

DETERMINATION OF THE CHEMICAL COMPOSITION OF THE GRAPE POMACE OF DIFFERENT VARIETIES OF GRAPES

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Abstract

The by-products of the winemaking industry can be a source of animal feed, but they are still insufficiently studied in Romania in terms of their composition and nutritive value. The objective of the hereby study was the comparative assessment of the chemical content of the grape pomace, resulted from the winemaking process, of the white grapes (Aligoté variety, from Huși area) and red grapes (Black Maiden, from Iași area), in two variants: with and without a stalk; the grape pomace was dried naturally at 20°C. Measurements targeted the dry matter content (DM%); crude ash (CA%); crude protein (CP), crude fat (EE), crude fiber (CF) and total polyphenols (TP). The results obtained highlighted the significantly higher content of red grape pomace of CA, CP, EE and TP compared to the white grape pomace. The additional removing of the stalks in the case of the red pomace caused a significant increase of CF content and the EE content, without significant changes in the CP and TP content. The chemical composition, especially the content of CP, EE and TP are arguments in favour of the usage of grape pomace in the farm animals' nutrition, with the crude fibre level being limited for the poultry.

Key words: grape pomace, chemical composition, polyphenols, red and white grape

INTRODUCTION

Annually the viticulture industry provides large quantities of grape pomace made of skins, seeds and few stalk parts. Currently, the grape pomace is recovered partially only for the oil extraction from seeds, used as an additional source of oil in the pharmaceutical industry due to some pharmacodynamic properties: antioxidant, antibacterial, cytotoxic etc. Studies on the chemical composition of the grape pomace reveal its content in protein, fibre and sugars, which along with fats and some biologically active compounds justify its use in animal nutrition [1] also in relation to the nutrient digestibility contained [4;7]. Various studies indicate that the differences in the grape pomace chemical composition are due to both the grape variety and species and to their growing conditions [5, 7], but

also due to the way the grape pomace is dried and stored. [4].

The Romanian published literature contains relatively few and older data on the chemical composition and especially on the nutritional value of the grape pomace, although there is a great availability of this resource.

The objective of this study aims to provide new data on the comparative assessment of the chemical content of the grape pomace naturally dried at 20°C resulted from the white grapes winemaking process (Aligoté variety from Huși area) and red (Black Maiden of Iași area) in two variants: with and without a stalk.

MATERIALS AND METHODS

The fresh white grapes (WGP) and red (RGP) pomace in two variants: with and without a stalk (RGP +S, RGP-S) was dried at 20°C in a 1-2 cm layer in especially designed, well ventilated spaces.

In order to determine the chemical composition, the samples were milled up to

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particles of 1 mm diameter, according to the standard [12].

The chemical composition intended to determine the dry matter (DM%), crude ash (Ash%), crude protein (CP%), crude fat (EE%), crude fibre (CF%) using standardised methods [9;10;11;13;14]; total polyphenols (TP%) and total tannins (TT%) of the alcohol extracts (50%) of the pomace obtained from the grape pomace samples according to the patent [3] were determined by the Folin-Ciocalteu method [6]. Three determinations were made for each of the three grape pomace samples analysed.

The expression of the chemical composition of the analysed grape pomace

was made by reporting all the compounds analysed to the DM. The results obtained were statistically processed using the single factor ANOVA test ($p < 0.05$) to highlight significant differences between the calculated values.

RESULTS AND DISCUSSIONS

The results on the chemical composition of red and white grape pomace with stalk parts (Table 1) showed significantly higher content of red grape pomace for the following components: DM (92.30%); Ash (7.12%), CP (16.60%); EE (10.19%) and TP (2.20%).

