ASPECTS REGARDING THE IMPACT OF TECHNOLOGIC WORKS ON A SOIL FROM A VINEYARD IN VITERBO REGION, ITALY

ASPECTE PRIVIND IMPACTUL LUCRĂRILOR TEHNOLOGICE ASUPRA SOLULUI ÎNTR-O PLANTAŢIE VITICOLĂ DIN REGIUNEA VITERBO ITALIA

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Abstract. *The experiences were carried out in 2010, in a vineyard, inhabited with Trebbiano grape variety, at the „Nello Lupori" experimental farm, in the town of Viterbo, Italy and aimed to determine the main physical properties of the soil for different maintenance variants. The tests made at the University of Tuscia's soil physics laboratory aimed to determine soil texture, bulk density, density and porosity for four different technological maintenance variants. After the interpretation of tests results, the best technological variants were established for soil maintenance, with the purpose to preserve its physical characteristics.*

Key words: viticulture, soil tillage, soil physical properties

Rezumat*. Experienţele au fost desfăşurate în anul 2010, într-o plantaţie de viţă de vie soiul Trebbiano, în cadrul fermei experimentale Nello Lupori din localitatea Viterbo Italia, şi au vizat determinarea principalelor proprietăţi fizice ale solului, pentru diferite variante de întreţinere a acestora. Analizele efectuate în cadrul laboratorului de Fizica solului al Universităţii Tuscia au vizat determinarea texturii solului, densităţii aparente, densităţii şi a porozităţii pentru patru variante tehnologice de întreţinere. După interpretarea rezultatelor obţinute s-au stabilit variantele optime de tehnologii pentru întreţinerea solului, folosite, în principal, pentru conservarea însuşirilor fizice ale acestuia.*

Cuvinte cheie: viticultură, lucrările solului, însuşiri fizice ale solului.

INTRODUCTION

Trebbiano Sortogrup counts for about one third in the assortment of white wine in Italy. It is used for blending, in more than 80 DOC wines in Italy, although it has only six varieties of its own (local clones): Trebbiano d'Abruzzo, Trebbiano di Aprilia, Trebbiano di Arborea, Trebbiani Capriano del Colle di, di Trebbiani Romagna and Trebbiano dei Colli Piacentini Val Trebbia.

Trebbiano grapes are often the foundation (basis) for white table wines from Italy, which can be significantly improved if they are mixed with Malvasia Bianca grapes.

Probably the most successful Trebbiano wine based on a mixture is Umbria Orvieto Bianco, using a local clone called Procanico.

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Besides the use of this variety for the wine production, it is also used to obtain beverages like armagnac and cognac or it is used in balsamic vinegar preparation, a product very popular in Italian cuisine.

MATERIAL AND METHOD

The experimental plot containing the Trebbiano grape variety is placed at the didactic and experimental "Nello-Lupori" farm, which was established in 1981, covers an area of 30 ha and is located in Riello, 500 meters away from Faculty of Agriculture, University of Tuscia, Italy.

The measurements were performed for four different technological variants of soil maintenance between the rows of plants, with three repetitions per each variant; the soil samples were analyzed in the laboratory of soil physics of the same faculty .

The soil samples taken at a 0-15 cm depth and 15-30 cm respectively, were used to determine soil texture, soil bulk density, soil density and soil porosity (Canarache A., 1990; Societa italiana della scienza del suolo, 1985**)**

The soil maintenance system for each experimental variant was as follows:

a) **tillaged**, which required four interventions on the soil between the rows (two with the disc harrow and two with the vertical rotors milling unit);

b) **natural,** which consisted of the land natural grassing and 4 grass chopping tillage;

c) **grass 1**, with *Trifolium* subterraneum and three works of grass mowing using the Turbo 2 machine manufactured by Gianni Ferrari;

d) **grass 2**, *Poa pratensis* and 5 interventions for cutting and for the vegetal waste recovery using Turbo 2 machine.

The following devices and materials were used in the field-laboratory: plastic bags, shovel, spatula, electronic scales, pycnometer, drying stove, cone with sand, leachate, measuring cylinders, etc..

