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The Variation Content of Nutrients Mobile Forms in Vine Leaves under the Influence of Technological Links

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Abstract. The research took place in a vineyard ecosystem from Bujoru's Hills. Ecopedological conditions are favorable for viticulture, especially for red varieties. The soil is a cambic chernozem with degradation trends.The experiment followed the dynamics of macroelements and microelements under the influence of mineral and organic fertilization as well as under the influence of the mechanical and biological maintenance of the soil during two important phenophases: flourishment and fructification. The parallel analysis of the soil and the plant is the most effective way to determine the nutritional regime of the vine. They allow us to interfere directly in order to optimize nutritional regime so as to achieve maximum efficiency and high quality. The data obtained in the context of the Bujoru ecosystem revealed the existence of the soil-plant-production relations which are useful in developing a coordinated system of fertilization and the maintenance of an ecological design.

Keywords: fertilization, maintenance, phenophase, nutrients, vine

INTRODUCTION

The need for nutrients is not the same in all the phases of growth and development, the most critical in terms of nutrition is at bloom and fertilization, when it's necessary to give the vine a specified quantity of nutrients to ensure a better vegetative potential and greater fertility of buds.

Knowing the mineral composition of the leaves can give a definite diagnosis and it can determine the measures that will contribute to an optimal development of the vine and to a stable production (Davidescu, 1992).

MATERIALS AND METHODS

The study consisted of studying the Muscat of Hamburg variety from a vine plantation located in Bujoru's Hills.

The experimental scheme included the following variable factors:
A. soil maintenance system with two graduations: a1- black field, a2- herbicidation
B. fertilization with 4 graduations: b1-unfertilized, b2-mineral fertilization, b3- manure fertilization b4 - green fertilization.

The experiment was set on subdivided parcels with three repetitions and from the combination of the factors have rezulted 8 variants. The manure was administered in an amount of 40t/ha,and the mineral fertilization consisted of ammonium nitrate, superphosphate simple potassium salt ($N_{75}P_{40}K_{60}$ a.s / ha).

The harvesting of the leaves samples for analysis and the methods used to determine their content in the main macro and microelements was done acording to the methodology developed by ICPA. The leaves were harvested during two important phenophases: flourishment and fructification.

RESULTS AND DISCUSSIONS

Acording to the speciality literature, the nutrient content of the leaves depends directly on the presence in the soil of appropriate forms of nutrients and their quality (nutrients easily accessible).

After Bergmann and Neubert, (1976), the optimal quantity (abundant) of nitrogen is between 2.2 and 2.6% at bloom (2% being the critical level), phosphorus between 0.19 and 0.25% (0, 10% being the critical level) and the potassium is 0.9% (0.6% being the critical level). The optimal quantity of calcium is between 2 and 2.5% and for magnesiumis between 0.25 and 0.30%. Bergmann's studies show that at optimal nutrition the vine leaves contain 60-100 ppm Fe, Mn 20-30 ppm, 20 ppm Cu and 30 ppm Zn.

Research shows that the content of different elements tends to decrease when the content of other elements tends to increase and that there is a correlation between the leaf content of different elements and their quantity in the soil. The data we've obtained in the Bujoru ecosystem revealed the existence of soil-plant-production relations which are useful in developing a coordinated system of eco-designed fertilization.

The transfer of nitrogen, phosphorus and potassium from the soil to the plant is positive, intense and specific compared to the metabolic capacity of the Muscat Hamburg variety (Ionescu, Conde, 1989). For diagnosis the plant material samples were analyzed after the ICPA methods. In Tables 1 and 2 are the results of foliar analysis of the Muscat Hamburg variety, during two important moments: flourishment and fructification.

