor Trifle leaky.
	Aug. 18	92.5	91.	91.75	81.76	14.06	2.95	1.23	Oily and burnt flavor.
	Av'ge	91.30	91.20	91.25	83.96	12.41	2.50	1.12	
	Jan. 17	92.	87.	89.5	85.95	11.07	1.71	1.27	Unclean stale old cream flavor.
	April 2	94.75	93.	93.87	84.61	12.58	1.53	1.28	Good butter. Trifle unclean flavor.
	May 12	92.5	89.	90.75	84.24	12.67	1.39	1.70	Old stale cream flavor.
29	June 16	91.5	88.	89.75	83.56	12.71	2.89	0.84	Coarse old cream flavor. Sa't gritty.
	Aug. 18	90.	91.	90.5	83.66	12.86	2.23	1.25	Stale old cream flavor.
	Sept. 5	90.5	90.	90.25	84.72	11.84	1.83	1.61	Coarse and old in flavor.
	Av'ge	91.87	89.66	90.77	84.46	12.29	1.93	1.32	
30	Jan. 17	91.5	86.	88.75	88.54	9.33	0.99	1.14	Strong oily old cream flavor.
	June 16	93.	91.	92	81.92	15.10	2.16	0.82	Fair butter. Shows old cream.
31	Aug. 18	88.	91.	89.5	82.93	14.55	1.66	0.86	Old stale cream flavor.
	Sept. 5	89.	93.	91.	85.23	11.78	1.88	1.11	Fairly clean but oily in flavor.
	Av'ge	90.	91.6	90.83	83.36	13.81	1.90	0.93	
32	April 2	90.	89.	89.5	83.47	11.54	3.81	1.18	Old stale cream flavor.
	April 2	91.5	91.	91.25	86.52	11.63	1.12	0.73	Stale flat and greasy flavor. Salt low.
	May 12	88.5	86.	87.25	86.75	10.43	1.37	1.45	Rank old cream flavor. Well made.
33	June 16	94.	88.	91.	85.54	12.38	1.09	0.99	Sour overripe cream flavor
	Aug. 18	90.	89.	89.5	83.34	13.77	1.81	1.08	Unclean flavor. Body greasy.
	Sept. 5	88.	88.5	88.25	88.22	9.83	0.53	1.42	Flavor and aroma very unclean.
	Av'ge	90.40	88.50	89.45	86.07	11.61	1.18	1.13	

TABLE III--(Continued.)

	April 2	94.5	91.	92.75	85.36	12.08	1.65	0.91	Trifle stale flavor. Well made.
	May 12	94.5	90.	92.25	82.25	14.66	1.77	1.32	Unclean flavor. Shows old cream.
34	June 16	93.5	87.	90.25	86.93	10.69	1.14	1.24	Old unclean flavor.
	Aug. 18	92.	95.	93.5	84.20	13.60	0.95	1.25	Sourish old flavor.
	Sept. 5	92.5	92.	92.25	85.37	12.24	0.71	1.68	Trifle unclean. Fair butter.
	Av'ge	93.40	91.00	92.20	84.82	11.65	1.24	1.28	
	April 2	93.25	88.	90.62	85.42	11.38	2.26	0.94	Lingering stale flavor.
	May 12	92.	93.5	92.75	87.46	10.27	1.10	1.17	Old stale cream flavor.
35	June 16	91.5	86.	88.75	87.19	11.32	0.93	0.56	Cheesy overripe flavor.
	Sept. 5	87.	87.	87.	85.18	12.54	1.01	1.27	Leaky. Low salt. Old stale cream flavor.
	Av'ge	90.94	88.62	89.78	86.31	11.38	1.32	0.98	
	June 16	92.5	89.	90.75	85.72	10.73	1.87	1.68	Flavor old and undesirable. Well made.
36	Aug. 18	91.	92.	91.5	85.16	12.75	1.03	1.06	Fermented sour cream flavor. Body weak.
	Sept. 5	93.5	94.	93.75	86.74	10.88	0.33	2.05	Old unclean cream flavor.
	Av'ge	92.33	91.60	92.	85.87	11.45	1.08	1.59	
									Fairly clean, but flat.
	Jan. 17	93.5	90.	91.75	85.	12.91	0.48	1.61	Mottled.
	June 16	92.	86.	89.	87.47	11.23	0.64	0.66	Cowy old cream flavor. Mottled.
37	Aug. 18	91.	89.	90.	85.42	12.31	1.15	1.12	Fermented old cream flavor.
	Spet. 5	96.5	93.5	95.	85.68	10.96	0.51	2.85	Fair butter.
	Av'ge	93.25	89.62	91.44	85.89	11.85	0.69	1.56	
	Aug. 18	91.	88.	89.5	85.61	13.49	1.89	1.01	Musty old cream flavor. Well made.
38	Sept. 5	87.	88.	87.5	81.14	15.83	1.88	1.15	Sour nasty old cream flavor.
	Av'ge	89.	88.	88.50	83.37	14.66	1.88	1.08	

TABLE NO. IV.

