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Statistical modeling of the process syneresis of the production of yogurt with water extract of Rosa canina

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Abstract
The role of antioxidants on the health of the human body begins to be explored in depth in the second half of the 20-th century with the discovery of the so-called free radicals. In this paper we explore the effect of Rosa canina as a natural antioxidant. The aim of the study is to find the dependency between percent water extract of Rosa canina and the amount of separated whey in preparation of yogurt. The process of separating the whey is crucial for good quality yogurt- texture, acidity, formation of the flavor of the milk. The results of statistical analysis show that 5 % water extract of the fruits of Rosa canina does not affect significantly the amount of separated whey in the process syneresis.

Keywords: yogurt, Rosa canina, whey, one-sample ttest

1. Introduction
The role of antioxidants on the health of the human body begins to be explored in depth in the second half of the 20th century with the discovery of so-called free radicals. Free radicals are atoms or molecules that are formed in the human body as a result of the processes of oxidation of essential nutritional ingredients. The negative effects of free radicals is called "oxidative stress".
Antioxidants provide effective protection against free radicals. For example, Vitamin C is an antioxidant that is necessary for the growth and repair of tissues and for improving the immunity function of the adrenal gland.
Wild rose, with its rich chemical composition is widely used in the manufacture of food products as a functional nutrition. Fruits of Rosa Canina can be used both in fresh and dried form but also in the form of extracts. Briar are 20 to 40 times richer in vitamin C than red tomatoes and lemons, and about 300 times more potent compared to apples. The content of L-ascorbic acid (vitamin C) is highest in the fruit flesh - 546 mg/100g in *Rosa damascene* and 2200mg/100g in *Rosa canina* [1].
Antioxidant activity of briar is mainly due to the synergistic combination of polysaccharides and organic acids, phenolic antioxidant compounds (glycosides, kaempferol), acids (galolova, cinnamic, ellagic) anthocyanins and tannins [2, 3].

2. Materials and Methods
In our research we used wild dog rose (Rosa canina L.), of 2012 year collected from the area of the town of Kyustendil. Fruits were grinded by laboratory mill to a particle size of 2-4 mm and extracted with water under hydro: 1: 20. The data consists of a quantity of whey obtained in four samples: the first sample was control, second, third and fourth samples are respectively the addition of 5, 10 and 15% water extracts of rose hips. The process of separating the whey is crucial for good quality yogurt- texture, acidity and formation of the flavor of the milk.
The aim of the study is to find the dependency between percent water extract of Rosa canina and the amount of separated whey in preparation of yogurt. The variable of interest is the amount of whey for each sample.
The null hypothesis is that the mean of the difference between the four samples is equal to zero. For one sample t-test [5], we use samples which are formed by the all possible differences: a control group - 5% water extract of rose hips;10% water extract of rose hips- 5% water extract of rose hips; 15% water extract of rose hips - 5% water extract of rose hips; control group – 10 % water extract of rose hips; control group – 15% water extract of rose hips; 10% water extract of rose hips – 15 % water extract of rose hips.

3. Results and Discussions

The results of the statistical analysis are presented in Tables 1 to 6. Table 1 shows, the mean difference between the control sample and sample with the addition of 5% water extract of rose hips The resulting difference is 3.02, the p-value less than 0.0001, confidence interval is [1.82-4.22] which allows to reject null hypothesis. The interpretation was that control sample produces larger amount of whey.

Table 1

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
kontrola_diff	5,498	12	,000	3,02308	1,8251	4,2211

The results with the other five samples are interpreted in a similar way. The results are listed in tables 2 to 6.

Table 2 indicates that the average difference between the sample with 10% water extract of rose hips and 5% water extract of rosehip is positive, the p-value =0.027<0.05 and confidence interval is above 0 ([0.3-4.08]). Therefore, taking the quantity of whey in the sample with 10% water extract of rosehip is larger as compared to that with 5% water extract of rosehip with mean difference of 2.19. Therefore, the amount of added rose hips extract affects the process syneresis.

Table 2

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
shipka_diff_10	2,524	12	,027	2,19231	,3000	4,0846

The average difference of yoghurt samples, prepared with the addition of 15% water and 5% rosehip extract is again positive, p-value is 0.020<0.05 and the confidence interval is over zero (0.64-6.12) with mean difference of 3.38. The obtained results are given in Table 3.

Table 3

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
shipka_diff_15	2,692	12	,020	3,38462	,6448	6,1244

The average difference of the control sample and the sample with addition of 10% water extract of Rosa canina is 0.83 (Table 4). The p-value is equal to 0.408. The confidence interval contains zero, which means that we could retain the null hypothesis. The interpretation was that the control sample and the sample with 10 % water extract of rose hips produce the same amount of whey.

Table 4

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
kontrola_diff_10	,857	12	,408	,83077	-1,2806	2,9421

In Table 5, we present the results of the one-sample t-test applied to the difference between control sample and the sample with 15 % water extract of Rosa canina. The resulting difference is equal to -0.36. The p-value is equal to 0.82. The confidence interval contains zero. Consequently, we could retain the null hypothesis and we could conclude that both samples produce equal amount of whey.

Table 5

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
kontrola_diff_15	-,233	12	,820	-,36154	-3,7474	3,0244

In Table 6, we present the results of the one-sample t-test applied on the difference of sample with 10% water extract of Rosa canina and the sample with 15% water extract of Rosa canina.

The mean difference is equal to -1.19. The p-value is equal to 0.19. The confidence interval contains zero and consequently we could retain the null hypothesis. The interpretation of the result is that there is no difference in the amount of whey separated by the two samples.

Table 6

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
diff_10_15	-1,359	12	,199	-1,19231	-3,1040	,7193

The tables are produced with SPSS software.

The results support the potential use of R.canina as a natural antioxidant that can replace synthetic additives and their use in the production of functional foods with high antioxidant activity [4].

Conclusions**:** According to the results of the statistical analysis shows that 5% water solution of the fruits of Rosa canina does not affect significantly the amount of separated whey in the process syneresis.

4. References

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