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THE PERSPECTIVES OF PROVIDING THE STORAGE OF IRRIGATION WATER IN THE CASE OF USING WATER COLLECTING ADDITIVES IN THE GROUND

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Taking into account that the flow of rivers in Armenia is small during the plant growth and can not satisfy the water demand of all crops, especially because of the widespread surface watering, the water leakage is high. They are also conditioned by the absence of a method for calculating parameters of irrigation regimes for crops in local conditions. At the same time, in mountainous countries, such as Armenia, there are many sand and clay basins, through which the water is filtered, causing the need to increase the irrigation frequency and the amount of water supplies. With the use of extreme storage facilities, it will be possible to significantly reduce the amount of irrigation water supplies and reduce the water supply frequency. Reducing the irrigation water supply will also help to reduce groundwater levels, leading to land degradation. This will also lead to the reduction of scattering of land plots on the lower levels.

Key words: water, irrigation, plant, ground, sand, filtration, water saving, polymer, additive, jelly

Introduction

The problem of water scarcity in agriculture is often faced not only by arid southern countries, but also by the middle zone regions. Since timely irrigation is important for the growth of plants, in conditions of water shortage, many areas that are quite suitable for agriculture stand idle or do not bring the expected harvest.

Among the promising ameliorative techniques expanding the possibilities for controlling the water regime of soils are moisture-swelling polymer additives, which repeatedly increase the volume as a result of swelling, have a high water-absorbing capacity, but do not dissolve.

For the first time, a similar idea on the accumulation of water with subsequent release into the soil was proposed by the Mexican researcher Sergio Velasco. His technological solution, called "Solid Rain" was interesting and innovative, but it did not come to the practical implementation because of the high cost of the project.

Nowadays, a moisture-swelling polymer derived from waste from the petroleum industry is often used.

In laboratory conditions, T. N. Danilova studied the water-retaining capacity of soils without additives and with applying dry additives to the soil. In the field conditions various methods of using polymer additives, their influence on the growth, development and productivity of wheat were investigated [1].

As a polymer additive she used a hydrogel. Hydrogel - a polymer that retains moisture is an environmentally safe preparation, it is non-toxic for both plants and humans. In conditions of climate change, the use of hydrogels to manage the water-retaining capacity of sandy and loamy soils seems promising. From a chemical point of view, moisture-swelling additives are insoluble polymers of a net structure. Due to the net structure, the macromolecule of the polymer is capable of swelling - absorbing a large amount of water to form a hydrogel. The amount of absorbed water exceeds the mass of the polymer itself by hundreds of times. Since swelling does not firmly bind water to the polymer molecule, plants can easily receive water from the hydrogel.

The grains of the hydrogel during the soaking swell very quickly to a coarse-grained consistency. The water absorption coefficient of hydrogel directly depends on the composition of water and soil. The hydrogel introduced into the soil improves its properties, making clay soil more

loose, and sandy soil - lumpy. The hydrogel transforms ground dust into stable large granules, protecting the soil from crust formation on its surface. Adding even a small amount of hydrogel to the ground allows not only to reduce fluctuations in soil moisture next to the root system of plants, but also increases the intervals between watering. Due to the reduction in the number of watering, nutrients and fertilizers are not washed out from the root zone, which also makes it possible to reduce the number of fertilizing. The plant itself selects moisture as much as it needs. Moreover, the surplus of moisture is in a bound state, which does not allow over moistening and rotting of the roots.

In drought-resistant terrain, on dried up soils, in mountainous terrain, on sloping fields as well as in deserts and on lands where surveying was conducted the use of hydrogel allows rational improvement of the surrounding landscape and accelerate the restoration of the natural environment for a given area. Hydrogel prevents water leakage and soil erosion, and, therefore, prevents water pollution in water dams.

The introduction of hydrogel in the soil and in the mixture simultaneously with the seeds significantly increases the germination rate, shortens the germination time, the plant grows better and develops, blooms more abundantly and longer, looks better. One gram of hydrogel can hold up to 300 ml of water, and the saturation and release of water by hydrogel are completely reversible, water and fertilizers dissolved in it are constantly in the root zone and can be used by the plant as needed. One application of the hydrogel can be used up to five years [2].

After five years, the hydrogel in the soil is completely decomposed. This is one of the serious disadvantages of hydrogel.

