

## THE COMPARISON OF COMPOSITION AND THE ASSESSMENT OF CORRECT LABELLING OF ORGANIC AND CONVENTIONAL MUESLI CEREALS

### Summary

Breakfast cereal is a very popular food product recommended by dieticians. All you need to prepare a muesli meal is to add some milk, yoghurt or juice. The objective of this study was the comparison of the ingredient composition of the conventional and organic muesli cereal and the assessment of marking and labelling used on organic and conventional muesli packaging. On the basis of this study a range of conclusions has been drawn in terms of improper labelling of muesli cereal. The major shortcoming of the improper labelling consists in the lack of information about the allergens, instructions how to prepare, incorrect expiry date note saying "use before the end of" instead of "use before". Organic muesli cereal did not contain any additions and its food ingredients included only cane sugar, salt and honey, and, in most of the cases, these components were also of organic origin.

**Key words:** organic and conventional muesli cereal, assessment of composition and labelling

## PORÓWNANIE SKŁADU I OCENA PRAWIDŁOWOŚCI OZNAKOWANIA EKOLOGICZNYCH I KONWENCJONALNYCH PŁATKÓW MÜSLI

### Streszczenie

Płatki śniadaniowe są bardzo popularnym produktem żywnościowym zalecanym przez dietetyków. Przygotowanie posiłku z wykorzystaniem płatków müsli sprowadza się do dodania ich do mleka, jogurtu lub soku. Celem badawczym pracy było porównanie składu konwencjonalnych i ekologicznych płatków müsli oraz ocena prawidłowości oznakowań zamieszczonych na etykietach ekologicznych i konwencjonalnych płatkach müsli. Na podstawie badań wyciągnięto szereg wniosków o nieprawidłowościach w zakresie oznakowania płatków müsli. Główne nieprawidłowości to braki w informacji o alergenach, informacji o sposobie przygotowania do spożycia, niewłaściwy zapis „najlepiej spożyć przed końcem”, zamiast „najlepiej spożyć przed”. Ekologiczne płatki müsli nie zawierały żadnych substancji dodatkowych, a ze składników żywnościowych tylko cukier trzcinowy, sól i miód w większości składniki te były ekologicznego pochodzenia.

**Słowa kluczowe:** ekologiczne i konwencjonalne płatki müsli, ocena składu i oznakowania

### 1. Introduction

In 2009 the Institute of Food and Nutrition developed the pyramid of healthy nutrition whose basis constituted cereal products. The major component of cereal are the complex carbohydrates which, within a correct diet, should supply above 50% of calories. The consumption of these products should be about 700 g a day [12].

Bread is one of the basic food products belonging to the cereal product group. Unfortunately, the consumption of cereals including bread has been dropping systematically. The average monthly bread consumption in 2006 was 5,6 kg per person whereas in 2012 it was only 4,4 kg per person [3].

As the life style and quality as well as nutrition habits have been changing, surprisingly, the cereal products have won attention again. The popularity of fitness and prevention against obesity and other civilization diseases have caused that the consumption of cereal products has grown. Concomitantly with the decrease of bread consumption, an increased consumption of other cereal products, particularly muesli, is noted. The cereal market is abundant and it has started to offer also organic products. The cereals market offers a wide choice of muesli compositions. This is why consumers choose their products at random, not giving any attention to the components or nutritional value. It often happens that consumers do not read the labels whereas the

information thereon could help them with the choice of product corresponding to their needs and presenting high nutritional value.

The objective of this work is the comparison of the ingredient composition of the conventional and organic muesli cereal and the assessment of properness of the conventional and organic muesli marking and labelling. According to the applicable law the manufacturers should provide the obligatory and additional information on the labels.

To carry out the research objective, the following working hypotheses were proposed:

- conventional muesli flakes contain additives, whereas organic muesli is produced without additives
- packaging of organic and conventional muesli flakes are improperly labeled, particularly with regard to the presence of allergic substances

### 2. The characteristics of muesli cereals

Breakfast cereal belongs to the easily prepared food, i.e. this kind of meal requires the simplest activities such as adding milk, yoghurt or juice. Easy food helps to reduce the time of meal preparation considerably, which is an important factor for contemporary consumers [1].

Cereals obtain their physical characteristics in the process of manufacturing. Modern technologies used in the

manufacturing process allow for combining different types of grain. Raw materials used for manufacturing cereals are: corn, wheat, oats, rice and barley [6].

The grain used for cereals, having undergone the preliminary process of purifying, decortication and fractioning or pressing, can be subjected to thermal processing, e.g. in autoclave so that the product obtains a desired structure necessary to produce so called instant cereal. Some cereals are obtained just by pressing the grains, some undergo a preliminary roasting process [9].

