ISSN 2518-1483 (Online),
ISSN 2224-5227 (Print)

2019 • 4

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

БАЯНДАМАЛАРЫ

ДОКЛАДЫ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

REPORTS

OF THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN

PUBLISHED SINCE 1944

ALMATY, NAS RK

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
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«Қазақстан Республикасы Ұлттық ғылым академиясының баяндамалары»
ISSN 2518-1483 (Online),
ISSN 2224-5227 (Print)

Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» Республикалық қоғамдық бірлестігі (Алматы қ.)
Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 01.06.2006 ж. берілген **№5540-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік

Мерзімділігі: жылына 6 рет.
Тиражы: 500 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18,
http://reports-science.kz/index.php/en/archive

Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

ДОКЛАДЫ **2019 • 4**
НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
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Доклады Национальной академии наук Республики Казахстан»
ISSN 2518-1483 (Online),
ISSN 2224-5227 (Print)

Собственник: Республиканское общественное объединение «Национальная академия наук Республики Казахстан» (г. Алматы)
Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан **№5540-Ж**, выданное 01.06.2006 г.

Периодичность: 6 раз в год.
Тираж: 500 экземпляров

Адрес редакции: 050010, г.Алматы, ул.Шевченко, 28, ком.218-220, тел. 272-13-19, 272-13-18
http://reports-science.kz/index.php/en/archive

Адрес типографии: ИП «Аруна», г.Алматы, ул.Муратбаева, 75

REPORTS **2019 • 4**
OF NATIONAL ACADEMY OF SCIENCES OF THE
REPUBLIC OF KAZAKHSTAN

Reports of the National Academy of Sciences of the Republic of Kazakhstan.
ISSN 2224-5227
ISSN 2518-1483 (Online),
ISSN 2224-5227 (Print)

Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)
The certificate of registration of a periodic printed publication in the Committee of Information and Archives of the Ministry of Culture and Information of the Republic of Kazakhstan N 5540-Ж, issued 01.06.2006

Periodicity: 6 times a year
Circulation: 500 copies

Editorial address: 28, Shevchenko str., of.219-220, Almaty, 050010, tel. 272-13-19, 272-13-18,
http://reports-science.kz/index.php/en/archive

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

REPORTS OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
ISSN 2224-5227 **https://doi.org/10.32014/2019.2518-1483.108**
Volume 4, Number 326 (2019), 10 – 19

UDK 622.61:551.3

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THE ENERGY CAPACITY OF AN AQUEOUS SOLUTION OF THE DRUG-STIMULATOR OF PLANT GROWTH

Abstract. Object of research is technology of formulation of physiologically active humic products, methods of aqueous solutions preparation and effectiveness of their impacts on seeds and sprouts of grain and vegetable crops, testing the product in rough soil and climatic conditions of the arid zone of Kazakhstan. Therefore, the purpose of paper is development of technology for formulation of preparation and agromethods of its use in order to increase agricultural crop yields in extreme soil and climatic conditions based on laboratory and field tests, biophysical monitoring, and main technological parameters adjustments.

The results of testing experimental sample of the product formulated according to the developed technology and agromethods on various types of low-productive soils of arid zones of the republic are presented. Optimal concentrations of aqueous solutions of humic product for agricultural crops seeds treatment, optimal technological parameters to prepare seeds for sowing (duration of treatment with humic product, tempering, etc.) have been determined by the method of biotesting: optimal conditions for sowing seeds into soil (substrate moisture content, temperature, salinity) have been determined. Research has been carried out in laboratory conditions in winter and on experimental sites in several farms.

As a result of executed work effectiveness of the product formulated according to the developed technology on low-productive soils with a salinity level of 0.8 2.2% was established. Increase in the yield of grain crops reaches 24.2 - 42.1%, rice 76.2 - 78.6%. and soybean - 34.8%.

Key words: Ecology, brown coal, sodium humate, stimulant, biotesting, energy capacity.

Introduction. Extensive irrigation soil development in the desert and foothill desert-steppe zones of Kazakhstan without sufficient scientific substantiation led to the Aral tragedy, the Ili-Balkhash problem, the rational use of water resources, their almost complete depletion, degradation of the soil cover, in particular, progressive secondary salinization, swamping and deserts. landscapes, soil pollution and drainage-waste water toxic chemicals and heavy metals, reducing the profitability of agricultural production .

