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Soil Moisture Dynamics in the Root Range

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ABSTRACT: Nowadays, areas undergoing degradation are growing in agriculture around the world. The condition of the land is deteriorating due to water erosion by 56%, wind erosion by 28%, due to a decrease in mineral elements in the soil, salinity, pollution by 12% and due to compaction, water logging, and under the influence of deposition processes by 4%. Because of such negative processes and because of the existing problems of water scarcity in 80 countries each year, as a result of the suspension of the use of agriculture in the sown fields in the world, the problem of food security arises.

KEYWORDS: land reclamation, irrigation

I.INTRODUCTION

Today, large-scale measures are being held in our republic to improve the ameliorative state of irrigated land, to increase soil fertility, to effectively use existing water resources when there is a shortage of water, and to create additional water resources. As a result of this activity, 38863 km of collector-drainage networks, 52 land-improvement pumping stations and 1344 land-reclamation wells have been repaired and reconstructed today. Drip irrigation methods were introduced in 13.2 thousand hectares, films in a furrow in 18.0 thousand hectares, irrigation with the help of portable flexible pipes instead of irrigation channels in 16.8 thousand hectares of area and as a result the ameliorative status of 1 million 200 thousand hectares of land was improved. Strategy of the Republic of Uzbekistan for 2017-2021 includes a special focus on the further improvement of the ameliorative status of irrigated land, on the development of networks of land-reclamation and irrigation facilities, on the widespread introduction of intensive agricultural production methods, primarily water-saving and resource-saving modern agricultural technologies. Studies of the intensity of agricultural production methods, soybean crops with water shortages and with soil degradation services in the process of irrigation erosion, for the production of modern water and resource-saving agricultural technologies are relevant.

To this day, the issues of transition to water supply systems and water to the plant roots have not been resolved. Studies have shown that plant roots absorb water through the intercellular spaces and epidermal cells. The membranes of the epidermal cells are able to squeeze out the solutes in moist soil, thereby absorbing the necessary mineral nutrients for the plant. Therefore, the content of solvent substances (concentration) (electrolyte) in the root layer (xelama) is usually much lower than the concentration of these solutions in the soil composition. Because the flow of water to the plant usually contradicts the gradient of the osmotic potential of water, and their effective migration occurs through metabolic processes. It then travels along the water root feed system to the xylene layer. And through this layer rises to the leaves.

Through the holes on the leaf surfaces they diffuse into the atmosphere in the form of steam. That is, transpiration occurs. The process of transpiration leads to a complete loss of water potential in the leaves compared to the soil.

At the same time, a potential gradient forms in the leaves, and through it water moves up, water reaches the soil, from the roots to the stem, and from it reaches the leaves. Research is a good source of water flow for young roots and their location. Depending on the thickness of the young roots in the soil layer, these seeds constantly change during the growing season. And the old roots gradually lose their root tentacles.

The intensity of the transpiration process is controlled by the leaf apparatus.

As the plant begins to eradicate tourism, drops.

Studies show that different leaf cultures are closed depending on the amount of water (potential) in the leaves.

According to the proposal of F. B. Abutaliev, changes in soil moisture should be shown (illustrated) as follows:

Property location

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$$\begin{cases} \dfrac{\partial W_1^*}{\partial t} = \dfrac{\partial}{\partial z}\left[D_1^*(W_1^*)\dfrac{\partial W_1^*}{\partial z}\right] - \dfrac{\partial K_1^*}{\partial z}, & (0 \le z \le z_1) \\ \dfrac{\partial W_2}{\partial t} = \dfrac{\partial}{\partial z}\left[D_2(W_2)\dfrac{\partial W_2}{\partial z}\right] - \dfrac{\partial K_2}{\partial z}, & (z_1 \le z \le z_{\text{УГВ}}) \end{cases} \tag{1}$$

$$W_{\text{ПОВ}} = W_1^*(x,0,t) = \begin{cases} W_{\text{ПН}} + \left(W_{\text{ППВ}} - W_{\text{ПН}}\right)\cdot th\left(\omega^* t\right) \\ W_{\text{ПН}} - \left(W_{\text{ПН}} - W_3\right)\cdot th(\omega t) \end{cases} \tag{2}$$

$$\left[K_1^*(W_1^*) - D_1^*(W_1^*)\frac{\partial W_1^*}{\partial z}\right]_{z=z_1} = \left[K_2(W_2) - D_2(W_2)\frac{\partial W_2}{\partial z}\right]_{z=z_1} \tag{3}$$

$$W_2\left(z_{\text{УГВ}}(x,t)\right) = W_{\text{ПВ}} = const \tag{4}$$

Doctoral student of the department "Operation of irrigation and drainage systems" R. Muradov looked at the solution to this as follows:

$$W_1^*(x,z,t) = \left.\begin{cases} W_{\text{ПН}} + \left(W_{\text{ППВ}} - W_{\text{ПН}}\right)\cdot th\left(\omega^* t\right) \\ W_{\text{ПН}} - \left(W_{\text{ПН}} - W_3\right)\cdot th(\omega t) \end{cases}\right\} + \beta_1 z^3 + \beta_2 z^2 - \frac{6\beta_1\beta_2 R_1^*}{\tilde{D}_1^*} e^{-\frac{\tilde{D}_1^* t}{\beta_2}} z \tag{5}$$

$$W_2(x,z,t) = \gamma_1\left(Z_{\text{УГВ}} - z\right)^3 - \left[3\gamma_1 Z_{\text{УГВ}} + \gamma_2^*\right]\left(Z_{\text{УГВ}} - z\right)^2 + \left(3\gamma_1 Z_{\text{УГВ}}^2 + 2\gamma_2^* Z_{\text{УГВ}} - 6D_2(t)\frac{\gamma_1\gamma_2^*}{\tilde{D}_2} + \gamma_3^*\right)\left(Z_{\text{УГВ}} - z\right) + W_{\text{ПВ}} \tag{6}$$

The results of experiments to determine the coefficients given in equations (5) and (6) are given in the table below.

Property location	Author	Mechanical structure of soils	Variable letter equation				
			α_1	α_2	γ_1	γ_2	γ_3
Farm "Oltinkuz"	Muradov R.A.	Harsh loamy	-7,6	-3,6	0,61	-0,22	-16,7
Farm "Sardor Kelajagi"	Muradov R.A. Barnayeva M.A	Average loam	-7,8	-3,4	0,54	-1,03	-18,4
Farm “Uksalish”	Muradov R.A. Barnayeva M.A	Average loam	-8,3	-3,2	0,24	-1,18	-13,5
Farm “Samargand Gumbazi”	Muradov R.A. Barnayeva M.A	Light loam	-7,3	-2,8	0,45	-1,51	-21,6
Farm “Samargand istiqboli”	Muradov R.A. Barnayeva M.A	Supes	-9,1	-2,9	0,21	-1,51	-21,8
Farm “Sarvar-Mamur-Maruf”	Muradov R.A. Barnayeva M.A	Supes	-9,2	-2,6	0,20	-1,55	-22,7

When solving equations (5) and (6) using the table number 1, the following graphs were obtained.

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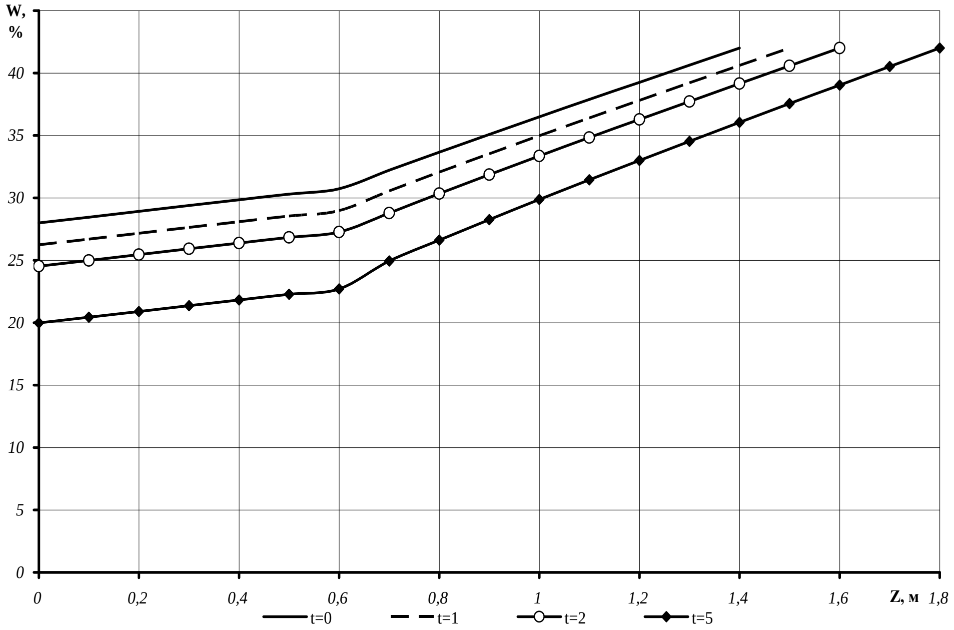

1- pic. Dynamics of changes in humidity in the root layer of a plant.

It is often very difficult to describe the movement of water in the root layer. The main difficulty in this lies in the mathematical formation and qualitative description of the physiological processes that determine the active mechanism of movement in the roots. Therefore, formulas (5) and (6) were taken as the initial study and their coefficients were determined.

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