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DYNAMICS OF THE LEAF SURFACE AREA OF COMMON HYSSOP DEPENDING ON THE DENSITY OF PLANT STANDING

Abiotic stressors include: lack of lighting, drought, exposure to high doses of ultraviolet radiation, extreme temperatures, soil salinity, lack of oxygen (soil compaction), etc. Currently, it was established that one of the common stress responses of plants to the action of damaging abiotic factors of various nature was the increased generation of reactive oxygen species and the development of oxidative stress. Another defense mechanism under oxidative stress was the stress-dependent accumulation of low-molecular-weight organic antioxidants in plants. Such metabolites include proline, polyamines, and phenolic substances such as anthocyanins, carotenoids, flavonoids, soluble phenols, and others. It also should be noted that most secondary metabolites, which include phenolic compounds and alkaloids, are the basis of the biologically active action of medicinal plants [1, 2]. As a rule, plants have the ability to adapt their metabolism to changes in the environment. When grown under normal conditions, they synthesize a complex of secondary products, stress factors can lead to an increase in their production. It was established that under stress conditions there was a significant excess of reducing equivalents (NADP · H + H +). At the same time, the number of secondary metabolites was higher in plants which were severely affected by abiotic stress, compared to plants grown under optimal conditions [3,4].

It is known that common hyssop (*Hyssopus officinalis L.*) is unpretentious to soil and climatic conditions, it is an essential oil, spicy-aromatic and medicinal plant, it adapts well to adverse environmental conditions, that is, hyssop is environmentally plastic. The plant is drought-resistant, grows well in eroded areas of southern exposure on low-thickness gravelly soils with the yield of limestone parent rock [5].

In the process of plant life, water is the main environment in the cell, where metabolic processes are carried out, and it is the most important product of biochemical reactions of the plant organism. Plants lose water during evaporation, so there is a constant need to replenish it. Although hyssop plants are drought-tolerant, severe drought affects the biometric growth parameters and yield of common hyssop. The lack of moisture in hyssop reduces the protein content and increases the enzymatic antioxidants in the plant. Drought also causes inhibition of seedlings, growth, reduction of leaf area, stomatal closure and reduction of transpiration, inhibition of photosynthesis, shifts in carbon and nitrogen metabolism, synthesis of compatible solutes and provokes secondary oxidative stress. Thus, in common hyssop, the height, diameter of bushes, and the number of flower-bearing shoots decrease, and therefore productivity indicators decrease [6, 7, 8]. At the experimental field of the Mykolaiv DDS IZZ NAAS, a study of the productivity of common hyssop was conducted, where it was found out that under the conditions of drip irrigation, optimal conditions for plant growth and development were created and the yield was provided at the level of 27.7-28.1 C/ha of dry raw materials [9].

An equally important abiotic stress that affects plant growth and development is soil salinization. High levels of sodium in the soil are very toxic to most plant species, affect growth, and limit their yield. In common hyssop, with an increase in soil salinity, the amount of essential oil obtained from the aboveground part of the plant increases [8]. In a study of the effect of salinity on hyssop germination, it was found that salt stress caused by -0.3 to -0.6 MPA could stimulate germination and, therefore, possibly improved the rooting of plant seedlings, since the root length also increased [9].

Light is a source of energy and it serves as an important signal for plants, allowing them to adapt to the surrounding conditions. Solar radiation consists of electromagnetic waves of various lengths and it is generally divided into ultraviolet radiation (UV < 400 Nm), photosynthetic active radiation (PAR ~ 400-700 Nm) and infrared radiation (FR ~ 700-780 Nm). Approximately 7-9% of all solar radiation reaching the Earth's surface is in the UV range (200-400 Nm) [10, 11, 12]. One of the first identified and most well-characterized photomorphogenic responses to ultraviolet radiation is the biosynthesis of certain secondary metabolites and flavonoids and it is a vital protective response against potential damage to plants by UV radiation [13,14]. The most valuable and biologically active substances of medicinal plants are secondary metabolites used in the cosmetic and pharmaceutical industries. Therefore, it could be assumed that for more active biosynthesis of secondary metabolites, hyssop should be grown in sunny areas. In shaded areas, shoots were stretched in height [15].

Thus, the response of common hyssop to stressors of abiotic nature is not always negative, and in some cases may be positive for obtaining more useful biologically active substances, such as growing in open sunny areas to obtain more secondary metabolites. As a result of salt stress, the rooting and germination of hyssop plants is activated within certain limits. But in conditions of prolonged drought, despite the drought resistance, the plant needs irrigation.

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РОЛЬ ЕКСПОРТУ ЗЕРНА ПШЕНИЦІ З УКРАЇНИ У ЗАБЕЗПЕЧЕННІ ПРОДОВОЛЬЧОЇ БЕЗПЕКИ У СВІТІ

У сучасному світі за даними Міністерства сільського господарства США (USDA) 870 мільйонів людей не мають доступу до достатньої кількості поживної та безпечної їжі [1]. Враховуючи зростання населення та збільшення доходів попит на продовольство зросте на 70-100 % до 2050 року. Щоб задовольнити цю потребу, за оцінками ООН, виробництво продовольства в країнах, що розвиваються, потрібно збільшити майже вдвічі [1, 2].

Зерно пшениці використовується в усьому світі як основний продукт харчування. Найбільше у світі вирощується три види пшениці: м'яка (*Triticum aestivum*), тверда (*T. durum*) і щільноколоса, або карликова (*T. compactum*). Пшеницю вирощують як товарну культуру, оскільки вона забезпечує достатньо високу урожайність, добре росте в помірному кліматі з коротким вегетаційним періодом, дає високоякісне борошно. Більша частина пшеничного борошна використовується для виготовлення таких продуктів, як хліб, макаронні вироби, пластівці, тістечка, печиво тощо. Крім того, пшеницю