There was a problem of “waste” lands and unpromising auls(villages). As a result of intensive secondary salinization only in Kyzylorda and Almaty regions, more than 30 thousand hectares of rice lands turned into salt deserts, covering rare shrubs of salt-tolerant halophytes. Lands saturated with destructive salt turn into poor pastures and a source of bitter-salty aerosol dust, which is carried by air masses for thousands of kilometers, poisoning all living things.

Due to the current situation, in front of ecologists, soil scientists, land-reclamation and other specialists of the republic faced a difficult task for the development of environmentally friendly, water- and resource-saving agricultural technologies that would do without pre-washing of saline soils with appropriate cost-scarce irrigation water and combine the reclamation period performance.

To solve these complex problems, fundamentally new scientific and theoretical developments and methodological approaches are required [1-6].

In the laboratory of Kunaev Institute of Mining. "Physical and chemical methods of mineral processing" is developing a technology for producing physiologically active sodium humate from brown coal, enriched with macro-microelements and wormwood extract, which increases the ecological stability of crops to extreme environmental factors.

Based on this, the following tasks were solved:

- the technological regimes of pre-sowing treatment of seeds of rice, wheat, barley, soybean with aqueous solutions of sodium humate on non-saline and highly saline soils of desert and piedmont desert-steppe zones of Almaty region against the background of optimal moisture supply of plants were determined; determined the effectiveness of the developed agromeliorative methods for crop yields with varying degrees and chemistry of soil salinization in combination with other methods of differentiated agricultural techniques.

The method of determining the energy capacity of water and aqueous solutions has been developed for these zones for the first time. Modern high-precision devices for measuring electrical capacitance were used. Platinum electrodes of special design were used as sensors. The electrodes were placed on and attached to a special circuit-board at a certain distance from each other. It was important to make them as thin as possible to reduce their response delay and intensify measurements.

Currently, a prototype model that allows us to remove to obtain the characteristics of the energy capacity of aqueous solutions of humic substances. Already the first data allowed us to discover interesting patterns in the behavior of aqueous solutions of humates.

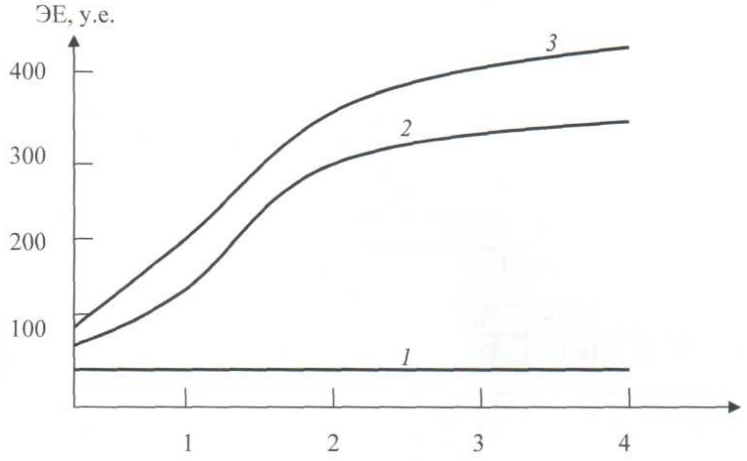
To solve the problem of efficient use of low-productive land and increase the profitability of agricultural production, non-standard methodological approaches have been developed, based on a fundamentally new scientific and theoretical concept of energy-information farming. Rational use on the fields of physiologically active humic preparations-adaptogens with multifunctional properties that increase bioenergy and ecological stability of agricultural crops to extreme environmental factors will provide agricultural producers with a reliable means to increase the yield of marketable products with minimal dependence on adverse soil and climatic conditions.

Due to its low price, environmental friendliness, availability and efficiency the product produced by the developed technology will be competitive in the domestic and foreign markets. In addition, cheap local raw materials and available reagents are used in the preparation of the humic preparation; its production is based on the use of standard equipment.

EXPERIMENTAL PART

Figure 1 shows that an aqueous solution of humic preparation has higher energy capacity (curve 2) than water (curve 1). At the beginning, the capacity of humic preparation increases slowly to the level of 100 CU (conventional units), then quickly increases to 300 CU, the peak of activity is at the level of 2.5%, after which the capacity decreases, despite the increased concentration of the solution [7-11].

