THE INFLUENCE OF PHYTOSANITARY TREATMENTS ON THE SOIL YEAST LOAD IN VINEYARD IAȘI, ROMANIA

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Abstract

The aim of this study was to determine the influence of phytosanitary treatments on the soil yeast load in Vineyard Iași.. The experiment study included 4 local grape varieties: Busuioacă de Bohotin, Fetească Albă, Fetească Neagră and Fetească Neagră (from Collection of grape varieties) from viticultural center Copou. The samples were taken at 3 depths: 5-7 cm, 10-15 cm, 15-20 cm. To determine the influence of phytosanitary treatments on the diversity and distribution of yeasts, 2 soil samples were taken in the 5-7 cm shoot phenophase at 10-day intervals. The yeast strains isolation and obtaining of the pure cultures was completed by successive replications using sowing on solid nutrient media technique.

Key words: phytosanitary treatments, yeast strains, vineyard Iasi

In oenological practice, the basic link is the quality of the fermentative process that ensures the obtaining of high-class wines that reflect the personality and typicality of the viticulture area. Study of indigenous yeasts and their use in technology represent a permanent concern in field of research. In order to explain the quality of the fermentative process and yeasts activity from the spontaneous flora it is considered necessary to study the effects of external factors on the diversity and distribution of yeast microbiota within the vineyard.

Yeast biodiversity is of major importance in nature having a balancing role between fungi and bacteria. In soil in particular, yeasts help plant growth and have a significant role in aggregate formation and maintaining soil structure. Yeast cells represent a nutrient source for other microorganisms, thus contribute to the development of essential ecological processes, such as mineralization of organic material and dispersion of the resulting compounds, namely carbon and energy in the soil layers. (Botha A., 2011).

According to Lopez-Pineiro A. et al., 2013, from all the soil microorganisms, yeasts show an obvious dependence on the phenological phases of the vine and on the development of fermentable sugars in the grapes until harvesting time.

Oenological indigenous yeast strains with particular characteristics are representative for a certain vineyard and their presence can increase the wines typicality (Barrera Cardenas S.M., 2011).

MATERIAL AND METHOD

The aim and objectives of this study consist in determining the influence of phytosanitary treatments on the soil yeast load in Vineyard Iași.

In the research activity, were chosen four grape varieties Fetească Neagră, Fetească Albă, Busuioacă de Bohotin and Fetească Neagră from the ampelographic collection of "Vasile Adamachi" Farm, Iași. The varieties were selected with the aim of increasing the diversity of the study and based on their fairly wide spread in Romanian vineyards.

The sampling process took place in summer 2021 from vineyard Copou.

In order to analyze the soil microbiota, the samples were taken at 3 depths: 5-7 cm, 10-15 cm, 15-20 cm. To determine the influence of phytosanitary treatments on the diversity and distribution of yeasts, 2 soil samples were taken in the 5-7 cm shoot phenophase at 10-day intervals as follows:

- a series of samples taken 3 days before the treatment with the commercial product Dithane ® M-45 using a dose of 0.2% (2021) and Acrobat® MZ 69 WG (2022) which shows action on the pathogens Plasmopara viticola and Botrytis cinerea that causes downy mildew and gray mold of grape. It should be noted that both Dithane ® M-

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45 and Acrobat ® MZ 69 WG contain 60-80% mancozeb as active substance.

- the second sampling after 7 days from the treatment against downy mildew and gray mold.

The samples were collected in aseptic plastic bags and transported to the microbiological laboratory of Iasi University of Life Sciences (*figure 1)*.

Figure 1 **Isolation source – soil**

The samples were prepared aseptically with dilution technique (10-1 – 10-6) in duplicates using as solid nutrient media: Glucose peptone chloramphenicol agar (GPCA) containing: 2% yeast extract, 5% peptone, 1% potassium phosphate, 0,05% chloramphenicol, 20% dextrose, 15% agar

The samples were introduced to the thermostat at 28°C for 3-5 days in order to develop the microorganisms The yeast strains isolation and obtaining of the pure cultures was completed by successive replications using sowing on solid nutrient media technique.

The colonies were examined in base of microbial load using the Wolfhügel counting board.

RESULTS AND DISCUSSION

According to the data in *table 1*, the phytosanitary treatment applied in the 5-7 cm shoot phenophase in had a negative impact on yeast development, the yeast load in the soil in the case of the three sampling depths being lower compared to the one before the treatment in all 4 varieties taken in experience.

Regarding the phenophases the data showed increased values of levurian load after 72h of incubation, for the samples collected at ripeness stage compared to the bunch compaction phenophase. The values increased in all four varietes of grapes.

