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Study of the Salt Regime of the Soil under Various Irrigation Regimes

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ABSTRACT

To obtain a high yield of cotton, it has a huge influence irrigation regime. To study the influence of the irrigation regime on the salt regime of the soil, we conducted observations on two experimental plots. Excessive content of readily soluble salts in soils leads to a decrease in the productivity of agricultural crops, in particular cotton.

KEYWORDS: *readily soluble salts, irrigation regime, water regime, ground water, soil, salt regime, mineralization*

In the soil and climatic conditions of the Karshi steppe, obtaining high yields of fine-fiber cotton with high technological fiber quality is closely related to the salt regime of the soil, since the excess content of readily soluble salts in soils leads to a decrease in the yield of agricultural crops, in particular cotton. This is due not only to the toxic effect of salts, but also to an increase in the concentration of the soil solution, accompanied by an increase in its osmotic pressure. As a result, the suction power of root hairs decreases, they cannot use the necessary water from the soil, which causes a deterioration in the water regime of plants, and in some cases their complete death.

To characterize the soils of the experimental plots by the degree of salinity, the initial content of salts was studied (Table 1). Analyzing the data obtained, we see that the soil of section I, due to the heavier texture and close (1.5-2.0 m) occurrence of mineralized (6-10 g / l of dense residue) groundwater, is comparatively more saline than that of section 2. section I in the upper meter layer contained 0.496% solid residue and 0.0048% chlorine - ion. There were even more salts in the soil layer underlain below the meter layer: up to 0.725% dry residue and 0.063% chlorine-ion.

Table 1 The initial content of water-soluble salts in the soils of the experimental plots

Layer, cm	Denseresidue	Totalalkalinity	Chlorine - ion	Residueofsulfuricacid
Plot 1				
0-20	0,654	0,037	0,028	0,378
20-40	0,876	0,032	0,053	0,513
40-60	0,470	0,038	0,046	0,143
60-80	0,473	0,039	0,057	0,237
80-100	0,477	0,038	0,048	0,260
100-200	0,952	0,040	0,045	0,252
120-140	0,830	0,020	0,072	0,490
140-160	0,817	0,030	0,072	0,481
160-180	0,680	0,020	0,060	0,380
180-200	0,617	0,036	0,043	0,344
0-60	0,666	0,035	0,043	0,344
60-100	0,375	0,038	0,052	0,248
0-100	0,496	0,037	0,048	0,296
100-200	0,725	0,025	0,063	0,402
0-200	0,610	0,031	0,054	0,349
Plot 2				
0-20	0,120	0,034	0,012	0,056
20-40	0,108	0,037	0,018	0,039
40-60	0,122	0,029	0,033	0,034
60-80	0,140	0,029	0,033	0,042
80-100	0,116	0,032	0,014	0,048
100-120	0,460	0,026	0,021	0,275
120-140	0,656	0,017	0,023	0,427
140-160	0,600	0,018	0,025	0,305
160-180	0,448	0,018	0,033	0,261
180-200	0,338	0,020	0,018	0,207
200-220	0,260	0,025	0,033	0,130
220-240	0,128	0,024	0,014	0,056
240-260	0,124	0,025	0,012	0,063
260-280	0,118	0,024	0,009	0,057
280-300	0,126	0,024	0,011	0,063

0-60	0,140	0,033	0,021	0,043
60-100	0,129	0,030	0,023	0,045
0-100	0,121	0,032	0,025	0,043
100-200	0,500	0,019	0,024	0,295
200-300	0,171	0,023	0,015	0,073
0-200	0,315	0,026	0,024	0,169

Salt accumulation in the soil of section 2 looks different, here in the upper 0-100 and lower 200-300 cm layers of the soil, a small salt content is observed - respectively 0.121 and 0.171% of a dense residue and 0.025% and 0.015% of chlorine - ion. In the middle part of the aeration zone in the 100-200 cm layer, relatively more salt accumulation is noted, the total amount of salts increases to 0.5%. Consequently, according to the initial content of salts, the soil of plot I is subject to weak salinity. On site 2, the upper 0-100 cm and lower 200-300 cm layers are practically not saline, its middle part (100-200 cm) is slightly saline. The soils of the experimental plots are of the chloride-sulfate type of salinization. The salts are dominated by sulfates, the supply of which is more than half of the dry residue. The sulfate anions in the soil of site 2 exceeded 4.8–8.1 times, and of site 2–1, 8–5.0 times. Since the soil in plot I is slightly saline, in plot 2 it is prone to salinization in a deeper (100-200 cm) layer, when favorable conditions are created, water-soluble salts can easily move to the upper soil layers and cause danger to the normal growth and development of cotton.