In simplistic terms, this may be explained by the fact that, as stated earlier, plants of certain species (or their seeds) have certain unique energy capacity. Evidently, the energy-informational interaction between the seeds and the humic preparation will yield the best effect only when both interacting objects come into resonance, which is only possible in a limited range of concentrations of the humic preparation working solution, or, in other words, at its certain energy capacity.



1 - tap-water (reference); 2 - aqueous solution of humic preparation, %;
3 - aqueous solution with surfactant (liquid soap) addition

Figure 1 - Energy capacity of humic preparation working solutions

Adding surface-active substances (surfactants) into water at the rate of 50 g per 1,000 l of water, and consequent increase in the concentration of the solutions of humic preparation from 0.01 to 4% result in further increase in their energy capacity. Therefore, adding surfactants and humic preparation into the solutions allows obtaining solutions with higher energy density, which will more efficiently influence plants' growth and development [12-17].

Subsequent measurement of the energy capacity of the water in which the preparation had been dissolved showed that its capacity increased when surfactants were added, obeying the same pattern that was observed before (curve 3). Therefore, a conclusion may be drawn that the mechanism of increasing the energy capacity of humic preparation is in neutralization of water hardness, after which the aqueous solution of humic preparation becomes efficient - it does not coagulate and better shows its qualities.

To identify the degree of influence of humic preparations on the main physiological processes in plants, it is necessary to determine the content of the most important groups of compounds associated with the energy metabolism of the cell. Humic compounds isolated from brown coal from the Kiyakty deposit were studied by gel chromatography [18–20].

To identify the degree of influence of humic preparations on the main physiological processes in plants, it is necessary to determine the content of the most important groups of compounds associated with the energy metabolism of the cell. It is necessary to determine the degree of influence on the energy levels of the cell. Humic compounds isolated from brown coal deposits of the Kiyakti field were studied by gel chromatography [18–20].

The results of the quantitative analysis are shown in Table 1. From the above data, it is clear that humic compounds contain aromatic condensed structures and oxygen in ether, lactone. heterocyclic and other structures, and also contain CH2 - CH3 - and COOH groups.

To identify the structural features of humic compounds, thermol thermography is used to evaluate their thermal stability, the ratio of the central and peripheral parts.

Table 1 - The number of fragments of the structure of desalinated humic acids

Humic acid	The carbon content in the fragments of the structure,% of C							The oxygen content in the fragments of the structure,% of O			
	CHap	CH_3	CH_2	COH	COOH	Сарконд	C=O	$O_{сон}$	Осо-он	Ос-о	Онф
Free, (1-step) *	2,0	3,1	27.2	8,2	4,0	51,5	4,0	7,3	6,9	5,3	8,8
Free	1,6	2,5	29,4	8,1	3,6	48,9	5,9	7,2	6,5	7,7	6,6
(II stage) *	3,7	5,2	25.7	7,9	3.6	47,7	6,2	7,0	6,3	3,1	5,5
Free, (stage III) *	2,0	6,0	32.7	6,6	6,9	36,6	9,2	5,4	10,8	12.3	5,9

* For a more detailed study of the fractional composition of humic ompounds from brown coal, a stepwise separation of fractions was carried out.

As can be seen from the results of the analyzes given in Table 2, the presence of 3 groups of thermo effects (endothermic, low-temperature and high-temperature, exothermic) suggests 3-member structure of the isolated humic compounds, namely: a hardly hydrolyzed part of the benzoid structure and the peripheral aliphatic part of the molecule

The first exothermic effect on thermograms of the humic preparation, manifests itself in the range of 340-390 ° C and is due to the destruction of aliphatic chains and their oxidation. The second group of exoeffects is in the temperature range of 400-600 ° C and higher. In the range of these temperatures, the destruction of more stable aliphatic chains occurs, the destruction of the peripheral part of the molecules, the cleavage of individual cycles and benzoid rings. Intensive destruction of benzoid structures begins,carbon evolution and its oxidation begin above 6000 ° C

Based on the results of the analysis, it can be concluded that the preparation contains humic compounds, which are a group of high-molecular dark-colored substances united by a common principle of construction. According to the chemical formula, these are aromatic hydroxycarboxylic acids, in which the aromatic cores of a low degree of condensation are combined with non-aromatic sites. The general structure of humic acids is represented as aromatic compounds with mobile P-electrons and various

functional groups at the core and side chains. The presence of paramagnetic centers determines the ability to ion exchange, the formation of complexes, tautomerism, redox reactions, and ultimately determines the universality of these compounds.

