

STUDY REGARDING THE INFLUENCE OF *VITIS VINIFERA* FRUIT (MUSCAT OF HAMBURG SPECIES) ON SOME BIOCHEMICAL PARAMETERS

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Abstract

The complex chemical composition of *Vitis vinifera* fruits (as well as its juice) because of the presence of resveratrol, is one of the strongest antioxidants known [1].

Tests performed in this study include the way in which certain biochemical parameters, such as glycemia, serum lipids, cholesterolemia, LDL-cholesterol (low density lipoproteins-cholesterol), HDL-cholesterol (high density lipoproteins-cholesterol), non-nitrogenous substances and activity of serum transaminases, were influenced by the consumption of *Vitis vinifera* fruit extract. The determinations were performed on uniform groups of Wistar rats, selected in advance that were treated orally with 10 % aqueous extracts of seeds, fruit skin and pulp extract of *Vitis vinifera* Muscat of Hamburg species.

The results revealed that there was a slight decrease in the level of blood glucose, which was 9.15% for the group treated with the skin extract. The decrease in cholesterolemia was 13.98% for the animals treated with the fruit skin extract and 12.8% for the animals that received seeds extract, while that for LDL-cholesterol and triglycerides after the administration of extract from grape peel was 11.99% and 12.44% respectively. There was a pronounced decrease in the non-nitrogenous substances, mostly uric acid with 15.09% for the group treated with fruit skin extract. Serum creatinine and the activity of serum transaminases did not show significant changes.

Rezumat

Compoziția chimică complexă a fructelor de *Vitis vinifera* în special datorită prezenței resveratrolului, unul din cei mai puternici antioxidanți cunoscuți explică multitudinea efectelor benefice pe care le au asupra organismului.

Testările efectuate au vizat modul în care anumiți parametrii biochimici, cum sunt: glicemia, lipemia, colesterolemia, LDL-colesterol, HDL-colesterol, substanțele azotate neproteice și activitatea transaminazelor serice sunt influențate de soluțiile extractive din fructele de *Vitis vinifera*.

Determinările s-au efectuat pe loturi uniforme de șobolani Wistar, selectați în prealabil care au fost tratați, p.o. cu soluțiile extractive apoase 10% din sâmburi, coajă și pulpa fructelor de *Vitis vinifera* specia Muscat de Hamburg.

În urma determinărilor efectuate se constată o ușoară scădere a glicemiei, cea mai pronunțată înregistrându-se pentru extractele din coaja fructelor fiind de 9,15%. Colesterolemia scade cel mai pronunțat, cu 13,98% pentru extractul din coaja fructelor și cu 12,8% pentru extractul din sâmburi. LDL-colesterolul și trigliceridele serice scad cu 11,99% și respectiv cu 12,44% după administrarea extractului din cojile de struguri.

Dintre substanțele azotate neproteice scăderea cea mai pronunțată a prezentat-o acidul uric cu 15,09% pentru extractul din coaja fructelor. Creatinina serică și activitatea transaminazelor serice în urma tratamentului nu prezintă modificări semnificative.

Keywords: *Vitis vinifera* fruit extracts, biochemical parameters, resveratrol.

Introduction

Fruits of *Vitis vinifera* have been used for thousands of years because of their nutritional and medicinal benefits. They are rich in sugars, flavonoids, anthocyanins and proanthocyanins [10], organic acids, tannin, mineral salts and vitamins.

Grapes skin, especially from the red and black species is rich in resveratrol which is a derivative of stilben.

Studies have shown that resveratrol is one of the strongest known natural antioxidants. It is found in a large quantity in black grape juice, skin and seed. Resveratrol has an antioxidant potential 50 times higher than vitamin C and E together. This substance prevents the oxidation of LDL-cholesterol, lowers total cholesterol levels [2, 3, 5, 8, 12], also demonstrates an antibacterial action, reduces the risk of cardiovascular diseases and can prevent the cancer development [1, 2, 6, 7].

In the present study we aimed to evaluate the influence of *Vitis vinifera* fruits (pulp, skin and seed) of muscat hamburg species on some biochemical parameters: glycemia, serum lipids, cholesterolemia, LDL-cholesterol, HDL-c cholesterol, serum triglycerides, non-nitrogenous substances and the activity of serum transaminases.

