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WATER-SOIL REGIME OF THE AMELIORATED SOILS AND THEIR IMPACT ON PRODUCTIVITY OF THE AGRICULTURAL PLANTS (IN THE EXPERIMENTAL AREA)

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The article deals with the information about the complex agromeliorative measures with the purpose of Learning the Water-salt regime on the basis of the balance observations, determining their influence on productivity of the agricultural plants and rising the soils fertility. It was determined that desaltation process was weak, but productivity reduced 25-30 % depending on salt quantity.

Key words: salt quantity, ground water, granulometric composition, water saline regime, producing.

INTRODUCTION

We know that the Mil plain is one of the regions which is busy with the ancient irrigation agriculture in Azerbaijan. The Last researches show that some ecological changes happened as a result of the antropogen and natural processes in this zone. The new relations creation in soils utilization, use of the private and farmer economies from soils, disturbing of the crop rotation, incorrect using from the cultivation technologies caused salinization of the soils definite part and solonetzification in the same zones.

The researches show that in satisfactory work of the collector drainage systems and irrigation canals which activate in these zones caused being of the subsoil waters level above (h=1,75-2,00 m) permissible depth, increasing of mineralization and salts quantity in the soil [1-4]. Regulation of the water-salt regime in the soils of Mil plain and an application of the complex measures system were a reason for increase soils fertility and getting of high productivity, and this was urgent and assumed a great importance.

The zone relief mainly consists of plains. Its general inclination is in the south-east direction of the plain and it is weakly felt. An impact of the Araz river in formation of the modern relief is clearly noticed. The microhollows, macrohollows and drainless are found in zome parts of the zone. The soilforming rocks mainly consist of alluvial rocks that are formed in consequence of the Araz river activity. A climate of the described zone belongs to arid, mild hot summer, semidesert mild and arid steppe climatic type. This climate type is charakterized by the least and weak humidity, dry hot summer and mild winter.

The plant cover in the zone is divided into the zone is divided into the following groups by G.Sh.Mammadov [2]; halophyte, xerophyte, ephemer and hydrophil plants. The carried out long researches show that the following soil types and subtupes spread in the zone: meadow-grey-meadow, meadow-boggy, salinized and solonetzificated and etc [2-4]. The upper layer of these soils is grayish, but yellow, towards depth. Dark-grey and grey colors are found in some places. Presence of this process, humus minority in soil, but yellowish on the deep layers are movement of subsoil waters towards upper layers along the soil porosities [5, 6].

OBJECTS AND METHODS

A research object is irrigative grey meadov soils belonging to the farmer economy which is in the Chahar village of Imishli. An experimental area surrounds 2,5 hectares of the zone. The characteristic places have been selected for the purpose of investigation of the salt quantity and subsoil waters mineralization, their placement level, the soil and water samples have been taken. The chemical analyses

which are required under the laboratorial condition were performed by generally accepted methods [7].

RESULTS DISCUSSIONS

The researches were carried out under grain plant in the selected experimental area. Some main indices were fixed in the same area for investigation of the changes occurred in the soil. The characteristic places were selected in the experimental area, a quantity and supply of salts on 0-200 cm horizons were determined by performing the soil researches on a scale of 1:2000. The water samples were taken from drain, canal which is used in irrigation of the experiment area, sections where the subsoil waters are observed, the intended chemical analyses were realized.

The analysis results show that the salt quantity in the soil of the experimental area is different along the profile, i.e. the soils change from weak desallation gradation till the soils salinized to an average degree by 0,239-0,791 %. While learning the changes happened in soil, firstly their some main parameters must be fixed (granulometric structure, salts quantity, pH, CO_2, $CaCO_3$, hydroscopic humidity, humus, absorbed bases and etc). As is seen from the table that a quantity of the particles less than 0,01 mm is 41,70-70,72 % along profile, their increase is observed on middle and low layers. Hygroscopic humidity was 4,2-6,4 %, CO_2 7,52-8,61 %, $CaCO_3$-13,68-19,23 %. A sum of the absorbed bases was 9,20-28,45 mg-ekv., a quantity of Na which is from absorbed bases was 7,45-9,73 %.

If we take into account that a quantity of total nitrogen is 0,14-0,04 %, humus number is 2,81-0,49 %, then the soils in the experiment area are provided with the nutrient weakly. If we take a quantity of Na from a sum of absorbed bases into consideration the soils are solonchak. It is known that placement of subsoil waters in the Mil plain is near the surface (0,5-1,5 m), but mineralization is higher some more times than permissible limit.

