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M. F. MILLER, *Director*

The Effect of Temperature Upon Score Value And Physical Structure of Butter

W. H. E. REID AND W. S. ARBUCKLE

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The Effect of Temperature Upon Score Value And Physical Structure of Butter

W. H. E. REID AND W. S. ARBUCKLE

Flavor is of ultimate importance in determining the score value of butter and is given considerable attention by butter judges. On the principal markets of the country butter is scored at approximately 40 degrees Fahrenheit. It is well known that the body of butter becomes firm and resistant at relatively low temperatures, thus making the product more difficult to spread. At higher temperatures the body is less firm and has more desirable spreading properties, while at still higher temperatures the butter may become oily, sticky or greasy. There also appears to be a relationship between the temperature and intensity of flavor of the butter. Little information is available as to the temperature at which butter is the most favorable for consumption. The object, therefore, of this investigation was to secure preliminary information on the effect of the temperature upon the score value, body consistency, and consumptive qualities of butter.

The literature reveals few investigations bearing on this subject. Parsons¹ states that the body, texture, and flavor of butter can be judged better at a fixed temperature rather than at one which is variable. Parsons² also believes that the body, texture, and flavor of butter can be better judged at 45 and 50 degrees Fahrenheit than at a higher temperature. Reid and Arbuckle³ found that there is a relation between the serving temperature and intensity of flavor of ice creams and sherbets. More intense flavors were observed at the higher temperatures.

PROCEDURE

The experimental work on this problem was conducted under conditions similar to those encountered in the creamery industry in order that the results might be more applicable to commercial conditions.

The most logical temperatures to use appeared to be 40, 50, 60 and 70 degrees Fahrenheit. To secure these temperatures a special, insulated cabinet with a number of compartments was constructed and the temperature of each compartment controlled by the use of a thermostat and a light bulb.

¹Parsons, C. H., 1937, *The Creamery Journal*, Vol. XLIII, No. 5, page 5.

²Parsons, C. H., 1938, *The American Produce Review*, Vol. 85, No. 12, page 326.

³Reid, W. H. E. and Arbuckle, W. S., 1938, *Missouri Agricultural Experiment Station Research Bulletin* 272.

Tempering of the Butter in the Cabinet

After one pound samples of butter had been secured, one quarter pound print of each sample was properly tempered at the desired temperature for four hours before being judged. At the end of this tempering period each sample was given a score value. The judges also indicated the temperature at which the product was most desirable for consumption.

Effect of Quality of Cream and Temperature to the Score Value of Butter

Butter manufactured from high, medium, and low quality cream was given a score value at each of the temperatures studied to determine the relation of the quality of cream to the score value of the butter at different temperatures.

The butter used in this investigation ranged in score value from 83 to 93 points. To acquire detailed information it was necessary to study a group of samples of high scoring butter; another with a medium score and still another group having a low score value. Butter with a score value above 90 points was considered a high scoring product; butter having a score of 88 to 90 inclusive, as medium; and that having a score value below 88 points as a low score butter.

The Relation of Serving Temperature to Spreading Properties

The spreading properties of the butter were determined by observations made by the judges and from microphotographs of actual spreading tests. Spreading properties were determined at the different temperatures of butter with a very firm waxy body; butter with a firm waxy body; butter with a medium firm waxy body; and butter with a soft and salvy body.

EXPERIMENTAL DATA

The temperatures most logical for use in this investigation were determined by information secured from Fig. 1, which shows that when butter is exposed at 80 degrees Fahrenheit, the rise in temperature of squares is rapid, while in quarter and pound print of butter the rise in temperature is somewhat slower due to relative surface exposure.

There is a relationship between the quality of cream used and the score value of butter at different temperatures.

Fig. 2 indicates definitely that butter made from high quality cream increased in score value as the serving temperature increased,

while the score of butter made from medium grade cream decreased slightly, and in butter made from poor quality cream a decided decrease in score value was observed.