Materials and methods

The samples of different parts of grapes (10g of skin, pulp, seed and fruit), were extracted in 70% (v/v) ethanol solution [11]. The plant material was used in its fresh state after grinding, the alcohol was separated by rotary evaporator and the final solution was used in the determination.

We considered 5 groups: control, skin, pulp, seed and fruit, each of ten white, male Wistar rats, weighing 180-200g.

Animals were kept in cages according to the European guides for laboratory animals protection. All experiments were performed in compliance with European Communities Council Directive 1986 (86/609/EEC) and Ordinance No. 37 of the Romanian Government from 2nd February 2002. The animals were fastened for 12 hours before the first administration, and then received orally the test solution (10%) in a daily dose of 10 mL / Kg body weight for 14 days.

The control group received normal saline solution (0.9%) in the

same mentioned quantity.

Two hours after the last administration, animals were killed under anesthesia with chloroform and then blood samples were collected. After separation, the serum was used to determine blood glucose, serum lipids, cholesterolemia, non-nitrogenous substances and the activity of serum transaminases. Glycemia determination was performed using the enzymatic Cormay method [4, 9].

Determination of total serum lipids, total cholesterol and LDL-cholesterol was performed by the enzyme-colorimetric method and the serum triglycerides by the enzymatic method [4, 9].

Urea and uric acid were determined by Cormay enzymatic method [9]. Creatinine was determined by a colorimetric method [9]. Activity of serum transaminases was assessed by the enzymatic method [9]. Experimental data represent the average of 8 determinations and the interpretation of results was performed by Student "t" test.

Results and discussion

It was concluded, from Table I and figure 1, that the blood glucose level presented a slight decrease of 9.15% for grape skin extract, 7.14% for the total extract, 6.10% for the pulp extract and virtually no changes were registered in the grape seeds extracts, compared to the control group.

Serum total lipids, total cholesterol, LDL-cholesterol and serum triglycerides showed slight decreases compared to the control group, the decrease being more pronounced in the case of the grapes skin extract 13.98% for cholesterol, 11.99% for LDL-cholesterol and 12.44% for serum triglycerides (Table II, Fig. 2).

Among non-nitrogenous constituents, uric acid level showed the most pronounced decrease of 15.09% for the grapes skin extract and 13.20% for the total extract. This result shows that these extracts favor the elimination of uric acid from the body. Serum urea decreased marginally with values ranging from 7.02% for the grape pulp extract to 11.95% for the total extract.

Serum creatinine changes were statistically insignificant (Table III, Fig.3) Serum transaminases activity was not significantly altered by the solutions taken into study that indicated that these solutions were not toxic to the liver cells.

The most pronounced decrease in the ALT (alanine aminotransferase) was presented in the pulp extract, being about 10.16% (Table IV, Fig. 4).

Table I
The effect of the extracts from the fruit of the species
Vitis vinifera Muscat of Hamburg on the glycemia in rats.

Tested product	Dose	Glycemia mg/dl		
		$\bar{x} \pm S.D$	Effect%	p v.s.control
Controls	NaCl 0.9%, 10ml/kgbw	75.40 $\pm$ 8.1	-	-
Total extract of fruits of <i>Vitis vinifera</i>	10ml/kgbw p.o	70.00 $\pm$ 6.8	-7.14	p < 0.05
Extract of skin of <i>Vitis vinifera</i> fruit	10ml/kgbw p.o	68.5 $\pm$ 7.5	-9.15	p > 0.01
Extract of pulp <i>Vitis vinifera</i> fruit	10ml/kgbw p.o	70.8 $\pm$ 7.9	-6.10	p > 0.05
Extract of seeds of <i>Vitis Vinifera</i> fruit	10ml/kgbw p.o	73.9 $\pm$ 8.1	-1.98	NS