A chemical composition of subsoil waters in the experiment area was fixed in 2014-2016. Subsoil waters mineralization is various in the research zone, their number was 2,420-3,200 g/l in 2014; 2,662-3,107 g/l in 2015; 2,245-2,890 g/l in 2016. Generally, it was known from the researches that the subsoil mineralization decreased in comparison with the previous years (2012 year 3,85-4,05 g/l) because of using the soils in the experimental area under salt resistant grain plant for 3 years.

During the research the samples from irrigative waters in the experimental area were taken with the purpose of learning a change of the salts quantity and chemical analyses were performed. Mineralization of the irrigative waters changes by 0,640-0,690 g/l at a period of the research. They are less than 1,00 g/l for irrigation and that's why they aren't dangerous in plants irrigation.

As is known that an investigation of other elements which enter the water regime in the research areas, irrigative waters, atmospheric precipitations, evaporation, the waters enter. The area by drainage and the salts quantity removed from the same zone and prognostication of them are one of the main problems.

Firstly, some parameters were determined below: - an average index of the salt quantity was fixed at a research period and a quantity of irrigative waters in order to define their number entering the experimental area by irrigative waters. Knowing a quantity of the applying irrigative water- 3300-3450 m^3/h, we can calculate the salts quantity by the following formula [8]:

$$S_{water} = VxS_m \quad (1)$$

Here, S_{WATER}- salt quantity entered by irrigative waters, t/h;

V- a quantity of irrigative waters, m^2/h

S_m - mineralisation of irrigative waters.

According to the abovementioned formula the salt quantity entered the experimental area by the irrigative waters can be fixed for 2014-2016.

$$2014: S_{water} = V.\ S_m = 3300 m^3/h \times 0{,}640\ g/l = 2{,}11\ t/$$
$$2015: S_{water} = V.\ S_m = 3350\ m^3/h.0{,}690\ g/l = 2{,}31\ t/h$$
$$2016: S_{water} = V.S_m = 3450\ m^3/h\ .\ 0{,}586\ q/l = 2{,}02\ t/ha$$

The consequences show that 2,11 t/h; 2,31 t/h and 2,21 t/h of salt enters the experimental area by the irrigative waters at a research period.

While fixing the salt quantity removed by the drainage waters, the average values of the drainage flow and mineralization were used. The analysis results show that the drainage flow values in the experiment area changed by 1920,8-1910,5 m^3/h, their mineralization changed 5,79-6,45 g/l. taking all these parameters into account the salts quantity which is removed from the experimental area by drainage was calculated by the following formula:

$$S_d = D \times S_{dm} \qquad (2)$$

Here **S_d-** a quantity of salts removed by drainage, t/h;

D- a quantity of drainage flow, m^3/h

S_{dm}- mineralization of the drainage waters, g/l

A quantity of the salts removed from the experiment area by drainage in

$$2014: \quad S_d = D.\ S_{dm} = 1920{,}8\ m^3/h\ .\ 5{,}79\ g/l = 11{,}12\ t/h$$
$$2015: \quad S_d = D.\ S_{dm} = 1917\ m^3/h\ .\ 6{,}10\ g/l = 11{,}69\ t/h$$
$$2016: \quad S_d = D.\ S_{dm} = 1910{,}5\ m^3/h\ .\ 6{,}45\ g/l = 12{,}32 t/h$$

So, a quantity of the salts removed from the experimental area by drainage was 11,12 t/h in 2014; 11,69 t/h in 2015; 12,32 t/ha in 2016. The research results show that the salts quantity removed by drainage is more than the salt number entered by the irrigative waters.

It is important to evaluate the salt supply in complex meliorative measures against secondary salinization and to keep the salts quantity in optimal level in the soil.

A value of the salts supply at 0-100 and 100-200 cm layers were calculated by the following formula according to the average values of the salts quantity in the taken samples over the soil sections in the soil area:

$$S = C_o h d \qquad (3)$$

Here S-salt supply, t/h, C_o-a salt quantity, %, d-bulky weight, g/cm^3, h-density of layer, cm. The average values of the bulky weight on the shown layers are 0-100 cm in 2014-2016; 100-200 cm-1,38 and 1,42 g/cm^3 on the initial layer in the experimental area. In the research years an average value of salts is 0,484-0,516-0,500 % in 2014; 0,447-0,495-0,476 % in 2015; 0,435-0,482-0,459 % in 2016.

