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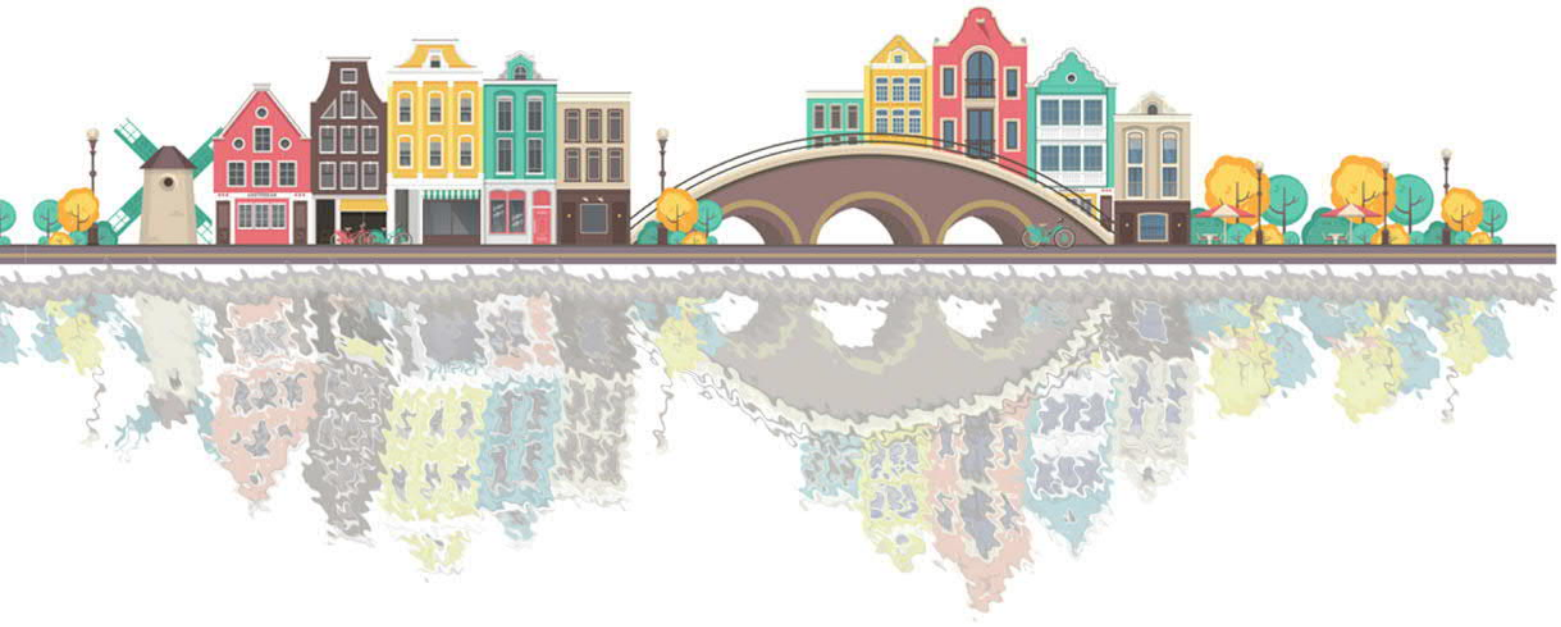
SPECIALIZED AND MULTIDISCIPLINARY SCIENTIFIC RESEARCHES

DECEMBER 11, 2020 • AMSTERDAM, THE NETHERLANDS

VOLUME 3



DOI 10.36074/11.12.2020.v3
ISBN 978-90-5767-591-1

EUROPEAN
SCIENTIFIC
PLATFORM

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SECTION VII.
BIOLOGY

DOI 10.36074/11.12.2020.v3.15

ABOUT THE NEGATIVE IMPACT OF SALINATION ON COTTON

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Due to the low amount of rainfall and intense heat, the regions of Central Asia are rich in saline soils, which contain sodium chloride, sodium sulfate, calcium chloride, magnesium chloride, sodium carbonate and magnesium carbonate salts [1]. Excessive soil salinity is doubly harmful to plants (especially agricultural crops). First, an increase in salt increases the osmotic pressure of the soil solution and negatively affects the rate of water swelling by the roots. Plants with low osmotic pressure cannot absorb water from such soils [2]. Excessive accumulation of soluble salts in the soil has a detrimental effect on plants. Salts that are non-deleterious at low concentrations also accumulate in cells and become toxic at high concentrations. These include sodium chloride and sodium sulfate salts [3].