Table 1 - Chemical composition of grape pomace with stalk parts

SPECIFICATION		Results ($\bar{X} \pm s_{\bar{x}}$)		Statistical significance (Anova)	
		White grape pomace	Red grape pomace	p-value	Significance threshold
DM%		90.40±0.3	92.30±0.01	5.64E-08	p<0.001
% of DM	Ash%	6.46±0.17	7.12±0.05	0.0043	p<0.01
	OM%	92.85±0.9	92.29±0.09	0.0106	p<0.05
	CP%	14.48±0.2	16.60±0.12	0.00041	p<0.001
	EE%	7.40±0.13	10.19±0.09	6.29E-06	p<0.001
	CF%	32.28±0.6	28.54±0.52	0.0022	p<0.01
	TP%	1.95±0.04	2.20±0.08	0.0079	p<0.01
	TT%	1.54±0.03	1.44±0.06	0.044	p<0.05
	SEN%	38.70±0.9	36.95±0.33	0.0069	p<0.01

The data presented in Table 1 reveal that white grape pomace has a higher content in OM (92.85%); CF (32.28%) and SEN (38.70%) compared to the red grape pomace.

Instead, total tannins showed similar values both in the white and the red grape pomace, 1.54% and 1.44% respectively.

The white and red studied grape pomace content had values similar to some of the published literature [1;2] and higher than those determined by *Zalikarenab et al.*, (2007) [7]; the differences appeared may be due to the areas of production, grape varieties

and types processed in the winemaking industry.

From the graphical representation (*Fig. 1*) of the relative differences between the components of the red and white grape pomace (RGP and WGP), it follows that red grape pomace has a higher content in CP with 14.65%, in EE with 37.85%; in CA with 10.11% and in TP with 12.49% compared to the white one. Instead, the white grape pomace presented a higher content in CF with 11.62% and in SEN with 4.51% compared to the red one.

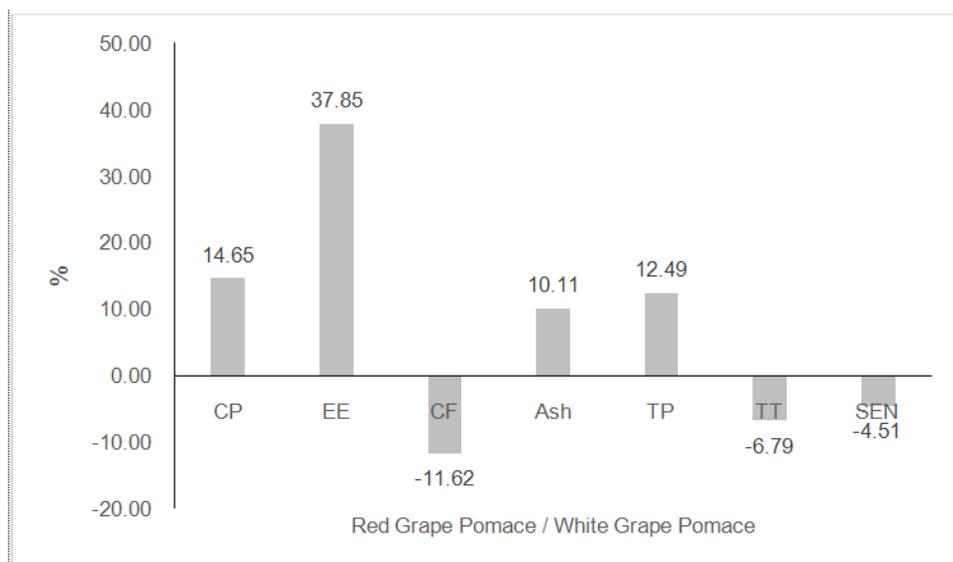


Fig. 1 Relative differences of the various chemical components of RGP and WGP

The comparative analysis of the chemical components values shown in Table 2 reveals that the elimination of the stalk bits of the tested sample RGP-S changes insignificantly CP% and TP%, appreciation supported by the statistical calculation; in the case of the OM, EE% and CF% components, the values determined are very significant compared to those of the sample RGP+C ($p < 0.001$),

whereas in the case of total tannins, the difference is distinctly significant ($p < 0.001$).

The increase of the RGP-S components may be due to the removal of 6.77 g of stalk from 100 g of RGP+C, which determined the increase of the proportion of seeds and skins, rich in crude fat and crude fibre.

