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БИОЛОГИЧЕСКИЕ ПОКАЗАТЕЛИ ЩЕЛОЧНЫХ ЗАСОЛЕННЫХ ПОЧВ ИЛЕЙСКОЙ ВПАДИНЫ

Аннотация

В статье рассмотрены количественный состав микроорганизмов, выделенных из щелочно-луговых засоленных почв Илейской впадины. Представлены количество содержащихся в почве бактерий - аммонификаторов, спорообразующих бактерий и бактерий, использующих минеральный азот, а также олиготрофных бактерий и актиномицетов. Определены характер изменения общего количества бактерий в зависимости от сезонов года. Установлено преобладание в почве аммонификаторов и бактерий, использующих минеральный азот.

Ключевые слова: Почва, микроорганизм, штамм, бактерия.

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BIOLOGICAL CHARACTERISTICS OF ALKALINE SALINE MEADOW SOILS

Abstract

The article considers the qualitative composition of microorganisms isolated from alkaline saline soils of Ili dropped out. The quantitative content in the soil of bacteria of ammonifiers, spore-forming bacteria and bacteria using mineral nitrogen, oligotrophic bacteria and actinomycetesis presented. The character of the change in the total number of bacteria is given depending on the changes in the seasons of the year. The prevalence in the soil of ammonifiers and bacteria using mineral nitrogen.

Key words: Soil, microorganism, strain, bacterium.

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ENVIRONMENTAL ASSESSMENT OF THE STUDIES AREA BY SALINITY LEVEL

Annotation

Study of the agro landscapes study, i.e. orientation and intensity of natural processes taking place under the conditions of anthropogenic activity, includes reflection of increased understanding of their critical situation and necessity to sustain ecological balance of the irrigated area.This is why environmental safety in the system of agricultural lands with the purpose of development of techniques for assessment of technical processes at all hierarchical layers of the irrigation system.

In this context the article views materials of environmental assessment of the studies area by the salinity level of soil upon various irrigation technologies. It is well-known that to reduce the soil salinity level a complex of agro-technical and hydro-ameliorative measures shall be applied including drainage, planning, principal and operational cleaning of soils, as well as other agro-technical measures.

The assessment of environmental state of the irrigated area based on identification of environmentally accept the ableirrigation standards, at various groundwater depths in submountain areas of Zhambyl region enables to give scientific explanations of the concept model of agro landscape productivity.

Key words: climatic conditions, agro-climatic assessment, water availability, hydrothermal mode, radiation balance.

Introduction

Study of natural objects from environmental position shall include study of the effect of natural and anthropogenic factors on it. In addition it should be considered that the reason for impairment of the object environmental condition is not only intensity but also the nature of this object use. To carry out environmental assessment the environment is first viewed at the regional and local levels regioning by types of activities, significantly not changing within the period t_1-t_0 (heret_1 – previous period, t_0- recent period). Parameters of activity D – are expressed in the percentage of the area where it is spread [1].

The main type of recoding the climatic effect over effectiveness is agro-climatic assessment of soil productivity. It is currently divided into three basic types.

The first one is one the main types of natural regioning: indexes characterizing climatic conditions of crops growing to the fullest are used; the accumulated bioactive temperature t (higher than definite levels, mainly higher than10 ^{0}C); total precipitation (Oc) (annual or per vegetation period), prost-free period duration (T, days), evaporability (E_0, mm), photosynthetic active radiation (R, kcal/sm^2), average moisture content of soil (W, m^3/he) [2-3].

The second type of regioning combines general agro-climatic regioning with special industrial one, i.e. characterizes not only heat provision and water availability, but also demand for heat and water used for comparative assessment of biological productivity geographically. The most significant for agricultural production are indexes of climate continentality $K=A*100/0,33y$ (where K – index of climate continentality, y – area latitude, heat provision ($t^0C> 10\ ^0C$), water supply – $Ky=Oc/E_0$ (whereOc - annual rainfall, mm; E_0 – evaporability, mm), and relative value of bioclimatic potential – $ГТК=10*Oc/t^0C$and$БКП=Ky*ГТК$, synthesizing the effect of heat and moisture over plants productivity.

The third type of landscape and environmental regioning is the assessment of anthropogenic activity over landscape condition and explanation of the system of measures on improvement of environmental conditions. For this purpose the system of integral indexes and criteria is used for quantitative description of the use of individual components and landscapes on the whole.

Materials and methods

Currently, when irrigation becomes widespread, there is a number of conceptually new issues, including the issues of an environmental and biological character. In this case, one of the main tasks is the evaluation of possible changes in the hydrothermal regime, the solution of which requires the development of the theory of modern soil-forming processes in the new anthropogenic environment, when fundamental condition of the soil-forming process changes – the regime of income and the amount of moisture income in the soil surface and the soil.

