

STANDARDIZATION OF COMPOSITION AND QUALITY OF NORTH DAKOTA BUTTER

By

C. Jensen¹, L. D. Beck² and Mrs. Emily Plath³

Thirty-one North Dakota creameries participated with the North Dakota Agricultural Experiment Station in October 1947 in submitting 32 samples of butter made in their creameries for examination in the Standardization Composition and Quality of North Dakota butter project. Financial support for the project which was begun in May 1945 has been furnished in a grant from the North Dakota Research Foundation, an instrumentality of the state set up to encourage the establishment and improvement of industry in the state. Butter manufacturing is a leading industry in this state—that industry is being served by being furnished a monthly laboratory report upon the quality of the product they produce.

Fresh samples of butter are analyzed for percentage of fat, water, salt and curd; mold and yeast counts, pH of butter serum or active acidity. Each item is scored on a percentage basis, the value depends upon the degree of compliance with established standards. For example, a score of 100 per cent would mean perfect compliance with the standard; unsatisfactory compliance would be given a lower score based on the test. An efficiency score, based upon a weighted combination of the individual scores of composition, mold and yeast and serum pH is given each butter sample. During the month of October two creameries obtained an efficiency score of 100; 12 plants scored from 90 to 99; 7 were between 80 and 89; 7 scored from 50 to 79, while 4 plants scored below 50 per cent.

Butterfat Content

Standards for composition have been established for the purpose of maintaining butter which safely meets the legal minimum standards with respect to butterfat content, at the same time holding it low enough to obtain efficient operation. Excessive fat in butter means that the creamery is taking an unnecessary financial loss, since it is not paid for the extra butter fat. Therefore, the recommended butterfat standard is established at from 80.3 to 80.5 percent. With the existing method of churning, the variation in composition of one lot of butter may vary plus or minus 0.2 points. Therefore, it would not be safe to establish a minimum lower than 80.3 percent. On the other hand, an efficient plant operator should be able to maintain the butterfat content below 80.5 per cent. Of the 32 samples of butter analyzed in October four contained more than 81 per cent butter fat; one sample tested 81.50 per cent fat, which is 1.2 per cent above the minimum test of 80.3 per cent required by the standard. The creamery making this butter gave away 18 pounds butter on a 1500 pound churning. At a market price of about 75 cents per pound, the loss would amount

¹Dairy Technologist, ²Ass't Dairy Technologist, ³Dairy Technician

to \$13.50 for each churning, or \$900.00 for every 100,000 pounds of butter. For a creamery manufacturing one-half million pounds of butter per year the loss would amount to \$4500.00, or the salary of a good plant operator. Ten butter samples contained from 80.5 to 80.99 per cent butterfat; 9 were within the recommended range of 80.3 to 80.5, while 8 samples were below 80.3; two of the latter group were below the legal limit of 80 per cent butterfat.

Yeast and Mold Counts

Yeast and mold count of butter is regarded as a sanitation index of the processing and handling of the product. Proper pasteurization of cream destroys living mold and yeasts. Therefore, butter with an appreciable mold and yeast count indicates that pasteurization exposure has been inadequate, or the butter has been contaminated after pasteurization. According to the mold and yeast standards set up for the butter standardization project, butter containing less than 5 molds and yeasts per gram, according to the plate count, scores 100. Butter with higher counts receive lower scores on a graduated basis. When the mold and yeast count exceeds 100 per gram the score on this item is 0.

Six of the 32 butter samples submitted for analysis during October scored 100 with respect to mold and yeast count; 12 scored from 90 to 99; 2 scored from 80 to 89; 4 scored from 50 to 79 while 8 samples scored below 50. Five of the low scoring samples received scores of 0, since the mold and yeast count exceeded 100 per gram.

While some creameries apparently experience little trouble with high mold and yeast counts, other plants constantly have difficulty controlling them. Excessive yeast and mold counts may be caused by contaminated pipelines, pumps, churns and butter packing equipment, as well as by infected water supplies. Wooden churns are most frequently the seat of contamination. Daily, rigid cleansing and sanitation procedures are essential for proper mold and yeast control.

Active Acidity in Butter Serum

Serum pH refers to the active acidity factor in the water portion of butter. In order to have butter of good keeping quality the pH factor should be adjusted within the range of 6.5 to 7.2. When the pH is under or over these values the butter would not be expected to keep well in storage.

With respect to serum pH 23 samples scored 100; 4 were between 90 and 99; one sample scored 80; while 3 obtained scores of 0. All three samples with the 0 score were acid in character and thus, would not be expected to keep well in storage. However, two of these samples had been ripened with butter flavor culture and obtained good flavor scores of 93 and 92 when fresh. When cream is moldy it has usually aged to the extent that high quality

butter cannot be made from it. Pasteurization kills the live vegetative mold cells in cream. However, the dead mold filaments, otherwise known as mold mycelia remain and are carried into the butter. Therefore the mold mycelia count of butter is an indication of the live mold growth in the cream from which it was made and indirectly of the age of the cream. Twenty-six butter samples analyzed showed mold counts ranging from 0 to 10; 5 had counts from 11 to 20 and one sample had a mold mycelia count of 33. While the butter with a mold mycelia count of 33 is not exceptionally high, it does indicate that there has been a lack of attention with respect to grading out cream with high mold count. Due to the climatic conditions facilitating cooling and cool storage of cream, the mold mycelia count of North Dakota butter should be so small as to be relatively insignificant.

Butter Scores

Quality of butter is of prime importance to the North Dakota dairymen. The future of butter industry in the state will depend to a large extent on the production and marketing of high quality butter. With all of the ingenuity of man and his scientific achievements, no one has found a way to make good butter from poor cream. The most significant measurement of quality is flavor and odor, secondly, body and texture. Other factors are also involved in arriving at the total quality rating for butter. Butter, with a total score of 93 is fine butter, made from sweet cream; 92 score butter is of good quality, however, it shows minor defects which would preclude a 93 score on the product. Butter scoring 90 to 91 is made from cream (usually sour), possessing various defects not serious enough to be highly detrimental to the flavor of butter, but sufficient to keep it out of the higher score classification; flavors such as old cream, coarse acid, etc., are common to this type of butter. Butter scoring 89 is of inferior quality; designations as stale, neutralized, scorched, weedy, etc. are employed to describe the defects common to this type of butter.

Of the 32 butter samples submitted for analysis in October one scored 93 when fresh; 3 scored 92; 3 scored 91; 20 samples scored 90 and 5 rated an 89 quality score. Through increased attention to grading and rejecting cream of inferior quality much could be accomplished with respect to improving the quality of North Dakota creamery butter.