WHITE PAPER

Performance of Reagents for Dairy Testing

Introduction

Dairy is often the first form of nutrition humans are exposed to as newborns, and it remains a staple of our diet throughout our lifespans. As the global population continues to grow, the dairy industry will continue to provide nutritious foods in every region. It is important that the dairy industry supplies product that is unadulterated and contains macronutrients in the appropriate quantities. Thus, standardized analytical methods exist in the dairy industry to enable consistent testing of samples. It is commonplace that dairy samples, particularly milk and cheese, are tested for fat content, protein content, and acidity. These analytical methods require high-quality reagents to achieve accurate results. The Fisher Chemical portfolio is broad and contains many reagents, including ones that are required in dairy testing methods. This paper illustrates the performance of several Fisher Chemical reagents in methods commonly used in the dairy industry.

Materials & Methods

All reagents evaluated in these methods are available from Fisher Chemical.

Sulfuric acid (S/9360) and isoamyl alcohol (A/7000) were evaluated for use in the acido-butyrometric method, otherwise known as the Gerber method (NF ISO 19662), for determination of fat content in milk. The two Fisher Chemical reagents were evaluated on 10 raw milk samples in a comparative test, run in duplicate, against reagents offered by another supplier available in the market.

Petroleum ether (P/1760) and diethyl ether (D/2450) were evaluated for use in the gravimetric method or Röse-Gottlieb method (NF EN ISO 1211) for determination of fat content in milk. The two Fisher Chemical reagents were evaluated on 10 raw milk samples in a comparative test, run in duplicate, against reagents offered by another supplier available in the market.

Sulfuric acid, 98% (S/9250), 40% sodium hydroxide (S/4960), and a 4% boric acid solution (K/0205) were evaluated for use in the Kjeldahl method (NF EN ISO 8968-1) for determination of nitrogen content in milk. The two Fisher Chemical reagents were evaluated on 10 raw milk samples in a comparative test, run in duplicate, against reagents offered by another supplier available in the market.

Glacial acetic acid (A/0400) and 60% perchloric acid (P/1240) were evaluated in the acido-butyrometric method, or Heiss method, (NF V 04 287) for determination of fat content in cheese. The two Fisher Chemical reagents were evaluated on 10 cheese samples in a comparative test, run in duplicate, against reagents offered by another supplier available in the market. The cheeses analyzed in this test were 4 soft cheeses, 2 hard cheeses, and 4 semi-hard cheeses.

Results

Table 1. Results from the acido-butyrometric method or the Gerber method (NF ISO 19962) for milk

Results (g/L)	Mean, X	Standard Deviation, Sx	Mean Deviation between sets of data, d	Absolute standard deviation between sets of data, Sd
Fisher Chemical Reagents	33.35	10.95	0.01	0.043
Competitor	33.34	10.96		

Table 2. Results from the gravimetric method or the Röse-Gottlieb method (NF EN ISO 1211) for milk

Results (g/kg)	Mean, X	Standard Deviation, Sx	Mean Deviation between sets of data, d	Absolute standard deviation between sets of data, Sd
Fisher Chemical Reagents	32.20	10.54	0.136	0.147
Competitor	32.06	10.58		

Table 3. Results from the Kjeldahl method (NF EN ISO 8968-1) for milk

Results (g nitrogen/kg)	Mean, X	Standard Deviation, Sx	Mean Deviation between sets of data, d	Absolute standard deviation between sets of data, Sd
Fisher Chemical Reagents	5.15	0.606	0.012	0.015
Competitor	5.16	0.606		

Table 4. Results from the acidio-butyrometric or Heiss method (NF V 04-287) for cheese

Results (g/100g)	Mean, X	Standard Deviation, Sx	Mean Deviation between sets of data, d
Fisher Chemical Reagents	26.74	6.193	0.036
Competitor	26.71	6.262	

Discussion

The calculated mean from the two sets of data in all the testing methods are not statistically different, and emphasize the accuracy of the data.

The Gerber method is used to measure the fat content in milk and cream samples. The addition of sulfuric acid to the sample changes the specific gravity of the milk serum. This change increases the difference of the specific gravity between the milk serum and the fat content allowing for separation; the fat content has a lower specific gravity than the milk and sulfuric acid mixture. With centrifugation, the fat rises to the surface. The use of isoamyl alcohol in this method facilitates the separation, and minimizes interaction between the sugar in the milk with the sulfuric acid.

