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**THE TECHNOLOGY OF IRRIGATION OF ALFALFA  
BY DRAINAGE-WASTE WATERS IN KYZYLORDA REGION**

**Abstract.** The article presents data of the technology of irrigation alfalfa by drainage-waste waters taking into account the mineralization. It is shown that the yield of alfalfa depends on the mineralization of irrigation water: the increasing mineralisation of irrigation water leads to decrease in the yield of alfalfa. The irrigation by drainage-waste waters with mineralization of 3.0 g/l is the critical dose for plants.

**Key words:** alfalfa, irrigation, drainage-waste waters, mineralisation.

**Introduction.** Alfalfa is the leading fodder crops on irrigated lands of the Kyzylorda region. Alfalfa occupies an important role in formation of the Southern Kazakhstan food base. Alfalfa under optimal irrigation has the yields of hay high-protein, improves soil fertility, and is a good precursor for rice cultivation. In addition, having a powerful root system, the alfalfa improves the agrotechnical properties of the soil, increases the filtration properties of the aeration zone, and improves the meliorative conditions of the irrigated land.

**Material and methods**

Object of research: alfalfa.

Alfalfa was grown in vegetation and field conditions. In field on the experimental sites of the water irrigation was as follows: on the 1st - the dense residue was 1.205 to 1.334 g/l, chlorine from 0.120 to 0.14 g/l; on the 2d - the dense residue was from 2.180 up to 2.489 g/l, chlorine from 0.280 to 0.320 g/l, on the 3d - the dense residue was from 2.602 to 2.737 g/l and chlorine from 0.320 to 0.680 g/l, on the 4th - the dense residue from 2.844 up to 2.930 g/l and chlorine from 0.660 to 1.100 g/l.

In the vegetation vessels' the water mineralization varied from 1.119 to 5.748 g/l. The necessary mineralization of irrigation water was obtained by mixing the drainage and waste water from the reservoir ZKK-6 with irrigation water. The mineralization of water in the reservoir ZKK-6 varied within the range of 4.692-6.623 g/l, chloride-sulfate type of salinity.

All experimental data is statistically processed by conventional methods, using "Microsoft Excel" computer program.

**Results and discussion**

The water is rich with ions of sulfate, chlorine and sodium. Large amounts of sodium ion in drainage-waste water is explained by the fact that all sodium salts associated with calcium are easily dissolved and washed out of the soil and enter a collector-discharge network. Sodium salts adversely affect the physiology of alfalfa. Chlorine ions are easily soluble in water and harmful to plants. The amount of chlorine ion in the drainage-waste water varies at a significant range from 0.284 to 1.100 g/l.

Experiments demonstrate that water quality is improved by higher concentration of calcium and magnesium ions. Their presence causes colloid coagulation of the soil, which improves the water permeability and water resistance of aggregates that affect the air, water, and heat and nutrient regimes of the soil. The calcium and magnesium ions in the drainage-waste waters during the irrigation period vary 0.100-0.490 g/l.

The irrigation water qualitative composition shows that when mineralization is below 2.5 g/l, the harmless calcium sulfate and calcium bicarbonate salts compose 25 -35%, the toxic salts of sodium sulfate, magnesium sulfate, magnesium chloride and sodium chloride compose 60-70% of the volume. The water quality is deemed satisfactory with such salt ratio. The increase of irrigation water mineralization to more than 3.0 g/l, its quality deteriorates sharply. The content of toxic salts reaches 80 ... 95%, including sodium salts - up to 60-70% of the volume.

On the experimental plots, the pre-damp humidity threshold is maintained at 75% of the lowest moisture capacity. The timing of irrigation and the magnitude of the irrigation rate are indicated in Table 1

Table 1 – Alfalfa irrigation regime on experimental plots

Date of watering	Norma of watering, m <sup>3</sup> /h	Inter-irrigation period, day	Irrigation norm, m <sup>3</sup> /h
1.05.	800	24	5400
24.05.	800	20	5400
13.06.	900	20	5400
3.07.	1000	20	5400
23.07.	1000	25	5400
17.08.	900	25	5400

It is shown that the alfalfa life cycle is divided into several stages and periods. In field the period before the first cutting was 53-57 days, and the second and third – 40-49 days. In the second year of alfalfa life cycle during the spring and summer growing season was produced 4 mowing.

