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Results of Scientific Research on Dripping Irrigation in Bukhara Climate Conditions

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Abstract: The article gives an analysis of the existing methods of irrigation of irrigated lands in the Republic of Uzbekistan, which for the most part are subject to salinization. As well as the result of a study to establish the main parameters (distance between droppers, water flow, and zone diameter and depth of the moisture distribution zone) of drip irrigation. In addition, the results of a laboratory test were given in which two drops of water per 900 holes and 1800 drops of water were obtained in one second. Then a 100-m pipe drips 162 103 kg of water in one second, which is 0.162 l/second.

Keywords: Water, Drip, Pressure, Amount of Water, Pipe, Diameter, Moisture.

1. INTRODUCTION

The use of water in drips in unscientific cases leads to an unjustified increase in water consumption [8, 9, 10].
The main disadvantages of drip analysis are the imbalance of water consumption at the point of intake of the main pipes and at the end of the distribution process. In addition, there is an increase in salinity at the drip points, and the dripping water is enjoyed by weeds [11, 12, 13, 14].

Popular methods of irrigating crops in modern agriculture are: above ground; raining; underground; from the ground; drip; spray irrigation. Recently, when irrigating agricultural crops by film, the furrows are covered with a film, and holes are formed at a certain distance from the bottom, and the water supplied from these holes is used to irrigate the crops. The main advantages of this method are significant water savings and relatively low weeds in the field. Irrigation over film involves the cost of the film and its removal, as well as the partial evaporation of water from the atmosphere. In the case of drip irrigation of agricultural crops, flexible glue pipes with a diameter of 16–20 mm are laid on the soil near the crop stalks, from

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which water holes or cracks are formed at certain intervals, and water drips from them. The crops are intended for irrigation. In most cases, the water is fed with a mixture of chemical and local fertilizers [15, 16, 17, 18, 19].

2. RELATED WORKS

The advantage of this method is that the soil moisture and the amount of water supplied to maintain the moisture in it are controlled, and the water is distributed evenly across the field according to the needs of each crop for a certain period of time. Unlike other irrigation methods, drip irrigation creates a favorable environment for the plant in the soil layer, where the roots of the crop develop.

One of the main achievements of the method is the frequent supply of small amounts of water and nutrients to the crop in accordance with its needs. The plant receives water and nutrients when it needs them. This method provides a constant supply of moisture to the root layer of the crop, allowing it to absorb water and nutrients. When the above procedure is followed, the plant uses all its energy to grow, develop, and increase its yield. The main disadvantages of drip irrigation are the complexity of the installation and assembly of the drip pipe, as well as the complexity of the water supply process, as well as the fact that during the growing season the roots of plants tend to the drip side, and in this case the fact that the upwards do not provide stability to the plant stem, in addition to the clogging of holes or crevices from the drips, is the cost of cleaning them from time to time.

In cases where the salt content of the water is high, it is considered necessary to cover the holes and crevices with salt due to the evaporation of water if the temperature is higher on hot days during irrigation. The above shortcomings of drip irrigation are causing negative protests from farmers in the area. In addition, in many cases, farms are not trained in water-saving technologies, and there is no perfect scientific basis for the use of drip irrigation by plant species [20, 21, 22, 23, 24].

3. MATERIALS AND METHODS

In order to solve the above problems in the laboratory "Resource-saving techniques and technologies" of the Bukhara Institute of Natural Resources Management, the National Research University of Tashkent Institute of Irrigation and Agricultural Mechanization Engineers carried out research to determine and set the main indicators of drip irrigation. It analyzes the optimal sizes and values of drip irrigation and application processes and studies the irrigation regime and the physical and mechanical properties of local soils and water. For this, the tasks of the research work were identified. Then: determining the amount of minerals and organic matter in irrigation water; setting the irrigation pressure of drip water; determination of the angle and diameter of the slope of the dropper relative to the horizon, as well as the mass of one drop; determine the amount of water passing through the drip, taking into account the natural moisture of the soil; determining the moisture content (diameter and

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depth of distribution) in drip soil; set the distance between the drops; to determine the effect of the volume of moist soil on productivity.

An area with a high salinity of 25 m in height and 15 m in width was selected from the laboratory area for the study.
Laboratory research was conducted at two locations on the site on January 3, 2022, at 10:30 p.m. Soil samples taken from the study area were taken by the Bukhara Regional Department of Environmental Pollution Monitoring (AMIMK) on the test method MH: GOST 26213-91. Photocolometric, argentometric, and turbidimetric methods were used [25, 26, 27, 28]. The analysis concluded that the soil in the cultivated part of the land was "strongly saline" in AMIMK Test Report No. 43. The amounts of humus, chloride, sulfate, dry residue, and nitrate ingredients were studied in two soil samples.

Earth Conditions

Table 1

Name of Indicators	**The Value of the Initial Indicators**	
	№1 -surface area	**№2 – surface area**
Humus	0,85	1,02
Dry residue	1,52	1,74
Sulfate	0,045	0,062
Chlorides	0,24	0,18
Nitrate	80	95

The analysis of Table 1 shows that a very low level of humus was selected. In order to overcome the shortcomings of the above methods as well as drastically reduce the "strong salinity" of the experimental plot, 3-order (sequential) laboratory experiments were conducted to fully perform the above tasks.

