

3rd INTERNATIONAL SYMPOSIUM FOR AGRICULTURE AND FOOD – ISAF 2017**EFFECTS OF NEW ORGANIC PREPARATIONS BASED ON ZEOLITE AND DOLOMIT OVER SOME CHARACTERISTICS OF THE GRAPE IN R. MACEDONIA****Vladan Pesic¹, Biljana Korunoska², Krum Boskov³**¹University of Belgrade, Faculty of Agriculture, Beograd- Zemun, R. Serbia²University „Ss. Cyril and Methodius, Institute of Agriculture, Skopje, R. Macedonia³University „Ss. Cyril and Methodius“, Faculty of Agricultural Sciences and Food, Skopje, R. MacedoniaCorresponding author: markovskabiljana@yahoo.com**Abstract**

In our research are covered the results of applying new organic products of mineral origin based on zeolite and dolomite. The specific substances processed at our paper represent minerals geographic origin of the mining localities in R. Serbia and the same are protected by intellectual property. In R. Macedonia are implemented on several agricultural crops including the grapevine. According to the method of application to plants can be as improvers of soil features which are applied on the soil of planted place, as well as their other formulations that are applied as fertilizer on the foliage (leaves). Way of their influence is based on improving the health and conditions and capacity of plant organisms and strengthening the entire immune system of the plant. Usually affect an increase in foliage and Equating the flowering and fertilization. Thereby receive yields that have improved quantity and quality. They represent formulations which are allowed to apply organic production of grapevine. In this examination are presented results of treating many varieties of grapevine on several localities in R. Macedonia. They are chosen at plantations with low condition and individual plantings for periods of two years. Were obtained visible results in increasing the useful leaf mass and in a timely and evenly flowering. Also, this year, these preparations improve the situation with the frozen vineyards.

Keywords: organic, mineral, zeolite, dolomite, grapevine.**Introduction**

In organic agricultural production in the R. Macedonia, for the improvement of the properties of the soil and for the nourishment of plants, preparations with natural mineral origin are increasingly used. The manner of their action refers to the improvement of certain soil characteristics and the improvement of certain physiological processes in plants. They do not act biocidally, but act in the direction of improving the overall conditional ability and plant health and improving the physico-chemical properties of the soil so that they can respond to the attack of diseases and pests (based on inducing defense reactions in the treated plants) [3]. This paper deals with the use of natural preparations based on minerals zeolite and dolomite (raw materials) having a geographical origin from the R. Serbia and are protected with intellectual property rights. These are the preparation - Terra Foster and its improved formula (gel variant) - Terra Powder. These innovative solutions were applied in two vegetations and several phenophases in the grapevine. From the application of the preparations, certain improvements in the properties and visible positive results were obtained [3], [7]. The raw materials - zeolite and dolomite and their preparations applied in our examination are analyzed in an accredited laboratory in the R. Macedonia. Macedonia, where a positive expert opinion on the physical and chemical components of the raw materials was obtained. Also, positive expert opinion was obtained for samples of preparations originally produced in R. Macedonia, in order to produce in the future larger quantities for broader markets [6], [8], [12].

Material and methods

The research in this paper was carried out on several varieties of grapevine in the Skopje vineyards, most of the varieties of which were examined in the Collection Plantation at the Institute of Agriculture, and several investigations were conducted in individual plantations. Studies in the collection plant at the Institute of Agriculture have yielded visible results in terms of treating the investigated preparations [4], [5]. Specifically studied varieties are Flem seedless (seedless variety), Chasselas (table white variety), Vranec (variety producing red wines), Ohrid white (variety for producing white wines). The preparations examined in this paper are obtained from the natural minerals zeolite and dolomite and represent new organic preparations - Terra Foster and Terra Powder. They are currently produced in the Czech company, GAIA LIFERESOURCES S.R.O. PRAGUE, CZECH REPUBLIC In a perspective with permission, they will be produced in the R. Macedonia. Treatment was performed in the period 2016 - 2017. Treatment with Terra Foster is done after the vegetation in November 2016. Treatment with Terra Powder is done during vegetation 2017. with 4 treatments on the vine. The first treatment is when the shoots have a length of 10 cm, the second treatment is before blossoming, the third treatment is prior to the formation of the grains and the fourth treatment is during the maturation of the grapes. Eventually the fifth treatment would be after the completion of the vegetation. The first treatment with Terra Foster is directly in the soil, the other 4 treatments are foliar feeding [4], [5], [8]. The method of applying the gel Terra Powder depends on the quantities of minerals and macro and micro nutrient elements currently found in the soil (it is necessary to analyze the soil). Quantities of 1 to 3 tons per hectare are commonly practiced. But in our case since individual vines are treated, the need for these raw materials (zeolite and dolomite) is about 0,100 to 0,400 kg in a plow place. Hereinafter, the composition of the mineral raw materials from which the preparations Terra Foster and Terra Powder are obtained are presented.