$\bar{x} \pm SD$ = mean $\pm$ standard deviation; NS = not significant

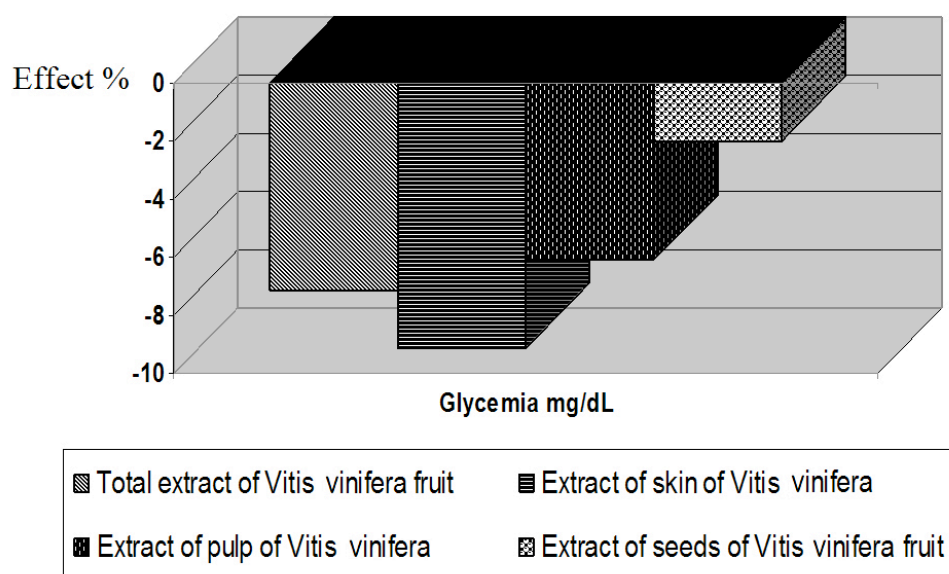
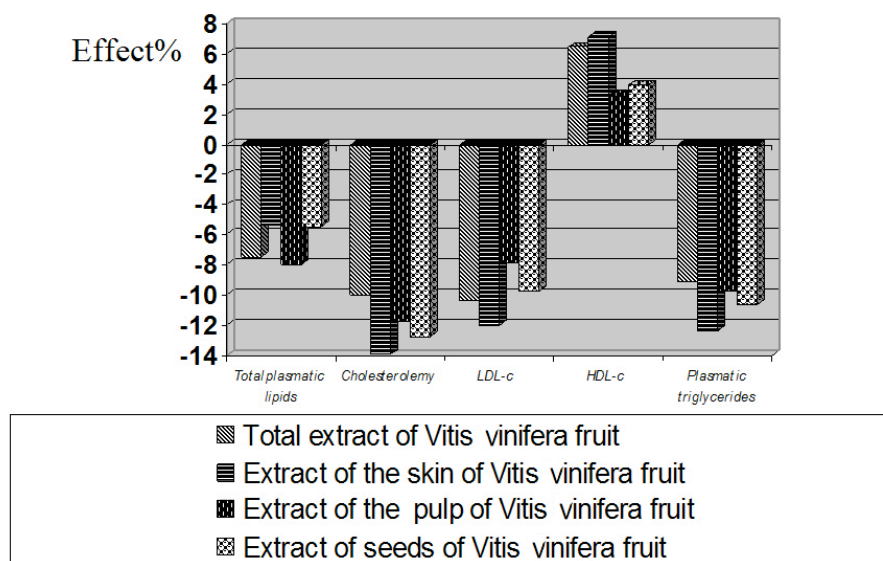


Figure 1
The effect of the extracts from the fruits of the species
Vitis vinifera Muscat of Hamburg in the glycemia on rats.

Table II
The effect of the extracts from the fruits of the species *Vitis vinifera* Muscat of Hamburg on the plasmatic lipids in rats

Tested product	Dose	Total plasmatic lipids mg/dL	Cholesterolmg/dL	LDL-c mg/dL	HDL-c mg/dL	Plasmatic triglycerides mg/dL
		x±SD	x±SD	x±SD	x±SD	x±SD
Controls	10 ml NaCl 0.9% /kg bw	190.4± 18.6	72.2± 6.9	44.2±3.9	27.8±2.9	45.8± 4.8
	10ml/kgbw p.o	176.2± 16.6	65.0 ±6.1	39.8± 3.2	29.6 ±5.1	41.6± 4.8
Total extract of <i>Vitis vinifera</i> fruit	Effect%	-7.45	-9.97	-10.40	+6.47	-9.17
	p vs control	p>0.05	p>0.01	p>0.03	p>0.05	p>0.05
	10ml/kgbw p.o	180.3± 17	62.1± 6.6	38.9± 3.7	28.9± 2.3	40.1± 3.9
Extract of skin of <i>Vitis vinifera</i> fruit	Effect %	-5.30	-13.98	-11.99	+7.19	-12.44
	p vs control	p>0.02	p>0.05	p>0.01	p>0.04	p>0.05
	10ml/kgbw p.o	175.2± 18.5	63.7± 6.1	40.7± 6.2	28.7± 3.2	40.1± 3.9
Extract of the pulp <i>Vitis vinifera</i> fruit	Effect %	-7.98	-11.77	-7.91	+3.23	-9.82
	p vs control	p>0.05	p>0.01	p>0.05	N.S	p>0.05
	10ml/kgbw p.o	180±20	63.4± 6.7	39.9± 3.4	28.9± 3.5	40.9± 5.1
Extract of seeds of <i>Vitis vinifera</i> fruit	Effect%	-5.46	-12.8	-9.72	+3.95	-10.69
	p vs control	p>0.05	p>0.01	p>0.05	N.S.	p>0.05