Table 2 Chemical composition of red grape pomace with and without a stalk

SPECIFICATION	Results ($\bar{X} \pm s_{\bar{X}}$)		Statistical significance (Anova)		
	Red grape pomace +Stalk	Red grape pomace -Stalk	p-value	Significance threshold	
DM% ¹	92.30±0.01	92.30±0.04	0.72	p>0.05	
% of DM	Ash%	7.12±0.05	6.51±0.07	0.0008	p<0.001
	OM%	92.29±0.09	92.95±0.09	0.0008	p<0.001
	CP%	16.60±0.12	16.35±0.16	0.091	p>0.05
	EE% ⁵	10.19±0.09	11.44±0.10	7.91E-05	p<0.001
	CF% ⁶	28.54±0.52	31.31±0.11	0.0009	p<0.001
	TP% ⁷	2.20±0.08	1.44±0.06	0.05	p>0.05
	TT% ⁸	1.44±0.06	1.68±0.04	0.0035	p<0.01
SEN% ⁹	36.95±0.33	33.85±0.14	0.0001	p<0.001	

The data obtained in the hereby study indicate that the stalkless red grape pomace (RGP-S) is more valuable in terms of chemical composition. These results are also

reflected by the graphical representation (Fig. 2) on the relative difference of the components of stalk and stalkless red grape pomace (RGP+S and RGP-S).

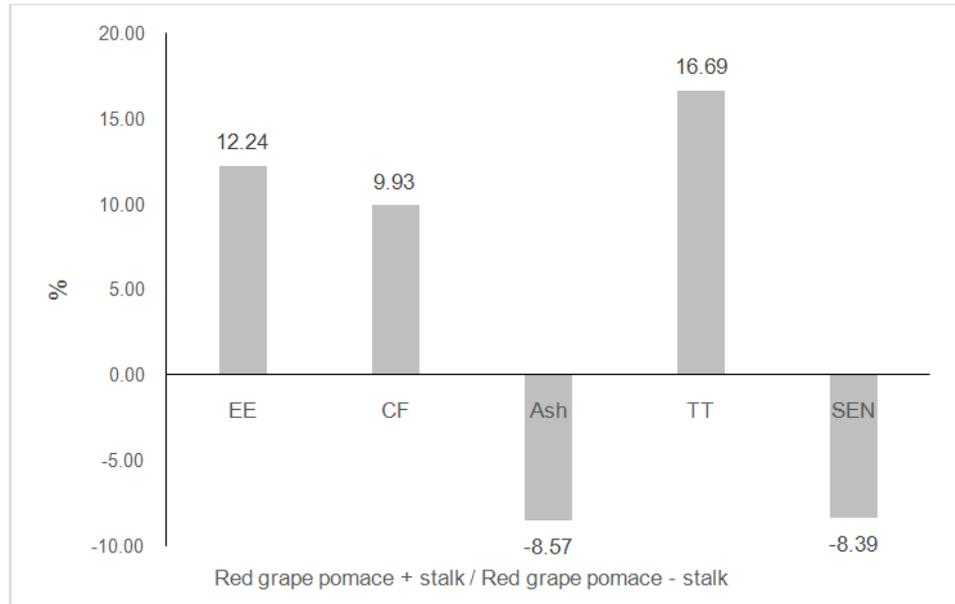


Fig. 2 Relative differences of the various chemical components of RGP+S and RGP-S

After the stalks are removed, the stalkless red grape pomace showed a higher content in EE with 12.24%, in CF with 9.93% and in TT with 16.69% compared with the one with stalk (RGP+C). Regarding the red grape pomace with stalk, it recorded a content in Ash higher with 8.57% and in SEN with 8.39%.

CONCLUSIONS

In the study performed it was found that red grape pomace has a higher nutrient content (Ash%, CP%, EE% and TP%) compared to the white grape pomace.

After the further removal of stalk parts of the red grape pomace, the content of CP%, EE% and TT% increased due to higher proportions of seeds and skins; the content of CP% and TP% changed insignificantly.

We believe that both the white and red grape pomace can be used to feed farm animals, in compliance with the maximum permitted levels of crude fibre for the animal category and species concerned.

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