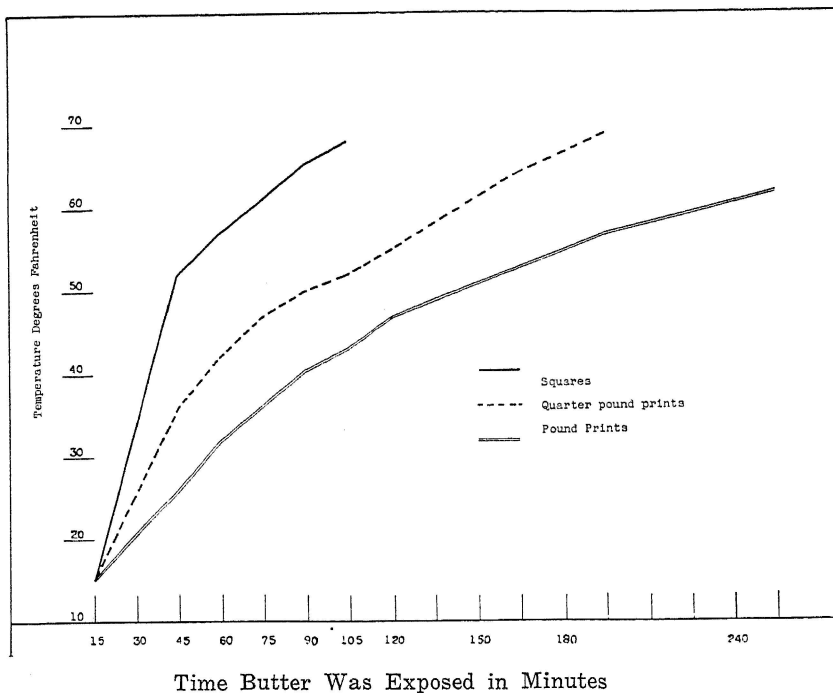


Fig. 1.—Increase in the Temperature of Butter Samples Varying in Surface Exposure When Held at a Temperature of 80 Degrees Fahrenheit.

Fig. 3 presents the score values of the high, medium, and low score butters at the various temperatures. It is interesting to note that the high score butter received a higher score at the higher temperature, while the medium and low score butter was given a lower score value at the higher temperatures.

Table 1 presents the comments made of the butter at the different temperatures by the judges. Flavor observations indicate that the flavor of butter scored at low temperatures was less distinct, while pronounced, full flavors were observed at higher temperatures. In high score butter the clean, mild, creamy flavor of the product became more pronounced, resulting in a higher score product at the higher temperatures. In medium and low score butter the undesirable, old, rancid, unclean and unnatural flavors became more pro-

nounced at the higher temperatures, resulting in a lower score butter. The salt flavor was more pronounced at 50 degrees Fahrenheit than at higher temperatures.

The body of the butter was firm, waxy and resistant at 40 and 50 degrees Fahrenheit; medium firm at 60 degrees; and salvy, leaky, and greasy at 70 degrees Fahrenheit.