Table 1

The influence of experimental factors on the yeast load in the soil

Grape variety	Sampling depth	The 5-7 cm shoot phenophase	
		3 days before treatment	***After 7 days of treatment***
		UFC/g	*UFC/g*
Fetească Neagră Colecție	A*	0.15± 26 x 10^6	0.10 ± 24 x 10^6
	B**	0.13 ± 15 x 10^6	0.13 ± 12 x 10^6
	C***	0.1 ± 12 x 10^6	0.09 ± 9 x 10^6
Fetească Neagră	A*	0.1 ± 18 x 10^6	0.1 ± 15 x 10^6
	B**	0.09 ± 10 x 10^6	0.08 ± 9 x 10^6
	C***	0.07 ± 8 x 10^6	0.07 ± 6 x 10^6
Fetească Albă	A*	0.12 ± 21 x 10^6	0.1 ± 18 x 10^6
	B**	0.09 ± 12 x 10^6	0.07 ± 10 x 10^6
	C***	0.08 ± 8 x 10^6	0.06 ± 7 x 10^6
Busuioacă de Bohotin	A*	0.13 ± 21 x 10^6	0.10 ± 18 x 10^6
	B**	0.09 ± 13 x 10^6	0.08 ± 10 x 10^6
	C***	0.09 ± 9 x 10^6	0.07 ± 6 x 10^6

*sampling depth 5-7 cm; **sampling depth 10-15 cm;
***sampling depth 15-20 cm.

Comparing the 4 varieties studied, the yeast load was superior both before treatment and after 7 days of treatment in the case of the Fetească Neagră Colecția variety, which recorded a maximum threshold of 26 x 106 CFU/g soil before treatment, respectively 24 x 106 CFU/g soil after treatment.

According to *figure 2* it can be seen that no. CFU/g soil decreases as sampling depth increases. These results confirm the studies in the specialized literature according to which the soil microbiota is spread especially in the superficial depths of the soil, both in terms of quantity and in terms of the diversity of microorganisms.

Also, comparing the yeast load before the treatment with the results after application of the fungicide, we observe a decrease in the number of UFC of approximately 1 x 106 UFC/g soil in the case of the 3 depths studied.

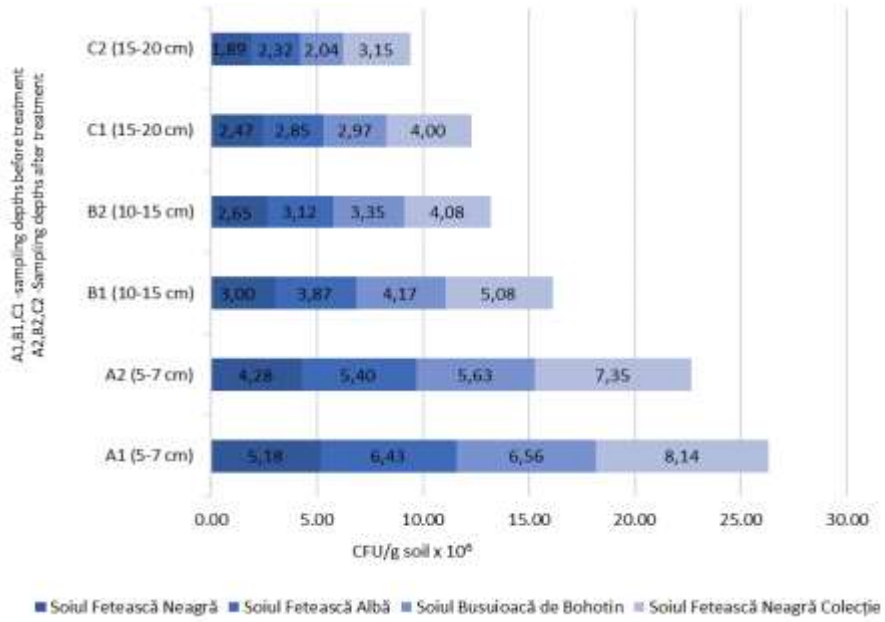

Figure 2 **The influence of experimental factors on the yeast load in the soil**

We can thus conclude that the application of the phytosanitary treatment had an impact on the viability of yeast cells both at the surface level of the soil and in the deeper layers.

It is noted that the yeasts load in both samplings is inversely proportional to the sampling depth, the maximum threshold being reached in the case of the variety Fetească Neagră Colecția, which recorded a number of approx. 24 x 10^6 CFU/g soil.

In the vertical division of levees in the ground according to figure no. 8.4. it can be found that the number of microorganisms shows a downward slope inversely proportional to the sampling depth, thus it can be deduced that the constant decrease in the activity of the microbiota in the lower layers is characterized by the lack of oxygen, the decrease in the amount of nutrients and of course the gradual alkalinization of the soil.

Acording to the results obtained in this study, clearly, the most important thing is to explore and preserve the biodiversity of oenological indigenous yeast strains in vineyard.

CONCLUSIONS

The administration of phytosanitary treatments in the studied years influenced the diversity and distribution of the microbiota in the soil and on the plants, recorded an negative influence for all grape varieties analyzed.

The reported differences between the experimental factors of the study (sampling depths, grape varieties, sampling phenophases) highlight the fact that the soil represents a rich and diverse microbial source. The yeasts number in a particular place is directly influenced by the amount of carbon and nutrients required for development.

Following the results expressed and correlated with the experimental factors, it was found that the yeast load in the soil of vineyard Copou Iași is influenced by the vertical spread of microorganisms, the grape variety, the phenophase of plant development and by the various treatments applied in vegetation to wine crops.

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