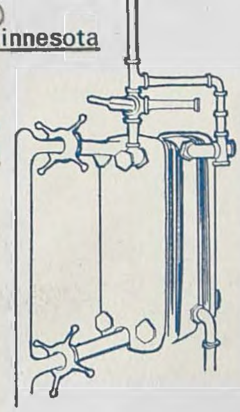
Agricultural Extension Service • University of Minnesota

MINNESOTA DAIRY PRODUCTS PROCESSOR



By V. S. Packard
Extension Specialist, Dairy Products

April 1974 No. 54

USE OF THE MARK III MILKO-TESTER FOR TESTING CREAM

In cooperation with the Dairy Quality Control Institute, Inc., we recently evaluated the Mark III Milko-Tester for milkfat testing of cream. As a part of this research we compared test results of the Babcock, Mojonnier, and Mark III methods. We'll take a look at what we found in this issue of MDPP.

HOW WE WENT ABOUT THE STUDY

We used raw cream in all cases. Cream was separated in a laboratory model separator, then diluted with raw skimmilk to obtain samples with milkfat levels ranging from 5.0 to 50.0 percent. These samples were then analyzed in triplicate by the Babcock and Mojonnier methods, and in quadruplicate by the Milko-Tester method.

It is very important to note that the Milko-Tester was calibrated on whole milk, not cream. This allows testing of whole milk and--with suitable calculations--the additional testing of cream samples without machine adjustment.

One other small, but potentially meaningful detail should be noted. The Mark III is automatic for milk testing and semi-automatic for cream testing. In the analysis of cream, a sample is drawn into the unit, diluted, and then discharged from the equipment for further testing. It is this diluted sample, then, that is run through the testing cycle. The problem is this: A drop of cream remains hanging in the intake tube when cream is initially taken into the machine for dilution purposes. This drop of concentrated cream could alter the dilution rate to some extent. To standardize the procedure, we waited about 10 seconds after sample uptake, then wiped the drop off with a brown paper towel. It's easy enough to do this and maximum test precision (minimum variability from sample to sample) is thereby assured.

WHAT WE FOUND

Keep in mind that "accuracy" is the ability to zero in on a reference test--either Babcock or Mojonnier in this case. "Precision" is the ability to replicate results, to test a sample over again and again and get the same results each time. Precision (or variability) measures one characteristic of a test, accuracy another.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Roland H. Abraham, Director of Agricultural Extension Service, University of Minnesota, St. Paul, Minnesota 55101. We offer our programs and facilities to all people without regard to race, creed, color, sex, or national origin.

Accuracy: In this study Milko-Tester accuracy was gauged against the Babcock and Mojonnier procedures--which *themselves* don't agree particularly well. Anyway, the correlation between the Milko-Tester and these two other tests was found to be 0.9987 and 0.9983, respectively. A correlation of 1.0 is considered perfect, so you can see that the Milko-Tester did in fact "zero-in" very well.

Precision: Variance is a measure of precision. The larger the number the more variable (the less precise) the procedure. We made a total of 243, 246, and 336 observations on the Babcock, Mojonnier, and Milko-Tester methods respectively. Variance averaged, respectively, 0.062, 0.048, and 0.017 percent. Note: the smallest number applies to the Milko-Tester. It was the *least* variable (most precise), followed by the Mojonnier, then the Babcock. Furthermore, we found that variance for each procedure tended to increase with increase in milkfat content of the cream, which is more or less what you'd expect. Anyway, if you'd like more details in this regard, please let us know.

APPLYING THE MILKO-TESTER TO CREAM SAMPLES

With the Milko-Tester calibrated on whole milk, cream readings must be adjusted to relate them directly to either the Babcock or Mojonnier results. Using our data, the formulae derived for doing this are:

(1) To convert Milko-Tester to Babcock: $\hat{y} = -0.94795 + 1.06699\ (X)$

(2) To convert Milko-Tester to Mojonnier: $\hat{y} = -0.60222 + 1.04850\ (X)$

In both formulae $\hat{y}$ is the reading you are trying to establish, X is the Milko-Tester reading obtained on the cream sample.

AN EXAMPLE

On 17 samples ranging in test from 35.1 to 45 percent milkfat, we got an average reading of 39.11 by the Mojonnier method and 37.90 by the Milko-Tester. Formula (2) above says that to estimate the Mojonnier from a Milko-Tester reading we multiply the Milko-Tester reading (X) by 1.04850, then substract 0.06022. Let's try it.

$$1.04850 \times 37.90 = 39.73815$$

$$39.73815 - 0.60222 = 39.14$$

The actual Mojonnier reading was 39.11; the adjusted Milko-Tester reading is 39.14. The difference, then, is -0.03. That's a pretty close estimate!

The following table summarizes our results.

SUMMARY OF FINDINGS

Range of Tests (%)	Avg. Babcock Test (%)	Avg. Moj. Test (%)	Diff. from Babcock	Avg. Milko-Tester Test[1]	Milko-Tester "Adjusted" to Babcock[2]	Milko-Tester "Adjusted" to Mojonnier[2]
25 -35	30.03	29.82	(-0.21)	29.10	30.10	29.91
35.1-45	39.52	39.11	(-0.41)	37.90	39.49	39.14
45.1-50	47.41	46.76	(-0.65)	45.14	47.22	46.73

(1) Reading as obtained directly from the Milko-Tester; no adjustment applied.

(2) Readings adjusted by use of appropriate formulae.

IMPLICATIONS

Since the Milko-Tester is much faster than either the Babcock or Mojonnier, you could run four tests on a cream sample, average the results, use an appropriate formula and come out with very close approximations of either Babcock or Mojonnier results, whichever you prefer to use as a standard. Or formulae could be derived for other standards.

We looked at a relatively small number of samples; a broader study might well have resulted in further refinement of the formulae. It is also quite possible that you would do better to develop your own formulae, using your standard(s) and your Milko-Tester unit. From our perspective it would seem that the potential to improve testing speed and precision is there. And, as always, testing is still the name of the game.

Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement is implied.

AGRICULTURAL EXTENSION SERVICE
INSTITUTE OF AGRICULTURE
UNIVERSITY OF MINNESOTA
ST. PAUL, MINNESOTA 55101
ROLAND H. ABRAHAM, DIRECTOR
COOPERATIVE AGRICULTURAL
EXTENSION WORK,
ACTS OF MAY 8 AND JUNE 30, 1914

OFFICIAL BUSINESS
875--4/74

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF
AGRICULTURE
AGR 101

U.S.MAIL

AGRICULTURE LIBRARY
ST PAUL CAMPUS DPP
ST PAUL MINN 55101