

QUALITY EVALUATION OF SELECTED MUSTARD AVAILABLE ON THE MARKET

Joanna Newerli-Guz

Gdynia Maritime University

Department of Commodity Science and Quality Management

Poland

ABSTRACT

Mustard paste is finely ground seeds of various species of mustard mixed with water, food acids and salt, sugar and various spices. It is commonly used condiment and on the market there can be found many of its types. Seven mustard paste type Sarepska were procured from the Tricity market and tested. The aim of this study was comparison of selected quality features. The content of sodium chloride, total acidity, dry matter content due to PN-A-86964 were analyzed. Additionally the color of the tested samples was determined using the CIE Lab method and the selected sensory features were rated. Studies have confirmed the differences in the quality of mustards, they meet most of the requirements of the standard, but their sensory evaluation was diverse.

Key words: mustard, Polish standards, sensory features.

INTRODUCTION

Mustard (*senf* (German), *moutarde* (French)) seeds which contain 38–4% oil are a good source of edible oil. They are used in the preparation of foods such as pickles, seasoning and mustard paste. Deoiled mustard cake finds use as animal feed and fertilizer [15].

MUSTARD PASTE

First mustard as a paste was made from mustard flour and grapes musts and had name *mustumardens* – burning, pungent musts.

Mustard paste is made from partly deoiled mustard flour and/or mustard seeds, water, food acids, salt, sugar and flavoring ingredients [12]. Mustard paste is a pungent, spicy-tasting condiment, used to many different types of food; meat products, mayonnaise, pickles.

Mustard seed powder is mixed with water, then vinegar, wine or musts (to maintain its seasoning properties for a long time) is added. Moreover, there are added sugar and salt, respectively from various mustard types different spices such as: paprika, cayenne pepper, coriander, pimento, cloves, cinnamon, ginger, nutmeg aril, capers, garlic, horseradish, or various kinds of herbs such as: tarragon, marjoram, thyme, etc. The addition of powdered turmeric – as a spice – also improve the color of mustard paste. Mustard paste should be stored in a cool place up to 8°C. Adverse changes of mustard may be due to the effects of light and drying. The formation of improper aroma is associated with the formation of nitriles [7].

Mild mustard pastes are prepared from the shelled seeds of white mustard, mustard extra strong from shelled seeds of black mustard.

Sarepska mustard paste is made from sarepska mustard seeds (*Brassica juncea*) [5]. Sarepska mustard should have strong pungent taste, proper aroma and color (visible black dots) and homogeneous texture (in case of popular Sarepska mustard perceptible particles of mustard seeds and spices are allowed) [12].

Raw material for the production of mustard paste are primarily mustard seeds, which have the biggest impact on the taste of mustard.

MUSTARD SEEDS

Mustard seeds have a delicate flavour which appears after grinding and gives it the sharpness. White mustard seeds (*Sinapis alba*) have a delicate, sweet flavour and are mild; brown and black mustard seeds (*Brassica nigra*) give mustard paste pungent and sharp flavor. Mustard seeds contain around 25% protein, having sulfur rich amino acids and typical flavour detected as pungency associated with bitterness [15].

Sinabin (SNB) is the major glucosinolate found in yellow mustard (*Sinapis alba*) [3]. Pungency and bitterness caused by glucosinolate breakdown products play a role in the taste preference of consumers and are therefore important quality factor for *Brassica* vegetables and derived products [13].

Glucosinolates are known as anticancer. The effect of glucosinolates and their metabolites on human health has been studied and antimicrobial and bioactive properties have been established against spoilage and pathogenic microorganisms contaminating food products [6].

The aim of the study was to compare selected quality features of mustard pastes type Sarepska available on the Tricity market.

MATERIAL AND METHODS

Seven commercial mustard pastes type Sarepska without visible mustard seeds, seed pieces or spices made in Poland by different manufacturers were investigated. They were obtained from the local Tricitymarket. The names of manufacturers: Dagoma, Devely, Kamis, Kielecka, Mikado, Prymat, Roleski were coded and analyzed samples were given numbers 1–7, respectively.

The content of sodium chloride and total acidity, dry matter content due to Polish standards [8, 10, 11, 12] were determined. Additionally the color of the tested samples was determined using the CIE Lab method [1] using Minolta Chroma Meter CR 400.

