



Cream separators























A Comparision of the Three Methods of Cream Separation, in Terms of Butter Produced.

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F-18, 1896

## THESIS

With the settlement and development of a fertile west our people have been driven to more intensive farming and the pursuance of special branches-notably the dairy.

Within the past decade dairying has made almost marvellous advances. With the advance in science new methods in caring for milk and in manufacturing milk products have been devised. Invention is incident to a progressive people. Among new methods of interest is that of separating cream from milk by means of the cream separator or centrifugal machine.

Various experiments have been performed giving results in favor of the contrifugal machine but, save one extended investigation in Canada, none have shown the differences between this method and either of the other two in terms of butter. actually produced.

In selecting this line of investigation it was my purpose to find out by careful experiment covering a period of three weeks the exact value of each of the methods by comparing the results of churning of the lots of cream obtained by the centrifugal machine, cold deep setting and shallow pan setting.

The evening milkings of five cows were reserved for use in the experiment. The animals chosen represented Jersey, Holstein, Guernsey and Red Polled breeds each being a fair representative of its respective blood and subjected to normal conditions.as to food and handling. The selection of animals was so made that various periods of lactation enterod into the experiment. This allowed a greater regularity in 94280

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The plan was to separate two milkings, then set two milkings in the cold deep cans and likewise set two milkings in shallow pans. When this schedule was covered the scheme was repeated in the reverse order. As a check three milkings were subjected to each of the three methods at the close of the investigation.

The greater part of the work was performed by myself assisted at times by one or another industrious freshmen. Messers True and Yebina aided me from time. To the former I am especially indebted for many suggestions and courtesies tendered.

On April 11th.I began the work, having been delayed three days by some mischievious under classman who made away with a quantity of the cream collected. The first two milkings were consigned to the separator, a De Laval Baby, which was turned 42 revolutions per minute. The milk was brought from the cows directly to the milkroom where after the temperature and samples had been taken it was separated. The skim milk was weighed and samples taken, as in each of the other methods, and the cream weighed and placed in a Wilson creamer. Here it remained till thoroughly ripened and ready to churn. The following table shows the results of the three methods covering seven days.

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Orte	Pounds of MILK	Per cent Fat	Pounds og FAT	Temp. of Milk	Pounds of CREAM	Pounds of Skim-Milk	Per cent Fat	Pounds FAT LOGT.	TOTAL # Milk	Тотян # Fat	Pounds of Butter-Hill	Pounds FAT LOST.	ek Butte
Apr.II.	45,	.05	2.25	94	5.	40.	.001	.04	2112 V	as de	iona a	22	
Apr. 12	49.7	.0475	2.36	94	6.3	43.4	.00075	.0325	94.7	4.61	6.5	.02/8	4.98
Rps 21	54.9	.0483	2.66	93	12.4	42.5	.0025	.1063	ettab 1	05 60	0 %0	note	
Apr22	56.7	.0505	2.86	92	7.4	49.3	.00/25	.0616	111.6	5.52	13.0	.0315	6.00
Apr 23	55,5	.049	2.52	94	5.9	49.6	0015	.0744	OT AL T	ayau a	*		-
Apr24	56.	.0475	2.66	95	5.8	50.2	Тяяся	OST P	Truis.	FAT	MILK L	147	UTEL .
Rp= 25	51,6	,0445	2,296	92	7,3	44.3	.0002	.0089	163.1	7.48	15.0	.0450	9.50
TOTAL	0.0 4	1012	975		13.5	39.5	003	.2937	369.4	17.61	94.5	.0990	20.48

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 $\sum_{i=1}^{n-1} \left( \sum_{i=1}^{n-1} \frac{|V_i|^2}{|V_i|^2} + \sum_{i=1}^{n-$ 

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In conducting the work with cold deep setting the same general plan was observed as in the separator test. The milk was taken from the stables immediately after milking weighed and placed in the deep glass cans of the Orystal Creamery after the necessary samples had been taken. The entire investigation with the cold deep setting was carried on with a Crystal Creamery. The temperature of the water in the creamery at time of settings varied from 41° to 52 ° F. the average being about 45°. Milk was allowed to remain in the glass vessels 84 hours when the skim milk was drawn off weighed and samples taken to test the per cent of fat. The cream was drawn off and placed in a Wilson Creamery to ripen. The accompanying table is of interest and enables one to note at once the result of the trials with this method:

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Date	兼 好 Milk	Per Cert Fat	Pounds of FAT	Temp. of Milk	# Cream	# Skim- Milk	Per cont Fat	# Fat Lost	TOTAL # Milk	TOTAL # FRT	H Butter: Milk	* Frt Lost	* Burne
Aprel 3	57.3	.0455	2,51	92	11.5	45,	.0055	.2475					
n 14	50.5	.049	2.475	91	13.5	39,5	.005	.1975	107.8	4. <b>98</b> 5	21.5	D16	5.11
• 19	49.5	.049	2.425	95	10.5	39.75	.0055	.2/86					
- 20	52.5	.0495	2.594	91	12.	41.5	.006	2490	102.0	5.019	2.3,	<i>.0 17</i>	5.14
- 29	57.75	.0%3	2.62	92	12.5	45.75	. 0055	.2516					
- 30	58,75	.046	2.70	90	12.5	43.75	.006	.2625					
May I	5/.25	.047	2.41	91	13.25	37.5	.0025	D938	167.75	7.73	24,5	THACE	8.34
TOTAL								<u>1.5205</u>	<u>377.55</u>	17.72	<u>69.0</u>	.033	18.59

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The shallow pan settings were made in the well lighted dairy room. New pressed tin pans about two and a half inches deep, holding about eight pounds of milk were sused. These were placed upon a shelf about four feet from the floor supported at either end. It is safe to state that any ordinary jar about the building did not disturb the milk within the The milk was brought directly from the milkroom at pans. the barn to the dairy room and turned into these shallow vessels, seven of which were necessary for each milking. These pans were undisturbed for 36 and 24 hours, and then the milk was skimmed. The cream as in the other methods was placed in a Wilson Creamer and the soured milk weighed after a sample had been taken to determine the per cent of fat not obtained.

Great caution was observed in skinning to produre all the cream. In the first trial the milk was allowed to remain in the pan 36 hours before skimming, in the other subsequent trails 24 hours was the length of setting. The latter did not allow the milk to sour so thoroughly or become loppered, the cream was also more readily separated in these last cases. The temperature of the room in which the settings were made varied somewhat, the average being about 71°. Following is the the table that gives in full the figures obtained in this method.

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Date	# of Milk	Per Cent Frt	201 ふ 作	Temp: •5 Milk	PER CENT FRT.	# Frt Lost	TOTAL # Milk	TOT AL # FRT	# Butter Milk	# Fat Lost	* Butter
Oupre.15	59.	.05/	52	92	.005	.9600					
- 16	55.	.048	49	94	,006/	.1989	114	5.65			
- 17	55,5	.046	48	94	.0045	.2/60					
- 18	53.5	. 0475	48	93	.0155	,2640	109	5.09	10.5	.068	10.57
- 26	55.2	.048	48.25	92	.008	.3860					
- 2	51.6	.045	44,5	93.	.0/3	.5785					
- 2	\$ 55,28	.048	48.	93	.0095	.4560	162.10	7.65	11.5	.043	7.43
TOTA	-					2.459	375,/0	18.39	22.	.111	18.00

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That nothing of value may be omitted I reporduce here my churn chart which includes the dataof the eight churnings. It will be noted that the loss throughout willbe<sup>r</sup>exceedingly small. This is best shown in the extensive table(No.5) immediately following the churn chart .

Dater	Pounds Oreaus	Olger ip Hours	Ясірітт	TEMPER- ATURE	PerCent of Fat	Time Obuzgino	Counds Sf Butternily	Eer Cept Fat.	Pounds Grapular Butter.	Per Cept of Salt.	Poweds of Butter	METHOD 95 SEPARATIN
Ape. 14	12	70 4ND 46	33.2	51	36.	1-39	6.5	.335	6.29	7	4.98	SEP.TR.
Apeli	26	72 ***5 78	44.	52	17.55	1-2	21.5	.075	7.	7	5.11	C. Deer
Apr.20	22.75	24-96	26.2	56	39.	- 52	10.5	. 650	12.5	7	10.57	S. PAN.
Apr.23	24.5	72-96	42.	58	19.8	-38	23,	.075	5.75	7	5.14	C.DEEP.
Apr.24	19.	48-72	21.	56	27.	-29	13,	. 250	6.75	7	6.	SEP.TR.
Pipe.27	20.5	48-96	28.1	5/	33.3	1-29	15.	.300	10.25	7	9.5	SEPTR
Apr 30	19,	48-96	42.6	50	31.	-59	11.5	.375	8.5	7	7.43	S. PAR.
Max.4	40.5	72-120	47.6	58	15.	-3/	24.5	Trace:	9,	7	8.34	C. DREP.

