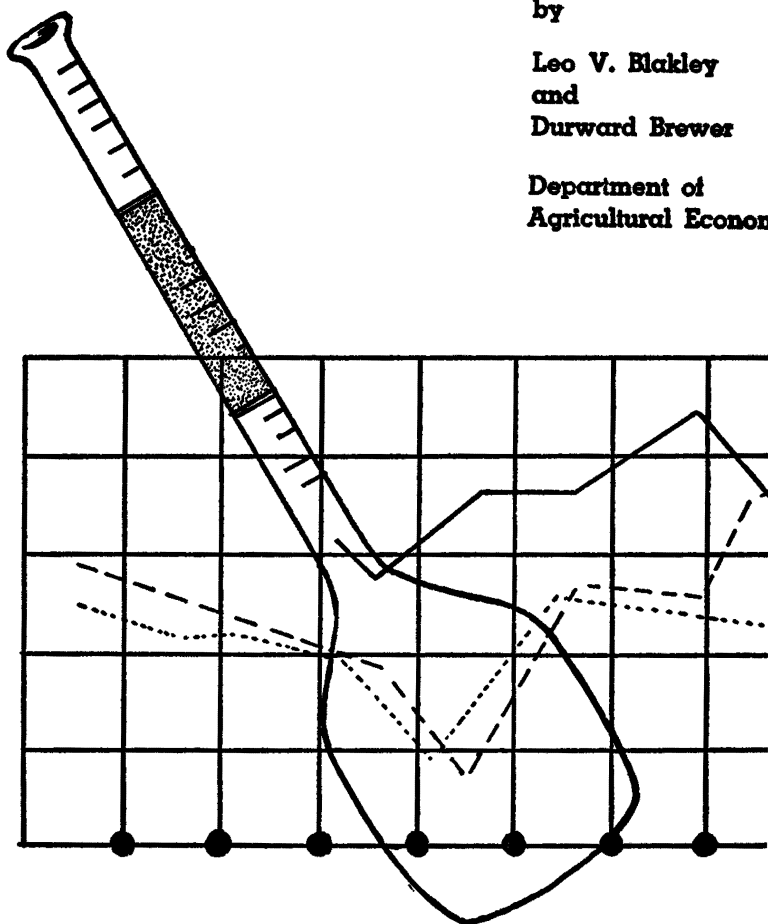


Milk Test Variations in the Tulsa Milkshed

by

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In A Nutshell

Milk tests of Grade A producers in the Tulsa milkshed were studied for the period May 1950 through December 1952. Tests usually were lowest in July and highest in November. For all producers during the period 1951 through 1953, tests averaged 47 points lower in July than in November. For a group of 48 producers for the years 1951-52, tests averaged 52 points lower in July than in November.

The variation of the milk tests within any one month was greater than producers expect. Tests usually varied over a range of 11⁶ points. The ranges were between 86 and 116 points for the oth months of the year. A majority of the producers who were interviewed expected the range to be not more than 60 points.

Statistical analysis of test variation showed that the number of milk tests per month per producer could be reduced to eight, and probably to six, without impairing the accuracy of the testing program. For the area served by the Pure Milk Producers Association of Eastern Oklahoma, this reduction to eight tests would eliminate about 2,000 individual tests per month. However, most of the producers interviewed said they prefer ten or more tests each month.

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The stage of lactation, age of cows, amount of feed, weather, care and management, and many other factors cause variations in milk tests. These variations are frequently quite large and may be an important source of controversy among dairy farmers. Consequently, the Experiment Station undertook a study in the Tulsa, Oklahoma, milkshed to determine:

(1) The amount of variation in milk tests from one month to the next; and

(2) the amount of variation in milk tests within each month. This bulletin reports results of the study.

Most of the analysis is based on information obtained from 48 producers, picked at random, in the Tulsa milkshed. Tests were official pay tests of both member and non-member producers as determined by testers of the Pure Milk Producers Association of Tulsa (later organized as the Pure Milk Producers Association of Eastern Oklahoma). No attempt was made to differentiate between variations arising from the mechanics of sampling and testing and those due to variations originating on the farm.

