

# Erythritol Like Sugar Substitute in Cocoa Dressings

R. Hadjikinova, R. Mihov, D. Hrusavov, K. Nikovska, M. Dzhivoderova

**Abstract** – Erythritol is one of the newest sweeteners from the group of polyols. What makes it different from other polyols is its energy value assumed for 0 kcal/g and its digestive tolerance. The purpose of this study was to define the impact of erythritol, like sugar substitute, on the main physicochemical parameters, energy values and viscosity of cocoa dressings. It is shown that erythritol is suitable sugar substitute for cocoa dressings.

**Keywords** – Erythritol, Cocoa Dressing, Nutritional Data, Viscosity.

## I. INTRODUCTION

Recently, the market of diet foods and low-calorie foods without sugar (sugar-free products), increases with significant rates. This is the reason for the use of a large number of sweeteners in different recipe compositions of sweet food from this type [1]. The experience has shown that polyols with their technological and functional properties are most suitable for partial or complete replacement of sugar in sweet foods, including dressings [5].

Erythritol is one of the newest sweeteners from the group of polyols. What makes it different from other polyols is its high digestive tolerance [3], [2] and its energy value assumed for 0 kcal/g [6]. For these reasons the aim of this study was to establish opportunities for application of erythritol like sugar substitute in cocoa dressings and to define its impact on the main parameters and properties.

The dressings are semi-finished products, which are used in confectionery and desserts. Sugar in dressings is the ingredient which defines their dessert profile [4].

## II. MATERIALS AND METHODS

To determine the impact of erythritol it was made a comparative characterization on the main parameters and properties between different cocoa dressings. These dressings are produced cocoa dressing with sugar - for brevity denoted as sample S, dressing with equivalent of sugar amount of erythritol denoted like sample E, dressing with erythritol and fructose-sample EF and dressing with erythritol and bee honey-denoted like sample EM. The compositions of the samples are presented in table I.

To prepare the samples was used erythritol with commercial name “Zerose™ erythritol 16952F” - Cargill. To prepare cocoa dressings was used rotary homogenizer „Disho-Labor“ – Koruma, with frequency 3600 min<sup>-1</sup> and vacuum -40-45kPa. Each sample weighs 2 kg.

To analyze the main physicochemical parameters of dry matter content, total sugar and reducing substances are used standard methods according to [8].

The nutritional information is calculated in accordance

with Regulation 1119/2011 of EU.

Table 1. Composition of cocoa dressings.

Components	Sample			
	S	E	EF	EM
Sugar	18.0	-	-	-
Erythritol	-	18.0	11.25	11.25
Fructose	-	-	6.75	-
Bee honey	-	-	-	8.0
Dehydrated skimmed milk	10.0	10.0	10.0	10.0
Cocoa powder	6.0	6.0	6.0	6.0
Sunflower oil	30.0	30.0	30.0	30.0
Pectin	0.5	0.5	0.5	0.5
Water	35.5	35.5	35.5	34.25

The viscosity of coca dressings was defined with „Rheotest 2“, Germany with share rate in a range from 0.5 to 218.5s<sup>-1</sup> at 25°C.

## III. RESULTS AND DISCUSSION

In table II are presented the values of main physicochemical indicators.

Table II shows that the value of parameter-total sugar content is the highest for sample S, it is due mainly to the high content of sucrose in its composition (Table I) compared with the compositions of other samples. The lowest value of this indicator has the cocoa dressing with erythritol (sample E). The relative content of total sugar in sample S is about 76% higher than in sample E (cocoa dressing with erythritol) and about 53% higher than in samples EF and EM. Samples EF and EM have close values of the total sugar content but the highest values of parameter-reducing substances. This fact can be explained with content of reducing monosaccharides in their composition, respectively fructose in sample EF and glucose and fructose from bee honey in sample EM.

The different content of sugar in the cocoa dressings will affect their nutritional value. Due to this difference it is calculated the nutritional information of the samples according to the recipe formulation of each cocoa dressing. Results are shown in table III.