x±SD = mean ± standard deviation; NS = not significant; LDL-c - LDL-cholesterol

**Figure 2**

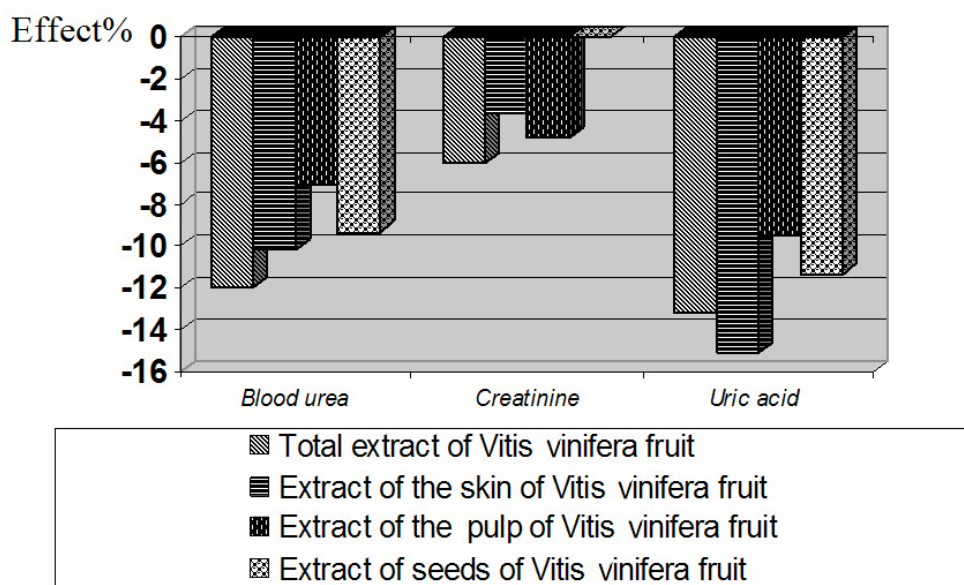
The effect of the extracts from the fruits of the species *Vitis vinifera* Muscat of Hamburg on the plasmatic lipids in rats.

Table III

The effect of the extracts from the fruits of the species *Vitis vinifera* Muscat of Hamburg on the non-proteic nitrogen compound in rats.

Tested product	Dose	Blood urea mg/dL	Creatinine mg/dL	Uric acid mg/dL
		$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Controls	-	34.30 $\pm$ 3.1	0.83 $\pm$ 0.14	5.30 $\pm$ 0.9
Total extract of fruits of <i>Vitis vinifera</i>	10ml/kgbw p.o	30.20 $\pm$ 2.9	0.78 $\pm$ 0.09	4.60 $\pm$ 0.5
	Effect%	-11.95	-6.02	-13.20
	p v.s.control	p>0.05	p>0.01	p>0.05
Extract of skin of <i>Vitis vinifera</i> fruit	10ml/kgbw p.o	30.80 $\pm$ 3.4	0.80 $\pm$ 0.05	4.50 $\pm$ 0.45
	Effect%	-10.20	-3.61	-15.09
	p v.s.control	p>0.05	n.s	p>0.05
Extract of the pulp of <i>Vitis vinifera</i> fruit	10ml/kgbw p.o	31.89 $\pm$ 2.5	0.79 $\pm$ 0.09	4.80 $\pm$ 0.3
	Effect%	-7.02	-4.81	-9.43
	p v.s.control	p<0.01	N.S	p>0.03
Extract of seeds of <i>Vitis vinifera</i> fruit	10ml/kgbw p.o	31.10 $\pm$ 3.0	0.82 $\pm$ 0.07	4.70 $\pm$ 0.40
	Effect%	-9.3	0	-11.32
	p v.s.control	p>0.05	N.S.	p>0.05

