Sensoryal and Physico-chemical Analysis of Curd Used for Cheese Production

Mirela JIMBOREAN, D. ŢIBULCĂ, Adriana PĂUCEAN

University of Agricultural Sciences and Veterinary Medicine, 3-5 Mănăştur Street, 3400 Cluj-Napoca, Romania. mirelajimborean2004@yahoo.com

Abstract. The present work aim was to assess the sensorial characteristics (colour, taste and smell) and also the physico-chemical characteristics (acidity, fat, dry matter and water content) of ripened curd. A total of 100 samples of curd were analyzed. The curd samples were collected seasonally, 25 samples each season. The obtained data were subjected to statistical analysis.

Key words: ripened curd, physical-chemical indicators.

INTRODUCTION

One of the most important steps in pressed cheeses production is the obtaining of curd. The curd, after aging and cutting in slices (thickness of 3-5 mm and width of 3-6 cm), undergoes scalding to a temperature of 76-80°C. The formation of cheese scalded paste is possible due to preliminary changes of casein under the influence of rennet and lactic acid produced by lactic bacteria.

MATERIALS AND METHODS

The analyzed curd samples were collected at the end of ripening period, when the curd could be scalded. The sampling was randomly performed, using sterile recipients, according to the regulation STAS 9535/1-87. A number of 25 samples / season were collected (autumn, winter, spring, summer).

The methodology used for cheese examination was:

- Fat reported to dry substance, % minim Acido-butyrometric method STAS 6344/88
- dry substance, % minimum Drying closet method SR EN ISO 5534/2004
- humidity, % maxim Drying closet method SR EN ISO 5534/2004
- Acidity, Thörner grades Actual method by titration SR ISO 1740/2004

The objective of sensorial analysis of ripened curd was the determination of colour, taste and smell. Cheeses’ taste is due to: fatty acids and organic acids with mixed functions, hydrosoluble peptides, sugars, non-volatile metabolites and other compounds.

The taste of cheese is harder to elucidate because on the receptors from oral cavity, there are some interferences between mechanical, physical and of impact characteristics. The texture and consistency, as well as the release of aroma compounds during mastication are influencing the perception of taste. The aroma compounds are perceived retro nasal and their direct impact on the nasal region give the nasal perception. Thus, for analysing the aroma compounds, the headspace method was used (Racolţa et al., 2008).
RESULTS AND DISCUSSIONS

The main organoleptic characteristics of ripened curd (colour, smell and taste) are presented in Table 1.

<table>
<thead>
<tr>
<th>Crt. No</th>
<th>Season</th>
<th>Samples/season</th>
<th>Colour</th>
<th>Taste</th>
<th>Smell with spots of mould on the surface</th>
<th>Slightly sweet</th>
<th>Sourish</th>
<th>Very sour</th>
<th>Barely perceptible of sour</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Autumn</td>
<td>25</td>
<td>12</td>
<td>13</td>
<td>-</td>
<td>10</td>
<td>15</td>
<td>-</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Winter</td>
<td>25</td>
<td>9</td>
<td>15</td>
<td>1</td>
<td>13</td>
<td>12</td>
<td>-</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>3.</td>
<td>Spring</td>
<td>25</td>
<td>8</td>
<td>17</td>
<td>-</td>
<td>11</td>
<td>14</td>
<td>-</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>4.</td>
<td>Summer</td>
<td>25</td>
<td>11</td>
<td>14</td>
<td>-</td>
<td>3</td>
<td>15</td>
<td>7</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td>40</td>
<td>59</td>
<td>1</td>
<td>37</td>
<td>56</td>
<td>7</td>
<td>55</td>
<td>45</td>
</tr>
</tbody>
</table>

From the total of 100 curd samples analyzed, 40% had a white colour, 59% had a white to yellowish colour and only 1 sample presented spots of mould on the surface. Regarding the results obtained for curd taste, 37% of samples had a slightly sweet taste, 56% of the samples had a sourish taste and 7% of the samples were characterized as very sour. The data obtained for curd smell, divided the curd samples in two groups: 55% barely perceptible and 45% sour smell.

The physic-chemical analyses were focused on the determination of ripened curd acidity, fat content, dry weight and water content. The seasonal variations of mentioned parameters are graphically presented in figure 1, 2, 3 and 4.

As it can be seen from figure 1 and 2, for ripened curd, the values of acidity and fat content varied as follows:
- 8% from curd samples had an acidity value lower than 200°T;
- 80% from curd samples had an acidity value between 200-220°T;
- 12% from curd samples had an acidity value higher than 220°T.
- 15% from curd samples had the fat content (reported to the dry weight) between 40-45%
- 85% from curd samples had the fat content (reported to the dry weight) higher than 45%.
Fig. 1. Seasonal variation of acidity in the ripened curd

Fig. 2. Seasonal variation of fat/TDM in the ripened curd
The data presented in figure 3 showed that for the 100 curd samples analyzed, the water content varies as follows:

- 40% from curd samples had water content lower than 50%;
- 60% from curd samples had water content between 50-55%.