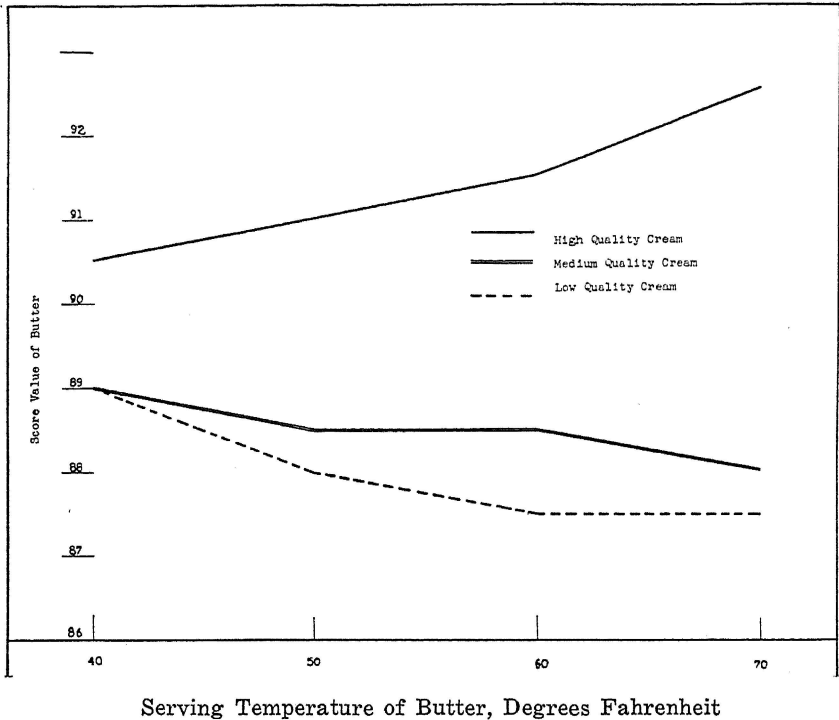


Fig. 2.—The Relation of the Quality of Cream to the Score Value of Butter When Served at Different Temperatures.

The color was rated as medium at 40 and 50 degrees Fahrenheit; more pronounced at 60 degrees Fahrenheit; and pronounced with a bright lustre at 70 degrees Fahrenheit.

The judges rated the spreading properties of the butter at 40 degrees Fahrenheit as poor, as it was too resistant and crumbly. At 50 degrees Fahrenheit the spreading properties were fair, being resistant and slightly crumbly. Butter at a temperature of 60 degrees Fahrenheit was rated as having very good spreading properties, while at 70 degrees Fahrenheit the qualities were rated as fair, the butter being easy to spread but slightly sticky.

TABLE 1.—THE RELATION OF TEMPERATURE TO THE SPREADING PROPERTIES OF SAMPLES OF BUTTER WITH HIGH, MEDIUM AND LOW SCORES

Temperature Degrees F.	Flavor			Body	Color	Spreading Properties
	High Score	Medium Score	Low Score			
40	Clean, mild, creamy, Full, medium salt, Lacking	Slight old, salt, Slight unnatural, flat, Very slight unclean, Slight off flavor	Salt, mild rancid, Fruity, aftertaste, Unnatural, Slight fishy	Firm, waxy, Too resistant	Medium	Poor, Too resistant, Crumbly
50	Clean, creamy, full, Salt more pronounced	Salt more pronounced Less unnatural, Slight unclean	Excessive salt, Old, Slight tallowy, Fishy, rancid	Firm, waxy, Medium Resistant	Medium	Fair, Resistant, Crumbly
60	Clean, creamy, Pronounced salt, Pronounced	Old, Pronounced unclean, Rancid, flat	Pronounced unclean, Fruity, Fishy, rancid	Medium firm	More Pronounced	Very good
70	More pronounced, Clean, creamy, Very full, Slight salt	Old, Does not clean up, Unclean Rancid	Sour, Unclean, Fishy, Off Flavor	Salvy, Leaky, Greasy	Pronounced Bright lustre	Fair, Easy to spread, Sticky