Additionally, cereal grains can be subjected to the expansion process in order to increase their volume. The expanded grains can be coated with glazing which consists of: glucose syrup, fat, powder milk and taste and fragrance substances [4].

Another technology is the extrusion which involves the treatment of grain with pressure and temperature. A sudden pressure drop at the exit of the device causes vaporization of water from the product, thus increasing its volume. In this way a crispy and porous texture of the product is obtained.

Muesli cereal is a culinary symbol of the modern culture promoting health, wellbeing and a natural and healthy life style. It was a Swiss physician and dietician, Maximilian Oskar Bircher-Benner PhD who discovered this product in 1900. Presently, muesli cereal is a mixture of oat, rye, wheat and barley flakes and sometimes of corn flakes, with miscellaneous additions including nuts, raisins, coconut flakes, sunflower and pumpkin seed, linseed and dried fruit, such as banana, apricot, apple, papaya, pineapple. Furthermore, the composition can contain bran, honey, dried figs, cranberry or other dried fruit. A muesli composition can be prepared freely, using any available dry ingredients so that the final product achieves a desired taste and nutritional ingredients [2, 7].

Due to the appropriate composition of miscellaneous components, cereals can be used in a slimming, strengthening or energizing diet. Some compositions of ingredients can also be helpful in the treatment of some disorders of alimentary tract, digestion and other [8].

### 3. Methods and methodology of study

Miscellaneous muesli mixtures, both organic and conventional ones, were tested as study samples. Altogether, 20 packages of muesli, including 10 packages of conventional muesli (7 brands) and 10 packages of organic muesli (5 brands) have been studied. Table 1 presents the listing of the tested traditional and organic muesli cereal.

The above cereals have been bought in different stores such as store chains and organic food shops. The subject matter study was performed in 2012.

The organic and conventional muesli cereal of selected brands were subjected to comparative analysis for the purposes of this work. The nutritional value of both the organic and conventional products has been compared and the properness of labelling both of the organic and conventional muesli cereals has been verified. The assessment of packaging conformance was done according to the valid European and Polish norms [12-19].

### 4. Test results and discussion

All the examined organic and conventional muesli cereal were labelled properly in terms of the requirements set out in the applicable standards and other legal acts [13, 20]. The labels of the tested organic and conventional muesli cereal presented the list of components, however, the labelling was not always appropriate.

Table 1. The listing of the tested conventional and organic muesli cereals

Tab. 1. Zestawienie müsli konwencjonalnych i ekologicznych poddanych badaniu

TYPE OF MUESLI	BRAND	NAME OF CEREALS
Conventional muesli cereal	<i>Sante</i>	Fruit Muesli
	<i>Vivi</i>	Oats Muesli. Dates and Almonds
	<i>Radix-bis</i>	Oats Muesli. Polish Fruit
	<i>Benus</i>	Plum Muesli
	<i>Nestle</i>	Tropical Muesli
	<i>Bruggen</i>	Multigrain Muesli
	<i>Tesco</i>	Classic Muesli
	<i>Tesco</i>	Tropical Muesli
Organic muesli cereal	<i>BioAvena</i>	Fruit Muesli
	<i>BioAvena</i>	Plum Muesli
	<i>Ekoprodukt</i>	Polish Fruit Muesli
	<i>Bio Raj</i>	Muesli with Amaranthus and Raspberries
	<i>Bio Raj</i>	Muesli with Fruit
	<i>Enerbio</i>	Oats Muesli
	<i>Enerbio</i>	Tropical Muesli
	<i>Enerbio</i>	Fruit Muesli
	<i>Enerbio</i>	Blueberry Muesli
	<i>Symbio</i>	Muesli Mix Grains with Apricot
<i>Symbio</i>	Banana and Nut Muesli	

Source: Own work / Źródło: opracowanie własne

#### 4.1. The analysis of the properness of the obligatory food product labelling

In result of the performed analysis of the components some cases of impropriety were found in terms of the correct labelling. The details thereof have been shown in Table 2.

The obligatory information to be put on the food product label is the minimum expiry date or „best before” date [23]. Most of the analyzed muesli cereal (85%) was labelled properly. All of them were labelled with the minimum expiry date. The impropriety concerned a misstatement: “best before the end of.” instead of “best before ...”. *Radix-bis* – Plum Muesli and both kinds of *EnerBio* muesli cereal had this error.

Some impropriety was found also in the labelling of the product weight. In the case of four products (*Ekoproduct* – muesli cereal with amaranthus and raspberries, fruit muesli and *EnerBio* – both fruit and blueberry muesli) there is no clear information confirming that the weight labelled on the product is a net weight. Giving the weight only without precise wording “net weight” can be misleading for consumers.

