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ОЦЕНКА НА ПОЧВИТЕ В РАЙОНА НА ОБЩИНА СЪЕДИНЕНИЕ – ПЛОВДИВ ЗА ОТГЛЕЖДАНЕ НА ОРИЗ
ESTIMATE OF THE SOILS IN THE REGION OF SAEDINENIE – THE DISTRICT OF PLOVDIV FOR RICE GROWING

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Abstract

In connection with the cultivation of rice near Saedinenie – in the district of Plovdiv, soil samples were taken and analyzed. The results of the analyses showed that the soil is characterized as sandy loam in the upper horizons to slightly sandy clay by the particle size composition in the lower horizons. The humus content varied from 0.27 to 2.27%. The soil reaction (pH) was slightly to moderately acidic (from 5.48 to 6.07) along the profile. Carbonates were not established in depth of the soil profile.

Key words: soil, organic matter, pH, rice.

INTRODUCTION

Bulgarian rice production has centuries of tradition and has established itself as an economic and environmental necessity. Cultivation of rice in the current borders of Bulgaria dates back to the first raids of the Turks in the Balkans, in the second half of the XIV century. At first this crop encompasses the valleys of the rivers Maritsa and Tundzha and their tributaries, later along the river.

Due to a number of objective (climate, limited suitable soils) and subjective reasons in Bulgaria (continuous reorganizations, restructuring, changes in ownership, etc.), in the past two decades a decline and a subsequent recovery of the occupied areas is observed. In our country there are 204 000 Time da paddies, but until now has been restored using only 50% of them. Due to the exigency of the culture to temperature and water regimes the rice production is concentrated in South Bulgaria, particularly along the Maritsa, Stryama, Topolnitsa and other rivers beds around the cities of Plovdiv and Haskovo.

Rice irrigation fields are formed as a kind of ecological systems that support biological balance between plant and animal species. Thaт has a decisive effect on the supply of groundwater, cleaned in the most perfect biological filter. Moreover, they create conditions for maintaining high atmospheric moisture areas surrounding them, which increases productivity of the other crops, too.

The altitude, on which the irrigated rice fields are situated, in the area of Compound, corresponds with the altitude that rice is grown in Northern Italy and France. Average monthly amount of temperatures from May to September ensure the cultivation of early, mid-early and mid-late varieties that have high performance. The soils in irrigated rice fields are mostly alluvial, favorable for rice cultivation at comparatively economical use of irrigation water - about 2000 - 2400 m^3 per hectare.

In the Mediterranean region (including in Bulgaria) Turkish and Italian Varieties are successfully grown. The variety adaptive abilities in different regions, productive and qualitative parameters were analyzed. New genotypes that more successfully combine both productive and technological parameters are needed. The performance of these parameters, in different ecological regions and the reaction of genotypes, in specific agro-meteorological conditions, were evaluated.

In the conditions of intensive agriculture, the soil factors like humus horizon power, humus content, soil mechanical composition, texture coefficient, soil reaction (pH), groundwater level, etc. have the biggest influence. At the same time the anthropogenic factor affect on these soil properties with a number of agrotechnical practices that are connected with crop production. That leads to changes of the natural structure and properties of soils.

The aim of the current study is to evaluate the more important soil parameters and soil characteristics for rice growing in Saedinenie region to be indited.

MATERIALS AND METHODS

The experiment was conducted in the permanent rice cell in the area of the town of Saedinenie. The rice sell is with total area of 2.8 acres on schedule (Sheme 1).

For this purpose soil profile was made. Soil samples were prepared for analysis and research in the department of Agrochemistry Soil Science at the Agricultural University - Plovdiv. The following soil indicators that were analyzed are:

- Soil mechanical composition (content of physical clay - <0,01mm) with foto sediment graph of FRITISCH;
- Total amount of humus - by Turin's method;
- Soil reaction (pH) - Potentiometrically (in H_2O);
- Available potassium - in hydrochloric acid leachate of 2n HCL;
- Mobile phosphates - in dvoynolaktatniyat by Egner - Rheem's method;
- Mineral nitrogen (Ammonium + nitrate) - extraction with 1% KCL.

RESULTS AND DISCUSSION

In terms of climate, the region of Saedinenie town is characterized as typical for the Thracian valley. The climate is transcontinental climate. Some differences in precipitation in comparison with the neighbor regions were observed. In this region the lowest average year precipitation for South Bulgaria were recorded (495 l/m^2). In this sense, the very well pronounced spring and summer droughts, as well as the high temperatures determine the region like not suitable for other crops growing. According to the meteorological data, taken from the meteorological station in Ivailo village, the earliest snow was in the second half of November and the snow cover staid till the second half of March. The snow cover was very thin, and the snowing period lasted approximately 80 days. The thinnest snow cover was observed in the second decade of November and in the third decade of January. The first winter cold is recorded averagely close to the 27th of October, and the last - averagely close to the 9th of April. That is why the possibility of pretty long period without incisive winter colds is possible and makes the region suitable for cropping, including rice growing. Favorable conditions for sustainable and

Fig. 1

high yields of rice are: high temperature, warm and sunny weather without winds, heavy rain falls and colds. Especially important for optimal development of the rice crop are the daily average temperatures and the air humidity.