A quantity of the salt supply on 0-200 cm layer of soil was calculated and their quantity was 140,14 t/ha in 2014; 133,36 t/ha and 128,47 t/ha in 2015 and 2016. As is show, decrease of the salts quantity in the research zone was observed at the end of the research.

As a result of carried out agromeliorative measures (cleaning of the irrigative canals and drain, provision of floating of the surplus waters into drain, using of the areas under plants, change of the plant places, application of fertilizers and etc) weak desaltation process occurs along profile [9].

Table 1 – Change of some parameters of the soils in the experimental area (2016)

Number of the sections	Depths, cm	Absorbed bases, mg-ekv			Sum of the abcorbed bases, mg-ekv	From a sum of absorbed bases, %			Humus, %	pH	CO_2, %	$CaCO_3$	Hygroscopic humidity, %	Total nitrogen %	Quantity of physical clay (<0,01 mm) %	Quantity of salts, %
		Ca	Mg	Na		Ca	Mg	Na								
K-2	0-20	15,50	8,00	2,20	25,70	60,31	31,13	8,56	2,68	8,40	7,52	17,09	5,7	0,11	58,90	0,282
	20-40	17,50	8,25	2,70	28,45	61,51	28,99	9,15	2,41	8,50	7,71	17,52	5,4	0,10	55,92	0,356
	40-60	17,75	7,63	2,50	27,88	63,67	27,37	8,96	1,85	8,46	8,08	18,37	4,9	0,08	63,80	0,381
	60-80	17,50	6,63	2,60	26,73	65,47	24,80	9,73	1,37	8,61	8,27	18,80	5,1	0,06	50,60	0,292
	80-100	13,13	6,37	2,00	21,50	61,07	29,63	9,30	0,58	8,53	7,89	17,94	5,3	0,05	52,64	0,250
	100-150	-----	-----	-----	-----	----	----	----	0,17	8,75	7,97	18,24	5,5	0,01	53,52	0,268
K- 3	0-20	11,87	7,38	1,50	20,75	57,21	35,57	7,22	2,81	7.60	6,02	13,68	4,7	0,14	64,24	0,682
	20-40	12,25	6,37	1,60	20,22	60,58	31,50	7,92	2,15	7.70	6,77	15,38	4,4	0,12	68,60	0,791
	40-60	11,12	7,63	1,70	20,45	54,38	37,31	8,31	1,78	7.80	7,71	17,52	4,2	0,09	57,22	0,669
	60-80	14,75	8,88	1,80	25,43	58,00	34,92	7,08	1,15	7.52	8,08	18,37	4,3	0,07	70,72	0,580
	80-100	13,87	6,00	1,60	21,47	64,60	27,95	7,45	0,85	7,65	7,52	17,09	4,5	0,05	68,58	0,790
	100-150	------	---	----	-----	------	-----	-----	0,21	7,80	7,77	17,35	4,4	0,02	65,40	0,775
K-6	0-20	6,25	2,25	0,70	9,20	67,93	24,46	7,61	2,57	8,10	8,27	18,80	6,3	0,10	48,40	0,262
	20-40	6,13	2,87	0,90	9,90	61,92	28,99	9,09	2,15	8,45	8,08	18,37	6,1	0,10	44,56	0,243
	40-60	9,38	3,62	1,20	14,20	66,06	25,49	8,45	1,73	8,31	8,46	19,23	6,4	0,08	43,98	0,239
	60-80	14,13	6,87	1,70	22,70	62,25	30,26	7,49	1,14	8,15	8,08	18,37	6,3	0,06	41,70	0,260
	80-100	13,50	6,75	1,80	22,05	61,22	30,61	8,17	0,49	8,20	8,27	18,80	6,4	0,04	42,58	0,256
	100-150	------	----	----	---	----	-----	------	0,18	8,50	8,39	18,96	6,6	0,02	42,34	0,252

An influence of the salt regime and irrigation regime on plants productivity in the soil was studied and it was determined that the productivity decreased 10-15 % in the places where the salt quantity rises and irrigation regime wasn't fulfilled. To learn a change of the grain and cotton plant productivity depending on salt quantity in the research area an academician G.Sh. Mammadov's formula was used (Table 2).