The study of the structural constraction of the compounds of the drug showed the presence of humic acids, as well as quinoid and aliphatic groups, determining the biological and physiological activity of the drug.

In addition to the above data on the structural constraction of humate, we conducted studies to determine the chemical properties of the resulting humic preparation for the following indicators:

content, ash content, solubility in water and alkali. The analysis showed that the drug has: pH -7.4-7.6, C% per sample -24.67-29.73, ash content% to sample 11.13-44.97, solubility: in H2O - good (solution transparent); 0.1 and NaOH in the cold is good; 0.1 and NaOH hot-good.

Table 2 - According to Thermal Analysis Peak Temperatures (DTV Curves) and Mass Loss

Sample Number	Peak Name (by DTV curves)	Peak Temperature (by DTV curves), 0C	Temperature range, 0C											
			20-100		100-200		200-300		300-400		400-500		500-600	
			Weight loss				Weight loss							
			мg	%, from loss	мg	%, from loss	мg	% , from loss	мg	%, from loss	мg	%, from loss	мg	%, from loss
1	Endo	85												
	/-/	132	4,5	13,5	5,0	15,1	1,6	4,8	5,9	17,8	7,0	21,1	2,1	6,3
	/-/	390												
	/-/	480												
2	/-/	80												
	/-/	390	5,5	27,5	3,1	15,5	1,4	7,0	3,4	170	5,7	28,5	0,9	4,5
	/-/	485												
3	/-/	90												
	/-/	330	3,0	23,8	3,2	25,4	1,5	11,9	1,9	15,1	2,4	19,0	0,6	4,8
	/-/	520												

The experimental batch of the drug was analyzed for the content of lead, mercury, arsenic, toxic substances that cause skin irritation and the presence of radionuclides (Table 3)

Table 3 - The elemental composition of the humic drug

1 Sodium HUMATE	Content, sand,%				Atomic relations		
	C	H	N	O	C:H	C.N- C:O	
1.From brown coal	29,2	35,9	1,6	33,4	0,81	18,26	0,87
2.From bioprosley	27,8	27.9	1,9	42,3	0,99	14,5	0.6

Table 4- Results of toxicological analysis of an experimental batch of the drug

Test conditions: atmospheric pressure 685 mm Hg, t ° C air 220C, relative humidity - 65%					
№	The name of indicators	Unit rev.	Norm on ND Actual ND indicator on test methods	Unit rev. Norm on ND Actual ND indicator on test methods	Unit rev. Norm on ND Actual ND indicator on test methods
1. 2	Organoleptic: Appearance, color			Amorphous powder black odorless	MP №7.05.005-97
	Physico-chemical - lead - mercury - arsenic	мг/кг мг/кг мг/кг	32,0 2,1 2,0	absence	Analysis of soil samples by stripping voltammetry method № M-135
3.	Toxicological: Toxicity Hazard Class Skin Irritant Effect		lack of grade 4 the absence of	Grade 4 is missing (low hazard)	MR №7.05.005-97 GOST 12.1.007-76

As can be seen from the results of the analysis of the drug, it does not contain heavy metals lead and mercury, arsenic is absent. In addition, the drug is non-toxic and does not have a skin-irritating effect.

Table 5 - Hygienic characteristics of an experimental batch of the drug

Name of indicators Valid levels Actual level values	Name of indicators Valid levels Actual level values	Name of indicators Valid levels Actual level values
The specific activity of natural radionuclides (average)	4000 Bq / kg	511.2 Bq / kg
The specific activity of natural radionuclides of radium-226 and thorium-232 in the studied sample does not exceed the permissible levels established by the standards of radiation safety (NRB-99)		

From the results of the analysis, it follows that the activity of natural radionuclides of radium-226 and thorium-232, which are contained in the raw material, brown coal, does not exceed permissible levels.

Humic preparations and inseparable, because only in the aquatic environment manifest the unique qualities of this product. Each culture is unique and its yield depends on the dosage of the drug. One of the common methods of growing crop production is pre-sowing seed treatment.