SHOWING AVERAGE SCORE AND COMPOSITION OF BUTTER IN EACH CONTEST.

No. of Entries	Month	SCORE			COMPOSITION			
		Brookings	Chicago	Average	Per Cent Fat	Per Cent Water	Per Cent Salt and Ash	Per Cent Casein (Curd)
28	Jan. 17	92.54	87.84	90.19	85.49	11.67	1.69	1.18
30	April 2	91.70	90.08	90.89	84.71	12.14	1.96	1.19
25	May 12	91.33	88.18	89.75	84.21	12.46	1.91	1.41
26	June 16	92.08	89.36	90.72	84.57	12.65	1.72	1.13
23	Aug. 18	89.97	89.56	89.77	83.68	13.16	1.88	1.27
25	Sept. 5	91.56	90.32	90.94	85.09	11.82	1.43	1.65

TABLE NO. V

SHOWING AVERAGE SCORE AND COMPOSITION OF ALL BUTTER.

Total No. Samples	No. of Contests	SCORE			COMPOSITION			
		Brookings	Chicago	Average	Per Cent Fat	Per Cent Water	Per Cent Salt and Ash	Per Cent Casein (Curd)
157	6	91.58	89.2	90.4	84.65	12.29	1.77	1.30

TABLE NO. VI.

SHOWING AVERAGE SCORE AND COMPOSITION OF ALL BUTTER ENTERED BY EACH CONTESTANT.

No. of Tubs	Entry Number	SCORE			COMPOSITION			
		Brookings Score	Chicago Score	Average Score	Per Cent Fat	Per Cent Water	Per Cent Salt and Ash	Per Cent Casein (Curd)
5	3	92.55	89.60	91.074	84.18	12.58	1.94	1.49
4	4	89.50	86.25	87.875	81.73	14.38	2.48	1.42
4	5	91.50	87.00	89.250	86.11	11.07	1.48	1.33
6	6	92.75	90.08	91.416	83.45	12.73	2.45	1.37
6	7	90.71	90.58	90.645	82.11	14.36	2.16	1.36
5	8	90.90	88.20	89.550	84.29	12.48	1.75	1.47
5	9	91.35	88.20	89.774	84.31	11.93	2.38	1.36
6	10	93.46	91.75	92.603	84.31	13.11	1.14	1.44
6	11	90.66	86.83	88.750	84.55	82.60	1.48	1.37
6	12	91.83	90.50	91.166	85.50	11.81	1.38	1.31
6	13	92.83	90.00	91.416	84.73	12.31	1.33	1.62
2	14	93.00	89.75	91.375	84.99	11.50	1.67	1.79
2	15	91.00	86.50	88.750	85.32	11.74	2.05	0.88
2	16	90.75	87.50	88.125	85.16	11.14	2.35	1.34
6	17	93.58	92.41	93.000	85.05	12.13	1.47	1.35
6	18	91.50	88.41	89.958	84.72	12.19	1.80	1.29
6	19	90.08	87.41	88.750	82.17	13.91	2.52	1.39
6	20	91.75	88.83	90.291	84.70	12.64	1.67	0.99
3	21	88.33	86.66	87.500	85.18	11.16	2.39	1.59
6	22	92.05	89.40	90.724	86.17	11.43	1.43	0.96
5	23	91.80	88.50	90.150	86.43	11.49	0.86	1.21
2	24	92.62	88.50	90.060	85.45	12.24	1.69	0.61
3	25	91.83	87.66	89.750	86.36	10.82	1.32	1.49
4	26	91.00	88.00	89.500	85.53	10.63	2.55	1.30
6	27	91.16	90.25	90.708	84.74	11.60	2.40	1.26
5	28	91.30	91.20	91.250	83.96	12.41	2.50	1.12
6	29	91.87	89.66	90.770	84.46	12.29	1.93	1.32
1	30	91.5	86	88.75	88.54	9.33	0.99	1.14
3	31	90.0	91.6	90.833	83.36	13.81	1.90	0.93
1	32	90.	89.	89.5	83.47	11.54	3.81	1.18
5	33	90.40	88.50	89.450	86.07	11.61	1.18	1.13
5	34	93.40	91.00	92.200	84.82	11.65	1.24	1.28
4	35	90.94	88.62	89.780	86.31	11.38	1.32	0.98
3	36	92.33	91.60	92.000	85.87	11.45	1.08	1.59
4	37	93.25	89.62	91.440	85.89	11.85	0.69	1.56
2	38	89.	88.	88.500	83.37	14.66	1.88	1.08