The data in table III shows that cocoa dressing with sugar (sample S) has the highest energy value and dressing with erythritol (sample E) the lowest. Cocoa dressing with sugar has about 18% higher energy value than dressing with erythritol and about 11% higher energy value than samples EF and EM. The amount of carbohydrates in each sample is similar. Significant differences exist in the calculated content of sugars (monosaccharides and disaccharides).



Table 2. Values of main physicochemical parameters.

Parameters	Sample			
	S	E	EF	EM
Dry matter, %	63.7	62.9	62.5	63.2
Total sugar content, % (like invert sugar), on dry matter	36.6	8.9	19.3	19.4
Reducing substances, % (like invert sugar), on dry matter	7.2	6.5	16.5	15.9

Table 3. Nutritional data of cocoa dressings for 100g product.

Nutritional data	Sample			
	S	E	EF	EM
Energy value, kcal/100g	401	329	356	355
Energy value, kJ/100g	1666	1360	1475	1472
Carbohydrates	25.1	25.1	25.1	24.8
By which				
sugars, g/100g	23.2	5.3	12.0	11.2
polyols, g/100g	-	18.0	11.2	11.2
Fats, g/100g	31.1	31.1	31.1	31.1
Proteins, g/100g	5.2	5.2	5.2	5.3

The highest content of sugars is in sample S, in which composition (Table I) erythritol is entirely missing. The lowest content of sugars is in cocoa dressing with erythritol (sample E), in which the content of polyols (erythritol) is the highest. Sample EF and EM have similar content of sugars and polyols.

Figure 1 shows the relative content of sugars, in the samples, compared to their amount in sample S (assumed for 100%).

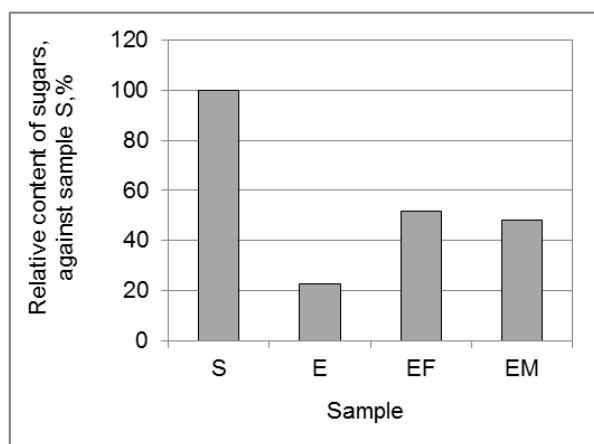


Fig. 1. Relative content of sugars in samples compared with sample S.

The data shows reduction of the content of sugars in samples with erythritol compared with sample with sucrose above 30%. This reason allows, in accordance with Regulation 1924/2006 of EU, cocoa dressings with

erythritol to be classified, as „low in sugar content“ food [7].

The viscosity of the dressings is the indicator, which in a significant extent defines their quality. Due to this it was carried out a study, which has to establish the impact of erythritol, like sugar substitute in cocoa dressings, on the value of their viscosity.

The dependence between viscosity of the samples and share rate, at 25°C, is shown in figure 2.

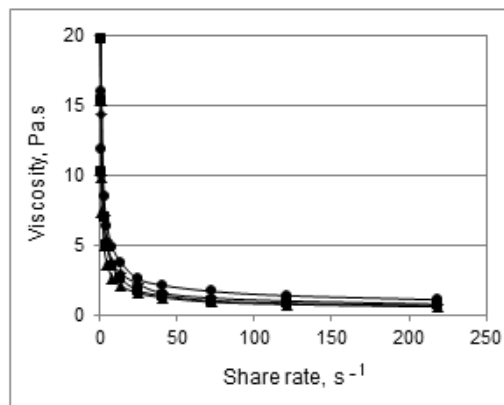


Fig. 2. Viscosity of cocoa dressings depending on shear rate at 25°C.

●-sample S, ▲-sample E, ■-sample EF, ◆- sample EM.