The results in Table 1 demonstrate the suitability of the use of Fisher Chemical sulfuric acid (S/9360) and isoamyl alcohol (A/7000) in the Gerber method. The calculated mean deviation (d) of 0.01 g/L and the absolute standard deviation (Sd) of 0.043 g/L are lower than the limits used to evaluate proficiency by Gerber method on milk, which are ± 0.20 g/L for mean bias and 0.30 g/L for standard deviation of differences. In other words, the performance of the Fisher Chemical reagents in this method is nearly equivalent to the performance of the other reagents used in this comparative test. This data demonstrates that isoamyl alcohol is suitable for use in this method.[1]

The Röse-Gottlieb method is another method to estimate the fat content in milk. Petroleum ether and diethyl ether are used to extract the fat from the sample after proteins have been dissolved and precipitated by other reagents. The results in Table 2 demonstrate the suitability of the use of Fisher Chemical petroleum ether (P/1760) and diethyl ether (D/2450) in the Röse-Gottlieb method. The calculated mean deviation (d) of 0.136 g/kg and the absolute standard deviation (Sd) of 0.147 g/kg are within the limits used to evaluate proficiency by this method, which are ± 0.20 g/kg for mean bias and 0.30 g/kg for standard deviation of differences.

The Kjeldahl method is used to calculate the protein content in milk by extrapolating from the measured nitrogen content in the sample. The nitrogen is measured via titration of the ammonium present in the sample after it has been digested and distilled using reagents like concentrated sulfuric acid, a weak acid like boric acid, and a base like sodium hydroxide. The results in Table 3 demonstrate the suitability of the use of Fisher Chemical sulfuric acid, 98% (S/9250), 40% sodium hydroxide (S/4960), and 4% boric acid solution (K/0205) in the Kjeldahl method. The calculated mean deviation (d) of 0.012 g nitrogen/kg and the absolute standard deviation (Sd) of 0.015 g nitrogen/kg are within the limits used to evaluate proficiency by this method, which are ± 0.04 g nitrogen/kg for mean bias and 0.03 g nitrogen/kg for standard deviation of differences.

The Heiss method is an acido-butryometric method used to measure the fat content in cheese samples. The data in Table 4 demonstrate the suitability of the use of Fisher Chemical glacial acetic acid (A/0400) and 60% perchloric acid (P/1240) in this method. The calculated mean deviation (d) of 0.036 g/100g is within the limits used to evaluate proficiency by this method, which are ± 0.30 g/100g for mean bias.

Conclusion

Based on the data presented in this paper, there is no statistical difference in the performance of the Fisher Chemical reagents and the competitor reagents when evaluated in these dairy testing methods. The Fisher Chemical portfolio is a great option for dairy processors and testing laboratories that perform these dairy testing methods.

Acknowledgements

Thermo Fisher Scientific would like to acknowledge ACTALIA Cecalait for their efforts to conduct this evaluation of the Fisher Chemical reagents.

Footnotes

1. The Certificate of Analysis (CoA) provided by Thermo Fisher Scientific for isoamyl alcohol (A/7000) does not explicitly state the assay or proportion of the two isomers in this product, which may be not be acceptable in some instances. The CoA reflects an assay value that is ≥ 98%, which is a sum of the two isomers

Find out more at **eu.fishersci.com/go/foodbev-reagents**

Contact us today:

Austria: +43(0)800-20 88 40 **Belgium:** +32 (0)56 260 260 **Denmark:** +45 70 27 99 20
Finland: +358 (0)9 8027 6280 **France:** +33 (0)3 88 67 14 14 **Germany:** +49 (0)2304 9325
Ireland: +353 (0)1 885 5854 **Italy:** +39 02 950 59 478 **Lithuania:** +370 5 2444442
Netherlands: +31 (0)20 487 70 00 **Norway:** +47 22 95 59 59 **Portugal:** +351 21 425 33 50
Spain: +34 902 239 303 **Sweden:** +46 31 352 32 00 **Switzerland:** +41 (0)56 618 41 11
UK: +44 (0)1509 555 500

fisher scientific
part of Thermo Fisher Scientific