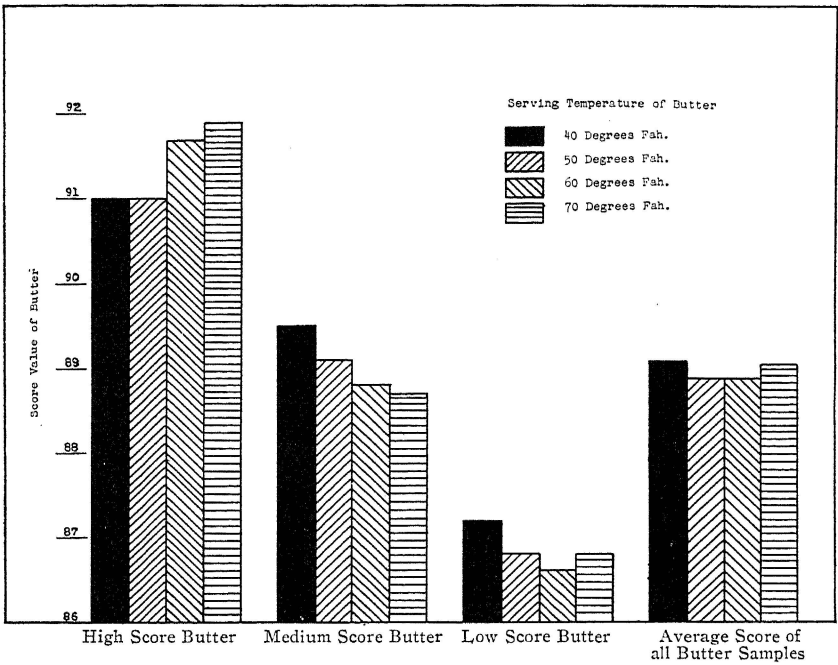


Fig. 3.—The Influence of Temperature Upon the Average Score Value of High, Medium and Low Score Butter.

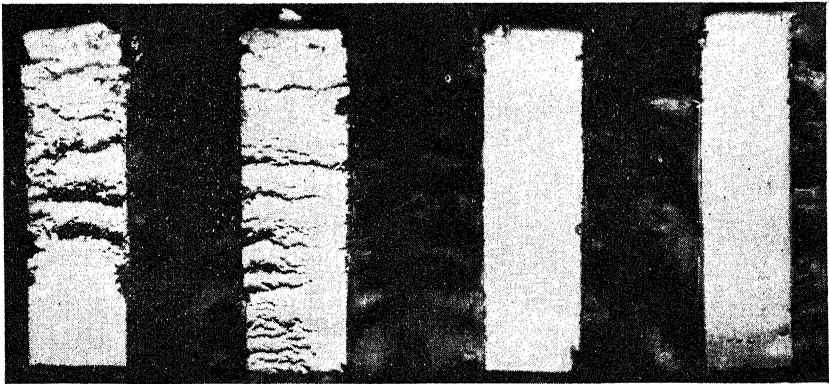


Fig. 4.—The Relation of Serving Temperature to the Spreading Properties of Butter with a Very Firm and Crumbly Body.

Fig. 4 shows the relation of serving temperature to the spreading properties of samples of butter with a very firm and crumbly body; Fig. 5 shows butter with a firm, waxy body; Fig. 6 shows butter with

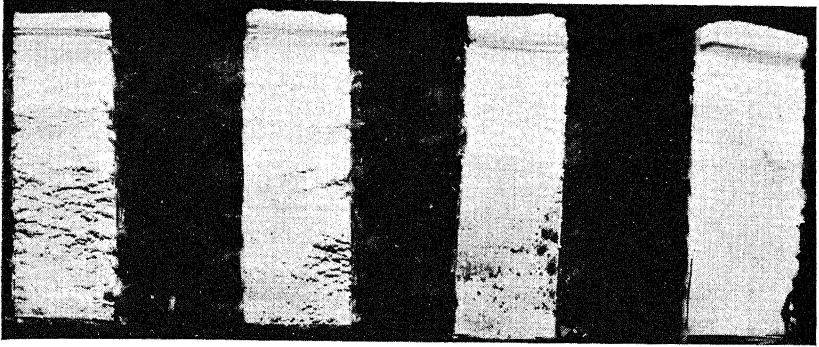


Fig. 5.—The Relation of Serving Temperature to the Spreading Properties of Butter with a Firm and Waxy Body.