$\bar{x} \pm SD$ = mean $\pm$ standard deviation; NS = not significant

**Figure 3**

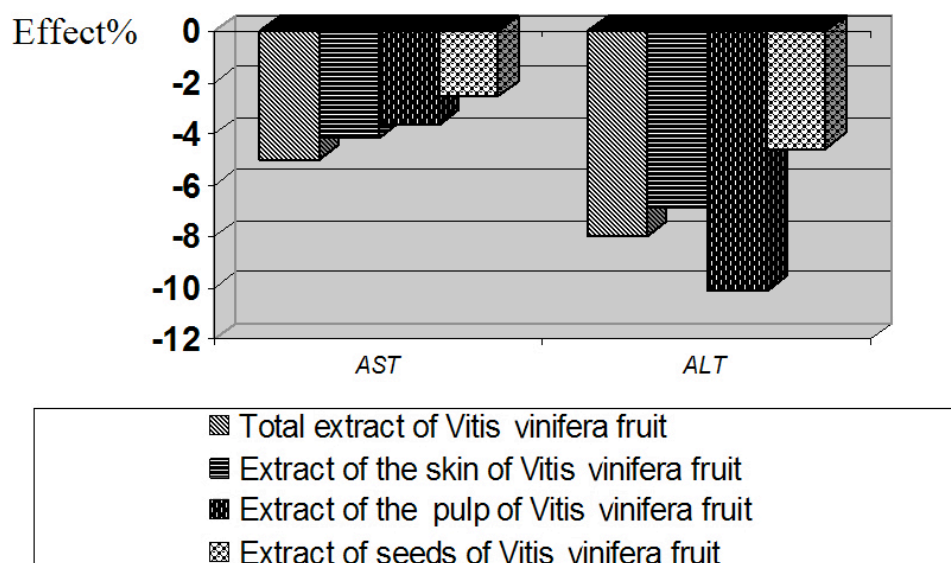
The effect of the extracts from the fruits of the species *Vitis vinifera* Muscat of Hamburg on the non-proteinic nitrogen compounds in rats.

Table IV

The effect of the extracts from the fruits of the species *Vitis vinifera* Muscat of Hamburg on the plasmatic transaminases in rats.

Testet product	Dose	AST U/L	Effect %	ALT U/L	Effect %
		x±SD		x±SD	
Controls	10ml NaCl 0.9% /kgbw	69.70±7.0	-	38.87±4.2	-
Total extract of <i>Vitis vinifera</i> fruit	200mg/kgw orally	66.20±6.8	-5.02	35.75±3.4	-8.02
	p vs.control	N.S		p<0.05	
Extract of skin of <i>Vitis vinifera</i> fruit	10ml/kgbw orally	66.80±7.1	-4.15	36.20±3.3	-6.86
	p vs.control	N.S		p<0.01	
Extract of the pulp <i>Vitis vinifera</i> fruit	10ml/kgbw orally	67.15±7.3	-3.66	34.80±4.3	-10.16
	p vs.control	N.S		p<0.05	
Extract of seeds of <i>Vitis vinifera</i> fruit	10ml/kgbw orally	67.90±6.9	-2.58	37.10±3.9	-4.55
	p vs.control	N.S		N.S	

x±SD = mean ± standard deviation; NS = not significant

**Figure 4**

The effect of the extracts from the fruits of the species *Vitis vinifera* Muscat of Hamburg on the plasmatic transaminases in rats.

Conclusions

Extracts obtained from *Vitis vinifera* fruits had moderately decreased the blood glucose level, the effect was more pronounced for the skin extract of the grapes. Serum total lipids, cholesterol, LDL-cholesterol and serum triglycerides also decreased moderately after the treatment with extracts of this plant. Among non-nitrogenous substances, uric acid showed the most pronounced decrease for the fruit skin extract.

In conclusion, the studied extracts of fruit skin, have the most pronounced lowering effect on serum cholesterol, LDL-cholesterol, triglycerides and serum uric acid.

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