- Butter Chart -

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Table No.5

Date		Pounds	Temp.	Per	Cent of	Fat i	n	
		mitr	erature	Whole	SKim- Milk	Cream	Butter	Pounds
Apr.	11	45.00	94	5.00	.100	36.0	.335	
11	12	49.70	94	4.75	.075	36.0	.335	4.98
	21	54.9	93	4.85	.25	- A.		pararon
	22	56.7	92	5.05	.125	27.0	.250	6.00
11	23	55.5	94	4.90	.150	ans p		
	24	56.0	95	4.75	trace			
	25	51.6	92	4.45	.020	83.3	.300	9.50
					Sec. 1	SEPARAT	여국 -	20.48
			A., 112		1.10			
Apr.	13	57.3	92	4.55	.55			
11	14	50.5	91	4.90	.50	17.55	.075	5.11
11	19	49.5	93	4.90	.55	1 62 60	-	
	20	52.5	91	4.95	.60	19.8	.075	5.14
	29	57.75	92	4.45	.55			
11	30	58.75	90	4.60	.60	100 100		
May	1	51.25	91	4.70	.25	15.0	trace	8.34
						COLD DI	EP -	18.59
		1 S	e () in					
Apr.	15	59.0	82	5.10	.50			
10	18	55.0	94	4.8	.81		1	
11	17	55.5	94	4 60	.45			
8	18	53.5	93	4.75	.55	39.0	.65	10.57
	26	55.25	82	4.80	.80			
	27	51.8	93	.4,55	1.30			
u.	28	55,25	93	4.80	.95	31.0 SHRLLOW	.375 PAN -	7.43

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From the foregoing tables I am able to deduct results much more in favor of the centrifugal machine than were those obtained from the Ontario college by H.H.Dean, - the latter's trial covering several months found no marked advantage as to butter returns by the use of the cream separator. A brief comparasion of results shows that at M.A.C.by separator it requires 18.18# of milk to produce one pound of butter, by shallow pan 21.74#, and by cold deep method 20.40#, the average per cent of fat being 4.76 while at Ontario with an average test of 3.66 it required.

23.91 pounds of milk vs 18.18 by separator at M.A.C. 24.47 " " vs 20.40 by cold deep at M.A.C. 35.05 " " vs 21.74 by shallow pan at M.A.C.

to produce one pound of butter. The per cent of fat was less by far in the cream and a much greater per cent was lost. (See table 5) as shown in the brief table.

Method	Per c	at in		
Skim	milk	cream	buttermilk	
separator .	093	22.38	.135	Ontario
Cold deep setting .	<b>29</b> 0	19.12	.195	Experiment
Shallow pan setting	.818	18 <b>.84</b>	<b>.24</b> 0	

Our investigation of 21 days during which no pains were spared in giving each method the best trail possible we obtained figures upon which our conclusions are based:

<u>.</u>		-	#fat	# fat lost	# butter.
369.4 lbs	milk by	separator gave	17.61	•3927	20.48
377.55 *	11 W	cold deep "	17.724	1.5545	18,59
385.10 "	11 V	shallow pan "	18.39	2.5700	18.00

If experiments are of any value in arriving at the worth of any method, and we have no other way to determine the value of a system, the cream separator is a great saving in butter making. The cold deep method is preferable to the shallow pan by a slight gain in butter product and in amount of labor expended.

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By means of separator 100 # of milk gave 5.5 pounds butter """ cold deep 100 #""" 4.9 """ """ shallow pan 100 # of "" 4.6 """ or a gain of nearly 1/20 in the first method over the last named.

From this conclusion it is evident that wherever a farmer has six to twelve cows or more his gain in butter product will soon repay the outlay for a separator, beside the fe will be a great saving in labor- say nothing of the convenience and satisfection experienced.

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