One of the criteria for the evaluation of soil-ecological conditions and needs of the soil-forming process, which is the most suitable for modern studies of geoecosystems in the water regimes, is the hydrothermal coefficient (radiative index of dryness).

Hydrothermal mode reflecting heat provision and water supply of the area are jointly characterized as «dryness index» [2-3]:

$$\overline{R} = Ro / L * Oc\ , \qquad (1)$$

Where R_o - radiation balance of natural conditions, kcal/sm^2.

The advantage of this index before others (*Ky, ГТК, БКП*) is obvious: first, itcharacterizestheconditionsofheatprovisionandwatersupplyofplants, i.e. biological processes, second, to a large extend it determines the conditions for formation of soil, hydrogeological and

geochemical conditions and third, enables to consider the nature of anthropogenic activity intensity (irrigation mode, structure of land use and etc.)[2-3]:

$$\bar{R}y = Ry / L*(Oc + Op), \quad (2)$$

Where Ry – radiation balance upon improvement;

$$Ry = Ro(1 - A_1)/(1 - A), \quad (3)$$

whereA_1иA – albedo, depending on the structure of use and degree of irrigated lands watering; Op – irrigation rate – net (mm).

Energy consumed for soil formation [2-3]:

$$Q_n = R / e^{-\alpha\bar{R}} \quad (4)$$

Where Q – energy consumed for soil formation, kcal/sm^2, α – coefficient considering condition of soil surface.

Moisture exchange intensity between the soil and subsoil waters [3-4]:

$$\bar{g} = g/(Oc + Op) = \exp(-1.5*\bar{R}). \quad (5)$$

The main indexes and modes for assessment of biological turnover on the irrigated lands are for soil [3-5]:

-hydrothermal mode, radiation dryness index:R=R/L(Oc+Op+W+g), (6) including water (values Oc, Op, W, g) and heat (R) modes;

- energy consumed for soil formation (Q), which is directly connected with hydrothermal mode (R) and the nature of irrigated lands use (Op); change of humus balance; salt condition and balance of the root layer on the basis of balance and differential equations of salt movement and ion exchange sorption of cations; change of nutritive regime in the soils on the basis of intraregional distribution of agrochemical properties of soil depending on the hydrothermal regime (R), for plants:

-biological productivity of soils which at optimal values of nutritive and salt regime is connected with hydrothermal mode and structure of the irrigated land use.

At the present time when irrigation is becoming large-scale the series of new issues including environmental and biological ones is arising. Assessment of possible changes of hydrothermal mode becomes one of the main tasks solution of which requires development of the theory of modern soil formation processes in new anthropogenic conditions when one of the main conditions of soil formation process changes essentially – the mode of water entry and amount of water entering the soil surface and soil.

To assess the role of climate in soil formation the most proper is hydrothermal regime index reflecting the ratio of heat and moisture in natural conditions [3-5]:

$\bar{R} = \frac{R}{LO_c}$ for automorphous conditions (7)

for hydromorphous conditions (8)

where: $\bar{R}$- index of hydrothermal regime; R – radiation balance, kJ/sm^{2}annually; O_c – total rainfall, sm; $E_г$ – evaporation from the subsoil water surface, sm; L – latent heat of vaporization, kJ/s mannually.

Values of water exchange between the soil and subsoil waters and evaporation are determined depending on $\bar{R}$ [3-5]:

$$g_a = \exp(-\bar{R}), \quad (9)$$

$$g_г = g_a - \bar{R}(1 - \bar{\Delta})^{1,5}, \quad (10)$$

$$E = 1 - g, \quad (11)$$

whereg_a и $g_г$ – water exchange in automorphous and hydromorphous conditions, shares of precipitation total;E – evaporation of the share of precipitation total; $\bar{\Delta} = \Delta/\Delta_0$; Δ – ground water depth, m; Δ_0 - ground water depth with evaporation from their surface equal to0, m.

Results of the research

The temperature of the soil and plants depends on the amount of solar radiation that falls on the area and absorbed by the land surface or crops. Part of the total radiation reflected in the

atmosphere (R). Residual shortwave radiation (VC =Q - R) causes a thermal effect, generally while the growing season and by accumulating a certain amount of temperatures.

The obtained results of solar power consumption for soil formation in crops cultivation are provided in the table 1.

