International Journal of Latest Research in Engineering and Technology (IJLRET)
ISSN: 2454-5031
www.ijlret.com || Volume 02 - Issue 07 || July 2016 || PP. 01-06

THE RESEARCH OF SOIL QUALITY IN SOME PLACES PCINJA REGION FOR BREEDING FRUIT CROPS

Jelena Markovic[1*], Jasmina Stojiljkovic[1], Svetlana Stevovic[2], Goran Markovic[3]
[1]*Colledge of Applied Professional Studies, Filipa Filipovica 20, Vranje Serbia1*
[2]*University Union Nikola Tesla, Faculty for ecology and environmental protection, Cara Dusana 62-64, Belgrade, Serbia*
[3]*Public company administration spas, Vranje*

ABSTRACT: Soil quality is one of the main environmental conditions for successful and sustainable orchards cultivation. The main role of the soil is reflected in its production activities or productivity. Soil fertility implies content available nutrients, such as individual elements, pH and humus. The research of soil quality leads to certain conclusions about which soil is suitable for growing crops. The investigation of soil quality for Pcinja District in southern Serbia is performed, with the goal to complete environmental conditions for cultivation of the most suitable crops. The methods that were used for the analysis of the soil in the fiziko chemical methods. The results in this paper show high quality land for sustainable growing fruit crops.
Keywords: environment, soil, potassium, phosphorus, humus, methods

1. INTRODUCTION

Region of southern Serbia is suitable for the development and production of organic food. Organic production greatly affects the quality of soil, if the soil is rich in humus, the development of organic farming is better and bigger. The plot is complex, live, variable and dynamic component of agroecosystems (Krnačova, et al.,2013). It represents the portion of the Earth's crust where plants live and other microorganisms. The composition of the soil directly affects the anatomical structure of plants and their characteristics (Stevovi, 2010), (Stevović et al., 2009). Development of appropriate soil analysis is especially important when it comes to growing medical plants (Stevović et al., 2011). From the standpoint of agriculture "perfect soil" should contain 45% of minerals, 5% of organic matter and 50% of the cavities, one of which should be half filled with air and half with water (Oljača, 2008). Good quality soil should be of good quality. Soil quality is reflected in the amount of chemical elements present at the most N (nitrogen), P (phosphorus) and K (potassium), of humus and the pH value, which is characterized by its fertility (Popovic, 1989, Steve and Čalić-Dragosavac, 2010, Stevović et al., 2013). Nitrogen contained in the soil affects the normal flowering and fruiting, and it is also required in the synthesis of the enzyme, it enters into the composition of chlorophyll and its deficiency causes yellowing of the leaves (Oljača, 2008). Phosphorus contained in the soil is in the construction of nucleic acids, nucleoproteins, phytate, including some sugars. The plant absorbs it through the root system. Essentially soil is poor in phosphorus, and for this reason the soil constantly trash phosphorus fertilizers (Oljača, 2008). Potassium is essential for growth and cell division in plants and if it has more soil, the plants are more resistant to diseases and stress (Stevovi et al., 2010). Lack of potassium in the soil causes a disruption in water balance, or curling of leaves and root rot.

2. MATERIALS AND METHODS

As the material in this study were determined using soil samples from various locations across the Pcinja District and villages: Rataje, Aleksandrovac, Zlatokop, Tibuzde, Ranutovac.

