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Response and Factors Affecting Tamarix Tolerance to Salinity and the growth of *Tamarix in Iran desert*

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Abstract:
Tamarix (scientific name: Tamarix) is a genus of the Tamarind family. Tamarind is a salt-loving tree native to the arid regions of Eurasia and Africa and includes 55 species, of which about 35 species are found in the Middle East and 23 species in Iran. Tamarix is C3 plant. But there is resistant to salt.
In this study, 8 field-grown Tamarix plants were irrigated with 3% (180 mM) salt for one month. Measurements of electrical conductivity (EC), physiological parameters such as stomatal conductance, stem length, leaf cover volume, chlorophyll content, and plant growth were performed on salt-treated and control plants. In the species Tamarix, the results showed that the physiological parameters of the plant showed that the plant species grown under sandy soil texture were more affected by salt exposure than the plant grown in loamy texture. Therefore, considering the greater tolerance of Tamarix to salt and/or water stress and the strict environmental regulations, the planting of native Tamarix species remains a preferred plant over non-native Tamarix around the deserts of Semnan province.

Introduction:

within each plant and under environmental conditions. Many factors related to the plant, soil, water, and atmosphere combine to affect a plant's tolerance to salinity. Therefore, the response of a plant to a given concentration of salt cannot be predicted absolutely. However, plants can be compared relatively to each other.

The tolerance of a plant to salinity is assessed by one of the following criteria:

The ability of the plant to survive in saline soil
The absolute growth or yield of the plant
The relative growth or yield of the plant in a saline soil compared to the growth of the same plant in a non-saline soil
Plant survival may be important to botanists or ecologists, but for farmers, the ability of a plant to survive in saline soil conditions and not produce a crop is not important. In fact, the farmer is looking for the yield of the plant in saline soil. Although absolute yield allows a direct estimate of economic returns under specific salinity conditions, the farmer's decision to choose a crop type to plant in a given soil is based on a comparison of their performance to salinity. Therefore, absolute yield cannot be used to compare plants. Therefore, the third criterion, the relative yield of a plant in saline soil compared to the yield of the same plant in non-saline soil, is used as a practical guide in selecting a plant type to plant and predicting the effects of salinity stress (Alizadeh 2006).

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Salinity stress affects plants at all stages of growth, but the sensitivity of the plant may differ at one stage of growth compared to another. At the germination stage, plant tolerance is measured only by the survival of the buds or the so-called percentage of seed germination, because no other criterion can be imagined for it, but at later stages, reduced yield is a comparable criterion for plant tolerance to salinity. Table 1 presents the relative tolerance of some crops at the germination stage and during the growth period based on the above two criteria. For example, in the case of eared corn, if the electrical conductivity of the saturated soil extract is 13 millimoos/cm, 50% of the seeds will not germinate, or if the electrical conductivity of the saturated soil extract reaches 50 millimoos/cm during the growth period, there will be a 50% reduction in yield.