The average tests from May 1950 to July 1954 are shown in Table I.

Variation of Tests Between Months

Traditionally, butterfat tests are lowest during the spring and summer and highest during the fall and winter months. An analysis of the seasonal variation of tests of all producers in the Tulsa milkshed revealed that November tests averaged about 47 points* higher than July tests (this would be the equivalent of a test of 4.19 percent in

* "Point" as used in this bulletin is 1/100 of a percent in the Babcock butterfat test. Thus 47 points is 0.47 percent.

Averages by Months

Table 1:—Monthly Market Average Milk Tests, Tulsa, Oklahoma Milkshed, 1950-1954.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1950	---	---	---	---	3.89	3.89	4.03	4.07	4.08	4.10	4.09	4.09
1951	3.96	3.93	3.82	3.75	3.70	3.77	3.81	3.80	3.96	4.13	4.25	4.10
1952	4.00	3.87	3.87	3.72	3.72	3.73	3.74	3.74	3.86	4.10	4.13	4.13
1953	4.02	3.87	3.80	3.78	3.77	3.67	3.79	3.83	3.95	4.11	4.20	4.20
1954	4.13	3.95	3.89	3.77	3.87	3.81	3.68	---	---	---	---	---
1951-53 average	3.993	3.890	3.830	3.750	3.730	3.723	3.780	3.790	3.923	4.113	4.193	4.143

SOURCE: Obtained from various reports of the Market Administrator for the Tulsa-Muskogee, Oklahoma, Milk Marketing Area, A.M.S., U.S.D.A., Tulsa, Oklahoma.

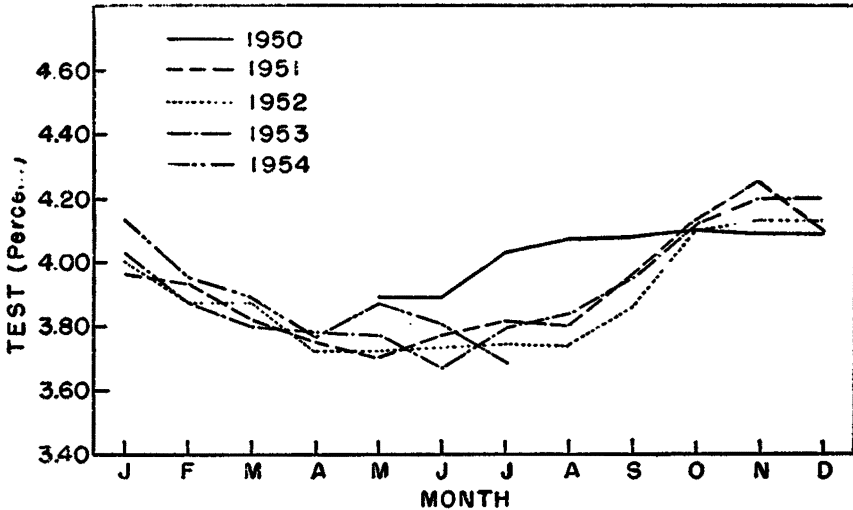


Fig. 1.—Seasonal Variation in Market Average Milk Tests; Tulsa, Okla., Milkshed; 1950-1954.

SOURCE: Various reports of the Market Administrator of the Tulsa-Muskogee, Oklahoma, Milk Marketing Area, Agricultural Marketing Service, U. S. Department of Agriculture. (See Table II.)

November and a test of 3.72 percent in July). The seasonal variation of tests was almost the same from one year to the next (Figure 1). The year 1950 appeared to be an exception, but this was the first year under a federal milk marketing order and significant adjustments to the order were in process.

An analysis of the individual tests of 48 producers selected at random from the Tulsa milkshed indicated the same seasonal pattern with November tests averaging 52 points higher than July tests (Figure 2). Statistical analysis indicated that both the average test and the variation were lowest in May through September and highest in October through April (Table II).