The first studied the effectiveness of different concentrations of the experimental drug, on the salt content of the treated seeds. Were processed seeds of wheat varieties Saratovskaya 29. barley varieties Chernigovskaya 5, rice varieties Sunny and soybean varieties Eureka. Presowing seed treatment of wheat, barley and rice was carried out in 0.1; 0.5; 1.0; 1.5; 2.0; 2.5; 3.0; 3.5; 4.0% aqueous solutions of sodium humate for 60 minutes.

Soybean seeds were soaked in 0.001; 0.005; 0.1; 0.02; 0.03; 0.04; 0.05; 0.1% solutions for 10 minutes. After the treatment, the seeds were extracted from the experimental working solutions of sodium humate, dried at 20-40°C to the conditional humidity, and sown without drainage into 0.5 l analytical glasses with meadow-gray strongly saline medium loam irrigated soil picked at LLC Panfilovsky of the Talgarsky district in the Almaty region, with the following chemical composition, %: dense residue 0.647; HCO31 - 0.019; C11 - 0,031; SO4 1.08; Ca2' - 0.31; Mg2 t - 0.030; Na'- 0.147; pH - 7.55; and fluent boron constituting 8.51 mg/kg of soil.

The seeds were germinated in a thermostat in accordance with the requirements of GOST (GOST 10250980. GOST 12038-84). Each experiment was repeated 5 times. Rice crops were watered by weight with tap water until substrate saturation. Humidity of the substrate in vessels with the remaining crops was maintained at 65-70% of its total water-holding capacity. Duration of the experiment was 20 days.

The results have shown that the proposed method of presowing treatment of seeds of agricultural crops increases the germination energy, seed germination rate, and stimulates early plant development on strongly saline soil.

It is known that all cultivated glycophytic plants are most sensitive to the adverse effects of salts at a young age, especially during the period of seed germination and sprouting. Therefore, obtaining normal

seedlings and ensuring their growth and development in the early stages of ontogenesis is crucial for increasing the effective fertility of saline soils, and all agro-measures aimed at accelerating germination of the seedlings also contribute to their salt tolerance.

The response of tested crops to presowing seed treatment with aqueous solutions of sodium humate was ambiguous, and was determined by their biological characteristics. Thus, 1.0-2.5% solutions were most efficient for wheat, 0.5-3.0% solutions - for barley, 1.0-3.0% solutions - for rice, and 0.005-0.04% solutions - for soybeans.

It is known that good seeds are a guarantee of getting a full harvest. There is a germination laboratory and field. The gap between them can be noticeable and agriculture) bears significant losses from poor seed germination. What is the reason for this and what measures can be taken to get full-fledged seeds? It is known that the accumulation of substances in the seeds, for example in the grain of wheat, there is a certain sequence. The storage proteins are synthesized for the most part while loading. In such an immature grain, where the humidity reaches 80%, there is a lot of a sugar and proteins, but little starch. During the period of dairy and the onset of wax ripeness, starch accumulates rapidly, the process is so intense that it exceeds the intensity of protein synthesis. The mutual rate of accumulation of substances to a large extent depends on the temperature and humidity of the air, day and night. The combination of a variety of factors during wintering leads to the fact that by the time of sowing the seeds are not in the best energy form. Therefore, the task of the farmer is to make the seeds as viable as possible.

This problem can be solved with the help of aqueous solutions of humates, to a large extent. The role of water in the development of a plant from a seed is extremely important because it is the material substrate on which and with which nature places atoms and molecules of living matter in developing plants. The treatment of seeds with humates leads to the fact that, in addition to the hereditary DNA programs, the energy information programs of humic preparations are also involved in the development of a new organism.

Using electrography of seeds and vegetative plants [19], were able to establish that seeds of wheat, rice, soybean and barley treated with an aqueous solution of the humic preparation have an increased energy potential, which is manifested in their brighter glow in the high-frequency field (Kirlian effect). According to its level, the energy potential of the treated seeds and seedlings exceeds by 2-3 times the potential of the control seeds.

