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PHYSICO-CHEMICAL BASIS OF THE EFFECT OF AROMATIC AMINO COMPOUNDS ON MAINTAINING PLANT MOISTURE

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Abstract: This article analyzes the role of aromatic amino compounds in maintaining plant moisture and their physicochemical properties. Research results indicate that aromatic amino compounds play a crucial role in plant water exchange processes. The mechanisms of moisture retention in plant tissues and the involvement of aromatic amino compounds in these processes are examined in detail.

Keywords: aromatic amino compounds, moisture retention, plant physiology, osmotic pressure, metabolism, water exchange.

INTRODUCTION

Water exchange processes are fundamental to plant life, playing a crucial role in all stages of their growth, development, and vital activity. Optimal moisture retention in plant tissues not only ensures the normal course of metabolic processes but also significantly increases the plant's resistance to various environmental factors, including abiotic and biotic stress conditions [1]. In the context of current global climate change, studying plant water supply and moisture retention mechanisms is a pressing issue.

Aromatic amino compounds actively participate in numerous biochemical processes within plant cells, performing important functions in cellular metabolism, signaling systems, and defense mechanisms. Recent research results have shown that these compounds significantly affect the plant's ability to retain moisture. The unique physicochemical properties of aromatic amino compounds, their ability to pass through cell membranes, and their interaction mechanisms with water molecules indicate their importance in plant water exchange.

The main objective of this research is to thoroughly analyze the physicochemical mechanisms of aromatic amino compounds in maintaining plant moisture, determine their role under stress conditions, and identify potential practical applications. New data in this area is crucial for agricultural practice in developing drought-resistant varieties and increasing the resilience of plants to various stress factors.

METHODOLOGY AND LITERATURE REVIEW

The research methodology includes a comprehensive literature review. The sequence of analyzed sources is as follows:

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Alekseev and Mikhaylov (2023) [1], in their fundamental research on plant physiology, detailed the main mechanisms of plant water exchange processes. The authors systematically analyzed the basic principles of moisture retention in plant cells and the role of substances involved in this process.

Smith and Brown's (2023) [2] study, "Plant Water Relations," deeply investigated plant water relationships. They studied the role of aromatic amino compounds in moisture retention in plant tissues using modern methods.

Ivanov et al. (2023) [3] studied the role of amino compounds in plant physiology, analyzing their importance in water exchange at the molecular level. Their research is crucial for understanding the effect of amino compounds on cell membranes.

Petrov and Smirnova (2024) [4] studied plant drought resistance mechanisms and identified the role of aromatic amino compounds under stress conditions. Chen et al.'s (2023) [5] research further elucidated the role of aromatic compounds in the plant stress response.

Johnson et al. (2023) [6] achieved significant results in studying drought resistance mechanisms. Karimov and Yusupov (2023) [7] revealed important aspects of plant biochemistry in their research conducted in Uzbekistan.

Zhang et al. (2023) [8] studied plant osmolytes and stress tolerance, identifying the role of amino compounds in regulating osmotic pressure.

Rahimov and Salimov (2024) [9] comprehensively covered the issues of plant water regime and its management in Uzbekistan in their monograph, "Modern Issues of Plant Physiology."

Sokolov and Nikolaev (2023) [10] in their work, "Biochemical Aspects of Plant Water Exchange," thoroughly analyzed the biochemical mechanisms of water exchange and the role of aromatic amino compounds in these processes.

Analysis of all sources shows that the role and importance of aromatic amino compounds in plant water regime have been studied by various scientists in different aspects. Their results complement each other and allow for a comprehensive illumination of the research topic.

RESULTS AND DISCUSSION

Analysis of the physicochemical properties of aromatic amino compounds shows that these compounds have a unique molecular structure, containing both hydrophilic and hydrophobic parts. This property ensures their easy passage through cell membranes and effective interaction with water molecules [2]. According to the research of Ivanov et al. (2023), the hydroxyl groups of aromatic amino compounds form strong hydrogen bonds with water molecules, which determines their moisture retention properties in plant cells [3].

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The effect of aromatic amino compounds on cell membranes deserves special attention. These compounds interact with membrane lipids, optimizing the fluidity and permeability of the membrane. Research conducted by Petrov and Smirnova (2024) showed that aromatic amino compounds play an important role in regulating osmotic pressure [4]. They function as osmolytes in the cell cytoplasm and help maintain water potential balance, which is crucial for maintaining the cell's water balance [5].

The molecular mechanisms of moisture retention in plant cells are a complex process consisting of several stages. Aromatic amino compounds participate in various stages of this process. According to the research of Johnson et al. (2023), the synthesis of aromatic amino compounds increases significantly under stress conditions [6]. This process is part of the plant's adaptation mechanisms to stress conditions and helps maintain their vital activity.

Analysis of moisture retention mechanisms under stress conditions shows that aromatic amino compounds play an important role in maintaining the vital activity of plant cells under drought and salinity conditions. They reduce the peroxidation of membrane lipids, preventing damage to the cell structure [7]. In addition, aromatic amino compounds increase the activity of antioxidant systems, reducing the harmful effects of free radicals in cells under stress conditions.

The role of aromatic amino compounds in the adaptation of plants to stress conditions is complex. They not only directly participate in moisture retention but also increase plant resistance through indirect mechanisms. Studies by Karimov and Yusupov (2023) investigated the effect of aromatic amino compounds on gene expression, revealing that these compounds regulate the activation of stress-related genes [7].

Aromatic amino compounds have significant practical importance. The research of Zhang et al. (2023) shows that studying and utilizing the properties of these compounds is crucial for developing drought-resistant varieties in agriculture [8]. Based on this knowledge, new approaches are being developed to increase the stress resistance of plants and stabilize yields.

The complexity of metabolic processes occurring in plant cells and the multifaceted effects of aromatic amino compounds indicate the need for further in-depth research in this area. Studying the activity of these compounds under various ecological conditions and understanding their mechanisms of action at the molecular level are particularly important.

CONCLUSION

The literature review resulted in a number of important conclusions regarding the role and importance of aromatic amino compounds in maintaining plant moisture. Aromatic amino compounds participate in maintaining water balance in plant cells through complex physicochemical mechanisms. Their most important functions include regulating osmotic pressure, ensuring the stability of cell membranes, and activating antioxidant systems.

According to the information identified in the research, aromatic amino compounds activate the protective systems of plants and increase their resistance under stress conditions, especially in drought and salinity. Their interaction mechanisms with water molecules, their role

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as osmolytes, and their ability to reduce membrane lipid peroxidation confirm their importance in regulating the plant water regime.

Based on the obtained results, recommendations were developed for further in-depth study of the role of aromatic amino compounds in plant physiology and the application of this knowledge in practice. By applying the results of these studies in agriculture, there are opportunities to create drought-resistant varieties, increase the resistance of plants to stress factors, and stabilize yields. Continuing research in this direction, studying new properties of aromatic amino compounds, and expanding their areas of practical application are important in the future.

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