Tab. 1

The influence of the system maintenance and fertilization on vine leaves macroelements at the Muscat of Hamburg variety during the flourishment phenophase

The variant	Analyzed element (%) from dry substance									
	Soil maintenance as black field					Soil maintenance by herbicide				
	N	P	K	CaO	MgO	N	P	K	CaO	MgO
Unfertilized	2,07	0,191	1,10	2,39	0,47	0,47	2,15	0,186	1,03	2,44
Mineral fertilization	2,83	0,188	1,046	3,38	0,58	0,58	2,92	0,182	1,02	2,97
Manure	2,93	0,181	1,02	2,64	0,45	0,45	2,95	0,178	1,01	2,75
Green manures	2,69	0,183	1,16	2,84	0,41	0,41	2,74	0,177	1,06	2,57

Tab.2

The influence of the system maintenance and fertilization on vine leaves macroelements at the Muscat of Hamburg variety during the fructification phenophase

The variant	Analyzed element (%) from dry substance									
	Soil maintenance as black field					Soil maintenance as black field				
	N	P	K	CaO	MgO	N	P	K	CaO	MgO
Unfertilized	1,42	0,136	0,85	3,37	0,61	1,52	0,119	0,86	3,38	0,63
Mineral fertilization	2,02	0,122	0,89	4,35	0,74	2,08	0,122	0,81	3,90	0,76
Manure	1,93	0,146	0,84	3,67	0,62	1,84	0,147	0,92	3,77	0,68
Green manures	1,88	0,136	0,96	3,47	0,57	1,89	0,133	0,93	3,61	0,65

Analyzing the data in Table 1 and 2 shows that plant extracts nutrients (NPK) from soil were influenced in terms of quantity by the fertilization system as well as the

maintenance. Note that the nitrogen and phosphorus have a clear tend to decrease during the growing season, compared to potassium.

The mineral fertilization based on nitrogen, phosphorus and potassium resulted in improved nutrition of vines, leaves, increasing content therein. The dose of 40 t / ha organic fertilizers(manure) administered every four years will also provide an improving mobile forms of N, P, K, content in the vine leaves.

Green fertilization generally provides improved mineral nutrition of the vine, but lower compared to the manure fertilization. Given the limits and the critical level of all elements we can say that in the analyzed leaves during the studied phenophases, there are provided sufficient quantities of these elements through the administered fertilizer doses.

Applying herbicides provides a better use of the nutrients from fertilizers. Nitrogen content in leaves during the flourishment phenophase varies between 2.0% (unfertilized) and 2.95% (mineral fertilization). From the flourishment to fructification the content decreases from 1.35% (unfertilized variant) and reached 2.16% in the fertilization with mineral fertilizers. From the average data presented it can be said that at the Muscat Hamburg variety grown on Bujoru's ecosystems, the soil maintaining with herbicide caused the highest percentage of nitrogen content in leaves.

Phosphorus content of the leaves was not visible affected by the soil's system maintenance and its fertilization. The increase of the extracted amount of phosphorus from a grape vine as a fertilization effect becomes obvious when expressed according to the vegetative development (Skiner and Cook, 1988). Similar results were recorded regarding the potassium. The highest percentage of potassium in leaves has been maintained that the vines of the following field fertilized with black and green manure. Increasing the amount of phosphorus and potassium extracted from the plants, as an effect of the soil's maintenance system and its fertilization, is of great importance during the soil's moisture deficit periods.

Due to the action of K and P ions within the meaning of macromolecular substances hydrolysis and the chemical water binding the content of the leaves is enriched in active osmotic substances (Ionescu and Condei, 1989). The Potassium absorption and accumulation in the stump's organs is enhanced by increasing the dose of nitrogen

The calcium content in leaves tends to increase during the growing season and it is well marked and it corresponds to its low mobility. At the end of the vegetation season nitrogen and other elements leave the leaf retreating up the bodies, which does not occur with calcium. Although this element does not stimulate the metabolic processes, it contributes to a favorable environment for their conduct and to strengthen the plant building. The presence of calcium in the analyzed leaves is above the critical point of (0.80% CaO), which indicates that feeding the vines with this item is satisfactory.

The magnesium also shows an increase during flourishment and fructification, with higher values than the optimal. This shows a good supply of soil in this element involved in the synthesis of the chlorophyll pigments, carbohydrates etc. Its presence in more than sufficient quantities in the leaves ensures the smooth running of photosynthesis and helps the phosphoglyceric aldehyde and pentose formation. By the carboxylase activity, the magnesium is involved in the acid acceptor synthesis, the malic acid and the formation of energy-rich pyrophosphate. By carboxypeptidase the magnesium interferes in the protein hydrolysis and refurbishment, extending its influence to the formation of nucleic acids (Peterfi, 1972, quoted by the Orchestra in 1989).