In order to determine the physical properties of the soil, the following formulae were used:

Density (SD) is given by:

$$d_s = \frac{d(P_s - P_v)}{P_s - P_v - (P_1 - P_w) \cdot f} \quad \text{(g/cm3)}$$

where: d – the density of water, at room temperature, Ps – the pycnometer mass containing the sample of air dryed soil, Pv – the empty pycnometer mass, P1 – the pycnometer mass containing the soil sample when filled with water; PW – the pycnometer mass, filled with water; f - correction factor for humidity

Soil bulk density (D_a) was determined using the sand cone and was calculated using the formula:

$$D_a = \frac{P_t - D_s}{P_s} \quad \text{(g/cm3)}$$

where: Pt = the mass of the soil dryed in the stove, SD = the sand density, Ps = the mass of the sand that filled the hole.

Soil porosity

Soil porosity is expressed as a percentage porosity (P) and it is given by:

$$P = 100 \cdot \frac{D_a}{d_s} \cdot 100$$

where: $\mathbf{D_a}$ is the soil bulk density and ds is the soil density.

RESULTS AND DISCUSSIONS

The results obtained in the experimental research are presented in table 1.

Table 1

The effect of technological works over the physical characteristics of the soil

Soil maintenance method	Depth *cm*	Soil texture			d_s *g/cm³*	D_a *g/cm³*	Porosity *%*
		Clay *%*	Dust *%*	Sand *%*			
tillaged	0 / 15	28,52	15,066	56,41	2,55	0,89	65,1901215
	15 / 30	31,89	17,383	50,73	2,40	1,11	53,9550375
tillaged	0 / 15	21,01	19,820	59,17	2,44	0,83	66,0253786
	15 / 30	22,6	18,957	58,44	2,40	1,01	57,7870564
Naturally	0 / 15	23,09	18,272	58,64	2,66	0,92	65,2992096
	15 / 30	25,64	18,844	55,52	2,40	1,09	54,6250000
Naturally	0 / 15	30,99	14,797	54,21	2,65	1,04	61,0022607
	15 / 30	34,97	19,320	45,71	2,52	1,00	60,3407290
Grass 1	0 / 15	26,04	24,340	49,62	2,54	1,06	58,2248521
	15 / 30	30,92	17,074	52,01	2,47	1,20	51,6781237
Grass 1	0 / 15	14,83	11,087	74,08	2,50	0,90	64,1313050
	15 / 30	17,33	14,651	68,02	2,45	0,93	62,2040816
Grass 2	0 / 15	15,44	17,840	66,72	2,37	0,95	59,9323753
	15 / 30	23,16	17,766	59,07	2,43	1,15	52,5773196
Grass 2	0 / 15	24,65	16,784	58,57	2,70	0,94	65,1851852
	15 / 30	29,22	16,919	53,86	2,68	1,12	58,2089552

Based on the granulometric analysis of the soil samples and using textural classification approved by Italian researchers, is was noticed that the predominant texture is sandy clay, followed by the clayed-sandy soil. The exception is represented by the grass 1 variant, in which case the soil is belonging to the goup with graded coarse, repsectively sand textural class.

Regarding the other physical characteristics of the soil, it was observed that the bulk density values (Y) for the 15-30 cm soil stratum indicates a slight compaction of this layer in all variants. The minimun value (0.83 g/cm3) for the 0-15 cm depth, was achieved in the tillaged variant.

For all the four technological variants, soil porosity fits within the normal limits. The maximum porosity, 66.0253786% respectively, was recorded in the tillaged variant, for the 0-15 cm depth, as expected, due to the large number of

loosening works (interventions) that were performed during the growing season. At the same depth, diametrically opposed, stands the grass 1 variant, which recorded a minimum value of 58.2248521%.

CONCLUSIONS

1. The maintenance system of the intervals between the rows of vines which is mainly used in most vineyards in Italy is the one with the grassing of these intervals.

2. Based on the analysis performed it was concluded that the experimental soil is of volcanic origin and has a predominantly middle texture.

3. Mechanical interventions over the soil in the tillaged variant at the 0-15 cm depth led to the maximum values of porosity (65.1901215%), due to the soil loosening as the effect of the action of the machines' active parts.

4. All the three variants using the technology of grassing the intervals between the rows of vines are more efficient from the economical and technological point of view, because soil tillage is thus avoided and the acces of the equipments during the rainy periods is facilitated.

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