Bioecological characteristics of the model plant Thellungiella parvula

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Abstract: In this article, the biological characteristics of the model plant Thellungiella parvula, salinity and drought tolerance functions are presented. The article also talks about the author's scientific research and feedback on the topic. In the study of the topic, methods of observation, comparison and analysis were used.
Keyword: thellungiella parvula, model plant, salinity, drought

It is known that the process of desertification is accelerating due to global climate change. For this purpose, the attention of research scientists is focused on the study of drought-adapted and salt-resistant plants. In the present conditions, the drought caused by the improper use of water from agriculture, now requires plants adapted to this environment. Studying plants suitable for such needs, applying their bioecological properties to agricultural crops is currently a priority task for breeders. Tellungiella parvula model plant belongs to such plants. The short vegetation period of this plant also gives researchers a number of opportunities.

Figure 1. Th. Parvula

Thellungiella parvula belongs to the Cabbage family and is an annual plant. It completes the vegetation period in 60-70 days. This plant, which reaches 20-30 cm in height, is distinguished by its slender stem. The stem is an erect stem. There are 2 types of leaves, the ones located at the bottom of the stem are large, the edges are trimmed, they are not banded. The leaves on the upper parts of the stem are whole, small in shape. The flowers are white, located in the inflorescence at the end of the stem. The fruit is a pod.Thelungiella parvula plants are studied for a variety of genetic studies, including as model plants with high-quality genome assemblies. According to the results of physiological and molecular studies, the differences in salt tolerance between halophytes and salt-sensitive plants are evident in their main physiological, biochemical and molecular processes.

Characterization of the physiological mechanisms of salt tolerance in halophytes has progressed over decades, but much remains unknown. However, the elucidation of the molecular mechanisms and adaptive evolutionary signatures of halophytism has lagged behind physiological characterization because there is no model halophyte that can be distinguished by all molecular and genetic tools. Thus, in 2001, the interest of the community in dealing with plant stress is mainly. In addition, data on Th parvula showed that it has many characteristics of salt-sensitive Arabidopsis-related plants: small size, short life, self-pollination, seed propagation, a relatively small genome (twice that of Arabidopsis), and technical feasibility of transformation. The plant is called Thellungiella halophila in some literature. S. parvula can be grown synchronously with Arabidopsis for comparative analysis in the culture medium. On the one hand, Parvula resembles Arabidopsis in that it has a rosette leaf ontology during vegetative growth and is reinforced during reproductive growth. However, the morphology of S. parvula can vary greatly in its natural habitat, with a complete absence of rosette leaves and only cauline leaves appearing in a few lesions. E. salsugineum also has a different developmental program than Arabidopsis; for example, the main ecotype under study requires vernalization to accelerate flowering, although the plant flowers without vernalization after about 10–12 months. It also exhibits long germination. According to Inan(2016), S. parvula shows similar growth rates to Arabidopsis, but has elongated leaves and shows undefined growth during vegetative and reproductive periods.

S. parvula has higher stomatal density as well as epicuticular wax content compared to Arabidopsis. Like other halophytes, E. salsugineum roots form a second layer of endodermis and an additional cortex layer, which may limit ion flow from roots to shoots [25, E. parvula is less sensitive to a number of abiotic stresses, including salt stress, than Arabidopsis resistant to nitrogen stress, phosphate deficiency, high boron levels and heat stress. E. salsugineum also exhibits cold and frost tolerance. However, compared to Arabidopsis, the relative tolerance of E. parvula depends on the compounds used, whether the plants are preacclimated, and whether the treatment is short or long term. However, E. parvula leaves have a structurally lower water content than Arabidopsis and are able to lose more water in response to osmotic stress, suggesting that E. parvula may be more drought tolerant than Arabidopsis.

Accordingly, E. salsugineum also exhibits greater tolerance to polyethylene glycol-induced osmotic stress than Arabidopsis. In addition to high Na + stress, S. parvula tolerates most ionic stresses, including K + , Li + , and Mg 2+ at levels toxic to many plants such as E. parvula and Arabidopsis.

Most studies have focused on the responses of E. parvula to salt stress. Unlike Arabidopsis, this plant is able to survive extreme salt concentrations up to 500 m m NaCl and complete its life cycle. These reports compared fresh and dry weight reduction as a marker of stress tolerance and showed that growth reduction by salt stress agent in E. salsugineum occurs at higher salt concentrations than in Arabidopsis. However, the study of more comparative phenomena shows that the total concentration of the rosette of E. salsugineum is reduced to 50 m m NaCl. This is an adaptive response consistent with data showing that plants actively reduce growth in response to stress independent of photosynthesis. A recently presented halophytic model suggests that S. parvula is able to tolerate higher levels of NaCl than E. salsugineum without reduced growth. In conclusion, Thelungiella parvula is a model plant for various genetic studies, including high-quality genome assemblies.

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