RESULTS FROM PROPERTIES IMPROVEMENT - GAIA - TERRA POWDER

Item no.	Parameter	Method	Received value	Declared value	Unit measure
Physical parameters					
1.	Moisture	MKCISO8190:1992	1,12	/	%
2.	Mechanical composition (size in granules)	MKC ISO8397:2009	1 mm 98 min 0,25 mm 80 min	1 mm 98 min 0,25 mm 80 min	%
3.	*Shape	Organoleptic	powder form	Powder form	/
4.	*Color	Organoleptic	white	white	/
5.	*Smell	Organoleptic	no	no	/
6.	*Solubility in water	Organoleptic	Very poorly soluble	Poorly soluble	%
Chemical parameters					
7.	pH	MKC ISO13037:2011	10,78	/	/
8.	*CaCO ₃	Volumetric ISO10693	83,31	/	%
9.	* Total CaO	Rulebook on inorganic fertilizers R.M. no. 96 from 31.06.2009	35,80	35±3	%
10.	* Total MgO	Rulebook on inorganic...	5,08	5±1,25	%

* Unaccredited method

Raw materials:

Zeolite and Dolomite: Water - H₂O, Calcium - CaCO₃ (total Ca), Magnesium - MgO (total Mg), Silicon - SiO₂, Aluminum - Al₂O₃, etc.

Small additions of elements: Phosphorus - total Phosphorus P₂O₅, Potassium - total Potassium K₂O, Zinc - total Zn, Sodium – NaO, etc.

According to the method of action, it can be said that the preparation Terra Powder due to the high content of Ca and Mg can be used as an enhancer of the properties of soils for fertilizing soils that have acidic pH reaction on the soil and in plants that require alkaline reaction [6], [7]. Terra Powder positively affects the physico-chemical properties and the water regime in the soil by affecting the water retention and making it available on the root of the plants. Terra Powder best shows results in light (sandy) soils, but also improves the structure of heavier (clayey) soils. Terra Powder has the capacity to bond heavy metals to keep them in and makes them unavailable for plants. It also has prolonged action and encompasses all phenophases in a single culture [1], [2], [11].

Precautions.

Protection of workers according to the prescribed rules in the package leaflet (washing, washing and changing, procedure for irritation of the skin and eyes, major irritant reactions where doctor advice is needed.

Environmental Protection.

Do not contaminate the water and other water courses, the way of safe storage of the packaging and the manner of safe removal of the packaging. When selecting raw materials for Terra Powder, be careful not to choose a zeolite that has already done decontamination of the land in a particular area because it has heavy metals bound in it and can react poisonily or even carcinogenic.

The data in this paper are statistically processed with mean value, coefficient of variation and standard deviation. Also in the following table are presented the results of the laboratory analysis of GAIA Terra Powder.

Results and discussion

The examination of the effect of the preparations was done on three groups of characteristics in individual units from the tested varieties of grapevine - Flem seedless, Chasselas, Vranec and Ohrid white. For the most part, the experiment was carried out in the collection plant of the Institute of Agriculture, but there were also treatments for individual vines in individual plantations and house yards [3], [4]. The period of examination (November-December 2016 and 2017) was unfavorable for the vegetation of the grapevine. During the winter period there was a great freezing, late spring frosts, and in the summer period there was a mild disease and certain pests (spiders). The application of the Terra Foster and Terra Powder preparations was welcomed in order to improve several important properties of the vines from the tested varieties in the investigated "problematic - bad" period. The overall health and resistance (preparedness) for obtaining solid yields was also improved [4] Based on the action of the investigated preparations that indirectly acted on the physico-chemical properties of the soil, the water regime in the soil and in the plant and the physiological processes in the plant habitat improved the resistance (response of the immunity) of the plant to unfavorable external conditions, diseases and pests. The investigated preparations are improving the properties and do not act biocidally. From the obtained results in the attached tables it can be seen that in the individual treated vines there is a difference with the untreated vines - the phenophases from beginning to end of vegetation are several days earlier which is significant for achieving full maturity and favorable chemical composition (sugars and acids). At the earliest it reaches full maturity variety Flem seedless (treated) - 08.08, and at the latest the Ohrid white (treated) variety 30.09. Also, in the investigated varieties, the yield per vine is higher in the treated vines and ranges from 2,414 kg / vine in Ohrid white to 4,105 kg / vine in Flem seedless. The photos can be seen that there is an increase in foliage and growth of shoots in treated individuals grapevine.

Table. 1 Phenological phases in treated and untreated vines from the investigated varieties

Varieties of grapevine	*T and *U	Branching of branches	Flowering			Beginning in maturing	Full maturity
			Beginning of flowering	Full flowering	End of flowering		
Flame seedless	U	13.04.	31.05.	03.06.	07.06.	14.07.	10.08.
	T	11.04.	29.05.	02.06.	05.06.	10.07.	08.08.
Chasselas	U	14.04.	31.05.	03.06.	06.06.	12.07.	16.08.
	T	11.04.	29.05.	01.06.	05.06.	08.07.	12.08.
Vranec	U	18.04	02.06.	05.06.	07.06.	30.07.	09.09.
	T	12.04	01.06.	04.06.	06.06.	22.07.	05.09.
Ohrid white	U	23.04	03.06.	06.06.	08.06.	09.08.	02.10.
	T	18.04	01.06.	04.06.	07.06.	07.08.	30.09.