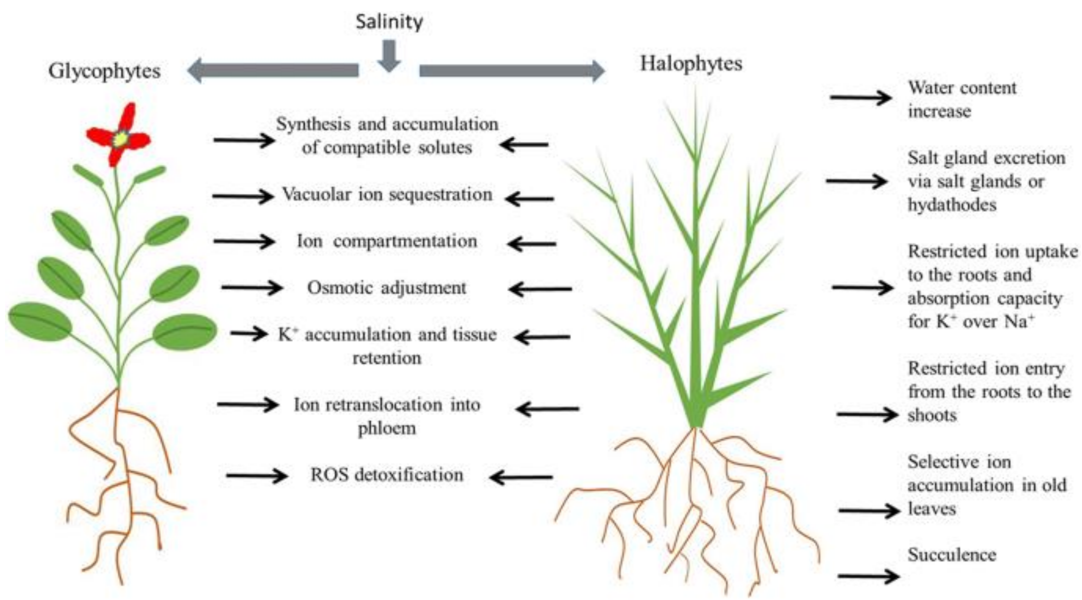

Figure 1 shows a comparison of root growth of the salt-loving Tamarix plant and other plants.

Various factors related to water, soil and environment combine with the problem of salinity and affect plant resistance to salinity. In some cases, they increase plant tolerance and in some cases, they reduce plant resistance to salinity. Temperature, humidity and air pollution are among these factors. For example, most plants are more sensitive to salinity in hot and dry conditions than in cold and humid areas (Bai Bordi, Mohammad 208).

It seems that plants that grow and develop in infertile soils are more resistant to salinity, and if their yield is low in these conditions, the problem may be related to soil fertility. However, regardless of whether the soil is saline or non-saline, the application of appropriate fertilizer increases yield, but this increase in yield is more significant in saline soils.

Another factor is water volume. As the plant extracts water from the soil, the remaining water in the soil becomes more concentrated and, as a result, with a decrease in soil moisture, the plant faces increased salinity stress as well as water stress. Plant growth is closely related to the salinity of the soil water in the root zone where maximum water absorption occurs. Therefore, the yield value should be related to the trend of salt increase over time in the root development zone where maximum water is absorbed by the root (Smidma, Lambert et al. Translated by Amin Alizadeh. New Drainage, 2005).

Tolerance of herbaceous plants to salinity
Herbaceous plants are divided into four groups in terms of their resistance to salinity, which are:

1- Sensitive 2- Relatively sensitive 3- Relatively resistant 4- Resistant

Material and methods:

Plan experimental show in figure 2. All soil microbial activity measurement by kheyrodin , methods 2014 . Soil microbial biomass and soil sampling measurement concluded by kheyrodin method 2005) In order to investigate the biological properties of the soil, sampling of the surface soil (0-5 cm depth) under the azalea shrub canopy and the open space was carried out using a systematic random method. The total number of soil samples was 62, of which 31 samples were from under the canopy and 31 samples were outside the azalea shrub canopy. After collecting the soil samples and transferring them to the laboratory, soil biological analyses including microbial biomass carbon and nitrogen,(Nelson 1986). basal respiration, substrate-induced respiration, microbial yield, metabolic yield, and soil organic carbon were

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performed on the samples. Statistical analyses such as one-way analysis of variance and correlation coefficient were performed with SAS 9.1 software. The t-test was used to compare the average of the biological properties of the soil. Soil microbial respiration and biomass analysis bt Anderson et al. method 1982 and 1990.all soil enzymes activity concluded by kheyrodin hamid methodes 2014.

