Studies on Physicochemical and Sensory Attributes of New Varieties of Mustard Cream

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Abstract. The paper presents methods for obtaining table mustard and other three new varieties: rosemary mustard, mint mustard, fennel mustard and also their physico-chemical, microbiological and sensory characterization.

After the determinations made, both raw materials and finished product quality parameters obtained are superior to existing assortments. Results of microbiological determinations for all 4 types of mustard studied are within the standards.

Scores obtained from sensory analysis was: classic table mustard 4.15 (max. 5 points), followed by fennel mustard - 4.02, rosemary mustard - 3.98 and mint mustard - 3.96.

Keywords: mustard, aromatic plants, mustard technology, spices.

INTRODUCTION

Nutrition is the most important external environmental factor affecting body. Healthy eating is one of the most important components of health, safety and quality of life (Simu, 2001). Human concern for diversification and improving flavour in various food products is very old. This concern led to the discovery of many spicy plants (Iburg, 2006).

White mustard (Sinapis alba L.) is reported by over 3,000 years, so it is one of the oldest spices; is an annual grass species, erect, 0.31 m high, fruit is a yellow silique, arranged almost perpendicular to the branch, 2-4 cm long, 4-7 mm wide, ending in an equal upper part 2-3 times longer than the rest silique presents bottlenecks with abundant hairs, with three longitudinal ribs, inside silique there are between 3 and 6 seeds (Muste, 2008).

The chemical composition of mustard: water 7.18%, nitrogenous substances 27.59%, fat 28.79%, non nitrogen soluble substances 22.55%, cellulose 8.55%, ash 4.47%, sinigrina 2.35%, sinalbina 14.40%, volatile oil 0.87% (Măndăță, 2002).

Rosemary (Rosmarinus officinalis) is a woody, perennial herb with fragrant evergreen needle-like leaves. It is native to the Mediterranean region.

Rosemary contains: 1-2% essential oil, tannin formed from caffeic and hidroxi caffeic acid, about 5% ursolic and oleanolic acid, cinelol 15-20%, 10-15% borneol, bornil valerian acetate 2-5%, camphor 4 -5%, free flavonoids and flavonoid glexozidate, triterpenoid, saponin, glycolic acid, nicotinic acid, gliceric acid, beta-siterol, vitamin C (Muste, 2008).

Mint is a perennial crop, 1 m high, strongly branched from the base. Leaves menthol smell is highly characteristic. For industrial purpose the plant is entirely harvested, when 15-20% is blooming.

Harvested during the flowering, aerial parts contain 0.3 to 0.5% volatile oil, and leaves 1-2% volatile oil with different chemical composition according to origin. The main component of volatile oil of mint is menthol (up to 70%), and menton, mento-furan, a-pinene,
Felandren, limonene, cadinen, cineol, acetic aldehyde, amyl alcohols and izzoamilic, thymol, carvacrol, penici sescriter-alcohols, cariofilen etc. The leaves also contain considerable quantities of tannin (up to 12% as caffeic acid), organic acids, vitamin C, minerals, antibiotic substances, etc.

**Fennel** (*Foeniculum vulgare* Mill) is a perennial plant. Ovoid-shaped fruits are greenish-gray color, till greenish brown. The plant cannot be confused because of the characteristic odour and taste, sweet, and low burner.

Fruits contain 2-6% volatile oil composed of 50-60% anethole, limonene, α-pinene, fencon, esdragol etc. in sweet variety and felandren in bitter variety; fat (about 15%), aleuron (approx. 20%), coumarin derivatives, flavonoids (cver cetin or camferoglicozid), flavonol-3-glucuronide, sugars, 7-8% minerals, mucilages, waxes, stigmasterin etc. (Muntean, 2007).

Păucean A. (2006) describe the technological flow of classical mustard production: cleaning, preparation of mustard flour, macerate preparing, grinding on wet colloidal mill, homogenization, and dosage of mustard in containers, closed container, labelling and storage at a temperature of 20°C.

The main raw material to obtain table mustard is white mustard seed (*Sinapis alba* L.); auxiliary materials include: salt, vinegar, sugar, oil, pepper, sugar, coriander, cloves, horseradish, etc. that distinguishes kinds of mustard (Banu, 2009).

**MATERIALS AND METHODS**

The raw material mustard (*Sinapis alba* L.) was purchased from S.C.D.A. Turda and auxiliary materials from Billa supermarket.

Four types of mustard were obtained: classical table mustard, mint mustard, rosemary mustard and fennel mustard.

Manufacturing process was adapted to obtain new mustard varieties (Fig. 1). The protocol used to obtain on laboratory scale these types of mustard is presented in Tab. 1.

