Advances in Crop Science and Technology

ISSN: 2329-8863

Hypothesis Open Access

Essential Considerations for Maximizing the Productivity of Irrigated Agricultural Land

Gevorg Kirakosyan*

Indo-French Cell for Water Sciences, Interdisciplinary Center for Water Research, Azerbaijan

Abstract

Optimally moistened soil has the best looseness, lower hardness and resistivity, it is less sprayed during processing and by the wind. However, these properties can be preserved during long-term irrigation only by observing a number of conditions: using a set of agrotechnical practices in crop rotation, appropriate irrigation methods and techniques, and strictly standardized supply of irrigation water. A distorted irrigation regime negatively affects the physical properties of the soil: density increases, porosity and water permeability decrease, structure deteriorates, and irrigation erosion develops.

Keywords: Optimal; Irrigation rate; Activation; Regulation; Irrigation regime; Water consumption; Soil layer; Depth; Loosening; Crop; Air

Introduction

The Republic of Azerbaijan is located in the South Caucasus. The total area of the republic is 8641.5 thousand hectares, of which mountainous and foothill areas account for about 60%. Of the 8641.5 thousand hectares of area, 4514.5 thousand hectares are agricultural land. Of the total area of farmland, irrigated lands account for 1335.2 thousand hectares. These lands provide 85% of the country's total crop production. Due to the complexity of physical and geographical conditions and anthropogenic impact, 43.1% of lands are susceptible to erosion processes to one degree or another. As is known, in terms of climatic conditions, Azerbaijan differs from other regions in that 9 out of 11 climatic zones existing in nature occur in our republic. This circumstance requires a special approach to solving problems of agricultural production. The situation is further complicated by the fact that precipitation on the territory of the republic is uneven, and in a number of regions it is insufficient to meet the needs of agricultural crops during their growing season, i.e. there is a water shortage. In the republic, water-intensive crops are traditionally grown, and water consumption per 1 hectare of irrigated land lags due to water shortages, as a result of which, instead of 4-5 waterings, plants receive 2 waterings [1].

During irrigation, water and mineral nutrition, including the provision of carbon dioxide and air, can be purposefully regulated by changing the methods, rates and number of irrigations, applying mineral and organic fertilizers, soil cultivation, etc. It is more difficult to influence the supply of light and heat to the plant, but, to a certain extent, it is possible to increase or decrease the temperature of the ground layer of air and the upper layers of the soil.

The purpose of the study: is to study the experience of optimal water supply as an active means of influencing the microclimate of the field: soil and surface air temperature, relative air humidity, wind strength and radiation balance [2].

Research Methods

Irrigation has a great influence on soil processes and microclimate. The transition from rain-fed to irrigated agriculture has a major impact on the soil.

Irrigation water helps improve soil fertility. It dissolves nutrients, makes them more mobile and digestible for plants. The closer the soil moisture reserves are to the optimum, the stronger the positive effect of irrigation on the soil, the higher its effective fertility. And only excessive soil moisture by irrigation can cause negative phenomena over time: rising groundwater, salinization and waterlogging of the soil, and a drop in its fertility [3]. Therefore, the soil water regime should be properly observed. When these changes have no effect negatively affects the growth and development of plants, the water regime is considered positive, and with intensive plant development-optimal. If fluctuations in soil moisture inhibit normal plant growth, the soil water regime is unfavorable. It is often observed under rain-fed crops in areas with insufficient precipitation, where the moisture reserves of the active soil layer at any phase of development can drop to the wilting moisture content, and the amplitude of their fluctuations reaches a maximum. When irrigated, the water regime of the active soil layer takes on a different character. Due to regular watering, it is maintained throughout the entire growing season, and with moisture replenishment during the growing season at a high level, close to optimal, for the growth and development of plants [4].