Fluctuation of Tests Within the Month

It is not uncommon to have a range of 1.0 percent (10 points) between the highest test and the lowest test for a given producer within any one month. However, a range this large is more likely to occur during the fall months, when tests are higher and when variations in feeding rates are more pronounced.

The variations in the individual tests within each month for each of the 48 producers in the sample of the Tulsa milkshed were analyzed for every month from May, 1950, through December, 1952. The tests of some producers varied only slightly during the month, while the

Monthly Variation

Table II: Monthly Average tests, Standard Deviations, and Coefficients of Variation for 48 milk producers: Tulsa, Oklahoma, Milkshed, 1951-52.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average test	4.06	4.00	3.98	3.84	3.82	3.85	3.84	3.87	4.03	4.24	4.34	4.20
Standard Deviation	0.49	0.46	0.44	0.45	0.40	0.42	0.42	0.42	0.42	0.47	0.54	0.50
Coefficient of Variation	.121	.116	.110	.117	.104	.109	.108	.109	.105	.110	.126	.119

SOURCE: Compiled by Department of Agricultural Economics, Oklahoma A. & M. College, from test data furnished by Pure Milk Producers Association of Eastern Oklahoma.

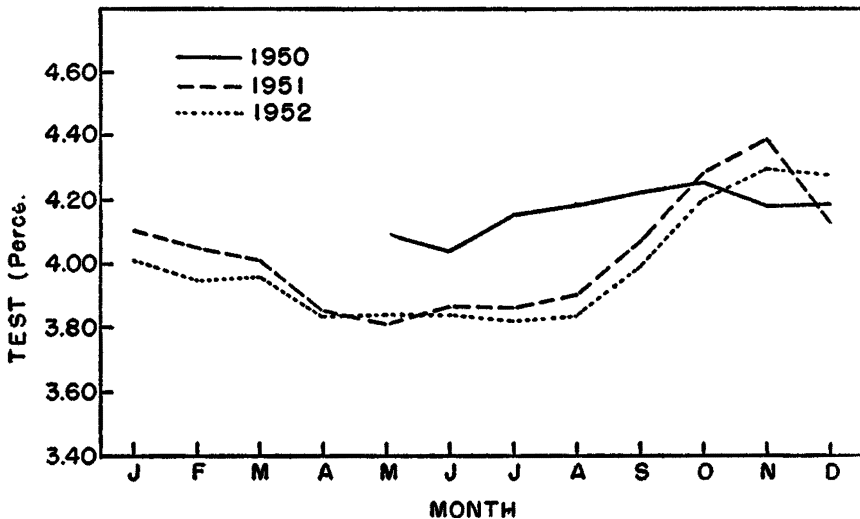


Fig. 2.—Seasonal Variation in Tests of 48 Milk Producers in the Tulsa, Oklahoma, Milkshed; 1950-1952.

SOURCE: Compiled from test data furnished by Pure Milk Producers' Association of Eastern Oklahoma. (See Table III.)

tests of other producers varied much more. The analysis indicated that an individual producer could expect about one-third of his tests to fall outside the range of his average test by plus or minus 0.24 (Table III). In other words, for an average test of 3.80 percent, a producer would expect roughly one-third of his tests to be either less than 3.56 percent or more than 4.04 percent.

The test variation within months was greater in the fall than in the summer months. In November, the range of variation was an average test plus or minus 0.29 percent as compared with the May range of an average test plus or minus about 0.23 percent for the two tests out of three probability level (Table III). March variation was somewhat lower than May.

A higher level of probability may be preferred in order to have a range which includes the usual variation and excludes the unusual variation. The information for this higher probability level, 19 tests out of 20, is also shown in Table III. In November, a producer with an average test of 4.34 would expect only one test out of 20 to be either less than 3.76 ($4.34 - 0.58 = 3.76$) or greater than 4.92 ($4.34 + 0.58 = 4.92$). This is a range of 1.16 percent or 116 points. The range for each of the other months would be determined in the same manner for 19 tests out of 20 probability level.