The hydrogel can be applied to all trees and shrubs in dry and swollen form. According to [2], when applying the hydrogel in dry form, it is possible to solve the problem partially with high groundwater. It absorbs excess moisture from the roots of plants. However, in our opinion, this method in combating high ground waters is not only inefficient, but it can also lead to the reverse effect. In the swollen gel, water remains in the soil and does not solve the problem of lowering groundwater in any way: according to the law of the bounding vessels, the place released in the ground after the hydrogel has collected moisture is filled with the same amount of water at once. The issue of reducing groundwater is solved by reducing the volume of water supplied to the soil under irrigation. An alternative way to reduce groundwater can be obtained by building sand basins with the addition of moisture-swelling polymer additives, which will play the role of drainage. The water collected there from the soil will disappear by evaporation. When analyzing the effect of reducing the amount of water supplied to the process of reducing groundwater, it is also necessary to take into account the water-holding capacity of the soil.

Water in the soil is in a complex interaction with the solid phase. The soil has a different degree of humidity. The term "moisture" characterizes the water content in the soil, expressed as a percentage of the mass of dry soil (wet weight) or the volume of soil (volumetric moisture). It is known that depending on the mobility and availability of plants, several forms of water in the soil are distinguished: gravitational, capillary, sorbet, vaporous, ground, solid, chemically bound and crystallized. Bounded waters are those ground waters that are physically or chemically related to the solid matter of rocks and therefore are immovable themselves as opposed to free gravitational waters. Directly for nourishing the plant only the gravitational and capillary waters are important, and the remaining forms of soil moisture, except for a small part of the plaque, are inaccessible to plants. Gravitational water fills the capillary pores between the structural parts, by which it moves under the influence of gravity. [3]. In [4], a mathematical model of the hysteresis of the water-holding capacity of the soil was proposed. The model describes the main and scanning curves of withers and moistening of the soil, as well as turning points. In constructing the model, a physically reasonable assumption was used that the function of the differential moisture capacity of the soil at each point on the hysteresis curves takes only two values that correspond to the sorption and desorption equilibrium of soil moisture.

The conducted studies showed that the best effect of hydrogel on the water-holding capacity of grainy sandy loam soil was noted when it was applied at a dose of 0.2%. The highest yield increase (11.2%) was obtained in the hydrogel variant introduced into the soil. Sowing in inlaid seeds also led to an increase in yield by 10.4% compared to the control. However, it has been established that it is more effective and economically justified with the use of hydrogel to inlaid seeds than to apply hydrogel to the soil [2].

One of the important parameters is the drying time of the hydrogel. To determine this indicator, plant roots were immersed in the hydrogel and then removed, placed on a flat surface in the shade in the open air at temperature of 20-21 ° C. The plants were immersed in the hydrogel at the same time. During the day, all the hydrogel samples on the plant with an open root system lost accumulated moisture. However, when the root of the seedlings is wrapped in polyethylene pellicle, the duration of preservation of the hydrogel on the roots increases many times, and as a result - the preservation of the roots, too. And with the more addition of wet peat, moisture remains up to 3-4 weeks [5].

Spheres of application of hydrogel [7]:

- Increasing the water absorbing abilities of soil;
- Decreasing the gravitation flow of moisture;
- The accumulation of moisture in condensed vapor space in soil in the regions with noticeable daily fluctuations of temperature and moisture;
- Increasing field growing of seeds;
- Inlaid seeds;
- Increasing the persistence of plants against soil drainage inlaid on seedlings of veggie plants, which demand moisture in the initial growing period;
- Increasing the effectiveness of using the fertilizers;
- Using polymers as amelioration of sands;
- Creating water holding capacity by preventing double salinity of soils with ground water;
- Applying water screens of swollen polymer in the form of depressor of ground oil vaporization;
- Condensing soil;
- Rural farming: grain crops, food grains and grasses;
- Preventing erosion and weathering of the soil;
- Irrigation of dry soils, regeneration of grazed pastures;
- Waterproof screens with the device of irrigated furrows, irrigation canals, rice checks, for accumulation of spring seasonal precipitation, for creating groundwater repositories, gravity drains and rising salt streams;
- Vegetable farming and gardening;
- Greenhouse and hothouse farming;
- Horticulture and gardening;
- Summerhouse and homestead farming;
- Growing berries and berry shrubs;
- Growing fruit trees and viniculture;
- Growing decorative trees and room plants;
- Transportation, preservation and planting of seedlings;
- Growing mushrooms;
- Floristic;
- Landscape design, greenery of towns: flowerbeds, parks, squares.
- Lawns and hydro sawing, sports grounds such as for golf, football, rugby etc;
- Agroforestry;
- Re-cultivation and regeneration of the ecology of techno genic zones, territories polluted as a result of industrial activity and atmospheric precipitation (strengthening and green planting on river dumps and water reservoirs, slopes, digging excavations, dumps, etc.);