<table>
<thead>
<tr>
<th>Ingredients [g]</th>
<th>Table mustard</th>
<th>Mint mustard</th>
<th>Rosemary mustard</th>
<th>Fennel mustard</th>
</tr>
</thead>
<tbody>
<tr>
<td>mustard flour</td>
<td>107,5</td>
<td>107,5</td>
<td>107,5</td>
<td>107,5</td>
</tr>
<tr>
<td>vinegar</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>sugar</td>
<td>73,75</td>
<td>73,75</td>
<td>73,75</td>
<td>73,75</td>
</tr>
<tr>
<td>salt</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>oil</td>
<td>2,5</td>
<td>2,5</td>
<td>2,5</td>
<td>2,5</td>
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<tr>
<td>wheat flour</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>pepper</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>garlic</td>
<td>7,5</td>
<td>7,5</td>
<td>7,5</td>
<td>7,5</td>
</tr>
<tr>
<td>bay leaf</td>
<td>0,25</td>
<td>0,25</td>
<td>0,25</td>
<td>0,25</td>
</tr>
<tr>
<td>turmeric</td>
<td>0,5</td>
<td>0,5</td>
<td>0,5</td>
<td>0,5</td>
</tr>
<tr>
<td>allspice</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>rosemary</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>mint</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>fennel</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>water</td>
<td>124,1</td>
<td>124,1</td>
<td>124,1</td>
<td>124,1</td>
</tr>
</tbody>
</table>

Technological flow of mustard production on laboratory scale is presented in Fig. 1.
Mustard seeds
↓
Cleaning
↓
Grinding
↓
Sieving
↓
Mustard flour
↓
Dosing
↓
Mixing
↓
Maceration
↓
Packing
↓
Table mustard

Fi.1. Technological flow of production of mustard at the laboratory scale

Following determinations were made: pisyco-chemical (hectolitre mass (Mh, kg/hl, relative weight, specific weight, water by oven method, protein substances (Kjeldahl method), fat (Soxhlet method), and minerals); microbiological (total number of germs (TGN)); sensory analysis: appearance, colour (tone and intensity), odour (typical, intensity), taste (typical, intensity). Sensory analysis was performed on a group of 84 persons.

RESULTS AND DISCUSSION

Pisycochemical Analysis
In Tab. 2 are values obtained by physical analysis of mustard.

<table>
<thead>
<tr>
<th>Product name</th>
<th>Hectoliter mass [kg/hl]</th>
<th>Mass of 1000 grains [g]</th>
<th>Specific weight [g/cm³]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mustard (Sinapis alba L)</td>
<td>72,35</td>
<td>6,55</td>
<td>0,72</td>
</tr>
</tbody>
</table>

Tab. 3 presents the results of chemical analysis for mustard flour and for all four types of newly created mustard.

Slominski B. A. et al., (1999) obtained values similar to those in Tab. 3 at the analysis of mustard flour: fat 26.4%, protein 37.5%, ash 5.4%.
The chemical composition of mustard and some varieties of mustard newly created

<table>
<thead>
<tr>
<th>Components</th>
<th>Mustard flour [%]</th>
<th>Table mustard [%]</th>
<th>Mint mustard [%]</th>
<th>Rosemary mustard [%]</th>
<th>Fennel mustard [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>5,74</td>
<td>48,85</td>
<td>42,59</td>
<td>47,56</td>
<td>44,55</td>
</tr>
<tr>
<td>Protein</td>
<td>28,65</td>
<td>8,94</td>
<td>9,1</td>
<td>8,94</td>
<td>8,86</td>
</tr>
<tr>
<td>Fat</td>
<td>22,37</td>
<td>2,32</td>
<td>2,27</td>
<td>2,41</td>
<td>2,18</td>
</tr>
<tr>
<td>Ash</td>
<td>5,07</td>
<td>4,60</td>
<td>4,68</td>
<td>4,59</td>
<td>4,64</td>
</tr>
</tbody>
</table>

**Sensory Analysis**

In Fig. 2 is shown the homogeneity sensory analysis, the highest score of mustard was obtained by table mustard (sample 111) and rosemary mustard (sample 222), and the lowest score was obtained by mint mustard (sample 333).

In Fig. 3 sensory analysis results concerning consistency are presented; the highest score was obtained by rosemary mustard (sample 222), having a good consistency compared with mint mustard (sample 333) which had the lowest score.

In Fig. 4 is presented the sensory analysis on odour intensity; the highest score was obtained by table mustard (sample 111) which was perceived as more pronounced odour intensity than the other types of mustard. The mustard mint had the lowest score. (sample 333). This result is because the panellists are not familiar with the 3 new types of mustard.

In Fig. 5 is presented the odour type sensory analysis, the highest score was obtained by table mustard (sample 111) which was perceived as stronger odour type than the other types of mustard and the lowest score was obtained by mint mustard (sample 333).
In Fig. 6 is presented the sensory analysis of mustard colour, the highest score was obtained by table mustard (sample 111) which was perceived as the most enjoyable colour and lowest score was obtained by fennel mustard (Sample 444). This result is due to the colour changing after adding different spices.

In Fig. 7 is presented the sensory analysis on the taste intensity, the highest score was obtained by fennel mustard (sample 444) which was perceived as more pronounced flavour intensity than other varieties of mustard and the lowest score was obtained by rosemary mustard (sample 222).

Sensory analysis is presented in Fig. 8 for flavour type, the highest score has been obtained with fennel mustard (sample 444) which was perceived as the most pronounced type taste from all the varieties of mustard and the lowest score was obtained with rosemary mustard (sample 222).

Overall score is shown in Fig. 9, the highest score was obtained by mass mustard (sample 111), 4.15 followed by fennel mustard (sample 444), 4.02, rosemary mustard (sample 222), 3.98 and mint mustard (sample 333), 3.96. This score is because table mustard is a mustard that tasters are used, while the other three types of mustard are new for tasters and for the future customers.

CONCLUSIONS

Original recipes were developed and a protocol was implemented for laboratory scale production of table mustard, fennel, rosemary, and mint mustard.

Results for physicochemical and microbiological analysis of raw materials and new products obtained fit into the standard values.
The sensory analysis showed the new obtained mustards are accepted and appreciated by potential consumers.

REFERENCES