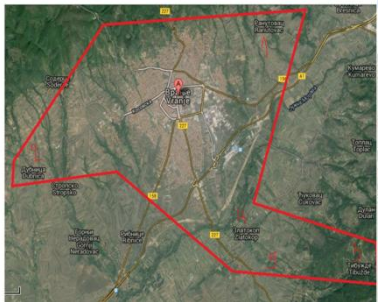

Fig. 1. The satellite image of willages, locations were soil samples were taken

The effect of soil quality is tested and presented in this paper. Testing was carried out in different locations and in a different period of a year. The parameters of soil quality, humus, P, K, N, were determined by titration methods, calibration and pH-metric methods. This test was carried out in order to find an area with the land that prone to the development of agricultural production. Types of soil to be used for sampling are smonica and gajnjaca. Gajnjaca and smonica are compacted clay soil. Gajnjaca may have a rosy and brown color and is less fertile than smonica. Smonica is black in color, rich in humus and very fertile land. Since the composition and quality of soil depends on the quality of yield of a plant that is planted or sown. Soil samples that were used for the analysis were tested in an agricultural laboratory and extension services in Vranje. To get the best possible results and quality of the country sampling should be properly done. There are several methods of sampling, but the main are: sampling at smaller and larger lots. Soil samples for testing in this study were taken from smaller pitches and with a few of them. Samples were taken from the same cadastral parcels, from an area of soil that belongs to the same type and under the same culture. Individual samples were used. Samples were taken at a depth of 17 cm, in the period after harvest (for crops) or prior to fertilization and during the growing season (for fruit crops). Methods that have been used for the sampling method are using the probe. Prior to field sampling, topographic and pedological maps are analyzed. There are chess and diagonal layout. In this paper, the chess schedule of sampling is used. Soil samples are mixed by hand in order to be chopped. If the weight of the earth is greater than the desired weight of the average of the sample, the elimination of the access of a part of the sample is used by means of eliminating the diagonal. The fragmented country schedules on paper is in the form of a square or rectangle, then a ruler is used to withdraw the diagonal, so that the country of the first two opposing triangles is away from paper and discarded, and the remaining land to the other two triangles again well mixed. Thus obtained samples were placed in paper bags on: sample number, the name of the farm, date of collection, name of the person taking the sample, label the plot, the depth at which the sample was taken and the type of soil. Soil samples are first dried and then tested. Dried samples were sieved in a sieve and only the fraction that passed through the sieve analyzes while the other ones are thrown away.

The methods that were used for the analysis of the country in the laboratory are: chemical and Al-methods and calibration and potentiometric, spectrophotometric, photometric. For potentiometric method pH meter, spectrophotometer classic which is determined by phosphorus and Flame Photometar device that determines potassium are used. These methods determined by the pH of the soil, the content of potassium, phosphorus, nitrogen and humus. Using a pH meter, measure the voltage, which is dependent on the activity of hydrogen ions in the suspension of land with water or with a normal solution of KCl. Measurement of the spectrophotometer, is carried out at a wavelength of 830 millimicrons. They use red photocells. The study of soil quality impacts on sustainable development and environmental protection, there by reducing the likelihood of potential pollution (Sobczyk, 2014).

In order to determine the content of potassium, phosphorus, nitrogen, humus and soil pH were used to dry soil samples. The task of calibration is to establish what the cultivated crop means analysis revealed nutrient content, and from which other properties of the soil, the extent of this depends on the availability of nutrients for cultivated crops.

Calibration should show where the boundaries of bad and good level of supply of a lot of phosphorus, potassium and other nutrients are beyond which limit one can expect good or poor performance of all the phosphorus and potassium fertilizer. (Manojlovic, et al., 1969). This is a method for determining the phosphorus content in the extracts by means of Al-molibden blue, in which a reducing fosfomolibden complex of ascorbic acid is used. Determination of humus, is calculated by the following formula:

$$\%\text{humus} = \frac{A \cdot 0{,}514 \cdot 1{,}72 \cdot 100}{C}$$

Where,

A- spent ml of 0.1N $KMnO_4$ solution to oxidize the carbon in the sample studied

0,514 - coefficient, which indicates that each ml of 0.1N $KMnO_4$ oxidizes 0,514mg C in CO_2

1.72 - coefficient for converting mg C in humus

C - taken probes country expressed in mg

100 - number in scoring percentage.

Specifying the humus and nitrogen is determined by the formula:

$$\text{Nitrogen} = 0.05 \bullet \text{humus} \quad (2)$$

3. RESULTS AND DISCUSSION

The test results of different soil samples were analyzed for the period from July 2013 to October 2014. The following results which are presented in tables.

The numbers 1, 2, 3, 4 and 5 in Table 1, show the village (Figure 1), from which they take soil samples for testing (Ranutovac, Zlatokop, Tibuzde, Aleksandrovac, Dubnica). Table 1 shows the results of the analyzed soil samples from these locations. Column one and two (in Table 1) shows the number of ml of oxalic acid and kaliumpermaganat used for titration of the sample of the earth, in which, using the equation 1 examines the content of humus. It can be seen from Table 1 that the humus content ranges in value from 2-4%, depending on which culture was on that land. Larger values of humus show that the land is better suited for the cultivation of fruit crops and that the samples of the country, where there are larger amounts of humus are actually samples from the soil on which they fruit culture were planted. Fruit crops in the autumn, when they discontinue vegetation and they drop leaves, return to the soil organic matter, which is what enriches and creates a fertile land. Organic matter is decomposed into simpler compounds decomposition and mineralization. Higher values indicate that the humus soil better for growing plants, in this case fruit crops. The quantity and quality of humus in the soil is constantly renewed, or the amount of new topsoil to replace old and thus maintains a certain level of humus in the soil, which is intended for planting some crops. This balance is of great importance for the creation and maintenance of soil fertility. (Oljača, 2008). Successive changes significantly affecting the quality of agricultural land (Špulerova, 2008).