Table 6 - Energy capacity in the system of vertical soil zoning

Soil	Energy intensity, cu					Atmospheric air
	Soil					
	Depth, cm					
	0-10	10-20	20-30	30-40	40-50	
Mountain forest heavy loamy	81-82	82-87	83-91	90-91	84-85	20-23
Dark Gray Forest	75-82	79-97	95-96	90-91	90	19-21
Chernozem low humus carbonate medium loamy	80-87	85-91	90-99	93-97	92-95	18-20
Dark brown colored loamy	73-84	84-87	87-89	84-90	90-91	18-19
Light brown medium loamy	71-74	74-75	75	75	75	16-17
Meadow sazovyoraschaemy solonchakovye medium loamy	79-87	89-91	86-90	97-101	93-96	16-17
Serozems ordinary irrigated saline medium loamy	74-79	78-82	81-82	80-81	79-80	14-16
Meadow-gray terrestrial irrigated saline medium loamy	72-75	75-76	76-81	81-82	89-90	15-17
Light-loamy light gray soils	57-72	72	73	75	78	14-15
Takyr-like alkaline-saline heavy loamy	78-79	79-81	81	81-83	79	16-17
Barchan sands	25-63	74-75	64-73	63-70	61-68	13-15

While the energy potential of seeds can be relatively easily determined or measured using highly sensitive instruments by electrography that are commercially available to industry, defining the energy of water and aqueous solutions is much more difficult.

The authors have developed a method of determining energy capacity of water and aqueous solutions. Modern high-precision devices were used as the basis for measuring electrical capacitance. Platinum electrodes of special design were used as sensors.

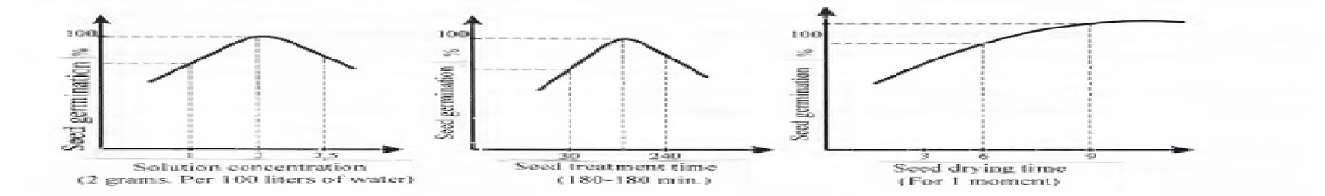
Certain energy capacity is also characteristic of soils; it is one of the indicators that characterize the levels of natural or artificial fertility.

Studies have shown that humic preparations derived from lignite are carriers of energy programs that affect the DNA hereditary program in plant seeds, and participate in the development of a new organism of the relevant crop. Each crop is unique and has certain energy capacity.

With the help of a PRE 1 device, it has been found that energy intensity of soil in the 0-50 cm layer in the system of vertical soil zonality of the Trans-Ilyisk Alatau obeys the fundamental law of soil and climatic zonality.

As shown by the results in Table 6, energy intensity of soil depends on the moisture content, the granulometric composition, and the content of organic matter. For example, soils with low humus content have lower energy capacity. With the same fineness and density, more humid heavy loam soil with relatively high content of humus is characterized by greater energy content than dry soil. Most likely, this can be explained by properties (structural ordering) of the water. Since water molecules can form hydrogen bonds, i.e. create associates, there is an infinite variety of clusters that carry high density energy and information. Therefore, the role of water in plant life and soil formation is extremely important.

a) 1-stage b) 2-stage c) 3-stage solution concentration



Picture 3 (a, b, c) - Processing of seed

Experimental work discussion: According to some provisions of the capillary and humic hypotheses, brown coal consists of liquid and solid phases. The solid phase of the coal mass consists of grinding colloidal humus particles with a particle size of 0.001 to 0.00004 mm. The cohesive forces of colloidal particles are different for different coals and depend on the degree of carbonization. The further this process goes, the more chemically older the coal and the smaller the capillaries. Using the provisions of these hypotheses from Kiyaktinsk brown coal, insufficient carbonation, by processing caustic soda (NaOH), plant growth stimulants were obtained, that is, a bioenergoinformation adaptogen that increases the environmental resistance of cultivated plants to extreme environmental factors (soil salinization, alkali-forming factors, pesticides, man-made environmental pollution, adverse climatic conditions in the form of dust emission, etc.).