According to figure 4, the content in total dry matter for the analyzed curd samples varied as follows:

- 60% from curd samples had 45-50% total dry matter;
- 40% from curd samples had over 50% total dry matter.
The statistical analysis of obtained data for the determined parameters is presented in tables 2, 3, 4 and 5:

**Statistical analysis of acidity determined in ripened curd per seasons**

<table>
<thead>
<tr>
<th>Season</th>
<th>Minimum value, °T</th>
<th>Maximum value, °T</th>
<th>Mean, $\bar{X}$</th>
<th>Standard deviation of the mean</th>
<th>Standard error of the mean, $s_\bar{X}$</th>
<th>Coefficient of variation, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>177.0</td>
<td>235.0</td>
<td>204.2</td>
<td>12.54</td>
<td>2.507</td>
<td>6.14</td>
</tr>
<tr>
<td>Spring</td>
<td>200.0</td>
<td>217.0</td>
<td>207.7</td>
<td>5.639</td>
<td>1.128</td>
<td>2.71</td>
</tr>
<tr>
<td>Summer</td>
<td>200.0</td>
<td>240.0</td>
<td>216.1</td>
<td>12.71</td>
<td>2.542</td>
<td>5.88</td>
</tr>
<tr>
<td>Autumn</td>
<td>181.0</td>
<td>237.0</td>
<td>206.8</td>
<td>12.61</td>
<td>2.522</td>
<td>6.10</td>
</tr>
</tbody>
</table>

**Statistical analysis of fat content determined in ripened curd per seasons**

<table>
<thead>
<tr>
<th>Season</th>
<th>Minimum value, %</th>
<th>Maximum value, %</th>
<th>Mean, $\bar{X}$</th>
<th>Standard deviation of the mean</th>
<th>Standard error of the mean, $s_\bar{X}$</th>
<th>Coefficient of variation, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>44.00</td>
<td>53.25</td>
<td>49.46</td>
<td>2.377</td>
<td>0.4754</td>
<td>4.81</td>
</tr>
<tr>
<td>Spring</td>
<td>43.95</td>
<td>53.09</td>
<td>49.34</td>
<td>2.904</td>
<td>0.5809</td>
<td>5.89</td>
</tr>
<tr>
<td>Summer</td>
<td>44.10</td>
<td>53.20</td>
<td>49.45</td>
<td>2.986</td>
<td>0.5971</td>
<td>6.04</td>
</tr>
<tr>
<td>Autumn</td>
<td>44.72</td>
<td>53.95</td>
<td>50.67</td>
<td>2.133</td>
<td>0.4266</td>
<td>4.21</td>
</tr>
</tbody>
</table>

**Statistical analysis of moisture content determined in ripened curd per seasons**

<table>
<thead>
<tr>
<th>Season</th>
<th>Minimum value, %</th>
<th>Maximum value, %</th>
<th>Mean, $\bar{X}$</th>
<th>Standard deviation of the mean</th>
<th>Standard error of the mean, $s_\bar{X}$</th>
<th>Coefficient of variation, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>48.89</td>
<td>54.00</td>
<td>50.97</td>
<td>1.453</td>
<td>0.2906</td>
<td>2.85</td>
</tr>
<tr>
<td>Spring</td>
<td>47.15</td>
<td>53.18</td>
<td>49.86</td>
<td>1.191</td>
<td>0.2381</td>
<td>2.39</td>
</tr>
<tr>
<td>Summer</td>
<td>48.53</td>
<td>51.07</td>
<td>49.87</td>
<td>0.7313</td>
<td>0.1463</td>
<td>1.47</td>
</tr>
<tr>
<td>Autumn</td>
<td>44.50</td>
<td>52.93</td>
<td>50.16</td>
<td>1.712</td>
<td>0.3425</td>
<td>3.41</td>
</tr>
</tbody>
</table>

**Statistical analysis of total dry matter determined in ripened curd per seasons**

<table>
<thead>
<tr>
<th>Season</th>
<th>Minimum value, %</th>
<th>Maximum value, %</th>
<th>Mean, $\bar{X}$</th>
<th>Standard deviation of the mean</th>
<th>Standard error of the mean, $s_\bar{X}$</th>
<th>Coefficient of variation, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>46.00</td>
<td>51.11</td>
<td>49.03</td>
<td>1.453</td>
<td>0.2906</td>
<td>2.96</td>
</tr>
<tr>
<td>Spring</td>
<td>46.82</td>
<td>52.85</td>
<td>50.14</td>
<td>1.191</td>
<td>0.2381</td>
<td>2.37</td>
</tr>
<tr>
<td>Summer</td>
<td>48.93</td>
<td>51.47</td>
<td>50.13</td>
<td>0.7313</td>
<td>0.1463</td>
<td>1.46</td>
</tr>
<tr>
<td>Autumn</td>
<td>47.07</td>
<td>55.50</td>
<td>49.84</td>
<td>1.712</td>
<td>0.3425</td>
<td>3.44</td>
</tr>
</tbody>
</table>
Statistically analysing the acidity variation per seasons, it can be noticed that:

- During autumn, acidity had a mean value ($\bar{X} \pm s_\bar{X}$) of 206.8 ± 2.522ºT and a variability coefficient of 6.1%. The determined values were between 181.0 and 237.0ºT.
- During winter, acidity had a mean value ($\bar{X} \pm s_\bar{X}$) of 204.2 ± 2.507ºT and a variability coefficient of 6.14%. The determined values were between 177.0 and 235.0ºT.
- During spring, acidity had a mean value ($\bar{X} \pm s_\bar{X}$) of 207.7 ± 1.128ºT and a variability coefficient of 2.71%. The determined values were between 200.0 and 217.0ºT.
- During summer, acidity had a mean value ($\bar{X} \pm s_\bar{X}$) of 216.1 ± 2.542ºT and a variability coefficient of 5.88%. The determined values were between 181.0 and 237.0ºT.

Statistically analysing the fat content variation per seasons, it can be noticed that:

- During autumn, fat content had a mean value ($\bar{X} \pm s_\bar{X}$) of 50.67 ± 0.4266% and a variability coefficient of 4.21%. The determined values were between 44.72 and 53.95%.
- During winter, fat content had a mean value ($\bar{X} \pm s_\bar{X}$) of 49.46 ± 0.4754% and a variability coefficient of 4.81%. The determined values were between 44.0 and 53.25%.
- During spring, fat content had a mean value ($\bar{X} \pm s_\bar{X}$) of 49.34 ± 0.5809% and a variability coefficient of 5.89%. The determined values were between 43.95 and 53.09%.
- During summer, fat content had a mean value ($\bar{X} \pm s_\bar{X}$) of 49.45 ± 0.5971% and a variability coefficient of 6.04%. The determined values were between 44.1 and 53.2%.

The statistical analysis showed that water content of curd samples varied during seasons as follows:

- In the autumn, it had a mean value ($\bar{X} \pm s_\bar{X}$) of 50.16 ± 0.3425% and a variability coefficient of 3.41%. The determined values were within 44.5 and 52.93%.
- In the winter, it had a mean value ($\bar{X} \pm s_\bar{X}$) of 50.97 ± 0.2906% and a variability coefficient of 2.85%. The determined values were within 48.89 and 54.0%.
- In the spring, it had a mean value ($\bar{X} \pm s_\bar{X}$) of 49.86 ± 0.2381% and a variability coefficient of 2.39%. The determined values were within 47.15 and 53.18%.
- In the summer, it had a mean value ($\bar{X} \pm s_\bar{X}$) of 49.87 ± 0.1463% and a variability coefficient of 1.47%. The determined values were within 48.53 and 51.07%.

The statistical analysis showed that total dry matter content of curd samples varied during seasons as follows:

- In the autumn, it had a mean value ($\bar{X} \pm s_\bar{X}$) of 49.84 ± 0.3425% and a variability coefficient of 3.44%. The determined values were within 47.07 and 55.5%.
- In the winter, it had a mean value ($\bar{X} \pm s_\bar{X}$) of 49.03 ± 0.2906% and a variability coefficient of 2.96%. The determined values were within 46.0 and 51.11%.
- In the spring, it had a mean value ($\bar{X} \pm s_\bar{X}$) of 50.14 ± 0.2381% and a variability coefficient of 2.37%. The determined values were within 46.82 and 52.85%.
- In the summer, it had a mean value ($\bar{X} \pm s_\bar{X}$) of 50.13 ± 0.1463% and a variability coefficient of 1.46%. The determined values were within 48.93 and 51.47%.
The aroma compounds from cheeses are formed during biochemical transformations. They are in a large number, and the structural identification of each one may offer valuable information on their impact/contribution on product flavour. Many aroma substances are known as having a detection threshold (the minimal concentration for identification; PD) and also a aromatic value ($V_a = C/PD$, where $C$ is the concentration of the aroma compound in mg/l sample mix in air or water).

- **Acidity** had a mean value ($\bar{X} \pm s_X$) of 208.7 ± 1.198ºT and a variability coefficient of 5.74%. The determined values were within 177.0 and 240.0ºT.
- **Fat content** had a mean value ($\bar{X} \pm s_X$) of 49.73 ± 0.2642% and a variability coefficient of 5.31%. The determined values were within 43.95 and 53.95%.
- **Water content** had a mean value ($\bar{X} \pm s_X$) of 50.21 ± 0.138% and a variability coefficient of 2.75%. The determined values were within 44.5 and 54.0%.
- **Total dry matter content** had a mean value ($\bar{X} \pm s_X$) of 49.79 ± 0.1380% and a variability coefficient of 2.77%. The determined values were within 46.0 and 55.5%.
- All the determined parameters had values within the normal limits.

**REFERENCE**