What can also be observed from Table 1, in conjunction with humus, is that the value of humus increases in the fall. With the increased work of the microorganism. Solid land for the cultivation of fruit crops is considered that when the value of humus is around 3, and the research found this.

Table 1. The content of the parameter K, F, N, pH and the humus of the assay samples the village (Figure 1), from which they take soil samples for testing (Ranutovac number 1, Zlatokop number 2, Tibuzde number 3, Aleksandrovac number 4, Dubnica Number 5)

Lokacija	The K %	The P %	The N %	pH	Humus %
Ranutovac	9.64	9.51	0.16	6.22	3.27
	10	12,52	0,15	5,59	2,28
	13.85	14,85	0,16	5,57	3,29
	14.62	20,40	0,16	6,38	3,30
Zlatokop	12,43	27,20	0,13	6,93	2,57
	15.38	13,62	0,11	6,52	2,21
	13.46	23,66	0,14	6,61	2,85
	13.08	21,60	0,13	6,86	2,67
Tibuzde	11.92	10,13	0,17	3,81	3,14
	10	13,48	0,16	3,74	3,23
	12.69	17,12	0,19	5,03	3,75
	>40	21,25	0,20	5,44	3,67
Aleksandrovac	>40	16,90	0,18	5,45	3,27
	9.64	8,93	0,18	4,04	3,53
	>40	>40	0,32	7,5	3,43
	13.46	14,16	0,18	4,62	3,16
Dubnica	10.38	9,78	0,16	5,17	3,21
	>40	>40	0,46	6,75	2,54
	11.92	10,61	0,17	4,03	3,06
	22,06	18,69	0,16	5,94	3,14

From Table 1, we see that the pH value of the soil generally ranges from 3 to 6. This means that for the growth and further growth of the plants most suitable are acid soils, which are in the range of 6 to 8. From Table

1, one can see the value of pH 3.81 and 3.74 of land like this are not recommended for planting seedlings, as reduced pH value can cause an increase in the concentration of aluminum and manganese to toxic values. In the samples in which a pH of about 7 the solubility of phosphorus is best.

The value of potassium (K) in Table 1 was obtained by the reading value of the Flame Photometar device at a given value, for example. The device is for a sample of countries alleged value so that the number 34 corresponds to the value of $ 12.69, and so for all values.

Results of testing samples show the presence of solid potassium and phosphorus as well as nitrogen and therefore can be said to have samples of soil suitable for growing plants. You can say that, fruit crops are planted on such land will give good yields, ie there will be no deterioration and decay, but such land shall periodically fertilized to obtain maximum yields. The only climatic factors can affect a significant impact.

In Table 1 one can see the values of potassium and phosphorus that are greater than 40. This means that when the values of potassium and phosphorus is greater than 40 (which is an upper limit, maximum), the land does not need to muck with the kinds of fertilizers are composed of potassium and phosphorus. It is believed that in the land which is investigated the content of potassium and phosphorus is over 40, self-sufficient without the addition of additional fertilizer.

Table 2. The amount of cherries yields in kg/per tree, to the content quality parameters (pH, K, N, P and humus) from the table 1, taken from different locations from different vilages in the region of South serbia.