The resulting drug - adaptogen increases seed germination, transplanting seedlings during transplantation, plant resistance to diseases (bacteriosis, fusarium, late blight, chlorosis, powdery mildew) and extreme environmental factors (drought, frost, salinization of soil, boric toxicosis, pathogenic microflora, etc.) promotes enhanced growth of the roots and above-ground parts of plants; improves mineral nutrition of plants by 25-30% by increasing the utilization of nutrients from the soil and fertilizers; reduces the nitrate content in agricultural products by 25-40%; helps to increase the size of the inflorescences and enhance the intensity of the color of flowers; accelerates the maturation of crops for 7-16 days; increases the yield of agricultural plants and fruit and berry crops on average by 30-80% improves product quality and prolongs its shelf life.

As the sample, we present the data (table 7) on the processing of 1 ton of wheat seeds with a consumption of -400 grams and barley -500 grams.

Table 7 - Treatment of wheat and barley seeds with an adaptogen

Culture	The concentration of the working solution for the drug,%	Processing time	(languor) of seeds, min Duration of extraction of dry treated seeds, days	Consumption of working solution, liters per 1 ton
Wheat (spring, winter)	2,0 (2 кг -100 l water)	30-240	2-9	15-20
Barley (spring, winter)	2,5 (2 кг -100 L water)	30-360	2-12	18-20

Presowing seed treatment is carried out in 2-3 days after their preliminary dressing. According to a special technological regime, presented in table 7.

Humic preparations from brown coal by the authors I.I. Lishtvan, Yu.G.Yanuta, A.M. Abramec and others (Institute of Environmental Management of the National Academy of Sciences of Belarus) have a different nature compared to brown coal from the Kiyaktinsky deposit, and their demineralization using traditional methods does not completely remove the ash components. These drugs are completely unsuitable in the conditions of the arid zone of Kazakhstan [14].

In the work of N.N. Bambalova “Precipitation of humics ubstances from a queous and alkaline solutions under the action of electrolytes: A review” (in the journal “Chemistry of solid fuels”, January 2016, Volume 50, Issue 1, pp 51–63) the coagulation thresholds of humic acids of solid fuel are very characteristic for different stages of metamorphism, and they adequately reflect the nature of the object is a natural feature of a natural feature, which is a natural feature. [15]. The Kiyakty deposit is represented by brown coals of the Jurassic period with a high degree of coalification. The formation of the coal-bearing stratum of the field is associated with continental-lagoon conditions, that is, it occurred in lakes and large swamps. The use of drugs from this coal-adaptogens showed good results in a sharply continental climate of the South-Northern part of Kazakhstan. You can add that these drugs are zoned for success can be used strongly saline soils.

As a result of the research, a conclusion has been drawn that energy of water, seeds, plants, soil is a key element in increasing crop yields, therefore, significant efforts should be made now to introduce highly sensitive instruments into the agricultural production to monitor energy-and-information transformations in the soil, water and in plants, not only at the laboratory, but also directly in the field.

Equipment had been installed and an experimental technological line assembled for the sodium humate production, where a representative batch of the tested preparation was produced in the amount of 550 kg in the period between 2004 and 2006. The obtained preparation was analyzed for chemical composition, tested for toxicity and presence of natural radionuclides at the Test Center of the Republican Sanitary-Epidemiological Station. It has been found that the preparation is not toxic, and the content of natural radionuclides is within the permissible limits.

Efficiency of humic preparation has been proven in course of laboratory and production tests at farms in the Almaty, Kyzylorda, Karaganda, and Akmola regions on various types of soil. Physiological activity of the preparation for the tested agricultural crops on low productivity soils was determined by the energy intensity of the working solutions used for presowing treatment of seeds and spraying vegetating plants in ontogenesis.

The developed agricultural method of presowing seed treatment with a solution of the preparation without additional irrigation of meadow-gray and light chestnut soils ensured stable increase in winter wheat yield by 24.2-36.4%, and increased the amount of raw gluten in the grains up to 29.4%. In the reference variant, the content of gluten in the grain was 25.4%. High efficiency of using agricultural practice of presowing treatment of seeds and spraying vegetating plants with the studied working solutions of the preparation was noted in cultivation of soybeans on light chestnut medium loamy and meadow-gray medium loamy irrigated soils. The yield of soybean grains increased by 34.8% due to presowing treatment of seeds and spraying vegetating plants with aqueous solution of the humic preparation.