Another information which should be shown on any food product label concerns the instructions how to prepare the product for consumption. The organic *Bioavena* – Plum muesli and Muesli Polish Fruit, *Ekoproduct* – Muesli with Amaranthus and Raspberries and Fruit Muesli of the same brand, *Bio Raj* – Oats and Tropical Muesli, did not provide any instructions how to prepare the product for consumption.

Furthermore, some impropriety has been confirmed in terms of the product storing information (Tab. 3). All muesli cereals had the batch number shown on the label except for the organic *Enerbio* muesli.

#### 4.2. The analysis of additional markings on muesli package labels

Apart from the obligatory marking and descriptions on food product packages some additional marks and symbols are placed on the packages. The subsequent analyses were oriented on the properness of labelling with additional information such as nutritional value (Guideline Daily Amounts – GDA) and the nutrition and health statements [5, 17].

Table 2. Impropriety related to the list of ingredients in the tested muesli cereals

Tab. 2. Nieprawidłowości związane z listą składników w badanych miusli

Type of product	Brand	Name of Muesli	Impropriety
Conventional muesli cereal	<i>Sante</i>	Fruit Muesli	A missing expression „in varied proportions” after „fruit mixture”. A mixture of fruit where none of the components is dominating in terms of weight and whose fruit proportions are varied, can be described in the list of ingredients as “fruit” with accompanying words “in varied proportions” followed directly by the list of the mixture components.
	<i>Vivi</i>	Oats Muesli Dates and Almonds	The quantities of components, such as oat flakes, dates and almonds mentioned in the cereal name, are not specified. No information about allergens – almond flakes.
		Oats Muesli. Polish Fruit	No information about the quantity of the separate component groups, i.e. oat flakes and fruit, present in the cereal name.
	<i>Benus</i>	Tropical Muesli	No information about the quantity of ingredients mentioned in the food product name (tropical).
	<i>Nestle</i>	Classic Muesli	Incomplete information about allergens – no information about the allergenicity of milk (addition of whey in powdered milk)
Organic muesli cereal	<i>Bioavena</i>	Polish Fruit Muesli	No information about allergens – sesame
	<i>Ekoproduct</i>	Muesli with Amaranthus and Raspberries	Incomplete information about allergens – no information about the allergenicity of sesame
		Oats Muesli	No information about allergens – sesame No information about the quantity of ingredients mentioned in the food product name (oats)
	<i>Bio Raj</i>	Tropical Muesli	No information about allergens – sesame No information about the quantity of ingredients mentioned in the food product name (tropical ingredients)
		Blueberry Muesli	No information about the quantity of components mentioned in the food product name (blueberries)

Source: Own work / Źródło: opracowanie własne

Table 3. Improper information about the product storing

Tab. 3. Nieprawidłowości dotyczące informacji o warunkach przechowywania produktu

Type of product	Brand	Name of muesli cereal	Impropriety
Conventional muesli	<i>Benus</i>	Tropical Muesli	No information about the product storing conditions
		Multigrain Muesli	
Organic muesli	<i>Bio Raj</i>	Oats Muesli	
		Tropical Muesli	

Source: Own work / Źródło: opracowanie własne

The information about the product nutritional value was placed on all packages of conventional muesli cereal. However, two brands of organic muesli - *Bio Raj* and *Symbio* – in spite of “no sugar” information, did not carry the information about their nutritional value, which, by this type of labelling, is required. The GDA information will be obligatory commencing from 2016 [20]. Currently, it is optional, however, it has been already implemented by most of the manufacturers. About 70% of conventional and 20% of organic muesli cereals had been already marked with GDA rate.

The diet and health relating statements or any statements on reducing the risk of disease are the markings which can be optionally placed by manufacturers, however, subject to compliance with certain requirements [24, 25]. Dietetic statements have been found on 80% of conventional and 60% of organic products. Organic products were not labelled with any statements on health or reducing the risk of a disease. It has been noted that the most frequent dietetic statement present on the packages of muesli compositions were dietetic statements referring to fiber.

The health statements which had been placed on muesli packages included, but were not limited to: „improves metabolism”, “influences on brain functioning”, “reduces cholesterol and triglycerides in blood thus reducing the risk of arteriosclerosis”. Health related statements could be found only on *Vivi* muesli packages.

#### 4.3. The analysis of properness of organic products labelling

Organic products, apart from the requirements on obligatory labelling, must comply with the regulations on organic products labelling [22].