The ΔE – total colour difference – was calculated using formula:

$$\Delta E_{ab} = [(\Delta L)^2 + (\Delta a)^2 + (\Delta b)^2]^{1/2}$$

L describes the lightness, a value the intensity of red colour in the positive range and the green one in the negative range, b value the intensity of yellow colour in the positive range and the blue one in the negative range. Three independent measurements were performed. For the study, results were used criterion by which the total colour difference (ΔE_{ab}) between 0–1 are unrecognizable, 1 to 2 it is small deviation, recognizable by experienced person, 2 to 3.5 - average deviation recognized even by untrained observer, 3.5-5 clear deviation, ΔE_{ab} above 5 indicates a large colour deviation.

The taste of mustard pastes was rated, using paired comparison. The panel consisted of 21 judges selected due to PN-ISO 3972 [9]. The panelists were asked to mark the presence of difference of taste of two compared samples.

Statistical analysis of the results involved the calculation of the basic measures such as: the average value and standard deviation. To determine the effect of origin (manufacturer) was done one-way ANOVA using Statistica Statsoft Inc. 10.0.

Statistical hypotheses were verified at a level of $\alpha = 0.05$.

RESULTS AND DISCUSSION

The results of the acidity and the salt content (NaCl) in mustard are shown in Table 1.

The acidity calculated as acetic acid varied between 1.35% for sample 2 to 1.71% for sample 7. There was a statistically significant effect of origin / producer on the acidity of the tested samples $F(6, 35) = 3.182$, $p = 0.0165$. Moreover, only some of the samples meet the required standards on the acidity - not less than 2% (m/m).

The acidity of the mustard determined by Sawicka was higher, for mustards investigated in the period 1995–1998 amounted from 2.25 to 2.32%. Tested products showed acidity fluctuation due to varied atmospheric conditions during mustard seeds vegetation [14].

Analyzed mustard samples were characterized by different levels of salt content. The lowest NaCl content was in sample number 7 (1.97%), the highest in sample number 1 (2.94%). Majority of the samples meet the requirements of salt (sodium chloride) content and did not exceed 3% (m/m). In two samples of manufacturers number 1 there was found increased salt content.

Sodium chloride content in investigated by other authors mustard samples was on the same level, from 2.33 to 2.65% [14].

The dry matter content was evaluated in duplicate. The lowest dry matter content has sample number 2 – 21.17g/100g, and the highest sample number 5 – 39.75 g/100 g. All investigated mustard pastes satisfy the requirements of the Polish standard [12] according to which the dry matter content of mustard should not be less than 20g/100g.

Results presented by Juszczak et al. [4] show that dry matter content in analyzed samples of mustard was in the range of 16.82 g/100g to 29.25g/100g.

Sawicka [14] presented similar dry matter content in the investigated samples. This trait value was mainly determined by mustard type. For the Sarepska mustard it was the lowest dry matter content -22.19 g/100g and the highest – 25.54% for the Kremska mustard.

Sodium chloride content and acidity of the tested samples are shown in Table 1.

Table 1. Sodium chloride content, total acidity in investigated mustard pastes [%]

Producer	Acidity calculated as acetic acid [%]	NaCl content [%]
1	1.40 ^a ±0.138	2.94 ^a ±0.812
2	1.35 ^a ±0.141	2.63 ^a ±0.0419
3	1.67 ^a ±0.135	2.66 ^a ±0.2666
4	1.62 ^a ±0.125	2.46 ^a ±0.244
5	1.46 ^a ±0.161	2.56 ^a ±0.182
6	1.53 ^a ±0.220	2.59 ^a ±0.182
7	1.71 ^a ±0.204	1.97 ^a ±0.156

^a mean values of five repetition

The graph shown in Figure 1. indicated the color lightness of studied mustard pastes. Color lightness expressed as L showed diversity in tested samples. The L coordinate in investigated samples of Sarepska mustard ranges from 48.48 to 62.29. The lowest value was recorded for mustard number 7 – it was the darkest one, the highest in the product number 2 – it was the brightest one.

