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Dairy Products Processor

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YIELD OF CHEESE

We have had some queries regarding cheese yield. For this edition of the "Processor" let's take a look at some of the factors involved and a method of calculating yield.

FACTORS RELATED TO CHEESE YIELD

Yield of any natural cheese depends upon (1) the amount of milk solids, especially fat and casein in the original milk, (2) the percent moisture in the cheese, and (3) losses in the whey.

EFFECT OF FAT AND CASEIN CONTENT

There has been a steady, though slight, increase in solids content in milk over the years due to breeding practices that focus on increasing butterfat output. Butterfat content and casein content are related.

Table I illustrates the relationship between fat and casein content and yield of cheddar cheese.

Table I*

<u>Fat</u>	<u>Casein</u>	<u>Fat plus Casein</u>	<u>Percentage yield</u>	<u>Yield/lb of milk fat</u>	<u>Casein/lb of milk fat</u>
%	%	%	%	lb	lb
3.2	2.18	5.38	8.70	2.72	0.68
3.4	2.26	5.66	9.16	2.69	0.66
3.6	2.34	5.94	9.61	2.67	0.65
3.8	2.42	6.22	10.06	2.65	0.64
4.0	2.50	6.50	10.52	2.63	0.63
4.2	2.58	6.78	10.97	2.61	0.61

*Data taken from Cheese, Van Slyke and Price, 2nd edition, Orange Judd Publishing Company, Inc. 1952.

In cottage cheese the same kind of relationship exists. Olson (1) has reported yields of 19.2 pounds of curd at 80 percent moisture from 100 pounds of high solids skimmilk. In low-solids skimmilk the yield was as low as 14.6 pounds/100 pounds of skimmilk.

EFFECT OF MOISTURE IN CHEESE

Cheese yield, of course, increases with increase in moisture in the cheese. The maximum moisture permitted is 39 percent, both federally and in Minnesota on a state basis.

Using the formula: $Yield = (F + C) N$, theoretical yields have been calculated for a variety of moisture contents for cheddar cheese. Elements of the formula are:

Yield = pounds of cheese per 100 pounds of milk

F = pounds of fat in 100 pounds of milk

C = pounds of casein in 100 pounds of milk

N = moisture factor (this varies with moisture content of the cheese)

Table II shows theoretical yields of cheddar cheese at several fat and moisture levels.

Table II*

Moisture content

Milk Fat (%)	34%	35%	36%	37%	38%	39%
3.0	7.905	8.058	8.186	8.313	8.441	8.568
3.1	8.148	8.279	8.410	8.541	8.672	8.803
3.2	8.366	8.500	8.635	8.769	8.907	9.038
3.3	8.583	8.722	8.860	8.998	9.136	9.274
3.4	8.801	8.943	9.084	9.226	9.367	9.509
3.5	9.019	9.164	9.309	9.454	9.599	9.744
3.6	9.237	9.385	9.534	9.682	9.831	9.979
3.7	9.454	9.606	9.758	9.910	9.404	10.214
3.8	9.672	9.828	9.983	10.139	10.294	10.450
3.9	9.880	10.049	10.208	10.367	10.526	10.665
4.0	10.108	10.270	10.433	10.595	10.758	10.920
4.1	10.325	10.491	10.657	10.823	10.989	11.155
4.2	10.543	10.712	10.882	11.051	11.221	11.390
4.3	10.761	10.934	11.107	11.280	11.453	11.626
4.4	10.987	11.155	11.331	11.508	11.684	11.861
4.5	11.196	11.376	11.556	11.736	11.916	12.096

*Data taken from Cheese, L. L. Van Slyke and W. V. Price, 2nd edition, Orange Publishing Company, Inc. 1952.

ESTIMATING YIELD

When milk is of "average" quality and composition, and is manufactured under "normal" conditions it is possible to estimate cheese yield by using the following formula:

$$\text{Yield} = \frac{(0.93 F + C - 0.1) 1.09}{1.00 - W}$$

Yield = Pounds of cheese per hundred pounds of milk

F = Pounds of fat per hundred pounds of milk

C = Pounds of casein per hundred pounds of milk

W = Pounds of water per pound of cheese

Let's look at an example: assuming 4% fat, 2.5% casein, and 37% moisture. Then,

$$\begin{aligned} \text{Yield} &= \frac{[(0.93 \times 4) + 2.5 - 0.1] 1.09}{1.00 - 0.37} \\ &= \frac{(3.72 + 2.5 - 0.1) 1.09}{0.63} \\ &= \frac{6.12 \times 1.09}{0.63} \\ &= 10.6 \text{ pounds} \end{aligned}$$

The formula was derived for cheddar cheese, but can be used with fair accuracy for other cheeses if processing losses are similar.

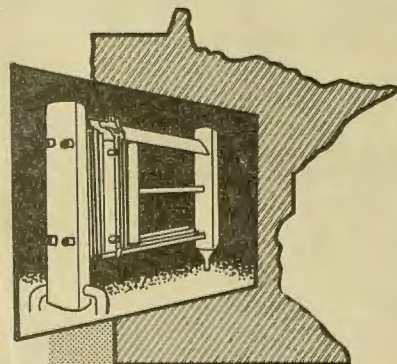
Reference

1. Olson, H. C. Some Problems in Cottage Cheese, International Association of Milk Dealers. 36 No. 13, p. 175. 1944

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