EFFECTS OF PHYLLOXERA – RESISTANT VINE CULTIVATION ON BROWN FOREST SOILS

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Annotation: The widespread rootstock of phylloxera resistant vine in viticulture, as well as in Western and Eastern Georgia and beyond its borders is Berlandieri x Riparia Kober 5 BB. The paper has studied and discussed the effects of cultivation of phylloxera resistant vine in brown forest soils – in Kvareli agro ecological area, considering the shortage of phylloxera – resistant rootstocks in accordance with the current situation and challenges of the viticulture in Georgia. In 2015, PH reaction and the basic nutrients K_2O and P_2O_5 needed for the plant have been determined in the soil with a laboratory method. In Autumn 2017, in the month of November, i.e. after the completion of vegetation in a mother plant, we examined the soil beneath the vineyard again to determine the effect of phylloxera resistant vine on the soil and the amount of the nutrients it takes out from there

Key Words: Viticulture, phylloxera resistant vine, brown forest soil, nutrients, agrochemical analysis

1. Introduction

Modern vineyards are mainly planted on the rootstocks of chlorosis resistance (carbonate rich soils). Berlandieri x Riparia Kober 5BB is recommended and widely spread in both Eastern and Western Georgia and outside its borders according to which this rootstock was used in an experiment [4].

Berlandieri X Riparia Kober 5BB was bred in Hungary by Kober from the seedling of Berlandieri X Riparia 8B through clonal selection, it is characterized by intense growth, with solid and abundant yield of the cane [1]. Root is practically resistant to phylloxera, the roots develop deeply due to which it can stand drought well and is resistant to fungal diseases. It endures large amount of lime (20% active lime content) in the soil much better [2]. It demonstrates high ability of rooting and production of callus and healing when grafting with grape varieties. Georgian and European grape varieties grafted on it: Rkatsiteli, Saperavi, Goruli Mtsvane, Chinuri, Pino Shavi and Aligote produce high and regular crop. Negative features of 5BB are the following: long internodes, large pith and loose wood which prevents ripening the sprout [3]. It is easily damaged by phylloxera and more.

It is distinguished with a slightly flattened structure of the sprout and fuzzy tips. The sinus of the stalk is mostly of a fork shape, it has equally developed sprouts and flowers of functionally female sex [5].

Description of a trial site. The trial plot of land is located on the southern slope of the Caucasus branch of Eastern Georgia, Inner Kakheti, Kvareli district – "Tsinakldeebi" where brown forest soils are spread.

Aim of the study: When selecting a plot of land for the vineyard, the normal growth and development of the vine should be taken into consideration, which is part of the modern agro technology of the vine and speeds up production of crop which is achieved with the optimal amount of nutrients in the soil. That is why, planting a vineyard should be preceded by a preliminary agrochemical study of the soil cover and determination of the level of soil fertility, according to which should be drawn up a scheme of fertilizers to be applied to the vineyard plot

2. Research Methods

In the Spring of 2015 (before planting a mother plant) we took samples of the soil for analysis from the selected area with the following method:

At an area of 1 ha, samples were taken from 5 points (crosswise) by drilling.

Samples were taken from each point from the layout of the vine root system and the main feeding zone vertically on three horizons:

Horizon I – 0-20 cm depth;

Horizon II – 20 -40 cm depth;

Horizon III – 40 – 60 cm depth.

Samples were taken from all five points and the average sample obtained after mixing the horizons differentially (i.e. by mixing samples taken from all five points at a depth of 0-20 cm and from the 20-40 and 40 -60 cm horizons mixed in the same manner) was transferred to the laboratory for analysis.

The reaction PH and the basic nutrients needed for the plant K_2O and P_2O_5 were determined in the soil with a laboratory method

3. Research Results

The obtained results show that the soil reaction is close to the neutral, the reaction decreases slightly in parallel with the depth of the soil. It is due to the chemistry of the rock because it has a shortage of Ca^{2+} and Mg^{2+} ions.

Table № 1

Results of Agrochemical Analysis of 2015

Horizon	**PH**	**K_2O**	**P_2O_5**
0 - 20 cm	6,8	34,0	4,0
20 - 40 cm	6,7	13,0	3,0
40 - 60 cm	6,7	18,0	1,5

These soils are diverse due to the content of nutrients on different horizons. The upper humus horizon is distinguished by high content of potassium due to the dead cover and active action (influence of temperature and humidity) of microorganisms. K_2O content at 0-20 cm depth is

34mg/100 g in the soil, there is also observed an uneven distribution of potassium according to the depth. The data show that there does not occur potassium leaching, however, potassium leaching takes place in the given soil on the illuvial horizon, as an increased amount (13,00 mg/100g in the soil in 20-40 horizon and 18mg/100g in the soil at the depth of 40-60 cm) of potassium is observed in the lower horizon.

As for the distribution of phosphorus, upper horizons are provided with the amount of phosphorus to be absorbed. Lack of calcium in the given soil leads to the increase in the amount of phosphorus to be absorbed, leaching of phosphorus into the lower layers is not observed which is due to its low solubility.

In August 2015, after the analysis the soil was cultivated deeply (planting) at 60 -70 cm depth. It should be noted that the trial plot had not been fertilized with organic and mineral fertilizers either before planting a mother plant or in the period of an experiment.

In Autumn 2017, in the month of November, i.e. after the completion of vegetation in mother plant, the soil beneath the vineyard was examined again with the same methodology to determine how phylloxera resistant vine affects the soil and what number of nutrients it takes from the soil.

The results of the analysis of 2017 with the results of 2015 are given in Table № 2.

Table № 2

Results of Agro chemical analysis of 2015 and 2017

Horizon	PH		K_2O		P_2O_5	
	2015	**2017**	**2015**	**2017**	**2015**	**2017**
0 - 20 cm	6,8	6,6	34,0	8,0	4,0	3,0
20 - 40 cm	6,7	6,7	13,0	7,0	3,0	1,5
40 - 60 cm	6,7	6,8	18,0	9,0	1,5	1,5

4 Conclusion:

The results of the analysis show that the soil acidity, compared to the existing one, has not been changed, especially in the rhizosphere, it slightly changed in upper humus horizon, which is due to the cultivation of the soil.

As for the change of potassium and phosphorus in different horizons, it is due to intensive use of nutrients by the plant root system. In particular: the amount of potassium was significantly reduced at 20-40cm depth (it almost became half), because it was intensively absorbed by the plant root system. In addition, soluble forms of potassium were partially washed out in the alluvial horizon because the cultivation of the soil provides intensive formation of soluble salts of potassium and its leaching in lower layers.

Similar process was carried out with respect to phosphorus as well, its quantity was halved in the distribution area of the root system as the vine plant intensively consumes phosphorus from the nutrients. Quantity of phosphorus in the soil is seen to be getting poor more intensively in the distribution area of the root system.

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