

## RESULTS OF WORK ON LONG TERM OF VARIOUS SYSTEMS OF SOIL MAINTENANCE OF VINEYARDS

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### **Abstract**

*The research related to the long term practice of the soil maintenance system from the wine growing plantations has been done during the years 2002 - 2012 on a plantation situated in Tileagd village, with the Fetească Regală sort, clon 21, grafted on the Kober 5BB stock*

*The experience had 3 alternatives, as it follows: mechanic maintenance, chemical maintenance, biological maintenance.*

*The content of the taste in sugar has been superior when the biological method was used.*

*The flouring attack has been higher at the middle of the chemical maintenance method of the soil.*

*The longevity of the vines was lower for the long term grassing methods but pretty close for the black cultivated field method.*

*A correct evaluation of the effects determined by the long term practice of different systems of soil maintenance (10 years) on wine growing plantations, of the possibilities and of the singular application limits of the soil, herbicides and grassing works needs, in an ecological concept, a systematic use of the technological solutions which the intensive type wine growing has.*

**Key words :** systems of soil maintenance, wine growing plantations

### **INTRODUCTION**

In order to obtain a superior production, both in quantity as well as in quality, on the intensive types of wine growing productions, in conditions of high economic efficiency, it is necessary to adopt a rational system of soil maintenance, a system which is able to eliminate the risk of environment pollution and the risk of wine growing pollution.

Modern technologies have been applied without any danger on the wine growing plantations after a series of research has been done upon soil maintenance through mechanic, biological and chemical methods. The research upon soil maintenance has been done over a period of 10 years.

### **MATERIAL AND METHOD**

The research related to the long term practice of the soil maintenance system from the wine growing plantations has been done during the years 2002- 2012 on a plantation situated in Tileagd village, with the *Fetească Regală sort, clon 21*, grafted on the *Kober 5BB* stock. At the beginning of the experience the plantation was 12 years old. The planting distances used have been of 2x1.2 meters so there were 4167 vines on a whole hectare.

The experience had 3 alternatives, as it follows:

Alternative 1 – mechanic maintenance: application of two deep works and of 5 superficial works (witness)

Alternative 2 - chemical maintenance: application, by turns, of some synthesis herbicides

Alternative 3 – biological maintenance: natural grassing with a periodic mowing of the plants.

The field disposal of the alternatives has been done in blocks with 4 repetitions.

The herbicides used during the experience have been the following: Gesaprim, Gesatop, Pitezin, Caragard, and Devrinol applied previously in doses of 6 – 8 kg on a hectare, and Gramoxone, Roundup and Fusilade applied afterwards in doses of 5 -10 liters on a hectare.

We have applied the method through which the whole soil has been spread with herbicides.

The observations, determinations and the analyses were referred to: water stability of the aggregates from the soil; soil humidity; pH in watery extract; humus; N, P, K in the soil –plant system; number of bacteria and fungi in the soil; herbicide remains in the soil and in the plant; vigor and longevity of the vines; grape production and quality of the production (sugar and the acid aspect of the must), etc.

#### EXPERIMENTATION CONDITIONS

During the experimentation period, the rain condition has registered superior values compared to the normal values on a period of 50 years. The distribution of the rains and the frequency of the years with optimum conditions for natural grassing is presented in the following table ( *Table 1* )

*Table 1*

Distribution of the rains and frequency of the years with optimum conditions for covering cultures during the experimentation period:

Period	Average rains mm	Variation limits mm	Frequency of the years with optimum conditions %
Yearly	698	473-1000	50
Vegetation period	465	248-735	40
Spring	182	83-393	30
Summer	227	70-369	20
Autumn - Winter	289	157-528	60

During the vegetation period 66% of the yearly rains have fallen. During spring 25% have been registered, in summer 35% and in autumn 40% of the yearly rains.

## RESULTS AND DISCUSSION

The effects of long term application of different soil maintenance systems in wine growing plantations are presented with the help of the data from *Table 2*.

*Table 2*

The effects determined by the long term practice of different soil maintenance systems in wine growing plantations (*Sort Fetească Regală, clon 21, 2002 – 2012*)

