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4.1.1. Общее земледелие и растениеводство (биологические науки, сельскохозяйственные науки)

ЭКОЛОГО-МЕЛИОРАТИВНОЕ СОСТОЯНИЕ ПОЧВ СУХИХ СТЕПЕЙ В УСЛОВИЯХ ОРОШЕНИЯ

Новиков Алексей Алексеевич
Доктор сельскохозяйственных наук, профессор
E-mail: al.al.novikov@gmail.com
ORCID: 0000-0001-9013-2629
SPIN-код: 6421-5833
Новочеркасский инженерно-мелиоративный институт имени А. К. Кортунова – филиал федерального государственного бюджетного образовательного учреждения высшего образования «Донской государственный аграрный университет» Россия, Ростовская область, Новочеркасск

В статье представлены результаты эколого-мелиоративных исследований по вопросам качественного состояния почв сухих степей Ростовской области при использовании различных способов орошения. Без орошения в метровом слое каштановых почв и их солонцовых комплексов по содержанию токсичных солей и хлор-иона почва относится к среднезасоленной, по сульфат-иону – слабозасоленной, в данном случае возможно осолонцевание, при этом почва является солонцом, количество водорастворимых солей составило около 62 т /га. Орошение дождеванием не изменило количество ионов, при этом содержание хлор-иона увеличилось практически в два раза, почва стала слабозасоленной. В 0-100 см слое почвы кислотность, сумма ионов и сульфат-иона остались прежними, осолонцевания профиля почвы не произошло. В условиях полива по полосам реакция почвенного раствора щелочная – pH=8,3, количество хлор-иона осталось неизменным, гидрокарбонат-иона уменьшилось практически в два раза, натрия – в три, при этом почва оставалась незасоленной, осолонцевание не наступало

Ключевые слова: ПЛОДОРОДИЕ, ОРОШЕНИЕ, СПОСОБЫ ОРОШЕНИЯ, ЗАСОЛЕНИЕ, СТЕПЕНЬ ЗАСОЛЕНИЯ, СОСТАВ СОЛЕЙ, ОСОЛОНЦЕВАНИЕ

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4.1.1. General agriculture and crop production (biological sciences, agricultural sciences)

ECOLOGICAL-MELIORATIVE STATE OF SOILS OF DRY STEPPES UNDER IRRIGATION CONDITIONS

Novikov Aleksey Alekseyevich
Doctor of Agricultural Sciences, Professor
E-mail: al.al.novikov@gmail.com
ORCID: 0000-0001-9013-2629 RSCI SPIN code: 6421-5833
Novocherkassk Engineering and Reclamation Institute named after A.K. Kortunov – a branch of the federal government budget Institution of Higher Education Don State Agrarian University» Russia, Rostov region, Novocherkassk

The article presents the results of environmental and reclamation studies on the qualitative state of soils in dry steppes of the Rostov region using various irrigation methods. Without irrigation in a meter layer of chestnut soils and their solonetzic complexes, according to the content of toxic salts and chlorine ion, the soil belongs to moderately saline, according to sulfate ion - weakly saline, in this case solonetzization is possible, while the soil is a solonetz, the amount of water-soluble salts was about 62 tons / ha. Sprinkler irrigation did not change the amount of ions, while the content of chlorine ion almost doubled, the soil became slightly saline. In the 0-100 cm soil layer, the acidity, the sum of ions and sulfate ions remained the same, and solonetzization of the soil profile did not occur. Under the conditions of irrigation in stripes, the reaction of the soil solution is alkaline - pH = 8.3, the amount of chlorine ion remained unchanged, bicarbonate ion decreased almost twice, sodium - three times, while the soil remained unsalted, salinization did not occur

Keywords: FERTILITY, IRRIGATION, IRRIGATION METHODS, SALTINATION, SALINITY DEGREE, SALT COMPOSITION, SALTANIZATION

Introduction. Currently, in the context of import substitution, there is a need to develop irrigation in arid conditions in arid and semi-desert zones of

Russia, while there is an urgent need and need for a qualitative assessment of such lands and not only their initial state, but also to have a reliable forecast for various stages of development and agricultural use. [1-4]. It is very important here to clarify and study the factors that do not contribute to or complicate the development of the irrigation system and determine the possibility of changing the qualitative state of irrigated lands.

Therefore, significant territories not only in the eastern and southeastern regions of the Rostov region, but also in other territories of the arid zone of the Russian Federation are of great importance for the development of both irrigated and non-irrigated agriculture, which in turn will contribute to ensuring the country's food security [4, 5].

Conditions and methods. The studies were carried out on chestnut and chestnut solonetsous soils in the southeast of the Rostov region, the density of which in a two-meter thickness ranges from 1.20 to 1.50 t/m2.

Experience scheme:

1. Sprinkler irrigation.

2. Irrigation by strips.

3. Non-irrigated area. Control.

Soil moisture varied from 11.35 to 20.20% of the dry soil mass.Groundwater at a depth of 1.40-4.09 m. The hydro chemical composition of irrigation water is bicarbonate sodium-calcium or sodium, the maximum mineralization is up to 0.9 g/l.

During the experiment, corn for green mass, alfalfa for green mass, and winter wheat were cultivated.

Results. Sprinkling did not change the amount of ions, the amount of chloride ion almost doubled, and the soil began to be slightly saline.

