

ADAPTATION OF PLANTS TO ADVERSE ENVIRONMENTAL CONDITIONS

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In the natural conditions of growth or cultivation of a plant in the course of its growth, development, they are often affected by adverse environmental factors, which include temperature fluctuations, drought, excessive moisture, soil salinity, etc. Each plant has the ability to adapt to changing environmental conditions within the limits determined by its genotype. The higher the ability of a plant to change metabolism in accordance with the environment, the wider the reaction rate of this plant and the better the ability to adapt. This property distinguishes resistant varieties of agricultural crops. As a rule, slight and short-term changes in environmental factors do not lead to significant disturbances in the physiological functions of plants, which is due to their ability to maintain a relatively stable state under changing environmental conditions, i.e., to maintain homeostasis. However, sharp and prolonged impacts lead to disruption of many functions of the plant, and often to its death.

Under the influence of unfavorable conditions, the decrease in physiological processes and functions can reach critical levels that do not ensure the implementation of the genetic program of ontogenesis, energy metabolism, regulatory systems, protein metabolism and other vital functions of the plant organism are disrupted. When a plant is exposed to unfavorable factors (stressors), a stressed state arises in it, a deviation from the norm - stress. Stress is a general non-specific adaptive reaction of the body to the action of any unfavorable factors. There are three main groups of factors that cause stress in plants: physical - insufficient or excessive humidity, light, temperature, radioactive radiation, mechanical stress; chemical — salts, gases, xenobiotics (herbicides, insecticides, fungicides, industrial wastes, etc.); biological - damage by

pathogens or pests, competition with other plants, the influence of animals, flowering, fruit ripening.

The strength of stress depends on the rate of development of an unfavorable situation for the plant and the level of the stress factor. With the slow development of unfavorable conditions, the plant adapts better to them than with a short-term but strong effect. In the first case, as a rule, specific mechanisms of resistance are manifested to a greater extent, in the second - non-specific ones.

Under unfavorable natural conditions, the resistance and productivity of plants are determined by a number of signs, properties, and protective and adaptive reactions. Various plant species provide stability and survival in adverse conditions in three main ways: through mechanisms that allow them to avoid adverse effects (dormancy, ephemera, etc.); through special structural devices; due to physiological properties that allow them to overcome the harmful effects of the environment.

Annual agricultural plants in temperate zones, completing their ontogeny in relatively favorable conditions, overwinter in the form of stable seeds (dormancy). Many perennial plants overwinter as underground storage organs (bulbs or rhizomes) protected from freezing by a layer of soil and snow. Fruit trees and shrubs of temperate zones, protecting themselves from the winter cold, shed their leaves.

Protection from adverse environmental factors in plants is provided by structural adaptations, features of the anatomical structure (cuticle, crust, mechanical tissues, etc.), special protective organs (burning hairs, spines), motor and physiological reactions, and the production of protective substances (resins, phytoncides, toxins, protective proteins).

Structural adaptations include small-leaved and even the absence of leaves, a waxy cuticle on the surface of leaves, their dense omission and immersion of stomata, the presence of succulent leaves and stems that retain water reserves, erectoid or drooping leaves, etc. Plants have various physiological mechanisms that allow them to adapt to unfavorable conditions. environmental conditions. This is the CAM type of photosynthesis in succulent plants, minimizing water loss and essential for the survival of plants in the desert, etc.

Numerous physiological changes accompany the development of cold resistance and frost resistance in winter, biennial and perennial plants with a decrease in day length and a decrease in temperature in autumn. In agricultural plants, stability is of particular importance, determined by the endurance of plant cells, their ability to adapt to changing environmental conditions, to produce metabolic products necessary for life. Plants tolerate adverse conditions best at rest.

The first signal for the transition to a state of rest is the reduction of the light period. At the same time, biochemical changes begin in plant cells, ultimately leading to the accumulation of reserve nutrients, a decrease in the hydration of cells and tissues, the formation of protective structures, and the accumulation of growth inhibitors. An example of such preparation is the shedding of leaves in the autumn period in perennial plants, the development of storage organs in biennials, and the formation of seeds in annuals.