Table1. Determination of costs of sun power for soil formation while crop growing.

cultures	Σ t, ^{O}C>10^{x}C	$R_{phar,}$ KJ/cm^2	Irrigation norms, Ir,mm	Precipitation Pr, mm;	Ir+Pr,mm	R=R/$_{OC}$	R=R/$_{(OC+OP)}$	Heat flow rate Q_{Ti}KJ/cm^2	Vapour exchange (Auto) ,g_a	Vapour exchange (Hydro),g_r
Lucerne	3200	165	780	250	1030	2.64	0.64	3.1	0.53	0.41
Fall wheat	1500	108	360	150	510	2.9	0.71	1.39	0.49	0.36
Grain maize	2700	148	400	220	620	2.69	0.95	2.71	0.39	0.21
Sugar beet	3000	158	730	240	970	2.63	0.65	3.0	0.52	0.40
Vegetables	2000	125	450	210	660	2.4	0.76	3.4	0.47	0.33

Ecological state of the territory characterizing the land plot exposed to degradation may be determined by the formula [1,4-7]:

$$Ec= 1\text{-}\exp (C_д*V_т*q_k), \qquad (12)$$

Where *Ec*– ecological coefficients characterizing the levels of danger of the soil; $C_д$– allowed mineralization in the soil solution, g/l; $V_т$- ratio of volume of transit waters discharged to the river in the process of washing; $q_к$ - ratio of volume of washwaters coming from CDS.

Quantitative evaluation of the level of degradation sierozemic-meadow soils of Zhambyl region were carried out based on the environmental factors, which were calculated on the basis of water-physical indicators of soil and different degrees of salinity that characterize different levels of risk soils (table 2).

Table 2. Ecological assessment of investigation of the area by the salinity level [1,5]

Indicators	Technology of watering of the test area					
	By furrows		By bars		By mellowing	
	medium saline	highly saline	medium saline	highly saline	medium saline	highly saline
Area,$\omega_{нт,}$ ha	500	800	500	800	500	800
Poriness, in ratio	0,46	0,47	0,46	0,47	0,46	0,47
Primary mineralization, g/l	2,5	3,4	2,3	3,2	3,5	4,2
Soil density, t/m^3	1,47	1,44	1,47	1,44	1,47	1,44
Salinity level, $S_{0,}$ %	0,52	1,2	0,47	1,5	0,54	1,7

Remaining salts, t/ha, ΔS	26,4	43,2	25,6	58,3	17,9	49
Level of ground waters (LGW), m	3,2	3,2	3	3	3,5	3,5
Volume of water before LGW, $\omega_{lgw,}$ m^3/ha	14720	15040	13800	14100	16100	16450
Leaching requirement, net, $N_{нт}$, m^3/ha	5000	7000	5000	7500	5000	7500
Leaching requirement, gross, $N_{бр}$, m^3/ha	6000	8000	6000	8500	6000	8500
Reserve salts in soil waters, $S_{гв}$, kg/ha	36800	51138	31740	45120	56350	69090
Allowed mineralization in the soil solution $C_д=ΔS+S_{гв}/ \omega_{угв}+N_{бр}$, g/l	3,05	4,09	2,90	4,6	3,36	4,73
Water inflow from channels Q, m^3/ s	0,25	0,40	0,25	0,40	0,25	0,40
Length of washing, $t=N_{нт}*\omega_{нт}/86406*г*Q$, сут	139	195	139	209	139	209
Ratio of volume of transit waters discharged to the river in the process of washing $V_т= N_{нт}*\omega_{нт}/86400*$ Q, t	0,83	0,83	0,83	0,83	0,83	0,83
Precipitation of the washing periodP, m^3/ha	1250	1700	1250	1720	1250	1720
Saturation in the saluted layer, $\omega_н$, m^3/ha	3528	3458	3528	3458	3528	3458
Evaporation in the process of washing, E_0, m^3/ha	1000	1000	1000	1000	1000	1000
Ratio of washwaters coming from CDS: $q=(N_{нт}+ p- w_нE_0) / N_{бр}$	0,287	0,53	0,287	0,56	0,287	0,56
Chemistry of salinity: chloride-sulphate (c-s)	c-s	c-s	c-s	c-s	c-s	c-s
Ecological coefficient $E= 1-exp (C_м*V_т*qk)$	0,52	0,83	0,50	0,88	0,55	0,89
Level of ecological danger	Dangerous	Highly dangerous	Dangerous	Highly dangerous	Dangerous	Highly dangerous

Conclusions

- formation of soil heat and air exchange certify that thermal and physical characteristics of soils and condition of its surface (moistening of albedo value, soil surface micro relief) and meteorological factors such as air temperature, relative humidity, precipitation, wind velocity, solar irradiation require improvement of models of landscape productivity environmental assessment models.

- study of the data on soil and climatic conditions for meadow-sierozemic carbonate soils as well as insufficient moisture determine the necessity of control over water-salt regime of the root layer.