Number of samples at various locations	Village	The amount of yield in kg / per tree		
		2014 Trees 6 years old	2013 Trees 5 years old	2012 Trees 4 years old
1	Ranutovac	30	29	28
2		29	28	29
3		31	30	29
4		29	29	27
5		31	31	30
1	Tibuzde	29	28	26
2		30	29	27
3		31	30	27
4		28	27	25
5		30	29	28
1	Zlatokop	32	30	29
2		29	27	27
3		30	29	28
4		31	30	29
5		29	28	27
1	Zlatokop	32	30	29
2		30	29	28
3		29	29	29
4		31	30	29
5		28	27	27

According to the tested samples, it was found that the composition of the soil has good indicators of the quality parameters of the following elements K, N, P, and also the ground was acidous enough which favored to increase the yield of cherries. Table 2 shows the results of yield cherries that are grown on samples of the tested ground. It is shown that the composition of the soil really affected the amount and quality of the yield.Sour cherries that were planted in villages Zlatokop, Tibužde, Ranutovac and Dubnica gave the following yield. Table 2 shows that the amount of cherries changed. In the first four years, the amount of yield is lower because the cherry trees are young, and in the following year 2013. it can be seen that the quantity increases, and this is due to the composition of land that was rich in humus and nitrogen, what caused fertilization. In 2014 the amount of the yield is even more increased. You can see that even though that are the same villages, the quantity of yields is somewhere higher and somewhere lower. The conditions of irrigation, fertilization and soil composition affected that. It may be noted that the highest yield was in 2014 in samples in all villages. Cherry trees are 3-6 years old. It is the sour cherry. Table 2 shows that the yield of cherry has not changed very much,

on average, about 1 kg / per tree, from year to year. This means that the cherries are well treated, irrigated, fertilized and that the quality of land was constant, and beside that the climate conditions were desirable (moderate continental climate). The change of pH and organic content as well as the N, K and M, were larger in some tested samples and in some samples were smaller. Where the soil quality parameters (K, N, P, pH and humus) were higher,that is to say, the composition of soil samples was richer with these parameters, the yield was bigger, better and of better quality. Table 3 presents the soil samples whose quality parameters reflected a better yield.

Table 3. Parameters of quality indicators that most affected the increase of a yield.

Village	K %	N %	P %	pH %	Humus %	The amount of yield in kg / per tree
Ranutovac	13,46	0,14	23,66	6,61	2,85	29
	>40	0,18	14,16	5,45	3,27	31
	13,38	0,16	20,38	5,17	3,68	30
Zlatokop	13,08	0,13	21,60	6,86	2,67	30
	13,85	0,16	27,20	6,03	3,05	31
	>40	0,26	21,25	5,44	3,67	29
Tibuzde	13,46	0,18	18,75	5,08	3,21	30
	14,46	0,16	20,40	6,38	3,30	31
	>40	0,32	>40	7,5	2,78	28
Ribince	>40	0,20	21,25	5,44	3,67	31
	12,69	0,19	19,05	5,03	3,75	30
	11,92	0,17	15,08	4,03	3,12	32
Dubnica	14,23	0,19	20,56	5,46	3,05	30
	>40	0,23	23,09	6,13	3,21	31
	12,92	0,17	19,69	5,86	2,97	30

The level of the soil resulted in K_2O in five samples was optimal, four middle and two very high. The level of provision to P_2O_5 was middle and optimal in five,precisely in three planted samples. Low and very low level of provision was registered in the remaining four planted samples. The humus content in all planted samples is in optimal amounts, or higher (2.4 to 5.5%). The amount of mineral nitrogen was on average 0.17% (0.10 to 0.22%). Table 3 shows that the composition of each component indicates the quality of the soil, and it gave a satisfactory yield. Table 3 shows that only the village Tibužde pH of 7.5 gave slightly lower yields than other plots of land, and that the reduced acidity in the village Ribince of pH 4.03 resulted higher yields. With this it is shown that a yield of a good quality is significantly affected by the composition of the land, whether the land is rich in minerals or not; whether the quantity of natural humus is better or not, as well as how the acidity affects the yield.

Based on the results of testing samples it can be concluded that the parameters that determine soil quality are satisfactory for the cultivation of fruit crops provided. This favorable results are influenced by favorable environmental factors, as well as good geographical position. Ecological factors (especially climate) are very important and their impact on soil quality is of great importance (Misic, 1964) alue of phosphorus in the studied samples in 100 g of soil. However, stakeholders desired future development and their perceptions of agricultural landscape values varied according to different pressures in the individual studied areas (Barankova et al., 2011).

