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# ARIDGROW TECHNOLOGY AND HUMIC PREPARATIONS FOR GREENING ARRANGEMENT OF THE ARID, EXHAUSTED AND ANTROPOHENIC POLLUTED TERRITORIES.

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## **Introduction.**

The exclusive role of the Humic Substances in the Nature and human life has received real acknowledgement only last decades and especially in the field of engineering ecology, i.e. in the field of practical realisation of problems of the environmental control. In this area as in any other, there were clear and definitely justified possibilities of this class of natural polymers and preparations on their basis as the tool, allowing to solve a wide spectrum of problems of the environmental control. Humic Substances is a wide class of connections which carry

out necessary mediatorial functions between the alive and mineral world. So, dark colouring Humic Substances is directly connected with regulation of a thermal regime of soils and a planet climate as a whole. Polyfunctionality of the Humic Substances provides a dominating role in accumulation and migrations of ions of metals in soils and land visual environments. Specific hydrophilic and molecular structure predetermine for the Humic Substances a unique role in formation of structure of soils, their regulators of air and water

regimes, means for recultivation of the territories polluted by economic activities of the people, exhausted and sandy soils and also other purposes [1].

**Results and discussion.**

Technology of greening of the arid, exhausted and anthropogenic polluted territories named AridGrow is a cooperational product of theoretical and experimental researches in a field of colloid chemistry of natural polymers, physical-chemistry of the surface phenomena and the theory of mass transfer processes in capillary-porous disperse materials and soils, executed for last 30 years at Institute of Natural Management of the National Academy of Sciences of Belarus with assistance of the United Kingdom scientific & research company AridGrow Laboratories Ltd.

AridGrow technology represents scientifically proved symbiosis of high technologies of arrangement of lifeless lands and soils space in which the root system of plants by means of natural polymeric preparations on the basis of the Humic Substances of peat, sapropel, lignin and other sources of the humic raw materials, develops as regulators of ion-exchange and migratory processes of a moisture and nutrients of plants. The developed technology is adapted for drip irrigation, i.e. for minimization of water consumption for maintenance of the life cycle of plants at their cultivation in arid conditions. Application of the AridGrow technology allows to reduce water consumption in 20-30% on the average and even much more in some conditions, that is caused by minimization of the expense of irrigation water on its unproductive evaporation and going throw deep into the soil according to the infiltration factor and also going throw in breadth under the influence of capillary forces. In all events the moisture is lost unproductively when leaves limits of a zone of dwelling of a root system of plants. Nevertheless, application of the AridGrow technology and based on it humic preparations allows to reduce essentially the expense of water and various mineral fertilizers even at casual technologies of irrigation.

Use of humic ameliorant preparations also allows to plant trees and shrubs in the salinized territories. It is caused by that the humic ameliorant preparations produced on original AridGrow technology provide essential decrease in osmotic stress of plants, i.e. their sensitivity to the salts which are in a zone of development of a root system.

AridGrow Technology generally assumes use of two kinds of humic ameliorant preparations: a powdered concentrated soil structure forming named Soil Creator and a liquid soil improver named Soil Activator. Creator uses at hollow arrangement at once i.e. at planting and Activator apply periodically in an irrigation cycle, i.e. together with irrigation water at service

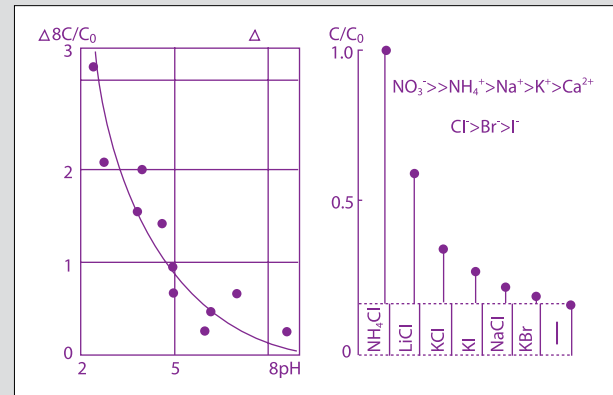


Fig. 1. Influence of pH and an ionic compound of a threshold solution of a soil on salt migration processes at isothermal moist



Fig. 2. Bahrain trees and vegetables tests in 2004



Fig. 3. Jordan lawn grass test in 2005 (1)



Fig. 4. Dubai, UAE palm test in 2007 (1)

of the transplanted plants. The general qualitative parameters of two basic humic ameliorant products are represented in booklets or at web-site [www.aridgrow.info](http://www.aridgrow.info)

As to the consumption of the humic ameliorant materials on planting realisation, for example for a one palm tree plantation, the expense of a powdered preparation takes 25 kg at once and 6 liters per year of a liquid one. It means, that in a year on each planted palm-tree we must add only 6 liters of the liquid ameliorant preparation into the irrigation water without entering any mineral, or other kinds of chemical fertilizers into the soil or water. With reference to the functions of the liquid ameliorant preparation, it is necessary to notice that water-soluble connections on the basis of salt forms of humic acids are rather effective activators of ion-exchange properties of soil minerals, and the connections initiating transition of elements from structure of a mineral of soils in a water-soluble status,

i.e. providing availability of the elements containing them in minerals of soil for their subsequent consumption by plants.