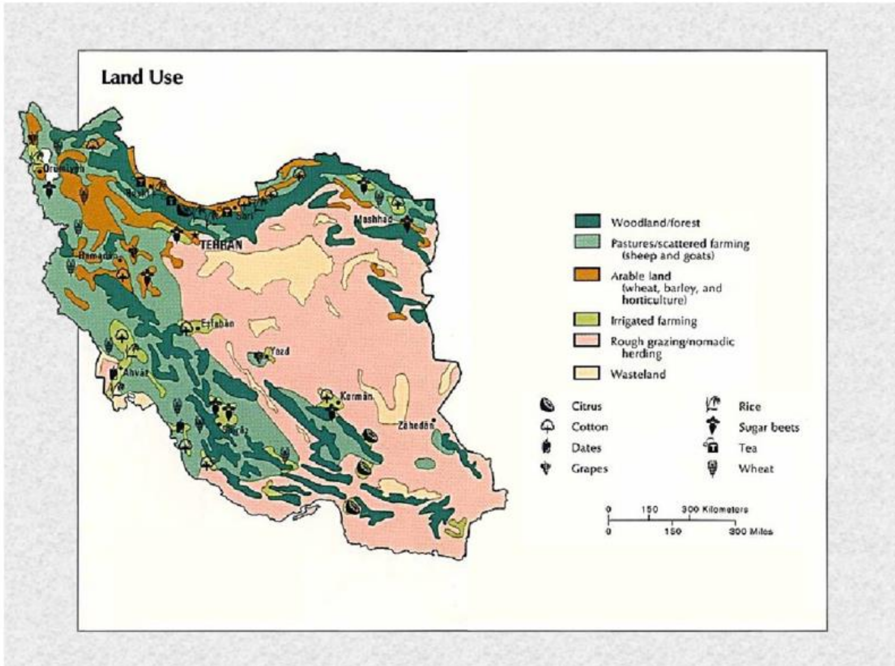

Figure: A map of the various agricultural and desert Tamarix cultivation areas of Iran

Difference between c3, c4 and cam plants

The main difference between C3 and C4 plants is that C3 plants form a three-carbon compound as the first stable product of the dark reaction, while C4 plants form a four-carbon compound as the first stable product of the dark reaction

In C3 plants, which include most common plants such as wheat and rice, carbon dioxide enters the Calvin cycle directly, producing the initial three-carbon product. This pathway is efficient at moderate temperatures and light, but its efficiency decreases in hot and dry conditions due to photorespiration. In contrast, C4 plants such as corn and sugarcane have an additional mechanism for concentrating carbon dioxide; CO_2 is first fixed to four-carbon compounds in mesophyll cells and then transported to bundle sheath cells to perform the Calvin cycle more efficiently. This feature allows C4 plants to perform better in hot and dry conditions and to show greater resistance to environmental stress (kheyrodin 2021).

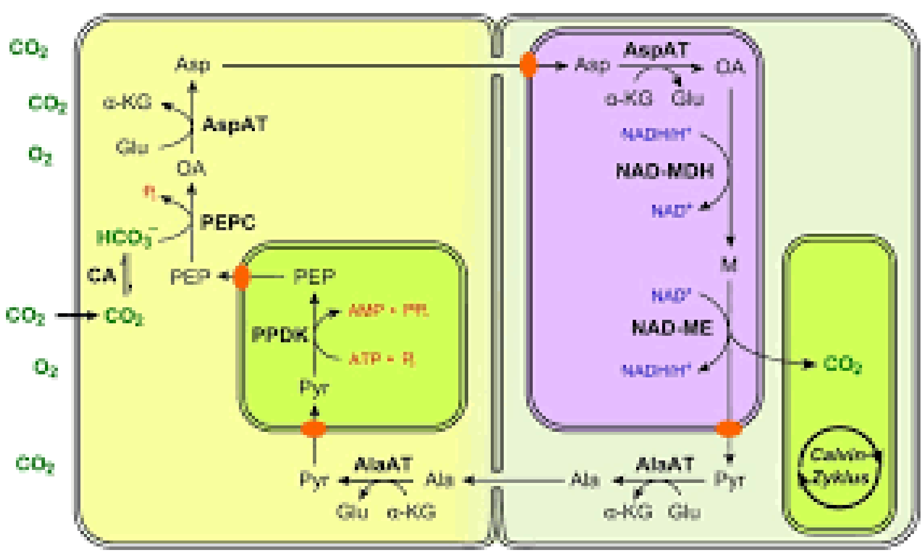

Figure 3: C3, C4 and CAM Plants -

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Result and Discussion

The Role of Artificial Intelligence in the Evolution of Tamarix Tree Cultivation
Artificial intelligence in smart agriculture acts as the driving force behind the evolution. By analyzing huge amounts of data collected from fields, this technology identifies patterns that are undetectable to the human eye. With recent developments, more than 50% of large farms are expected to adopt AI-based soil monitoring systems.