Discussion of the Research Results

It is believed that the soil air regime is of great importance for the normal growth and development of plants. Air occupies all water-free pores in the soil. In addition, a small amount of it is adsorbed on the surface of soil particles and dissolved in soil water. The higher the soil moisture, the less air it contains. After watering, almost all soil pores are filled with water. At humidity corresponding to NV, only about 20% of soil pores are occupied by air. Its composition is heterogeneous and very different from the atmospheric one. Soil air is always more

***Corresponding author:** Gevorg Kirakosyan, Indo-French Cell for Water Sciences, Interdisciplinary Center for Water Research, Azerbaijan, E mail: gevory.kirakosyan@gmail.com

Received: 01-Dec-2023, Manuscript No: acst-23-123397, **Editor Assigned:** 04-Dec-2023, pre QC No: acst-23-123397 (PQ), **Reviewed:** 18-Dec -2023, QC No: acst-23-123397, **Revised:** 22-Dec-2023, Manuscript No: acst-23-123397 (R), **Published:** 29-Dec-2023, DOI: 10.4172/2329-8863.1000651

Citation: Kirakosyan G (2023) Essential Considerations for Maximizing the Productivity of Irrigated Agricultural Land. Adv Crop Sci Tech 11: 651.

saturated with water vapor up to 90-100%. The oxygen content in it decreases, and carbon dioxide increases with the decomposition of organic compounds and the activation of the nitrification process.

The oxygen content also decreases due to its greater consumption by plant roots due to their increased growth, as well as due to intensive microbiological activity in the soil [5].

Carbon dioxide in soil air with weak aeration under a closed crop cover and in compacted soil often contains 1.5-2%, while in atmospheric air it is 0.03%. The optimal concentration of carbon dioxide is less than 1%. Under the influence of gas exchange between soil and atmospheric air, the concentration of oxygen in soil air increases, and carbon dioxide decreases. The intensity of gas exchange changes under the influence of daily fluctuations in temperature, atmospheric pressure, under the influence of rain, wind, diffusion of irrigation water and other reasons.

A prerequisite for regulating the air regime is the correct regulation of irrigation, the prevention of waterlogging of the soil, the formation and long-term standing of puddles. Deep loosening, slotting, and hilling actively improves soil aeration. Not wetted from the surface, between furrows and under subsoil humidifiers, they easily allow atmospheric air to pass to the roots of plants.

Aeration is enhanced by periodic loosening after watering and precipitation. It should also be noted that the thermal and nutrient regime of the soil is necessary for the life of plants. Moist soil promotes the flow of heat from the lower non-freezing horizons; when moisture freezes, latent heat of phase transition is released, as a result of which the soil temperature in winter does not drop as low as without winter watering and rises more slowly in the spring. Thanks to this, fruit trees bloom later and avoid spring frosts. In addition, irrigation greatly changes the nutritional conditions of plants. Nitrates, moving into the zone of activity of the active root system, improve plant nutrition. However, watering with excessively high rates washes nitrates beyond this zone, and then the nitrogen nutrition of plants deteriorates [6].

Numerous studies have revealed that in an orchard an accumulation of nitrate nitrogen in a layer of 80-100 cm was established up to 30-40 mg per 1 kg of soil as a result of systematic moistening to a depth of 100-120 cm, while in the upper horizons its content was not exceeds 10-15 mg.

Soluble compounds of phosphorus and potassium are less mobile, but they can also be washed to depth, which contributes to the cultivation of the underlying layers.

Long-term experiments show that the potassium content in the soil solution changes more noticeably depending on humidity. The potassium concentration in soddy-podzolic soil at a moisture content of 16.5% was 5.2, and at 25.2-1.5 mg/l.

Irrigation also changes the conditions for the supply of microelements to plants, especially when it impairs aeration, the resulting ferrous compounds are poorly absorbed by plants, and the supply of boron, copper and other microelements is hampered. Irrigation water itself often contains significant amounts of nutrients and enriches the soil with them [7].