- When creating fields under the steam (fire stop strips) in forest areas;
- Mixtures with grounds and fertilizers;

Application of hydrogel expands noticeably the opportunities of landscape design, allows to reach good results while creating the elements of landscaping. An opportunity occurs to do difficult land surveying, to prevent the slope flow and fertilize with high efficiency.

Conflict settings

Quantitative assessment of the changes in water-holding capacity of soils with introduced hydrogel and availability of accumulated moisture for root systems of plants is important for determining irrigation regimes.

Research results

The water-holding capacity of soils in the range of humidity measurements of 45-50% characterizes the moisture available for plants. The introduction of hydrogel into the soil contributes to an increase in the amount of moisture in this range. From the analysis of the water retention curves it follows that samples of sandy loam soil with the addition of a gel in an amount of 0.2 g of 100 g of soil are the most water-retaining capacity. When gel is added to soil samples, it shows that the water-retaining capacity of soils varies - the soil retains more moisture available for plants. With the onset of hot, arid weather, when the air temperature was within 28-32 ° C, the hydrogel introduced into the soil began to work. There was an improvement in the state of plants both in appearance and in biomass increment compared to other variants. With an increase in the dose of hydrogel to 0.2 g of 100 g of soil, the density of sandy soil decreases, which creates additional porosity and, correspondingly, increases the moisture capacity [2].

Voronezh State University is proposed to use a specially developed polymer in the form of small grains that are able to accumulate moisture. This sorbent is introduced into the soil together with fertilizers, and as the soil dries up, it can give up the water accumulated in its grains. According to the research group, the use of the technology developed by them "Solid Water" reduces irrigation costs twice and significantly reduces the amount of water necessary for the favorable ripening of agricultural plants. One kilogram of granulated Sorbent made by Voronezh scientists can accumulate up to half a ton of water, and the volume of the granules themselves can increase by 100 times. Upon penetration into the granule, the water binds to the walls of the sorbent and is fixed in it in the form of structured ice. When the moisture concentration around the pellets drops below the threshold value, the internal bonds of water with the sorbent begin to break, so that the liquid begins to be released from the granules into the soil. In order for the sorbent to work efficiently, the field after the granules is to be carefully poured with water. The grains store the necessary reserve of water and give it away when the soil dries up, and accumulate moisture back in proportion to the rainfall, thereby regulating the moisture content of the soil. According to scientists, the abundant and primary irrigation is sufficient to ensure that the accumulated water is sufficient for one season of growing crops. Grains can also save fields from excessive water flooding, abundantly absorbing moisture in case of too long rains. The big advantage of the new technology is that the sorbent is not washed out of the soil and can effectively provide soil with moisture for ten years. In addition to water, granules can accumulate in their water solutions of the necessary mineral fertilizers and additional trace elements, so that during the entire period of vegetative growth the root system will receive nutrients necessary for the plant. At the same time, the cost of 1 kilogram sorbent by Voronezh scientists will cost about $ 10, which is two times lower compared to foreign counterparts. Also, the undoubted advantage of the new technology is the stability of the sorbent to low temperatures, which makes it possible to use safely "hard water" in conditions with a harsh climate. The most important advantage of the new granulated sorbent is its high economic efficiency in comparison with the traditional forms of irrigation and even super-economic drip irrigation. According to research estimates, the use of sorbent reduces at least twice the

water costs for irrigation of the soil. To that, when using granules, water-soluble fertilizers and minerals are not washed out of the soil and are consumed for a long time in the most efficient manner [6].

One of the ways of using water swelling polymeric additives is the fermentation of seeds. The aim of coating is to create a surface layer of hydrogel, which, accumulating the moisture, must support an appropriate water-nourishing regime round the seeds in the conditions of water deficit and lack of microelements in the ground. As coating the food yeast may be used. The technological process of fermentation consists of the following operations:

- Loading the seeds in the tanker of fermentation;
- Adjusting the fermentation process and moisturizing the seeds with liquor hydrogel (for 50 kg seeds 5 liter of liquor is needed);
- Gradual addition of hydrogel in the camera box and mixing with hydrogel (for 50 kg seeds 5 kg of hydrogel is needed) till a solid crust is formed round the seeds.