All the analyzed organic muesli cereals totally complied with the requirements regarding labelling with the European organic production mark [18, 19]. All the organic muesli cereals also showed the number of the unit certifying the product. Moreover, some of them had the name of the certifying unit and the place of origin on them each time when the components were from outside the European Union.

Organic food can be labelled with some additional elements which also include organic marks. *Bio Raj* muesli cereal was labelled with “Ekoland” mark, whereas *Enerbio* was labelled with “Bio-Siegel” mark. The former one is granted by the Association of Organic Food Manufacturers, the latter is the mark of German organic manufacturers.

#### 4.4. The analysis of organic and conventional muesli labelling with additional substances and components added to the food product

The additional substances and other food components were listed on almost all labels of conventional muesli (80%) and on 40% of organic muesli labels. *Vivi* conventional muesli and *Bioavena*, *Ekoprodukt* and *Bio Raj* organic muesli did not contain any additional substances or food components. 40% of conventional muesli labels declared the addition of preservatives. Aromas, emulsifiers and dyes were on 30% of labels. On 8 of 10 examined conventional cereals other additions such as sugar and salt were listed. The analysis of organic muesli has shown that these products did not contain any additional substances. 40% of these packages included other food additions which were mainly organic sugar, honey and salt [14, 15].

The conventional muesli contained such additional substances as: ammonia caramel which, when eaten in excessive amount, caused anxiety and stomach problems and sulphur dioxide which protected the product against humidity and mould, however, for sensitive persons it could cause a nuisance, diarrhea and headache and, furthermore, it destroyed vitamin A and B<sub>1</sub> contained in food [10].

It must be pointed out that only 4 of 10 organic muesli cereals contained an addition of sugar, salt, honey or barley malt. Furthermore, 4 conventional muesli mixtures (*Benus* – Tropical Muesli, *Nestle* – Tropical Muesli, *Bruggen* – Fruit Muesli and *Tesco* – Fruit Muesli) had fat added whereas the organic muesli did not contain any fat [14].

The final stage of the comparative analysis of conventional and organic muesli cereal was the price analysis. In order to carry out the comparative analysis of price per unit package, the price per each package unit has been converted to price per kilogram of the product. The price for conventional muesli cereal was between PLN 9.91 – 19.43 per kilo, thus making the average price of PLN 15.47 per kilo. The price for organic muesli cereal was in the range PLN 22.65 – 51.60, the average price amounting to PLN 29.34 per kilo.

The price for organic muesli is comparatively higher, however this difference is generated by the costs of production, certification and higher raw material prices. The observed growth of demand for organic products can cause a certain price reduction, nevertheless, it must be remembered that these prices are not probable to equalize.

### 5. Summing up and conclusions

The marking and labelling system applied so far has not been homogenous and considerably leaves manufacturers at liberty in terms of specifying the details expected on the product or its label. Consumers pay most attention to the price and, then, to the product expiry date. Their low interest in nutrition facts panel has been confirmed also in other EU countries [11].

Table 4. List of additional substances and other components added to muesli cereals

Tab. 4. Lista substancji dodatkowych i innych składników zawartych w miusli

Type of product	Additional substances	Components added to food
Conventional muesli	Dye – ammonia caramel, aroma, emulsifier, - soya lecithin, preservative – potassium sorbate, acidity regulator – citric acid, preservative – sulphur dioxide, aroma, emulsifier – mono and diglycerides of fat acids, anticaking agent – rice flour	Salt, sea salt, sugar, glucose and fructose syrup, plant fat, barley malt extract, oligofructose, plant oil, powdered (milk) whey, coconut oil, cane molasses
Organic muesli	–	Corn malt, cane sugar, sea salt, barley malt extract, honey

Source: Own work / Źródło: opracowanie własne

This is why the European Union has introduced the new Regulation No. 1169/2011 of the European Parliament and of the Council of 25<sup>th</sup> October 2011 on the provision of food information to consumers [16].

If any product fails to meet these requirements and expectations the consumer might consider either an organic or conventional product as falsified. The lack of visible authenticity symbols and the consumers' inability to identify the product impinges the special significance of the organic farming not only in terms of the product image [21].

The originally stated working hypotheses were positively verified, as summarized in detail in the conclusions.

Thus, on the basis of the carried out research the following conclusions can be drawn:

1. Organic muesli flakes did not contain additives, which confirms their increased wholesome properties. Only one product among the conventional muesli flakes did not contain additives.
2. The list of food components in the muesli cereal included, but was not limited to, glucose and fructose syrup, oligofructose, sugar, salt and plant fat, whereas the organic muesli cereal contained cane sugar, sea salt and honey. These components were mostly of organic origin.
3. Most packages of organic and conventional muesli flakes did not contain the required information about the presence of allergic substances.

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