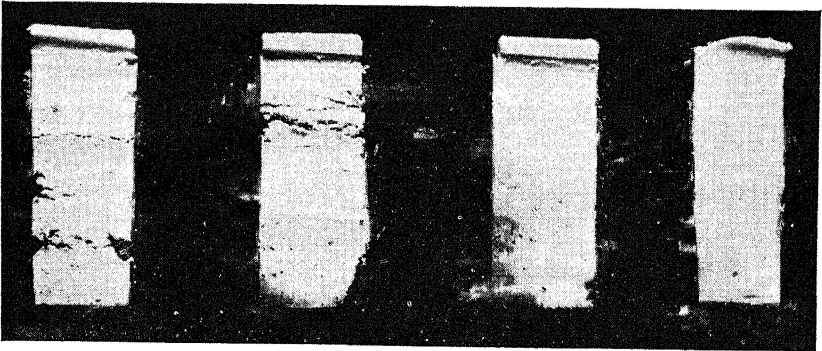


Fig. 6.—The Relation of Serving Temperature to the Spreading Properties of Butter with a Medium Firm and Waxy Body.

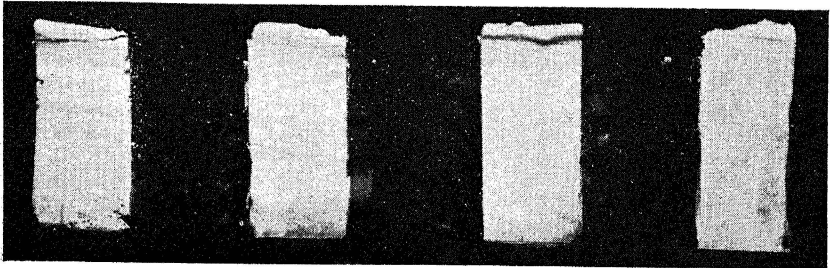


Fig. 7.—The Relation of Serving Temperature to the Spreading Properties of Butter with a Soft and Salvy Body.

a medium firm, waxy body; and Fig. 7 shows butter with a soft, salvy body. The spreading properties appear to be most desirable at 60 degrees Fahrenheit in all samples except those butters having a soft, salvy body. These butters appeared to be more desirable at 40 and 50 degrees Fahrenheit.

DISCUSSION

That temperature has a marked effect upon the score value, body consistency, and consuming properties of butter is clearly indicated by the results of this preliminary investigation. The score value and consumptive properties of the product are influenced greatly by its flavor; and as the flavor, whether it be desirable, full, clean and creamy, or undesirable, old, rancid, unclean, and unnatural, becomes more pronounced at the higher temperatures, it is of prime importance and highly essential that the butter, if it is to receive the maximum score value and secure the maximum consumer acceptance under all temperature conditions, be manufactured from the highest quality of cream available.

The data indicate that high score butter and butter made from high grade cream increases in score value at the higher temperatures, while medium and low score butter and butter made from medium and low quality cream decreases in score value at the higher temperatures. These changes in score value may be attributed to the fact that the true flavor of the butter becomes more volatile and pronounced at the higher temperatures and the prevailing flavor is more easily detected by the judges.

CONCLUSIONS

1. These preliminary studies seemed to indicate that the temperature at which butter is scored has an influence upon its score value and consumptive properties.
2. Butter that will receive a high commercial score value will usually have a higher score value at 70 degrees Fahrenheit than at 40 degrees Fahrenheit.
3. Butter which is usually given a medium or low score will generally have a higher score at 40 degrees than at 70 degrees Fahrenheit.
4. Flavor observations indicate that all flavors are less distinct at 40 degrees Fahrenheit, while at 70 degrees the flavors are full and pronounced except when the salt content is sufficient to submerge the true flavors.

5. The score value of butter manufactured from cream of a high quality is enhanced as the serving temperature is increased; whereas the score value of butter manufactured from cream of a fair or poor quality diminishes as the serving temperature is increased.

6. The spreading properties of butter appear to be most desirable at 60 degrees Fahrenheit.