Table 1: Consequently, a higher root/ shoot ratio was recorded in *T. jordanis,* while non-significant changes of root/shoot ratio were detected in *T. aphylla (*Victoria Dawalibi et al. 2015)

Species	Treatment	Plant height increment (cm/14 days)	Shoots dry mass (g plant^{-1})	Root dry mass (g plant^{-1})	Root/shoot ratio
T. aphylla	C	0.73 ± 0.06^a	41.45 ± 4.37^a	20.37 ± 2.55^a	0.49 ± 0.02^b
	S	0.53 ± 0.05^b	42.95 ± 5.62^a	21.38 ± 2.35^a	0.50 ± 0.03^b
	D	0.52 ± 0.05^b	33.65 ± 2.94^{ab}	20.92 ± 1.50^a	0.63 ± 0.03^{ab}
	DS	0.11 ± 0.01^c	26.84 ± 4.45^b	21.06 ± 3.68^a	0.85 ± 0.17^a
T. jordanis	C	1.10 ± 0.16^a	66.00 ± 7.74^a	30.19 ± 2.13^a	0.47 ± 0.04^b

Plant Water Stress Detection

The Internet of Things technology plays a vital role in precision agriculture. By connecting various sensors across the fields to continuously monitor moisture, pH levels, temperature, and crop health, this robust sensor network continuously collects data and sends it to centralized systems for processing and analysis.

The ghazal is a desert tree and plant, shrubs or in fact evergreen ghazal trees with a height of about 10 to 12 meters with needle-shaped leaves are called desert cypress. The Tamarind tree is found in streams, waterways and rivers, where the ground is salty and the soil is moist. In the place where this desert tree grows, Nabka forests are usually created under special conditions. We have also talked a lot about Nabkas, these desert pots, on the Yardang site.

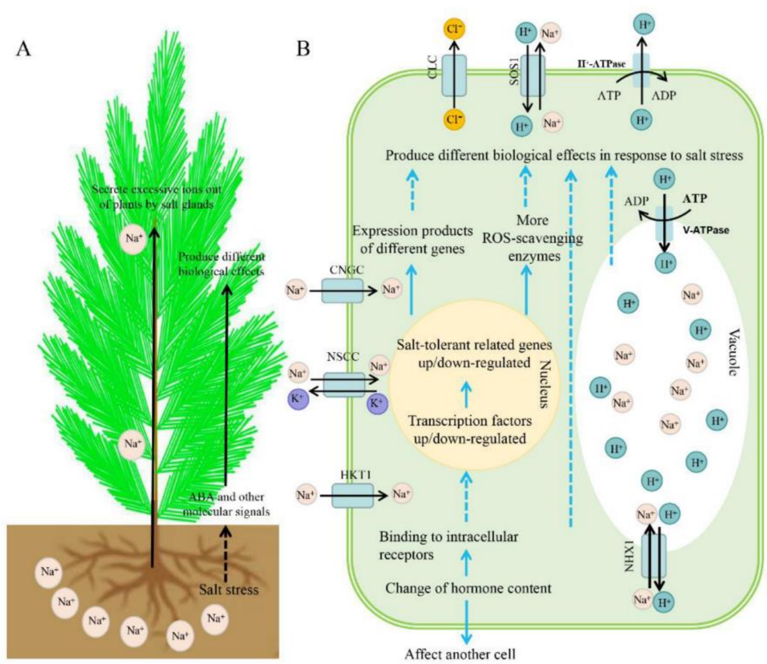

Figure 3: Recent Progress on the Salt Tolerance Mechanisms and Application of Tamarix

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The Tamarind tree, with the scientific name Tamarix, is from the Tamaricaceae family, of which 27 species have been seen and recorded in Iran. Species with a height of 1 meter to even higher than 10 meters, which can be called by the names of Salty Tamarind (King's Tamarind), Fire Tamarind, Turkmeni Tamarind, Caspian Tamarind, Bushehr Tamarind, Isfahan Tamarind and Omani Tamarind.

The leaves of this plant are eaten by livestock, such as camels and sheep, in the deserts, and the branches and leaves of these beautiful and resistant trees are harvested by livestock breeders in the desert fringe area. On the other hand, some farmers also use its branches and leaves for windbreaks around their fields, and on the other hand, due to the high flammability of its trunk and branches, it is used as firewood by the uninitiated to start fires, and all these destructive human factors cause the drying and destruction of the gaz tree and the saplings produced from them.
Tamarix tree sap, a desert plant harvested in Iran, is used in confectionery in these regions due to its high sucrose content. In addition to the confectionery industry, its properties are also used in traditional medicine treatments to improve liver disorders.

Acknowledgments

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