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Paper Authors:

Saidkhajayeva Dilsora¹, Egamberdieva Shakhnoza²



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WATER PERMEABILITY OF THE SOIL IN FURROW IRRIGATION OF COTTON PLANT CULTIVATED IN COMBINATION WITH MUNG BEAN

Saidkhajayeva Dilsora¹, Egamberdieva Shakhnoza²

“Senior Lecturer of "Electricity and pumping stations"¹”

Associate Professor of "Hydraulic Engineering and Land Reclamation"

Doctor of Philosophy²

E-mail: saidxodjaeva.1951@gmail.com

Abstract: Conducting of theoretical investigations for special purposes are of great importance in improvement meliorative condition of the ground, determination of watering and irrigation norm jointly swed plants, improvement of irrigation regime and irrigation technology, rfsing water consumption efficacy, in working out the ways of estimation of jointly cultivated plant intercommunication and their productivity. Investigations in improvement upon irrigation regime and irrigation technology in jointly cultivating of two agricultural crops in one season and one field are of great importance as well.

Keywords: irrigation erosion, water permeability, infiltration, filtration, joint cultivated plants, furrow irrigation, irrigation regime, irrigation technology, water absorption rate, upper layer.

Introduction

Analysis of condition of modern irrigation system in traditional irrigated regions their exploitation rate in crop cultivation gives us the opportunity to state out serious defects in rational water consumption taken from water resources. One of the main reasons that cause changes in arable soil layer is acidity and water saturate in vast irrigated territories. It is the result of over-irrigation of agricultural crops The most frequently used way of irrigation in Uzbekistan with various natural agricultural conditions is superficial. In industrial crop cultivation mainly in cotton plant growing furrow irrigation is used. Though it is the most simple, convenient and cheapest way of irrigation, it needs the most perfect irrigation technology that makes use of land more rational and effective. It can bring to save water coming from irrigation resources, job, technological, material and finance resources as well.

It is well-known that the elements in furrow irrigation depend on permeability of maintained layer of the soil. To investigate permeability of the mentioned soil layer and working out scientifically determined suggestions on perfecting furrow irrigation technology.”Andijon 35” cotton plant variety

laguminuos(mash) crops and soybean, were naken.

The investigations were made on “Zamirabonu sahovati” farm territory of Buloqboshi district Andijon region, Uzbekistan.

Investigations of agricultural crops irrigation ways and technologies are based on studying water absorption with in saturate soil and on the base of accepted hypotheses were aimed to investigate types and dependence of water absorption rate of the soil. Characteristic index of absorption is the rate of water absorption of the upper level of the ground in furrow irrigation. A.N.Khostyakov was the first in land melioration investigations. He determined dynamic nature of absorption and suggested to show water absorption rate in time in the following formula

$$K_t = f(t)$$

$$K_t = \frac{k_1}{t^\infty}$$

Here K_t – is water absorption of the soil, m/minute,

K_1 – is water absorption at the beginning, first minute, m/min

t – water absorption time, minute

∞ - index characteristic to water absorption of the soil.

Dependences proposed by N.T.Laktayev[2] and J.S.Mustafayev[3] more fully characterize starting and final nature of absorption but their application is difficult though the formulas are unwieldy, they can not appropiate real data. Complexity of mathematic calculations, based on these dependences caused to search the ways of solution to determine water absorption just in special cases[3].

The process of water absorption of soil has two stages: in the first stage big microporous are filled in, -influxion, then infiltration takes place[4].

In common case the height of absorbed water in the soil(for the first period t) is: $h_t = H_0 \cdot K_{ot}^{(1-a)}$ (1)
Here H_0 – the height of water level before starting absorption depending on cultivation system, the depth of laying of single tilling sole etc.

As for A.N.Khostyakov the formula is as follows[1]:

$$K_{ot}^{(1-a)} = S \frac{Kt^{(1-a)}}{1-a} \quad (2)$$

It is better to base absorption calculations on the dependence taking into account two shown stages, its parametres can easily be determined measuring just in the place.

The particular method is based on a briefed balance calculation;

$$V_{nog} = V_{bn} \cdot V_{ep} \quad (3)$$

$V_{nog} = 0,06 \cdot q \cdot t$ means the volume of water (m^3) brought to furrow, water expenditure q – (λ/c), t – time(min)

$V_{bn} = \int W_{cp} P_{cp} X dt$ – is the volume of water (m^3) absorbed along the furrow length $X(m)$, where the average data of moistened perimeter P_{cp} (m) and absorption along the given furrow length is W_{cp} (m/min).

The formula $V_{cp} = W_{cp} \cdot X$ – is the volume of water(m^3), accumulated in the furrow line with average amount.

Differentiating the equation we can have $0,06 \cdot q_0 = W_{cp} P_{cp} X \frac{dx}{dt}$ (4)

In the given equation all parametres except W_{cp} , are measured in reality, then absorption rate W_{cp} are determined according to the following formula

$$W_{cp} = \frac{W_{cp} \frac{dx}{dt}}{p_{cp} \cdot X} \text{ m/min} \quad (5)$$

Permeability of soil is estimated by two periods of infiltration and filtration.

The full mathematic theory of infiltration was presented by A.N.Kostyakov precisely concrete and simply in the following form:

$$K_l = K_f \cdot t^a \text{ m/t} \quad (6)$$

K_l – absorption rate at the end of first time period,

K_f – established average rate of absorption(k darsi), m/t.

t – time where infiltration is finished and absorption becomes level

a – shows infiltration rate

$$a = \frac{\lg K_l - \lg K_f}{\lg t - \lg t_f} \quad (7)$$

$x - k_t$ = absorption rate at the given moment t , m/h

$$K_o = \frac{K_l}{1-a} \text{ m/h} \quad (8)$$

K_o – the average absorption during the first period of time, m/t

$$K_{cp} = \frac{K_o}{t^a} \text{ m/h} \quad (9)$$

K_{cp} – average rate for t period.

In the logarithm diagram absorption coordinator in infiltration period m/h ($K_l = \frac{K_l}{t^a}$) is a straight line.

$$L_g K_g = L_g \cdot K_L - a \cdot L_g \cdot t \quad (10)$$

I.G.Aliyev and N.F.Bonchkovski presented the following formula

$$K_o = K_{cp} \cdot (10 \Pi)^2 \quad (11)$$

$$\Pi = 0,501694$$

Here K_{cp} – the average absorption rate during infiltration and is determined with formula

$$K_{cp} = \frac{K_{l1} t_1 + K_{l2} t_2}{t} \quad (12)$$

t_1 – infiltrated absorption period m/h

t_2 – filtrated absorption period m/h

According to the particular method water permeability of the soil in Andijan region natural conditions during irrigation of cotton plant grown jointly with masn and bean(leguminous crops). On the experimental plot of average grey soil at “Zamirabonu Sakhovat” farm in Bulakbashi district of Andijan region absorption rate at starting

vegetation period to the end of the period of time, was 0,056 m/h, in the mid vegetation – 0,042 m/h, and filtration efficacy accordingly made 0,017 and 0,014 m/h. According to the particular investigation irrigation method, at the final plot of irrigation furrows was determined as well.

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