Variation Within Months

Table III: Average of Individual Standard Deviations within the month for 48 milk producers, Tulsa, Oklahoma Milkshed, 1950-1952.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1950	---	---	---	---	0.24	0.23	0.26	0.24	0.24	0.24	0.24	0.21
1951	0.21	0.24	0.21	0.23	0.20	0.20	0.20	0.23	0.27	0.25	0.35	0.29
1952	0.26	0.21	0.22	0.23	0.24	0.24	0.23	0.28	0.27	0.28	0.28	0.26
Average* (2 out of 3 tests)	0.24	0.22	0.21	0.23	0.23	0.22	0.23	0.25	0.26	0.26	0.29	0.25
Average* (19 out of 20 tests)	0.48	0.45	0.43	0.46	0.46	0.45	0.46	0.50	0.52	0.51	0.58	0.51

SOURCE: Compiled by Department of Agricultural Economics, Oklahoma A. & M. College from test data furnished by Pure Milk Producers Association of Eastern Oklahoma.

* Averages are obtained from data before rounding off.

These variations are greater than most producers expect. In a personal interview survey of the 48 producers in the sample, 85 percent expected a usual variation of from 0.10 to 0.30 percent, either up or down, from their average test. Only about 10 percent of the producers expected a variation in tests which was larger than 0.30 percent. If the 19 tests out of 20 probability level is the usual test variation, then producers would expect only about two-thirds the test variation which actually occurs.

The Proper Number of Tests

When the Federal market order became effective in 1950, the Pure Milk Producers Association of Tulsa took over the job of testing milk. At first, 12 fresh milk tests were taken each month for each producer.¹ As the number of producers increased, the testing job became heavier and the number of fresh milk tests per month per producer was reduced to 10. If this number of tests could be still further reduced, then the cost of this service to all dairy producers could also be reduced.

The analysis of test variability within the months for individual producers provides a basis for statistical evaluation of the number of tests that should be taken each month. The largest variation in any month for any of the producers sampled, and the low test of 3.0 percent, were selected for the purpose of this analysis. Both were arbitrarily selected in order to insure that the final number of tests would be the largest number needed for all practical situations.

Using this variation and test as a base, it was found that only 4 tests per month would be sufficient accuracy for the 99 out of 100 probability level.² Therefore, the number of tests per month per producer could be reduced to 8 and probably to 6. For the area served by the Pure Milk Producers Association of Eastern Oklahoma, the reduction to 8 tests would eliminate about 2,000 individual tests per month. After this reduction, additional study of variation could be made to determine the desirability of still further reduction.

The 48 producers who were interviewed differed as to the number of tests that they thought should be taken, but 9 out of 10 wanted at least 10 tests per month. Forty-six percent approved of 10 to 12 tests per month, 22 percent wanted 14 to 20 tests per month, and 22 percent preferred daily tests. No particular preference was expressed by the remaining 10 percent.

¹ Additional information on composite testing of daily samples was not available. Consequently, a comparison of composite testing vs. fresh milk sample testing was not possible.

² Based on $s^2 = .5476$ and $\bar{x}^2 = 9.00$ with t at 1% level.

Summary and Conclusions

The butterfat tests followed a fairly specific pattern of seasonal variation, with tests lowest in July and highest in November—47 points above July. The test variation was generally low in the spring and summer and high in the fall and winter.

Tests in May varied over a range of about 0.92 percentage points, and in the fall tests varied over a range of 1.16 percentage points, at the 19 test out of 20 probability level. This is about 50 percent more variation than producers expect.

Based on the analysis of test variation, a reduction from 10 to 8 and probably to 6 tests per month of producer milk could be made. This reduction in the number of tests would reduce the cost of the testing without impairing the accuracy of the testing program. However, most producers now prefer 10 or more tests per month.