In the soil layer of 0-100 cm, indicators of the qualitative state of the soil, such as acidity, the amount of ions and sulfate ion, did not change, at the same time, the amount of bicarbonate ion decreased by 1.5 times, and chloride ion

increased by 2 times. Due to irrigation, salt reserves increased to 21 t/ha. Based on this, it can be noted that, according to the ratio of cations, solonetzization of the soil in this layer did not occur. In the soil layer of 0-200 cm, the content of toxic salts increased, the soil turned out to be in the category of slightly saline, in terms of the amount of chlorine ion - moderately saline, and solonetzization is possible in this soil layer.

In the variant of the experiment, when watering in strips in a meter horizon of the soil, the reaction of the soil solution was alkaline - pH = 8.3, the amount of chloride ion was unchanged, the amount of bicarbonate ion decreased almost two times, and sodium - three times. At the same time, the soil remained non-saline and solonetzization was absent here.

On the whole, according to the salt profile, the condition of the irrigated soil in strips in a meter layer was somewhat better than during sprinkling.

In the two-meter layer of soil, the ameliorative state, as well as in the one-meter layer, remained stable, the amount of toxic salts decreased. The pH value decreased from 8.50 to 8.26, the content of bicarbonate ion and chloride ion fell 1.5 times. In general, a significant desalination of the soil occurred in the two-meter layer.

In the variant of the field experiment without irrigation in the soil layer of 0-30 cm, the pH increased from 7.8 to 8.2, the total alkalinity is 0.35 mg-eq, which indicates alkalization of the arable layer.

The content of chlorine ion decreased from 0.33 to 0.22 meq, the sum of ions remained at the level of 0.085% of the mass of dry soil.

In the 0-100 cm layer, the active acidity index increased from 7.90 to 8.15, the content of chloride ion increased by more than 4 times, and sodium almost by five times.

The content of absorbed magnesium is 1.3% higher, absorbed sodium is almost six times higher than with strip irrigation. According to the sum of toxic salts and chloride ion, the soil was classified as moderately saline, and according

to sulfate ion, it was slightly saline. According to the ratio of cations, solonetzization of the soil is possible. According to the content of absorbed sodium, the soil is solonetz. Stocks of water-soluble salts have increased almost to 62 t/ha.

In a two-meter layer of a non-irrigated field, the pH increased from 7.90 to 8.14, the chlorine content more than doubled. According to the sum of toxic salts and chloride ion, the soil became highly saline, and according to the content of sulfate ion, it became moderately saline. The ratio of cations is 2.76, which indicates the possibility of solonetzization of the soil. All this indicates the need for immediate implementation of organizational, reclamation and agrotechnical measures to reduce the existing and prevent new salt accumulation in this layer.

The amount of toxic salts in the first meter of the profile in the sprinkling variant was 0.089%, in the two-meter profile it was 0.255% (Table 1). Therefore, in the 1-meter layer, the soil is non-saline, and in the 0-2-m layer, it has passed into the category of slightly saline.

According to the ratio of Ca^{2+}, Mg^{2+} and Na^{+} + K^{+} cations, the risk of solonetzization in a meter thick layer is excluded, but in a two-meter layer it is possible.

When irrigating in strips, the amount of toxic salts decreased from 0.051 to 0.038%, which eliminated the danger of soil solonetzization both in the 0-1 m layer and in the 0-2 m layer.

In the non-irrigated area, the amount of toxic salts in the first meter increased to 0.355%, and the soil changed from weakly saline to moderately saline, in the 0-2 m layer the soil changed from moderately saline to highly saline.

According to the ratio of calcium, magnesium and sodium in the layers of 0-1 and 0-2 m, solonetzization of the soil is possible.

Table 1 - Influence of the irrigation method on the degree of soil salinity in the layer 0-100 and 0-200 cm

Layer, cm	Σ toxic salts, %	Soil salinity			$\frac{Na^+ + K^+}{Ca^{2+}+Mg^{2+}}$	Grade danger osolon-kissing
		by the amount of toxic salts	according to the content of Cl^-	By content SO_4^{2+}		
Sprinkling						
0-100	0.089	non-saline	medium saline-naya	weakly saline-naya	0.385	no danger of salinity
0-200	0.255	weakly saline-naya	medium saline-naya	weakly saline-naya	1.380	maybe
Watering in stripes						
0-100	0.051	non-saline	non-saline	non-saline	0.150	no danger of salinity
0-200	0.038	non-saline	non-saline	non-saline	0.230	no danger of salinity
Non-irrigated area						
0-100	0.355	medium saline-naya	medium saline-naya	weakly saline-naya	1,790	maybe
0-200	0.513	highly saline	highly saline	medium saline-naya	2,760	maybe

Correlations between the sum of water extract ions and the content of individual ions showed that there is no linear relationship.

At the same time, due to the salt reserves in the 0-100 cm layer, a close correlation was established between the sum of ions and irrigation methods. This relationship is expressed by the following equations:

Udozhdev. = $0.01x^3$ - $3.478x^2$ + 6913 - 5E + 06 R = 0.659

Upbands = $0.023x^3$ - $142.5x^2$ + 28328x - 2E + 08 R = 0.964

Uneorosh. = $0.002x^3$ - $17.36x^2$ + 34474x - 2E + 07 R = 0.949

The presented assessment of correlations was made for the first meter of

the soil layer.

Conclusion. Thus, when irrigated by sprinkling, the soil became slightly saline; according to the ratio of cations, solonetzization did not occur in the 0-100 cm layer.

When irrigating in strips over the entire soil profile in the 0-200 cm layer, a significant desalination of the soil occurred, solonetzization was excluded.

In the non-irrigated area, the soil is slightly saline in terms of the amount of toxic salts, solonetzization is possible in terms of the ratio of cations, and the soil is solonetz in terms of the content of absorbed sodium.

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