*T = Treated, *U = Untreated

Treated individuals give uniformized grains and clusters in color and fertilization, a beautifully colored and fresh leaf mass and a uniform almond color. In the treated varieties, the percentage of sugar is also higher, which is very significant in the case of seedless seed varieties and wine processing varieties to improve the properties of the wine obtained. Most important is that the treated vines of the variety to produce red wines Vranec, sugar full maturity reached 225 g/dm³. It should be noted that the varieties tested in all treatments retain the variety characteristics.

Tab. 2 Quantity of harvested grapes (yield) in *T and *U vines from the investigated varieties

Varieties of grapevine	*T And *U	Yield grape kg/vine
Flame seedless	U	3,376
	T	4,105
	Average	3,741
	sd	0,515
	CV%	13,781
Chasselas	U	2,185
	T	2,895
	Average	2,540
	sd	0,502
	CV%	19,766
Vranec	U	3,360
	T	3,750
	Average	3,555
	sd	0,276
	CV%	7,757
Ohrid white	U	1,900
	T	2,414
	Average	2,157
	sd	0,363
	CV%	16,850

*T = Treated, *U = Untreated

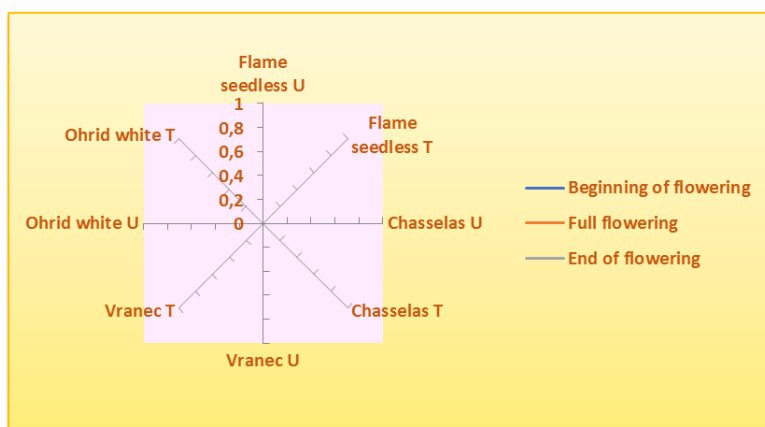


Chart 1. Diagram for displaying the phenophases of flowering in the investigated grape varieties

Tab. 3 Chemical composition of the grapes in treated and untreated vines from the investigated varieties

Varieties of grapevine	*T and *U	Sugar g/dm ³	Index	Total acids g/dm ³	Index
Flame seedless	U	167	104	4,4	94
	T	172		4,2	
	average	170		4,3	
Chasselas	U	186	98	6,4	121
	T	202		5,9	
	average	194		6,2	
Vranec	U	196	106	5,6	105
	T	225		5,2	
	average	211		5,4	
Ohrid white	U	180	96	4,0	94
	T	199		5,6	
	average	190		4,8	



1



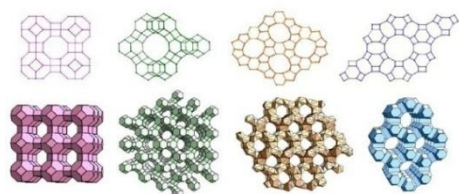
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5



6

Fig. 1, 2, 3, 4, 5 and 6 Structural formulas of the Zeolite mineral and its modifications



Fig. 7 Untreated



Fig. 8 Treated



Fig. 9 Untreated



Fig. 10 Treated



Fig. 11 Treated vines in the plantation



Fig. 12 Examined preparations in packaging

Conclusions

On the basis of the performed examinations and the achieved results the following can be concluded:

The tested preparations - Terra Foster and Terra Powder showed favorable physical and chemical composition and in the viticulture of plants there was a positive reaction from their application

The tested varieties of the grapevine - Flem seedless, Chasselas, Vranec and Ohrid white which were treated with the preparations phenophases were several days earlier than the untreated vines, which is significant for the vegetation and the full maturity of the grapes and the grains.

treated individuals have a higher yield and quality of untreated individuals.

The treated units have higher sugar content, which is significant for processing in wine, drying and consumption.

In the treated varieties there is improvement of other properties - quantity of leaf mass, color and size of tendrils, uniform fertilization

The raw materials for preparation - Terra Foster and Terra Powder are zeolite and dolomite. When choosing their ore deposit, care must be taken of the origin - not to originate from contaminated areas already decontaminated under their influence (zeolite binds heavy metals and cleans the soil. It is also possible for the investigated preparations, if necessary by processing, to correct the size of the grains (the mechanical composition) of the raw material and the preparation according to the requirements of the consumers.

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