The results of our three-year studies have shown that various irrigation regimes for fine-fiber cotton played a certain role in changing the salt regime of the soils of the experimental plots.

Experiments carried out on a site with a groundwater level of 1.5-2.0 m showed that under the influence of irrigation regimes, a sensitive change in the salt regime of soil occurs. So, in the experiment of 1988, with the mode of pre-irrigation soil moisture 70-70-65% HB (option 2), the content of dense residue in the 0-60 cm layer from spring to autumn decreased from 1.153 to 1.121% in 60-100 cm from 1.105 up to 1.046% and in the layer 100-200 cm it increased from 1.019 to 1.240%. However, the amount of chlorine ion at the end of the growing season in the 0-60 cm layer increases from 0.027 to 0.096%, in the 0-100 cm layer, from 0.028 to 0.075, in the 100-200 cm layer from 0.029 to 0.062%.

In variant I, where the regime of pre-irrigation soil moisture is 60-70-65% HB, the salt content in the soil increases significantly from spring to autumn. The same picture is observed in variants 3-4. So, if at the beginning of the growing season in the 0-60 cm layer there was 1.153% of a dense residue, by autumn it was found in option 3-1.270 and in option 4-1.261%. However, in deeper soil layers (100-200 cm), the salt content is lower (1.227-1.262% :) than in option I (1.328%). Comparative analysis of the obtained data showed that the most favorable soil reclamation regime is observed in variants 2-3, where the regime of pre-irrigation soil moisture is 70-70-65 and 70-75-65% HB.

The data on the salt regime of the soil in the area with deep groundwater, where the upper 0-100 cm layer is practically not saline, are given in table 4,5,3. under such conditions, as shown by three-year data, the salt content in the 0-100 cm layer both in terms of dry residue and chlorine-ion does not change significantly from spring to autumn under various irrigation regimes, it is maintained in a stable position. A more noticeable change in the salt regime occurs in the 100-200 cm layer, where the soil is relatively more saline than in the previous layer. Here, in all the years of research under all soil moisture regimes, the movement of salts into the lower layers, i.e. water-soluble salts are washed out.

In 1986, the amount of solid residue with an initial content of 0.588% by autumn according to various variants of the experiment decreased to 0.229-0.539%, in 1987 from 0.600 to 0.231-0.408%, in 1988 - from 0.588 to 0.209-0.432%. If we consider the change in salts in the context of various irrigation regimes, then it can be noted that options with pre-irrigation moisture 70-75-65 and 75-75-65% HB turned out to be more effective in desalinating a layer of 100-200 cm. Desalination proceeds worse at a humidity mode of 60-70-65 HB. Var. 2, where the cotton was watered with a moisture content of 70-70-65% HB, occupied an intermediate position.

The decaying effect of preventive watering must be strengthened by carefully conducted vegetative watering. On our experimental plots, early spring preventive watering was carried out annually closer to the sowing of cotton, at rates of 1200-1500 m3 / ha. If we take into account that in the area with deep groundwater, the soil is complex, with the exception of the arable layer, of light loam, has a loose constitution, facilitating from top to bottom and has good water permeability, then with such rates of preventive irrigation, it is quite possible to achieve desalinization of the soil to a depth of 2 m. Naturally, this was also facilitated by vegetative irrigation, carried out by norms for the deficit of the calculated layer in combination with high-quality inter-row cultivation, timely feeding of plants, weed control and other types of agro technical measures.

Thus, from the foregoing, it follows that on the irrigated lands of the Karshi steppe, subject to low salinity, during the cultivation of cotton, pre-sowing reserve preventive irrigation with rates of 1200-1500 m3 / ha should be used annually as a mandatory agro technical method. The effect in soil desalinization achieved by these irrigations must be consolidated by using optimal irrigation regimes for fine-fiber cotton during its growing season in combination with other agro technical measures carried out using intensive technology. With the introduction of such interrelated agro-reclamation measures, a prerequisite is created for the maximum prevention of the process of movement of water-soluble salts from the lower, more saline layers to the upper ones. Thanks to this, farmers will be able to ensure the maintenance of the upper soil layers in the most favorable ameliorative state during the entire growing season.

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