Table 3 shows the relative results of the microelements variation in vine leaves. It is assumed that there is no determined regularity in the dynamic content of these elements in the leaves.

Tab. 3

The content of microelements in the grapevine leaves from the Muscat of Hamburg variety (ppm)

Analyzed element	Unfertilized		Mineral fertilization		Manure		Green manures	
	I	P	I	P	I	P	I	P
Fe	99,7	91,0	105,2	96,86	103,7	94,5	102,5	94,0
Mn	39,5	56,7	44,86	60,86	45,0	63,4	46,6	66,5
Cu	13,7	36,6	18,43	41,3	19,5	46,3	21,7	46,8
Zn	69,2	43,2	74,1	47,8	74,5	49,8	71,5	48,0
B	83,1	55,0	65,03	56,43	75,3	60,5	70,1	58,5

I – flourishment, P- fructification

During flourishment phenophase the Fe content varies from 99.7 ppm at unfertilized variants to 105.2 ppm at those mineral fertilized.

From flourishment to fructification a slight decrease of this element in leaves is observed. Its role in the leaves is very important. It takes part in breathing to mobilize stored energy from photosynthesis. Fixed in substances that contain it, the iron can't be used, which means that in case of a failure of this microelement, the upper leaves can not get it from the aged ones and as a result of this the chlorosis occurs.

Concerning the manganese's dynamic the content of this element in leaves has a slight increase from the flourishment to fructification, especially the variant with green manure. This element has a multiple role. It is a component of some respiratory enzymes and an activator of oxido-reducing enzymes. It has a role in the process of synthesis, participating at the split reaction of water molecules O2, H2 and electrons through a redox system (Lixandru, 1990). Manganese ion increases the plant's resistance to drought, by lowering transpiration (Davidescu, 1992).

The amount of copper in the analyzed leaves show an increasing tend increasing trend in bloom farge, likely due to the application of phytosanitary treatments. At the unfertilized and fertilized variants with manure this element is below the optimum (20 ppm), so that the weakness phenomenon is manifested. Copper has an important role in the metabolism, being a constituent element of ascorbicoxidase and polyphenoloxidase. It influences the carbohydrate and protein balance of the plants and prevents the physiological aging process and promotes the vital activity of leaf extension (Lixandru, 1990).

The zinc content in leaves is superior to the optimum range at all analyzed alternatives and the quantity in the leaves decreases from flourishment to fructification. Its role is very important in plants life, entering into the composition of enzymes with role in the breath. The zinc is necessary for the synthesis of ribonucleic acids, to form proteins, chloroplasts, having a great importance in the phosphatic regime of the plants (Mengel, 1968 cited by Lixandru, 1990).

The boron is present in the leaves of the Muscat of Hamburg variety in plentiful quantities for this variety, as evidenced by the absence of the degeneration phenomenon. The presence of this element is necessary in the vines because this element helps to form pollen and stimulates the activity of various enzymes and participates in the oxidation-reduction processes in plants (Calancea, 1977 quoted by Lixandru in 1990).

In terms of quantitative presence of these microelements in the leaves it can be said that these are found at a satisfactory level, which means that in the soil there are enough quantities of these elements.

CONCLUSION

The results of the foliar diagnosis have led to these conclusions:

Giving the content of the leaves in N, P, K, Ca and Mg determined at Muscat of Hamburg variety it is found that the mineral and the organic fertilization ensures a sufficient supply regime with these elements for the plants.

Mineral fertilization ensures a high nitrogen content in leaves, followed by the fertilization with manure.

The amount of NPK has a downward trend during the vegetation period, from flourishment to fructification, and the magnesium and calcium have an increase trend.

The Fe levels reaches maximum values during the bloom, then decreased sharply, and the Cu grows during the vegetation period.

And for the zinc and boron it is observed a decreasing during the flourishment till fructification.

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