-environmental assessment of methods for improvement of saline lands with consideration of heat provision and water supply on the basis of hydrothermal regime and by the degree of

salinity with different irrigation techniques enables to determine the level of environmental danger coefficient.

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ЗЕРТТЕУ ТАНАБЫНДАҒЫ ТҰЗДАНУДЫҢ ДӘРЕЖЕСІНЕ СӘЙКЕС ЭКОЛОГИЯЛЫҚ БАҒАЛАУ

Аңдатпа

Агроландшафтың күйін зерттеуде,яғни табиғи үрдістердің қарқындылығы мен бағыты, мұнда антропогендік іс-әрекеттің жағдайлары жүреді, онда суғармалы аумақтың экологиялық тепе-теңдігін жақсарту қажеттілігі мен олардың сынамалы күйінің дамуын түсіну болып табылады. Сондықтан ауылшаруашылық жерлері жүйесіндегі экологиялық қауіпсіздіктін тұрақтылығын қалыптастыру мақсатында суландыру жүйесі деңгейінің барлық сатысында технологиялық үрдістерді бағалау тәсілдерін дайындауда қажет болады.

Бұл жағдайдағы жоспарда мақалада әр түрлі суғару технологиялрында зерттеу танаптарында топырақтың әр түрлі дәрежеде тұзденуіндағы экологиялық бағалау материалдары қарастырылды. Жалпыға белгілі, мұнда топырақтың тұзденуін төмендету үшін кешенді агротехникалық және гидроиелиоративтік шараларды қолдану қажет, оған енетіндер тұзданған топырақты күрделі шаю, жерді тегістеу, керіздеу және басқада агротехникалық шаралар кіреді.

Суғармалы жерлердің экологиялық күйін бағалау жұмыстары Жамбыл облысындағы тауетегі аймағындағы ыза суының орналасуы әр түрлі тереңдікте орналасқандағы, суғару мөлшерлерінің экологиялық жағдайға қолайлы сипатына негізделген.

Кілт сөздер: климаттық жағдайлар, агроклиматтық бағалау, ылғалмен қамтамасыз ету, гидротермиялық құбылым, радияциялық тепе-теңдік.

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ЭКОЛОГИЧЕСКАЯ ОЦЕНКА ИССЛЕДУЕМОГО УЧАСТКА ПО СТЕПЕНИ ЗАСОЛЕННОСТИ

Аннотация

При изучении состояния агроландшафтов, то есть направленность и интенсивность природных процессов, которые происходит в условиях антропогенной деятельности, является отражение роста понимания их критического состояния и необходимости поддержания экологического баланса орошаемой территории. Поэтому экологическая безопасность в системе сельскохозяйственных земель с целью формирования устойчивости нуждаются в разработке способов оценки технологических процессов во всех иерархических уровнях оросительной системы.

В этом плане в статье рассмотрены материалы экологической оценки исследуемого участка по степени засоленности почвогрунтов при различных технологиях полива. Общеизвестно, что для уменьшения засоления почв необходимо применять комплекс агротехнических и гидромелиоративных мероприятий, которые включают дренаж, планирование, капитальную и эксплуатационную промывку почв, капитальную промывка и другие агротехнические мероприятия.

Проведенная оценка, экологического состояния орошаемой территории, основанная на выявления экологически приемлемых норм орошения, при различных глубинах залегания грунтовых вод в предгорных зонах Жамбылской области, позволяет научно обосновать концептуальные модели продуктивности агроландшафтов.

Ключевые слова: климатические условия, агроклиматическая оценка, влагообеспеченность, гидротермический режим, радиационный баланс.

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КӘСІПОРЫНДАРҒА ЖЕР БӨЛІП БЕРУ ҮШІН ГЕОАҚПАРАТТЫҚ ЖҮЙЕЛЕРДІ ПАЙДАЛАНУ

Аңдатпа

Мақалада геоақпараттық жүйелерді (ГАЖ) жерге орналастыруда пайдаланудың қазіргі жағдайы және оларды кәсіпорындарға жер бөліп беруде пайдалану мүмкіндіктері жайлы зерттеулерді талдау нәтижелері баяндалады.

Кілт сөздер: геоақпараттық жүйелер, жерге орналастыру, жер кадастры, ауыл шаруашылығы, өнеркәсіп, кәсіпорын.

Кіріспе

Геоақпараттық жүйелер мен технологиялар біздің қоғамымызды ақпараттандыру үрдістерінің ажырамас бөлігі болып табылады. Қазіргі кезде оның көмегімен іс жүзінде адамзат қызметінің барлық: саясат пен экономика, ғылым мен білім, денсаулық сақтау мен экология, қорғаныс пен қоғамдық тәртіпті сақтау, басқару мен жоспарлау салаларындағы