1-1-1965

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D N. Tulloch

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COPPER IN WEST AUSTRALIAN BUTTER
Notes on a recent survey

By D. N. TULLOCH, B.Sc. (Agric.), Dairy Laboratory

A SURVEY was conducted throughout 1963 to determine the copper content of West Australian butter. Samples were collected about three times monthly from each of the seven W.A. butter factories and examined in the Dairy Laboratory of the Department of Agriculture.

Effect of Copper on Butter
The presence of very small amounts of copper hastens the oxidation of the butter fat by dissolved oxygen. This will be further accelerated if such butter is activated by short wave light, such as ultra violet or fluorescent light. All butter contains dissolved oxygen, but, if the copper content is below 0.08 p.p.m. (parts per million) oxidation is slow. Severely oxidised butter tastes tallowy and can show bleached areas. This is both un-attractive and unpalatable.

Source of Copper
Naturally occurring copper in milk is present in a concentration of about 0.04 p.p.m. but this amount of copper is not affected by the varying intakes of copper by the cow.

Milk, cream or butter passing over any untinned copper or brass surface dissolves small quantities of the copper from the surface and it is this dissolved copper that causes the deterioration of quality in butter.

Results of Survey
Only 20 per cent. of the W.A. butter has a copper content below the level of 0.08 p.p.m. as shown by Table.

The frequency distribution of copper content among all samples of factory butter

<table>
<thead>
<tr>
<th>Copper content (p.p.m.)</th>
<th>Number of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.07</td>
<td>47</td>
</tr>
<tr>
<td>0.08 to 0.09</td>
<td>57</td>
</tr>
<tr>
<td>0.10 to 0.12</td>
<td>52</td>
</tr>
<tr>
<td>0.13 to 0.16</td>
<td>19</td>
</tr>
<tr>
<td>0.17 to 0.20</td>
<td>30</td>
</tr>
<tr>
<td>More than 0.20</td>
<td>25</td>
</tr>
</tbody>
</table>

There is a seasonal variation in the copper content of butter, with maximum levels corresponding to minimum production. It is suggested that this is due to the smaller volume of cream flowing over the same surface areas of exposed copper and the combined effect of higher summer temperatures and increased acidity of cream, which would increase the rate of pickup from any surface of copper.

Some butter factories have maintained much lower levels of copper throughout the year than others. In the period January to May, no factory was able to meet the standard of less than 0.08 p.p.m. copper in butter.

It was shown that the major source of copper pickup came from within the factories. Replacement of copper equipment by stainless steel or retinning of copper will reduce the copper pickup.

Remedy
The pickup of copper will be eliminated when all equipment through which milk, or cream or butter come in contact with is stainless steel or glass. Wherever possible factories are being requested to replace old copper equipment by new stainless steel and to ensure any copper equipment in use is kept coated with tin or nickel.

Bleached areas on butter with a high copper content. The bleaching is due to oxidation of high-copper butter by fluorescent light.
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