Table 2 – Alfalfa yield on experimental plots

Mineralization of irrigation drainage-waste waters, g/l	Vegetative of plants	Yield, c/ha				Total of yield, c/ha
		1-st mowing	2-d mowing	3-d mowing	4-th mowing	
Field						
1.0-1,1	hay	33,2	23,3	21,7	9,5	87,7
	green mass	136,0	79,7	78,7	48,6	342,4
2.0-2,2	hay	28,7	20,6	14,9	4,8	69,0
	green mass	112,3	72,7	58,4	28,7	305,1
3,0-3,2	hay	14,3	9,4	7,8	3,8	45,3
	green mass	60,8	39,7	28,4	19,6	148,5
4,0-4,2	hay	23,6	17,8	12,2	4,7	58,3
	green mass	102,7	69,5	43,2	27,3	247,7
5,0-5,7	hay	Died				
	green mass					
Vegetation						
1.0-1,1	hay	31,6	22,7	22,1	9,8	86,2
	green mass	109,4	75,9	78,4	47,4	321,1
2.0-2,2	hay	22,4	18,4	12,8	3,7	59,3
	green mass	100,1	69,4	59,3	26,2	265,0
3,0-3,2	hay	11,7	9,6	7,8	2,8	31,9
	green mass	66,8	54,2	48,6	21,4	181,0
4,0-4,2	hay	8,4	6,7	5,2	1,2	21,5
	green mass	48,2	35,6	30,4	10,2	124,2
5,0-5,7	hay	Died				
	green mass					

Analysis of growing crop alfalfa third year showed that the plants develop normally at salinity irrigation water not exceeding 3 g/l.

Analysis of the alfalfa harvest in the third year of life shows that plants develop normally when the irrigation drainage-waste waters mineralization does not exceed 3 g/l. On the first plot of mineralisation of irrigation drainage-waste waters (1,0-1,1 g/l) in total of four mowing was obtained 87.7 c/ha of hay and 342.4 c/ha of green mass. On the second plot of mineralization of irrigation drainage-waste waters (2,0-2,5 g/l) was obtained 69.0 c/ha of hay and 305.1 c/ha of green mass. The minimum yield of hay was obtained on the 2nd and 3rd plots. Increase of mineralization of irrigation drainage-waste waters decrease the yield of alfalfa (Table 2).

The same result was obtained in the vegetation experiments. The maximum yield was obtained in the 1st vessel of mineralization of irrigation drainage-waste waters(1,0-1,1 g/l) 86,2 c/ha of hay and 321.1 c/ha of green mass and in the 2nd vessel of mineralization of irrigation drainage-waste waters (2,0-2,2 g/l) 59,3 c/ha of hay and 265,0 c/ha of green mass. Increase of the drainage-waste waters mineralization from 3 g/l to 4,2 g/l decreased the yield of plants to 21,5 c/ha of hay and 124,2 c/ha of green mass. May be that of the drainage-waste waters mineralization of above 3.0 g/l for alfalfa irrigation was critical? When the drainage-waste waters mineralization of above 5,0-5,7 g/l plants was died in field and vegetation experiments.

**Conclusion.** Alfalfa is a known culture of agriculture. Alfalfa is considered an ideal food for cattle, because it has an excellent absorption and high content of protein and increases the filtration properties of the aeration zone, and improves the meliorative conditions of the irrigated land. It is very actual problem for the Southern Kazakhstan. One of the important problems is the determination of the watering norm by drainage-waste waters. Our results showed that irrigation by drainage-waste waters with mineralization of 3.0 g/l is the critical dose for plants. The optimal norm for irrigation by drainage-waste waters for alfalfa was the drainage-waste waters with mineralization of 1-2,2 g/l.

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### **ТЕХНОЛОГИЯ ПОЛИВА ЛЮЦЕРНЫ ДРЕНАЖНО-СБРОСНЫМИ ВОДАМИ В КЫЗЫЛОРДИНСКОЙ ОБЛАСТИ**

**Аннотация.** В статье представлены данные о технологии орошения люцерны дренажно-сточными водами с учетом минерализации. Показано, что урожайность люцерны зависит от минерализации оросительной воды: повышение минерализации в оросительной воде приводит к снижению продуктивности люцерны. Орошение дренажно-сточной водой с минерализацией 3,0 г/л является критической дозой для растений.

**Ключевые слова:** люцерна, орошение, дренажно-сточные воды, минерализация.

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### **ҚЫЗЫЛОРДА ОБЛЫСЫНДА ЖОҢЫШҚАНЫ ДРЕНАЖДЫ-ҚАШЫРТҚЫ СУ АРҚЫЛЫ СУАРУ ТЕХНОЛОГИЯСЫ**

**Аннотация.** Мақалада минерализацияны ескере отырып жоңышқаны дренажды-қашыртқы су арқылы суару технологиясының мәліметтері келтірілген. Жоңышқаның өнімділігі суармалы судың минерализациясынан тәуелділігі көрсетілген: суармалы судағы минерализацияның жоғарылауы өнімділіктің төмендеуіне әкеледі. Өсімдікті минерализациясы 3,0 г/л дренажды-қашыртқы су арқылы суару критикалық (сындарлы) мөлшерлеме болып табылады.

**Түйін сөздер:** жоңышқа, суару, дренажды-қашыртқы су, минералдану.