From the graphically expressed dependence is seen that analyzed dressings have non-Newtonian viscosity and viscosity depends on shear rate (D). In this case with the increase of share rate, the viscosity decreases. For example, at change in share rate in range from 8.1 to 121.5s<sup>-1</sup>, relative viscosity reduction of sample S is 71%. Reduction in sample E, EF and EM is respectively 69%, 74% and 73%. From this example is evident that dependence of viscosity on share rate, for samples with erythritol (E, EF and EM) is similar to this with sugar-sample S.

### III. CONCLUSION

From the conducted comparative analyses and received results is found that analyzed cocoa dressings with erythritol are with a lower total sugar content and lower energy values. They have analogical viscosity like cocoa dressing with sugar. For those reasons erythritol is defined like suitable sugar substitute for cocoa dressings.

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## AUTHOR'S PROFILE



### Raina Dimitrova Hadjikinova

was born in Plovdiv, Bulgaria, in 1989. Hadjikinova graduated as BSc in 2013 and MSc in 2014 the University of Food Technologies, Plovdiv, Bulgaria. From January 2015 Hadjikinova is postgraduate student in University of food technologies, department "Sugar, sugar products, starch and starch hydrolysates".

The title of her last publication (in collaboration) is "Rheological characteristics of cocoa dressings with erythritol", Scientific Works of University of Food Technologies Magazine, Volume LXII, 2015. Her research interests are in the field of technology of sugar products and functional sweet products.



### Kremena Nikovska

was born in Plovdiv, Bulgaria, in 1973. She received the M.Tech. and Ph.D. degrees in food technologies engineering from the University of Food Technologies (UFT) Plovdiv, Bulgaria in 1997 and 2008, respectively.

In 2000, she worked at the Food Research and Development Institute, Plovdiv, Bulgaria, as a Research

Scientist. Since February 2005, she has been with the Department of Foods, Nutrition and Tourism, UFT Plovdiv, where she was an Assistant Professor, became an Associate Professor in 2011.

The titles of two of her publications are: "Oxidative stability and rheological properties of oil-in-water emulsions with walnut oil. Adv. J. Food Sci. Technol., 2 (3): 172-177, 2010", "Evaluation of Mayonnaise-like Food Emulsions with Extracts of Herbs and Spices, Emir. J. Food Agric., 24 (3), 2012, 191-199". Her current research interests include food technologies, food emulsions, principles of nutrition, sensory analysis of foods. Dr. Nikovska is a member of Union of Scientists in Bulgaria.



### Mina Minkova Dzhivoderova

was born in Sofia, Bulgaria, in 1987. She received a BSc degree in 2010 and MSc in 2012 from University of food technologies, Plovdiv, Bulgaria. Subsequently Dzhivoderova was an assistant technologist in a sugar products factory and since September 2013 she

is Assistant Professor in University of food technologies, department "Sugar, sugar products, starch and starch hydrolysates".

The titles of two of her last publications (in collaboration) are:

"Research on the characteristics of oil-in-water emulsions with cassava starch" and "Comparative rheological characteristics of glucose syrups depending on the ratio between dextrose and maltose" Scientific Works of University of Food Technologies Magazine, Volume LXII, 2015. Her research interests involve technology of starch and starch hydrolysates. She is a member of Union of Scientists in Bulgaria.



### Rumen Mihov

was born in Plovdiv, Bulgaria, in 1961. He received the M.Tech. and Ph.D. degrees in food technologies engineering from the University of Food Technologies (UFT) Plovdiv, Bulgaria in 1987 and 2009, respectively.

In 1987, he worked at a research center at the UFT Plovdiv, as a Research Scientist. Since January 1988, he has been with the Department of Foods, Nutrition and Tourism, UFT Plovdiv, where he was an Assistant Professor, became an Associate Professor in 2012.

The titles of his last publications (in collaboration) are: "Evaluation of Mayonnaise-like Food Emulsions with Extracts of Herbs and Spices, Emir. J. Food Agric., 24 (3), 2012, 191-199", "Influence of the Flour's Type on Rheological Properties of Cake Batters, Ecology and Health, House of Science and Technique – Plovdiv, 2014, 419".

His current research interests include food technologies, food emulsions, emulsifying equipment. Dr. Mihov is a member of Union of Scientists in Bulgaria.