

O. A. C. Experiments in Cheese-making, 1910.

Paper by Alex. McKay, Demonstrator in Cheesemaking, O. A. C., Guelph, read at the Western Ontario Dairymen's Convention in Stratford, 1911.

In this paper it will only be possible for me to deal very briefly with a few of the experiments conducted at the Dairy Department of the College during the past season.

The milk used was received from a number of farmers in the neighborhood of the College, so was similar in all respects to that received at the average factory. The average per cent. of fat in the milk for the season was 3.6, and casein 2.46.

PER CENT. OF ACID AT DIPPING.

The first series of experiments were a comparison of different percentages of acid at time of dipping. The milk, as received, was thoroughly mixed, then divided into two vats, and treated as nearly alike as possible until the time of dipping. Then the B vat was dipped with an average acidity of .17. The A lots were held in the whey until they developed an average of .2 per cent. of acidity, as determined by the alkaline test. This left the A vat much longer in the whey than was the B vat, but the period from dipping to milling was shortened to the same extent, as we wished to keep all other conditions as nearly alike as possible. When the B curd was ready to mill, the A curd was also milled. We usually found that the B curd showed more acid at this time than did the A vat, also had a nicer texture and general appearance. We found that the B curd, or the one dipped with the least acid, kept in the lead both in respect to acid development and maturing of curd.

The average loss of fat in the whey from the A vats was .24, and from the B vats .23. The per cent. of moisture retained by the cheese was slightly in favor of the B cheese, or the one dipped comparatively sweet. The yield of cheese per 1,000 pounds milk was for the A lots 91.68, for the B lots 92.41, making a difference of about 1/4 of a pound of cheese in favor of dipping with the smaller amount of acid. The quality of the cheese was slightly in favor of the B lots, the score being 92.7 for the A lots, and 93.02 for the B lots.

Conclusions to be drawn from these experiments are that giving a large amount of acidity at dipping does not shorten the time for making cheese, other things being equal, and, if it is done to any great extent, that it results in a reduced quality and quantity of cheese—two of the main points to be kept in view in the making of finest cheese. Of course, dipping sweet can be carried to excess, but it is quite safe to state that the closer we are able to keep to the sweet line and get our cheese close, the more and better cheese we will be able to make from a given quantity of milk.

STIRRING CURDS AT DIPPING.

The next series of experiments were conducted along the line of stirring, compared with not stirring, curds at the time of dipping, all other things being equal. The milk, as delivered to our cheese department, was thoroughly mixed in one large vat, then divided into two smaller ones. All together, there was used in this experiment 17,242 pounds milk testing an average of 3.57 per cent. fat. The average loss of fat in the whey was .22. Both vats were treated as nearly alike as possible, except that the A vat was not stirred at the time of dipping. B vats were stirred in the usual way. There was practically no difference in the rate of acid development in the two curds. The yield of cheese per 1,000 pounds milk was:

A vats, or those not stirred	92.95
B vats, or those stirred	92.05

The quality of cheese is indicated by the following score:

	Flavor.	Close-ness.	Color.	Texture.	Finish.	Total.
	40	15	15	20	10	100
A Not stirred	35.75	13.91	14	16.86	10	90.52
Stirred	36.10	13.98	14.21	17.33	10	91.62

A difference of 1.1 points in favor of the stirred curds. This is the average of fourteen experiments.

The next series is along lines similar to the one just given, except that the milk was all made up in one vat until the time of dipping, then the curd was divided into two equal parts, but not weighed until the time of salting. In this case, A part was not stirred at all after being thrown out into the curd sink. The B part was stirred in the usual way.