From our first series of experiments with constant water pressure in the drip pipes (1.4 m/s), the droplet mass, the diameter of the bearing holes of the dropper, and the mass of 100 drops per drop were determined, and the results obtained are given in Table 2.

Results of Passed Experiences Over Dropper

Table 2

№	**Mass of Water, g**	**Dropper Diameter of, mm**	**Mass of Drops, g**	**The Mass of a Drop, g**	**Number of Drops,**
1	100	3,5	7	0,07	1429

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2	100	4,5	9	0,09	1111
3	100	5,5	11	0,11	909

Commonly accepted methods have been used to determine the minerals in irrigation water [29, 30, 31, 32, 33, 34].
It is necessary to determine the pressure of the irrigated water, the density of the water, and the amount of organic matter dissolved in it, as well as the tensile strength. The surface tension coefficient is the ability of the drop to break through the holes.
The following conditions must be met for the drop to break through the hole: The following inequalities must be satisfied:

$$F_{og'k} \geq F_{stk} \qquad (1)$$

where is the gravitational force of the drop, N; and the surface tension force, N.
It is known that the gravitational force of a drop can be determined as follows:

$$F_{og'k} = m \cdot g \qquad (2)$$

So we find the surface tension force as follows:

$$F_{stk} = \pi \cdot \sigma \cdot D \qquad (3)$$

where *m* is the mass of the drop, kg; is the acceleration of free fall of objects, m / s2; s is the surface tension coefficient, N / m; and *D* is the diameter of the drop hole, *m*.
Then formula (1) looks like this:

$$m \cdot g = \pi \cdot \sigma \cdot D$$

From this equation, the surface tension coefficient is:

$$\sigma = \frac{m \cdot g}{\pi \cdot D} \qquad (4)$$

After determining the surface tension of the droplet, our next experiments focused on determining the moisture limit in drip-soaked soil.
To determine the moisture content, Test 63.03.2001, "Testing of agricultural machinery. The energy evaluation of machines ``[35, 36, 37, 38] was performed using a special device (Figure 1). The medical pipe 5 was selected for its high accuracy in dripping water from the device.

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Dropper (error in water volume + 0.001 mg/aa). Taking into account the hydraulic resistance of the droppers, in the first experiments, the number of droplets passing through the dropper and its volume in m^3/s and m^3/s were measured and visually observed. The device consists of: Stand (column) 1, water tank 3 (water tank capacity 0.5 l), and a water tank fastening device. 2. device for increasing or decreasing the number of drops (adjusting) 4, drip guide tube 5, dropper 6, and dropper holding device 7.

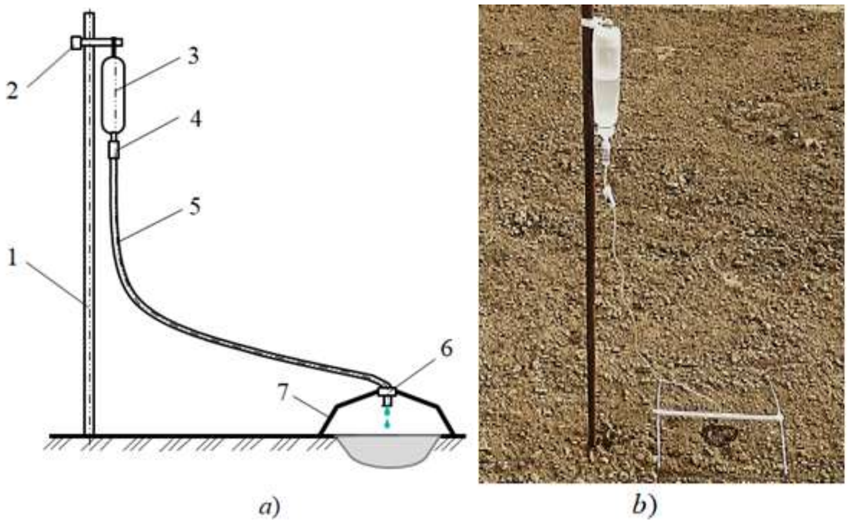

Figure 1. Drip device: general view of the a-device; b-picture of the device

Subsequent experiments determined the size of the droplet, the volume of moist soil, the cross-sectional area, and the amount of water dripping.

4. RESULTS AND DISCUSSION

To do this, a column was chosen to hang the water tank (3) at a certain height in order to ensure that the dripping water flows into the pipe at a certain pressure. The column (1) is knocked to the ground, and the water tank (3) is attached to the tripod by means of a special fastening device in the drops, which is set at a certain height. With this device, it is possible to control the change in pressure in the droplets. The water tank was equipped with a device that controlled (increased or decreased) the number of drops and ensured that the number of drops of water per unit time was constant. The device is connected to a drip pipe, on one side of which is installed a drip device.

5. CONCLUSION

Setting the water container (volume error 0.04 mg) to a certain height, water was poured into the container, and the droplets were adjusted and fed to the dropper using a drip adjuster.
Given the large number of repetitions of the experiments, after each experiment, the depth of the soil moisture on the surface of the droplets, diameter D, and angle h at an angle of 900 to the horizon are measured (Table 2).

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