Determination	Soil maintenance system	Soil maintenance system	Soil maintenance system
	Mechanic	Chemical	Biologic
Physics and chemistry of the soil			
Water stability of the soil aggregates (%) at a:			
- Depth of 0-10cm	71	76	89
- Depth of 0-60cm	78	80	83
Humidity of the soil (%) during drought at a:			
- Depth of 0-10 cm	21	17	12
- Depth of 0-60 cm	21	23	16
Ph in the water	8,2	8,4	8,0
Humus (%)	1,7	1,5	2,1
N-NH <sub>4</sub> (mg/100g of soil)	0,8	1,5	0,6
N-NO <sub>3</sub> (mg/100g of soil)	0,2	0,1	0,2
N-NH <sub>4</sub> , NO <sub>3</sub> (mg/100 g of soil)	1,0	1,6	0,8
PAL ( mg/ 100 g of soil)	4,6	4,6	6,1
KAL (mg/ 100 g of soil)	11,4	10,9	15,2
Microbiology of the soil			
Bacteria (106/g dry soil)	209	113	413
Fungi (103/g dry soil)	728	234	114
Remains of herbicides in the plant and in the soil.			
Terbiumthylazine(ppm) remains in the soil at a:			
- Depth of 0-10cm	-	0,115	-
- Depth of 10-20cm	-	0,011	-
- Depth of 20-30cm	-	0,009	-
- Depth of 30-40cm	-	0,006	-
Atrazin (ppm)remains in the plant in the:			
- Leaves	-	0,041	-
- Grapes	-	0,005	-
Intensity and quality of the mineral nutrition			
N totalized (%) from the root, wood, leaves, offshoot, grapes	4,16	4,32	3,59
P totalized (%) from the organs of the vine	0,83	0,82	0,71
K totalized (%) from the organs of the vine	6,99	8,26	8,43

Totalized global nourishment (%)	11,98	13,40	12,73
Vine vigor, fruit bearing, resistance and longevity			
Fresh phyto weight, wood and leaves(Kg/vine)	1,8	1,9	1,1
Grape production (tons/hectare)	16,3	16,1	12,5
Relative production versus the witness (%)	100	99	76
Must sugar (g/l)	197	181	201
Acid aspect of the must (g/ l H <sub>2</sub> SO <sub>4</sub> )	5,1	5,4	5,0
The frequency of the vines with flouring attack symptoms (%)	40	62	26
The gaps from the plantation at the age of 25 (%)	21	22	26

The water stability of the soil aggregates has been positively influenced by the biological factor and it has been negatively influenced by the mechanic soil maintenance means, especially in the superficial layer found at a depth of 0-10 cm.

The humidity of the soil has been maintained at a satisfactory level with the help of mechanic means and it decreased a lot under the minimum at a depth of 0-60 cm in the case of the biological maintenance. In a certain way the herbicides led to a low water provision in the superficial layer of the soil.

The compaction of the soil grew at the action of herbicides and mechanic works and decreased at grassing.

The content of the humus from the soil decreased when the herbicides had been applied and it grew during the biological maintenance.

The content of the soil in N mineral has been superior at the herbicide alternative followed by the soil maintenance system where the soil is regarded as a black cultivated field. The content of the soil in P mobile and K mobile contributed a lot to the system of soil maintenance through grassing.

The micro flora of the soil expressed through the number of the bacteria and fungi, has been positively influenced by the mechanical and biological means of soil maintenance. After the herbicides have been applied the number of the bacteria from the soil has decreased.

At the chemical means of soil maintenance, the herbicide and plant remains resulted after a prolonged application of the herbicides have situated themselves under the accepted limits.

Nutrition with P and K of the wine growing plantation has been superior when the soil has been mechanically and chemically maintained and the nutrition with K has been superior when the soil has been biologically and chemically maintained. The global nourishment with N, P, K has been higher at the herbicide alternatives, determining a higher productivity of the vines, resembling the one registered when using the black cultivated field.

In what the vigor and the fruit bearing vines are concerned, when the mechanic means of soil maintenance were used, the grape production was of 16,3 tons/hectare and when the chemical means were used the production was of 16,1 tons/hectare. The biological maintenance has decreased the vigor and the production of the vines with 24%.

The content of the taste in sugar has been superior when the biological method was used.

The flouring attack has been higher at the middle of the chemical maintenance method of the soil. The longevity of the vines was lower for the long term grassing methods but pretty close for the black cultivated field method.

## **CONCLUSIONS**

The mechanical maintenance of the soil has led, to a certain extent, to a reduction of the humus content and of the water stability of the soil aggregates and it favored the growth of production, the longevity of the vines the restraint of water in the soil and the mineral nourishment with phosphorus.

The herbicides have led to the reduction, to a certain extent, of the stability of the aggregates in the soil, in the superficial layer, to the reduction of the micro flora of the soil, of the humus content, of the resistance and longevity of the vines and it favored a better maintenance of the water from the soil, it favored the mineral nutrition with nitrogen as well as the grape production.

The grassing action led to a reduction of the soil humidity, to a reduction of the grape production, and of the vine longevity and it favored the structure of the soil by increasing the water stability, the humus level, the biological activity of the soil; it also favored the improvement of the mineral nutrition with potassium and the accumulation of the sugar in the grapes.

A correct evaluation of the effects determined by the long term practice of different systems of soil maintenance (10 years) on wine growing plantations, of the possibilities and of the singular application limits of the soil, herbicides and grassing works needs, in an ecological concept, a systematic use of the technological solutions which the intensive type wine growing has.

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