Based on the above, we find criteria for the impact of irrigation on the physical state of the arable layer.It should be taken into account that under the influence of irrigation, the mechanical composition of the soil profile often changes-silt fractions from the arable layer move to the lower horizons.

As a result, at a depth of 30-80 cm in heavy soils and at a depth of 1.5-3 m in light soils, a compacted layer is formed, which impedes root growth and the penetration of air and water. On heavy soils it usually forms I'm at the depth of plowing. The mechanical composition of the soil is often improved due to silt particles brought by irrigation water. The water-air and nutrient regime of the soil is significantly influenced by its structure. Crop rotation and proper agricultural technology, even with prolonged use of irrigation, make it possible to maintain the structure of the soil. At the same time, the regular supply of irrigation water reduces the concentration of the soil solution, thereby promoting the dissolution of minerals.

Depending on irrigation rates and the filtration capacity of the soil, these salts accumulate at a certain depth or are carried out by groundwater outside the irrigated field.

Moreover, irrigation also changes the qualitative composition of soluble salts and the reaction of the soil solution. Thanks to its hydrolyzing effect, water breaks down salts of strong acids and weak bases in the soil.

It is known that irrigation creates more favorable conditions for soil microorganisms. The optimal humidity for them and plants is approximately the same [8].

Consequently, the activity of microorganisms that provide plants with nitrogen nutrition is favored by maintaining humidity at a level of at least 50-60% for light sandy soils and 70-80% NV for heavy clay soils.

Optimal soil moisture enhances the activity of nodule bacteria. When there is a lack of soil moisture, few of them settle on the roots of leguminous plants, and often they not only do not absorb gaseous nitrogen, but also feed on nitrogen at the expense of the plants.

To increase the fertility and productivity of plants, it is necessary to take into account the microclimate. Irrigation is the most active means of influencing the field microclimate: soil and surface air temperature, relative air humidity, wind strength and radiation balance.

Changes in soil temperature under the influence of irrigation are closely related to changes in its heat capacity and thermal conductivity, as well as with the evaporation of soil moisture. In addition, most of the heat flowing to the surface of dry soil is spent on its direction, and on moist soil it is spent on evaporation [9,10].

Conclusions

Irrigation regime and irrigation technique as categories that determine the intensity and duration of the impact of irrigation measures on the plant and its habitat (soil, ground layer of air), which are closely and inextricably linked with each other. Their mutual influence is multifaceted. To select irrigation technology and irrigation regime, it is extremely necessary to know irrigation and irrigation standards. Consequently, the value of the irrigation norm depends on soil-climatic and hydrogeological conditions.

References

1. Sastry SK, Mandal B, Hammond J, Scott SW, Briddon RW, et al. (2019) Encyclopedia of Plant Viruses and Viroids. New Delhi, India: Springer Nature.
2. Gergerich RC, Dolja VV (2006) Introduction to Plant Viruses, the Invisible Foe. Plant Heal Instr 1-17.
3. Rubio L, Galipienso L, Ferriol I (2020) Detection of Plant Viruses and Disease Management : Relevance of Genetic Diversity and Evolution Front. Plant Sci 11: 1-23.
4. Mumford RA, Macarthur R, Boonham N (2016) The role and challenges of new diagnostic technology in plant biosecurity. Food Secur 8: 103-109.

5. Takahashi H, Fukuhara T, Kitazawa H, Kormelink R (2019) Virus Latency and the Impact on Plants Front. Microbiolgy 10: 1-18.
6. Dpv (2021) Descriptions of Plant Viruses 1-11.
7. Wessner DR (2010) The Origins of Viruses. Nat. Eduation 9: 3-5.
8. Nasir A, Romero-severson E, Claverie J (2020) Investigating the Concept and Origin of Viruses. Trends Microbiol 28: 959-967.
9. Payne S (2017) Introduction to RNA Viruses. Viruses 97-105.
10. R. I. Hamilton RI (2014) Replication of Plant Viruses. In Plant Virology, 5th Editio R Hull Ed Elsevier 5: 223-245.