For effective fermentation it is necessary to use hydrogel of small grains of fraction d shorter than 0.1 mm. The shell of fermented seed material has the ability to accumulate up to 4000% out of its weight of water.

Conclusion

Moisture swelling polymeric additives, which repeatedly increase the volume as a result of swelling, can be effectively applied in agriculture, both for the cultivation of decorative plants, as well as for vegetable growing and horticulture. Particularly effective will be the use of polymer additives for the manufacture of grass coatings. However, the use of a hydrogel is not effective enough, it spoils under the influence of the sun.

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ՈՌՈԳՄԱՆ ՋՐԻ ԽՆԱՅՈՂՈՒԹՅԱՆ ԱՊԱՀՈՎՄԱՆ ՀԵՌԱՆԿԱՐՆԵՐԸ՝ ԳՐՈՒՆՏԻ ՄԵՋ ՋՈՒՐ ԿՈՒՏԱԿՈՂ ՀԱՎԵԼՈՒՄՆԵՐ ՕԳՏԱԳՈՐԾԵԼՈՒ ԴԵՊՔՈՒՄ

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Բուսաճի շրջանում Հայաստանի գետերի հոսքը փոքր է և այն չի կարող բավարարել բոլոր մշակաբույսերի դաշտերի ջրապահանջը, նամանավանդ, որ համատարած կիրառվող մակերեսային ջրման եղանակի պատճառով մեծ են ջրի հոսակորուստները: Դրանք պայմանավորված են նաև տեղական պայմանների համար մշակաբույսերի ոռոգման ռեժիմների պարամետրերի հաշվարկման մեթոդի բացակայությամբ: Միևնույն ժամանակ, լեռնային երկրներում, ինչպիսին է Հայաստանը, շատ են ավազային և կավավազային գրունտները, որոց միջով ջուրը ֆիլտրացվում է , որի պատճառով անհրաժեշտություն է առաջանում ավելացնել ոռոգման հաճախականությունը և տրվող ջրի քանակությունը: Ջուր կուտակելու հատկանիշներով օժտված պոլիմերային հավելանութերի օգտագործմամբ հնարավորություն կընձեռնվի զգալիորեն կրճատել ոռոգման նպատակով մատակարարվող ջրի ծավալը և կրճատել ջրամատակարարման հաճախականությունը: Ոռոգման նպատակով մատակարարվող ջրի նվազեցումը հնարավորություն կտա նաև նվազեցնել գրունտային ջրերի բարձրացման մակարդակը, ինչը հանգեցնում է հողերի աղակալմանը: Դա կբերի նաև առավել ցածր նիշերի վրա գտնվող հողատարածքների ճահճացման մասշտաբների նվազեցմանը:

Բանալի բառեր. ջուր, ոռոգում, բույս, գրունտ, ավազ, ֆիլտրացիա, ջրի խնայողություն, պոլիմեր, հավելանյութ, դոնդող

ПЕРСПЕКТИВЫ ОБЕСПЕЧЕНИЯ СБЕРЕЖЕНИЙ ОРОСИТЕЛЬНОЙ ВОДЫ ПУТЕМ ИСПОЛЬЗОВАНИЯ В ГРУНТЕ ВОДОАККУМЛИРУЮЩИХ ДОБАВОК

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Сток рек Армении мал и он не может удовлетворить потребность в воде всех возделываемых культур на полях, тем более, что из-за применения поверхностной системы полива - потери воды значительны. Большие потери также обусловлены несовершенством методов расчета орошения культур в местных условиях. В то же время, в горных странах, как Армения, много песчаных и суглинистых грунтов, сквозь которые происходит интенсивная фильтрация, из-за чего возникает необходимость увеличения частоты орошения и объема подаваемой воды. Способность аккумулирования воды полимерных добавок позволяет сократить объемы и частоту орошения, при их внесении в грунт. С целью орошения уменьшение подаваемой воды также дает возможность уменьшить уровень поднятия грунтовых вод, что приводит к засолению земель. Это приведет также к масштабному уменьшению заболачивания земель, находящихся на наиболее низших отметках.

Ключевые слова: вода, орошение, растение, грунт, песок, фильтрация, сбережение воды, полимер, добавка, гель