There were 32 experiments conducted on the 64,687 pounds milk testing 3.5 per cent. fat, and 2.3 per cent. casein. The smallest quantity of milk used at any one time was 1,551 pounds, and the largest quantity was 3,205 pounds. I must state here that the curds were cut with the horizontal blade knife and the 1/4-inch perpendicular wire knife, and were normal curds, dipped with an average acidity of .185, milled at about

.7, salted at 1. per cent., with practically no difference in the development of an acidity in each lot. There was a difference in moisture content in favor of the curds not stirred of 6.23 per cent. in the curd at dipping, in the green cheese of .42, in the cured cheese, one month old, of .36 per cent. The quality, as determined by the score, was:

	Flavor.	Close-ness.	Color.	Texture.	Finish.	Total.
	40	15	15	20	10	100
A Not stirred	36.18	14.18	14.25	17.52	10	91.19
B Stirred	36.34	14.27	14.39	17.81	10	92.81

Or, a difference in favor of the stirred curd of 1.62.

The results of this work would indicate that, even under our very best conditions, the curd should be stirred sufficiently to allow for the escape of the free moisture before the curd is allowed to mat, though the amount of stirring will all depend on the condition of the curd at this particular stage, and is a place where the cheesemaker must use his best judgment. Moisture of curd and cheese in this experiment:

	Curd.	Green Cheese.	Cured Cheese.
A	53.21	35.57	35.32
B	46.98	35.15	34.96
	6.23	.42	.36

LOSSES IN OVERRIPE MILK.

The next series of experiments were a comparison of overripe with normal milk. The method of conducting the experiments was to make up the milk, which was delivered in an overripe condition into cheese, and on the following day, when the milk was in a normal condition, make this also into cheese, and compare results. There were 12 experiments made: 7 of overripe, using 16,413 pounds milk testing 3.46 per cent. of fat and 2.36 casein; loss of fat in the whey, .26. There were five tests made with the normal milk, using, in all, 6,408 pounds milk, containing an average per cent. of fat of 3.38, and casein of 2.31; loss of fat in the whey, .23. The overripe milk remained in the whey an average of 51 minutes, the normal lots 2 hours and 39 minutes. The average yield of cheese was 88.96 per 1,000 pounds milk for the overripe lots, and 91.44 pounds from the normal. In the first case it took 11.17 pounds of milk to make one pound of cheese, and in the other case 10.78. The quality of the cheese, as indicated by the average score, was:

	Flavor.	Close-ness.	Color.	Texture.	Finish.	Total.
	40	15	15	20	10	100
Normal	36.25	14.87	14.89	17.81	10	93.84
Overripe	35.83	14.2	14.29	17.63	10	91.73
	.42	.69	.62	.17		1.91

The normal milk made 2.48 pounds cheese per 1,000 pounds milk more than did the overripe milk, though the overripe milk tested slightly higher in both fat and casein. Roughly speaking, there is a loss of 24 pounds cheese for every 1,000 pounds milk delivered to the factories in this condition. Surely this is strong enough argument to induce the producers of milk to make some special effort to take proper care of the milk during the warm weather.

EFFECT OF FAT AND PROTEIN CONTENT ON QUANTITY.

The next experiment I wish to draw your attention to very briefly is a comparison of the yield and quality of cheese produced from milk containing different percentages of fat and casein. This work was commenced in May, and continued until the end of October, one experiment being made each week during that time. The method followed in making these tests was to select the milk high in fat and casein, and put it into one vat, and that low in fat and casein, and put it into another. Both vats were treated as nearly alike as possible. There were eighteen tests made in all, using 20,692 pounds of milk. The average fat and casein were, for the A or high-testing vat, fat 3.86, and casein 2.65, and for the B or low testing, fat 3.52, and casein 2.14, a difference of .3 of one per cent. in fat, and two-tenths in casein.

The A or high-testing lot produced 97.34 pounds of cheese for every 1,000 pounds of milk used. The B or low testing produced 92.70 pounds of cheese for every 1,000 pounds milk used, or a difference in favor of the higher-testing milk of 4.64 pounds of cheese for every 1,000 pounds of milk used; or, expressed in another way, the A or higher-testing milk took 10.27 pounds of milk to make one pound of cheese, while the milk low in fat and casein took 10.78 pounds of milk to make one pound of cheese, or a difference of .51 or 1/2 pound of milk to every pound of cheese produced. The quality of the cheese was slightly in favor of the milk testing lower in fat and casein, though this may be due to the season in which the curd was received, as the same condition of the milk has more to do with

the quality of the cheese than has either the fat or casein content. This is particularly true in regard to flavor. The results of these and other experiments should be an inducement to patrons of cheese factories to adopt some better means of distributing the proceeds than the pooling system affords, although you often hear doubts expressed as to the accuracy of sampling milk at the weigh cans, as commonly practiced at the factories.