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ӨСІМДІКТЕРДІҢ ӨСУІН ЫНТАЛАНДЫРУ ПРЕПАРАТЫНЫҢ СУ ЕРІТІНДІСІМЕН ЭНЕРГЕТИКАЛЫҚ СЫЙЫМДЫЛЫҒЫ

Аннотация. Мақалада зерттеу объектісі-гумин препараттарының алу технологиясы және оларды Қазақстанның шөлді аймақтағы бүлінген топырақты қайта қалпына келтіру арқылы пайдалану тиімділігі. Сондықтан біздің мақсатымыз көмір майдасынан препарат алып оны толыққанды ауыл-шаруашылық мол алудың жолында далалық эксперимент және биофизикалық мониторинг арқылы бұл технологияға өзгерістер енгізіп тиімді параметрлерін анықтау. Эксперимент аясында алынған препаратты жылда өнімді аз беретін топырақ жағдайында тексеріп көру. Ол үшін гуминдік препаратты суда еритін және 1 га жерге оның қанша жұмсалатынын есептеп шығардық, оның ішінде бидайдың тұқымын су ерітіндіге бұқтырып, кептіріп содан кейін ғана топыраққа себудің режимін анықтадық. Осындай тәжірибеден кейін анықтағанымыз топырақтағы тұздың көлемі 0,8-2.2%-те болғанымен сол жағдайдың өзінде дәнді-дақылдан 24,2-42,1%-ке, күріш 76,2-78,6%-ке, соя 34,8%-ке өсім берді. Бұл тұзды топырақтың және құрғақшылығы жиі кездесетін жағдайда көңіл көншітетін көрсеткіш болып есептеледі.

Түйін сөздер: экология, қоңыр көмір, натрий гуматы, ынталандыру препараты, биотестілеу, энергетика сыйымдылығы.

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ЭНЕРГЕТИЧЕСКАЯ ЕМКОСТЬ ВОДНОГО РАСТВОРА ПРЕПАРАТА-СТИМУЛЯТОРА РОСТА РАСТЕНИЙ

Аннотация. Объектом исследования является технология получения гуминовых препаратов и эффективность их использования в низкопродуктивных почвах пустынной зоны.

Цель работы - исследование, разработка и испытании технология получения гуминовых препаратов и агромелиоративных приемов повышения урожайности культурных растений на низко-продуктивных почвах, а также рационального применения физиологически активного гумата натрия, получаемого из бурого угля в совокупности с другими приемами комплексной и дифференцированной агротехники.

На основе данных исследований энергетической емкости водных растворов гуминовых препаратов, биофизического мониторинга и корректировки основных технологических параметров предложена технология обработки семян различных культур.

Представлены результаты испытаний экспериментального образца препарата и агроприемов на различных типах низкопродуктивных почв засушливых зон республики. Методом биотестирования определены оптимальные концентрации водных растворов гуминового препарата для обработки семян сельскохозяйственных культур, оптимальные технологические параметры подготовки семян к посеву (продолжительность обработки гуминовым препаратом, отлежки семян и др.); определены оптимальные условия высева семян в почву (влажность, температура, засоление).

В результате выполненных работ установлена эффективность препарата, получаемого по разработанной технологии на низкопродуктивных почвах с уровнем засоления 0,8-2,2 %. Повышение урожайности зерновых культур достигает 24,2-42,1 %, риса 76,2-78,6%, а сои -34,8 %.

Определены объекты, методы исследованы, а также результаты лабораторных и полевых опытов по изучению, разработке и испытаниям гуминовых препаратов и агромелиоративных приемов предпосевной обработки семян, опрыскивания вегетирующих растений водными растворами физиологически активного гумата натрия при выращивании сельскохозяйственных культур на низкопродуктивных почвах на фоне зональной агротехники в различных почвенно-климатических зонах Казахстана.

Ключевые слова: экология, бурый уголь, гумат натрия, препарат-стимулятор, биотестирование, энергетическая емкость.

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ISSN 2518-1483 (Online), ISSN 2224-5227 (Print)

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Редакторы *М. С. Ахметова, Т.А. Апендиев, Д.С. Аленов*
Верстка на компьютере *А.М. Кульгинбаевой*

Подписано в печать 12.08.2019.
Формат 60x881/8. Бумага офсетная. Печать – ризограф.
11 п.л. Тираж 500. Заказ 4.