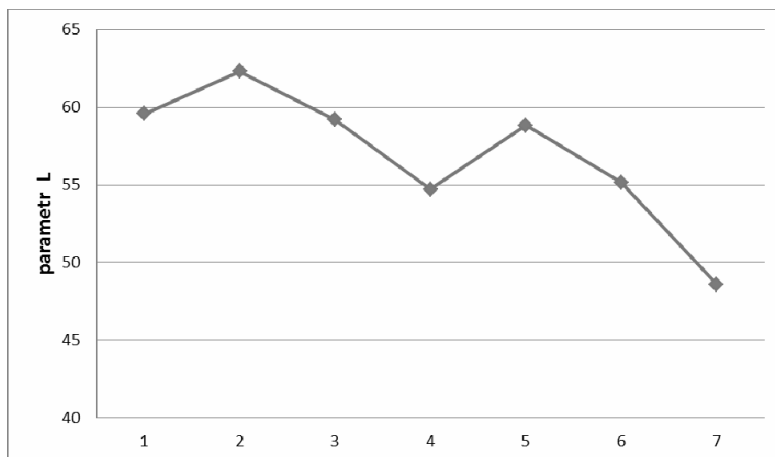


Fig. 1. The value of the parameter L for investigated mustard samples

It was found that total colour difference (Table 2) ΔE_{ab} for all investigated samples vary, and has a value from 0.57(pair 3-5) to 15.34 (pair 2-7).

The majority of compared samples (except 6 pairs) have total colour difference ΔE_{ab} values higher than 5. This means that standard observer has the impression of two different colours compared with these two samples. Only in one case the ΔE_{ab} value was less than 1 - samples 3 and 5 were unrecognizable.

Table 2. Colour difference ΔE_{ab} values of Sarepska mustard pastes

Sample nr. \ Sample nr.	1	2	3	4	5	6	7
1	X	2.82	3.42	5.58	3.04	7.03	12.59
2	2.82	X	5.12	7.92	5.02	8.53	15.34
3	3.42	5.12	X	6.30	0.57	9.32	10.96
4	5.58	7.92	6.30	X	5.88	4.27	9.41
5	3.04	5.02	5.88	5.88	X	8.85	10.75
6	7.03	8.53	9.32	4.27	8.85	X	13.00
7	12.59	15.34	10.96	9.41	10.75	13.00	X

Paired comparison allowed to detect differences at the level of $\alpha = 0.05$ in the taste of the tested mustard pastes. There were taste differences in the majority of investigated samples except of two compared samples number 1 and 3.

Many authors indicated a great influence of raw material on sensory features of mustard paste [2, 14, 15]. Sindhu observed no significant difference in colour between the samples processed in different temperatures. The flavor seemed to reduce as the processing temperature increases and more so in bold kernels compared to medium kernels. Processing at 100°C drastically reduced the

pungency/flavor in all kernels. Though processing reduced the bitterness it was not very significant by sensory analysis, perhaps due to non-tolerance for bitterness in general. It is possible to prepare the mustard powder with retained pungency and reduced bitterness by resorting to total hydrolysis of the glucosinolates rather than inactivating the enzyme myrosinase [15]. It is observed that the bitterness in full fat mustard powder gradually increase on storage. When stored, mustard exhibits syneresis which lowers its quality and sensory acceptance. This phenomenon is particularly pronounced at a high (e.g. 40°C) storage temperatures [2].

CONCLUSIONS

The tested mustard pastes type Sarepska were characterized by varied content of sodium chloride, dry matter and acidity. There was a statistically significant influence of origin / producer on the acidity of the tested samples. Tested samples of Sarepska mustard fulfilled Polish standards in case of dry matter and sodium chloride content. Acidity determined in majority of samples was too low, less than 2% (m/m) recommended by the Polish regulation.

There were colour and taste differences in the majority of investigated samples. In 16 from 22 calculated cases, using the CIE L a b method, ΔE_{ab} values were above 5, which indicates large deviation in colour of investigated mustard samples.

Paired comparison showed differences in the taste of investigated mustard pastes, only in one case - between samples number 1 and 3 there was no difference.

Summarizing, samples of mustard pastes type Sarepska from Tricity market differ from each other. They mostly fulfilled the requirements of Polish standards. Their sensory evaluation indicated a difference in taste and colour.

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