Carrying over of moisture to capillary-porous materials or soil generally represents a torrent of a porous solution on capillaries or in the form of a film moisture on a surface of particles of soil under the influence of a gradient of motive forces. For moving to material volume water molecules or the dissolved in it connections should overcome influence of "neighbors"; and within interphase layers of a moisture - in addition and influence of surface forces of a particle of a solid phase, i.e. balance in system: the particle surface - a porous solution defines intensity of carrying over of a moisture and dissolved matters (mainly ions) in a soil system. It is practically impossible to change magnitude of interphase interaction by using physical methods. Modification of a soil by surface active agents, high-molecular connections allows to influence actively as a charge of a surface

of a solid phase, structure of interphase layers of a moisture, and on properties of a porous moisture as a whole [1]. Number of such modifying connections is known as Humic Substances and being natural polymers.

Fig. 1. Influence of pH and an ionic compound of a threshold solution of a soil on salt migration processes at isothermal moisture transportation.

$\Delta C = C_i - C_o$ ;  $C_o$  and  $C_i$  - concentration of ions in a soil before and after experiment;

$C_o = 0,05 \text{ M}/100 \text{ grams of a dry matter}$

When pH of the soil changes, the charge of a surface of base units of its solid phase also changes, so if a soil pH higher, the higher negative charge of a surface of minerals of a soil i.e. its electrostatic (Coulomb) action on moisture interfacial layers increases. As a result it reduces migratory conduction of moisture and dissolved in it compounds on vertical and horizontal profiles of a soil horizon [1]. Similar effect, but much "softer" from a position of agrochemistry demonstrate Humic Substances and first of all with their water-soluble forms, so in our case liquid humic preparation named Soil Activator. The swelling structures of humic connections which formed in a soil during Humic Substances modification increase a content of a physically and chemically bounded moisture in it, so "control" transportation of a moisture and ingredients of plant nutrition for the purpose of minimization of their unproductive losses. All above mentioned testifies to the special role of the Humic Substances and the surface phenomena as a whole on processes of transportation of moisture and salts in soil systems and at the same time for creation of "comfortable" conditions for plants in a green arrangement of various territories.

At cultivation of agricultural production and especially for row crop cultures it is necessary to correct a ratio of the humic preparations as to the regional ground





Fig. 5. Dubai, UAE salt lake test in 2008 (1)



Fig. 6. Dubai, UAE lagoon test in 2009

and soil properties so to the irrigation conditions specificity. Here we mean the scheme of the agricultural areas arrangements, rates, periodicity and specifications of the irrigation. As to the properties of the regional ground and soils, it is rather important for us its mineralogical composition and a specification of the irrigation water.

With a reference to the problems of the irrigation water savings when using sprinkling irrigation technology, it is possible to assure on the experience of the lawn grass tests that using AridGrow technology including based on it humic preparations, allows to save not less than 20-30% of the irrigation water, and even more, when the preparations are adapted to the local conditions, i.e. to the physicochemical composition of the local soils and irrigation water. To solve the concrete task is possible when doing such analysis of the local soil

and irrigation water composition at our Institute in Belarus or at any specialized regional laboratory in your country.

Simultaneously, at cultivation of date palms using the AridGrow technology with application of such irrigation technologies as a drip irrigation, or injection irrigation allows to save not less than 30% of the irrigation water and more.

#### Conclusion.

1. AridGrow Technology and the Humic Preparations invented on its base have already passed comprehensive tests in Bahrain, Jordan, Qatar and United Arab Emirates. Nowadays they are entering the Kingdom of Saudi Arabia market. Results of using AridGrow Technology are introduced on fig. 2, 3, 4, 5, 6.
2. It is experimentally proved, that the Humic Substances are highly effective universal regulators for the fertility of

sandy soils and the territories broken by economic activities of the people, allowing to provide green arrangement of the deserted, arid and salinized territories.

3. High hydrophilicity of the Humic Substances on the basis of natural caustobiooliths opens practically unlimited possibilities of working out on their basis of new reclamative materials for recultivation of the territories broken by economic activities of people and, first of all arid territories. In the given direction urged to solve HS for maintenance of problems on technology AridGrow.

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