The study of the problem of salt tolerance of plants in the world is of great theoretical and practical importance. The increase in soil salinity from year to year negatively affects the yield of several high-quality crops. Saline soils are common in hot and dry climates, accounting for almost 25% of the world's land area [4]. Plants are divided into two main groups depending on soil salinity: halophytes and glycophytes. Plants growing on saline soils and adapting to high soil salinity due to traits and properties manifested in the process of evolution under the influence of living conditions in ontogeny are called halophytes [5]. Salt tolerance varies depending on the stage of development of the cotton. Young plants are salt-resistant, especially during the flowering period when the plants are negatively affected by salt. They grow poorly due to their salt sensitivity, and as the plant grows, its resistance to salinity increases [6]. Excessive accumulation of salts in the soil is harmful to most cultivated plants. Saline soils grow salt-tolerant plants called halophytes. They differ from other plants in many anatomical and physiological features [7,8]. Excessive soil salinity is harmful to plants on both sides. On the one hand, the accumulation of salts

increases the osmotic pressure of the soil solution. This pressure prevents root swelling, making it difficult to supply plants with water [9]. However, the excessive accumulation of soluble salts in the soil, in addition to the osmotic effect, also has a toxic effect on plants. Even salts that are neutral at low concentrations are toxic at dark concentrations [10,11]. They disrupt the normal course of physiological processes. An example of such salts is sodium sulfate, which is common in saline soils. Although saline soils often contain equilibrium solutions, their toxic effects at very high concentrations are well known. However, different plants have different resistance to this effect [12]. Soil salinity prevents seed germination and root growth in a young plant. The accumulation of salts in cells poisons the protoplasm and slows down synthetic processes, including photosynthesis and protein synthesis [13]. When the soil is salted with chloride and sulfate salts, the exchange process changes. For example, when salted with sulfate salts, photosynthesis is greatly slowed down, and respiration and the activity of some enzymes increase [14].

The proximity of saltwater to the surface can lead to its slow absorption into the soil, as well as to intense evaporation from the soil surface. It is known that for most crops the content of chlorine in the soil is more than 0.2% and soluble salts are unacceptable [15]. The most effective fight against salinization of irrigated lands is salt leaching. In the regions of Central Asia, salt leaching is carried out when the soil 1.5 m thick contains 0.8-1.2% salt. Leaching rates are usually designed for desalination within one meter of the topsoil to such an extent that the main crops form active roots [16]. Using the salt washing regime, i.e. increasing the irrigation rate due to a lack of moisture in saline soils, as well as maintaining soil moisture before irrigation at a level of 75-75-85% of its full moisture capacity, and frequent watering can lead to dilution of the soil solution [17]. It is not recommended to plant plants when the amount of salt in the soil exceeds 0.5%. If the amount of salt in the soil is about 0.2-0.5%, it is recommended to plant crops, but the yield will be relatively low. Such soils are moderately saline. With a salt content of 0.1-0.2%, plants can be planted and high yields from them can be obtained, and such soils are not considered saline [18-24].

The salt tolerance of cotton varieties is influenced by the mechanical composition of the soil, the level of soil moisture during the growing season, climate, microrelief, and other factors [20]. In plants, salt tolerance varies depending on their biological properties. Some plants have high salt tolerance but low yields, while others are relatively high. For agriculture, varieties with high salt tolerance and, at the same time, high plant productivity is valuable [21, 22]. Soil salinization has a negative effect on the physiological processes in cotton. In saline soils, ions pass through the root system, are carried to all plant organs and accumulate in cells. As soil salinity increases, the inflow and accumulation of ash elements in plant organs increases and the negative impact on plants increases [23].

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