4. CONCLUSION

This paper is research of the different soil samples from different locations and samples taken at different times of the year. Test results that were obtained showed that the samples examined countries solid quality, but considering that it comes loam type of soil and forest soil, then the obtained results are also good. Test results showed that the samples of soil are mainly with pH around 7, that are acidic; that some samples of the country does not need aditional fertilizing as they are rich in phosphorus and potassium (phosphorus and potassium have values greater than 40). Results showed that soil is rich in humus because of all the samples of humus value is around 3-3.5. Based on the obtained results, it can be concluded that the tested soil samples are suitable for the cultivation of fruit crops and the region of Southern Serbia can develop in that direction. That

the results of research conducted soil confirms the correctness of orientation towards the cultivation, which opens the posibility of organic cultivation and at the same time contributing to sustainable rural development in the region southern Serbia.

The research which was done in this study showed that the quality of the soil is very important for the cultivation of crops, and that depending on the soil composition yields can be higher or lower, and of higher or lower quality. The land is rich in mineral elements to a greater or lesser extent, but a certain percentage of these elements has a very negative impact on yield. This work analyzes the amount of the yield of cherries based on the tested soil samples from locations in the region of South Serbia. It has been shown that the acidity of the soil is very important, that is to say, if the amount of land acidity is higher, the amount of the yield will be higher. It also can be said that the humus is very important, if the land is richer in humus, the quality of the yield will be better and the fruit is richer in juice, sweeter and tastier. The increase of K, N and P in the soil affects the development of the root, leaves and, thus, the fruit (Table 1 and 3). If the tree is healthy, it will give bigger and better yield, and therefore it will live longer.

The results are presented in the form of potential methods of developing fruit production in southern Serbia (Cizler, 2013).

REFERENCES

[1]. Barankova Z., Dobrovodska, M, Štefunkova, D., Babicova, D., Moyzeova, M., Petrović, F. (2011), Participation of local people on indentifyng the landscape values and futur development in historical agricultural landscapes , Ekol., Bratislava 30 (2), 216-228

[2]. Cizler J., (2013), Opportunities for the Sustainable Development of Rural Areas un Serbia Problemy ekorozwoju – Problems of sustainable development, vol. 8, no 2, 85-91

[3]. Krnačova Z., Hreško J., Kanka, R., Boltižar, M., (2013), The evaluation of ecological factors affecting environmental functions of the soils in area of traditional agrarian structures, Ekol. Bratislava, 32 (2), pp. 24

[4]. Misic V. (1964), Ecological factors and their significance in the plant world, Belgrade Manojlovic, S., Rajkovic Ž., Glintić M., Šestić S., (1969), Handbook for Systematic control of soil fertility and fertilizer, Belgrade

[5]. Oljača S. (2008), Agroecology edition, Faculty of Agriculture, Belgrade Popovic Z., (1989), Agrohemija, Scientific Book, Belgrade Sobczyk W, (2014), Sustainable development of rural areas Problemy ekorozwoju – Problems of sustainable development, vol. 9, no 1, 119-126

[6]. Stevanovic, B., Jankovic, M., (2001), Ecology of plants with the fundamentals of the physiological ecology of plants. NNK International, Belgrade, 514 pp

[7]. Stevovi S., (2010), Environmental impact on morphological and anatomical structure of Tansy, African Journal of Biotechnology, 9 (16), 2413-21

[8]. Stevovi S., And Calice-Dragosavac D., (2010), Environmental study of heavy metalsinfluence on soil and Tansy (Tanacetum vulgare L.), African Journal of Biotechnology 9 (16), 2392-400

[9]. Stevovic Svetlana, Mikovilović, Vesna Surcinski and Čalić-Dragosavac, baby, (2010), Environmental impact of site location on marco-and microelements in Tansy, African Journal of Biotechnology 9 (16), 2408-12

[10]. Stevovic, Svetlana, Mikovilović, Vesna Surcinski and Dragosavac, DC, (2009), Environmental adaptibility of tansy (Tanacetum vulgare L.,) 'African Journal of Biotechnology 8 (22)

[11]. Stevovic Svetlana, Dervnja, Nina and Čalić-Dragosavac, baby, (2013), Environmental impact quantification and correlation between site location and contents and structure of Tansy, African Journal of Biotechnology 10 (26), 5075-83

[12]. Stevović, Svetlana et al., (2011), Correlation Between Environment and Essential Oil Production in Medical Plants, Advances in Environmental Biology, 5 (2), 465-68

[13]. Špulerova, J., (2008), Succession changes in extensively used agricultural land Ekol. Bratislava 27 (1), 54-64