In order to get some information on this question, we conducted some experiments which may be of interest to those who held this opinion. The method followed was to take a sample from the top and bottom of the weigh can as soon as the milk was poured into it, continuing this at intervals of two minutes for fifteen minutes. We found, as a result of this work, that the tests were practically the same for a period of ten minutes, so that under ordinary conditions, the samples, as taken at the weigh can, may be considered correct.

The Products of a New York State Farm.

In the course of a letter to "The Farmer's Advocate," E. W. Mosher, of Cayuga Co., N. Y., gives the following record of how his cows have tested, and the products of his farm:

You may be interested to know something more of Brightside, which is a farm of 230 acres, farmed on a rotation of corn, oats or barley, and wheat, and maintains a herd of 24 Jersey cows, and about as many young things. We also breed a few horses, now having seven colts on the place; also a flock of 400 White Leghorn fowls, which have been giving us about sixty dozen eggs a week.

All but two cows in the herd have yearly authenticated records, the lowest yield of a two-year-old being 4,940 pounds milk in 319 days, testing 281.49 pounds butter-fat; average fat test, 5.694; estimated butter, 331 pounds 3 ounces; 85 per cent. fat. The lowest yield of a mature cow is 8,559.5 pounds milk in 328 days, testing 442.48 pounds fat, equivalent to 520 pounds 9 ounces 85-per-cent. butter. We also have three cows with records of 700 pounds or better:

Ben Hur's Witch 188696—Four years; 11,285.3 pounds milk, 596.24 pounds fat, 701 pounds 7 ounces butter.

Ben Hur's Diana 176275—Seven years; 11,829.3 pounds milk, 630.67 pounds fat, 741 pounds 15 ounces butter.

Ledyard's Jessie 168991—Nine years; 12,840.6 pounds milk, 669.89 pounds fat, 788 pounds 2 ounces butter.

These cows were not forced, and can repeat their performance without any trouble. They were never milked but twice a day. Every female in the herd has been bred on the farm, also their dams, and in most instances their grandams.

The products of the farm for 1910, besides 3,000 bushels of husked ears of corn, were: 903 bushels wheat, 788 bushels barley, 993 bushels oats, and 256 bushels buckwheat, from eight acres that was sown Aug. 10th, after taking off a crop of hay and fifty tons of alfalfa, and enough ensilage corn to fill two silos holding 125 tons each. The sales of eggs and poultry amounted to over \$500; hogs, \$175.

This isn't a model farm in neatness, but it is run for the money there is in it. Cayuga Co., N. Y. E. W. MOSHER.

GARDEN & ORCHARD.

Plum Trees as Fillers.

A. M. C. asks whether it is advisable to grow alfalfa in an orchard, and would it pay to plant plum trees between the apple trees?

The alfalfa would be all right, seeded down the first year with a light crop of barley, or alone. If you seed down with barley, it will be necessary, of course, to sow early. If you seed with alfalfa alone, which is perhaps the best way, the trees may be planted, and the surface worked after planting two or three times until about the middle of June. By that time, all the worst weeds which interfere with alfalfa-growing would be killed, and the alfalfa seed could be sown then, and would have made a good growth before winter. You would, of course, keep not less than three feet each side of the young trees free from grain and alfalfa. This space will be increased each year by a foot, more or less, until the fifth or sixth year, when the trees will be given the whole ground.

Re plum trees as fillers, I do not approve of planting plum trees between the apple trees, unless suitable ground for plums is scarce or very valuable. If you have other land suitable for plums, and not worth more than \$100 per acre for the bare land, do not think of planting the plum trees between the apple trees, but plant them on a separate piece of land. Your plum trees will be just beginning to bear when they