The relief of the municipality is mostly flat. The average altitude of the municipality is 200 m. Almost all populated places are cut across from rivers and gulls, that forms the terrains.

Under long-standing influence of soil forming factors - sediments, climate, vegetation and human activities in the municipality, the following soil differences are formed:

- Eutric vertisols, clay and heavy sandy-clay
- Chromic Cambisols
- Mollic Fluvisols, sandy-clay
- Koluvium, light sandy-clay

One part of these soils have transformed into so called rice soils or known also as Rizosols. At the continuing growing of rice at the same area, in the normally developed soil a number of changes occur. At the construction of the rice cells leveling of the territory is done. Those actions are destroying the natural structure of the soil profile. When flooding the rice field, on the soil surface a fine slime is often formed. The continuous maintenance of the rice plants under water is creating hydromorphic conditions in the soil profile – gleyic processes is observed, especially in the bottom part of the profile. That is expressed in grey spots of sesquioxides If the soil is lighter by soil mechanical composition the washing and acidification is streghtened. A hidromorphic humus formation is observed. During the period, when the water is drained, the oxidation processes are started – the divalent iron and manganese sources are oxidized and rusty and black spots occur. A periodic automorph and hydromoph transformation of conditions is found.

The trail was conducted on Mollic Fluvisols that take bigger part from the area of Fluvisols. They are situated very close to the river bed of Luda Yana River. It is typical for this soil that they have light sandy clay mechanical composition, high underwater level and good water-physical properties. The quantity of humus is below 2,5%, but with expressed capacity (from 50 to 100 cm). Mollic Fluvisols have light and moderate sandy clay content in the surface horizon.

On Table 1 are shown the data of physico-chemical properties of the rice cell, on which the experiment was situated.

Fig. 2

Table 1. Physical-chemical properties

№	Depth, cm	pH (H_2O)	Organic matter, %	Particle size composition, %	
				1 – 0,2 5 mm	< 0,01 mm
1	0-20	5,48	2,72	23,2	93
2	20-40	5,67	1,75	20,3	12
3	40-60	5,85	1,72	15,4	24
4	60-80	5,91	1,10	17,3	30
5	80-100	6,07	0,27	16,4	36

Table 2. Agrochemical properties

Съдържание на основни макроелементи				Запасеност	Критерии
	2013	2014	2015		
NH_4-mg/1000 g почва	6.16	7.10	7.23	Бедна	Под 40 mg/1000 g почва
NO_3-mg/1000 g почва	4.65	4.30	4.28		
Общ N – mg/1000 g почва	10.81	11.50	11.51		
P_2O_5 – mg / 100 g почва	10.40	11.20	10.45	Добре запасена	10-15mg/100 g почва
K_2O - mg/100 g почва	22.00	21.00	21.00	Добре запасена	над 20 mg/100 g почва

In the upper layer (up to 20 cm), the humus content was 2.72%, in the lower layers the content was rapidly decreasing. The soil reaction is relatively acidic in the upper layer - 5.48, while in 1m depth the reaction was 6.07. The upper layer was characterized with high percentage of physical clay – 93%.

The results from the analyses of the soil sample in 20 cm depth, for evaluating the content of available N, P_2O_5 and K_2O, that were taken before the sowing, from the terrain on which the sixth rice varieties were grown are shown on table 2. The total available nitrogen for the three experimental years varies from 10,81 to 11,51 mg/ 1000 g soil. These results determine the soil as nitrogen poor. ко. Regarding the content of available phosphorus and potassium, according to the criteria of the availability, the soil from the trail aria is with good reserve from the concrete elements.

CONCLUSIONS

From the performed soil research of the area of rice growing that is situated around the land of the town of Saedinenie, the following conclusions could be made:

1. The soils from the studied area have the typical features of the rice soils - class Rizosoli / Rizosols/ by FAO.

2. The soils are characterized with LSL (light sandy loam) to SL (sandy loam) mechanical structure in the lower horizons and HC (heavy clay) in the upper horizon of the soil profile - at the flooding of the rice field, on the soil surface, more often a fine slime is precipitated.

3. The lighter mechanical structure creates conditions of washing and acidification of the soils.

4. In the periodical changes of automorph with hydromorph conditions, a typical process for these conditions - gleyic processes expressed with showing of rusty and black spots from от sesquioxides was observed.

5. From the studied rice varieties grown under the soil-climatic conditions of the town of Saedinenie, the Turkish varieties - Otomanchick 97 and Gala had higher pace of development in comparison with the Italian varieties - Linche, Kameo, Buma and Brio.

In conclusion we can say, that the soil is a result of concrete geological and climatic preconditions defining the natural soil fertility, which is changing under the influence of anthropogenic activity and is transformed into an effective fertility, but one part of the soils are losing their natural structure and properties and are turned into anthropogenic soils.

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