Table 2 – Productivity change depending on the salt quantity

A name of Plant	Productivity	Salt quantity, %				
		<0,25	0,25-0,50	0,50-1,00	1,00-2,00	2,00-3,00
Grain	Productivity, c/h	26,30	24,40	18,61	11,11	5,10
	Product loss, c/h	-----	1,90	7,69	15,20	21,20
	Product loss, by %	-----	7,22	29,24	57,79	80,61

As is seen from the table the grain productivity reduces while a quantity of salts in the soil of the experimental area rises. While the grain productivity is 24,40 c/h (product loss is 7,22 %) in the weakly salinized soils i.e. the salt quantity is 0,25-0,50 %, their quantity is 0,50-1,00 % in the areas where the productivity is 18,61 (product loss is 29,24 %). According to the results, being of the production 57,79-80,61 % in the strong and very strong soils for the salts quantity shows that performing the agrome-liorative measures system in the same areas was to be organized for the purpose of decreasing the salt quantity till the salinization degrees of the weak and average degree.

CONCLUSION

The researches show that the salts quantity in the soil of the experimental area in Mil plain was 0,239-0,791 %; subsoil waters mineralization was 2,42-3,20 g/l; pH-7,52-8,61; humus quantity was 2,81-0,49 %; SAB-9,20-28,45 mg-ekv; Na-quantity from SAB- 7,45-9,73 %; but a quantity of physical clay-41,70-70,72 %; $CaCO_3$-13,68-19,23 %; CO_2-7,52-8,61 %; hygroscopic humidity-4,2-6,4 %; Na quantity 0,14-0,04 %.

It was determined that the salt supply was 69,66 t/h 0-200 cm-layer in the research zone; the salts entered by the irrigative waters -2,11 t/h; 2,31 t/h and 2,02 t/h; but a quantity of salts removed by drainage was accordingly 11,12 t/h; 11,69 and 12,32 t/h. the researches show that the productivity is as the following depending on salts quantity: 26,30 c/h in the desaltation areas, 24,40 c/h in the weak salinized soils, 18,61 c/h in the average salinized places and 11,11 c/h in the stroung salinized areas and 5,10 c/h in the strong salinized areas and 5,10 c/h in the strong salinized places.

We notice that the soils are salinized to weak and average degree (the areas are observed to be salinized areas to a strong degree in a spot form) and weak solonchak and an application of the following measures system is offered: deep ploughing of the same areas, applying of the organic and mineral fertilizers under tillage while performing winter supplementary irrigation, small meliorative measures in the middle salinized and weak solonetzificated area-loosening, temporary drain and weighing of the water collectors, applying of irrigative waters corresponding to the plants need and gypsum with 2,5 t/h norm.

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ТҮЙІН

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МИЛЬ ДАЛАСЫНЫҢ МЕЛИОРАЦИЯЛАНҒАН ТОПЫРАҒЫНЫҢ СУ ЖӘНЕ ТҰЗ РЕЖИМДЕРІНІҢ АУЫЛШАРУАШЫЛЫҒЫ ДАҚЫЛДАРЫНЫҢ ӨНІМДІЛІГІНЕ ӘСЕРІ (КІЛТТІ АУМАҚТА)

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Мақалада топырақтың құнарлығын арттыру үшін жасалған агромелиоративтік шараларды жүргізу және оларды өсімдіктің өнімділігіне әсерінің теңгерімін бақылау негізінде су және тұз режимдерінің зерттелуі жайында ақпараттар берілген. Бұл топырақтарда тұздану үрдісі баяу болғандықтан сәйкесінше тұздардың мөлшеріне қарай өнімділік 25-30 % төмендейтіні анықталған.

Түйінді сөздер: тұздар мөлшері, ыза су, гранулометриялық құрам, су және тұз режимдері, өнімділік.

РЕЗЮМЕ

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ВОДНО-СОЛЕВОЙ РЕЖИМ НА МЕЛИОРИРУЕМЫХ ПОЧВАХ МИЛЬСКОЙ СТЕПИ И ИХ ВЛИЯНИЕ НА УРОЖАЙНОСТЬ СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР (НА КЛЮЧЕВОМ УЧАСТКЕ)

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В статье была дана информация об изучении водно-солевого режима на основе балансовых наблюдений, об их влиянии на урожайность растений и о проведении агроме-

лиоративных мероприятий для повышения плодородия почвы. Было выявлено, что в этих почвах процесс засоления был слабым, а урожайность в зависимости от количества солей уменьшается на 25-30 %.

Ключевые слова: количество солей, грунтовая вода, гранулометрический состав, водно-солевой режим, урожайность.