

ЕКОЛОГО-ЕНЕРГЕТИЧНА БЕЗПЕКА МІСТ: ІННОВАЦІЙНІ ТЕОРЕТИЧНІ І ПРИКЛАДНІ АСПЕКТИ

USE OF PLANTS IN THE COMBATING PHYSICAL POLLUTION OF URBANIZED TERRITORIES

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Plants are well-known primary absorbers of anthropogenic pollutants, producers of oxygen and organic substances on the planet, biological indicators of environmental quality and phytomeliorants. Plants are used in many phytoremediation technologies for cleaning water, air, and soil from heavy metals, oil products, and other chemical pollutants. However, today, physical pollution of the environment is no less relevant and requires careful research and appropriate environmental protection methods. Physical pollution includes electromagnetic, noise and vibration pollution caused by the activities of enterprises in the electric power industry. The well-known methods of protection against negative physical radiation include: reducing the level of noise and vibration at the sources of their formation; isolation of noise and vibration sources by means of sound and vibration isolation and absorption; architectural and planning solutions that provide for the rational placement of technical equipment; using personal protective equipment against vibration pollution.

Electromagnetic radiation causes heating of plant organs tissues, which leads to evaporation of water, impaired functioning of enzymes, appearance of necrotic damage to assimilation organs and premature aging of the body in the whole.

Plants sensitively react to the impact of noise fluctuations in the environment with various physiological changes in metabolism. It is known that plant roots find a source of water in the soil by responding to vibrations caused by the movement of water in the soil. Acoustic gradients allow roots to detect a water source at a distance, while moisture gradients help them reach their target more precisely. Noise signals have an impact on the ability of roots to sense and respond correctly to the surrounding soundscape. Vibration pollution affects the physiological qualities of plant seeds, reducing their germination. It is known that sounds of different frequencies have different effects on plant growth. Optimal plant growth is observed when plants are exposed to pure tones, in which the wavelength coincides with the

average size of the leaf [2]. The peculiarity and advantage of using plants as noise absorbers and blockers is that they best absorb sounds at high frequencies, which are the most harmful and irritating to humans [1].

Absorption of sound vibrations by plants occurs by converting sound energy into kinetic and thermal energy due to the vibration of leaves. The vibration of plant leaves attenuates low-frequency noise, the amplitude of self-vibration of plant leaves is 1 μm in the absence of noise. The amplitude of vibration of plant leaves increases in the range of 4-12 microns under the influence of sound vibrations. A vibration of the same intensity causes different vibrations in the leaves of different plants. The main factors affecting the increase in the amplitude of plant leaves vibrations are the mass, area and thickness of the plant leaf. The amplitude of leaf vibrations increases in direct proportion to the increase in leaf area and mass, and is inversely proportional to the increase in leaf thickness. The mass and area of a leaf are the two most important factors affecting the amount of vibration of plant leaves. The length and thickness of petioles affects the vibration increase of plant leaves. The influence of leaf mass and area on the amplitude of leaf vibrations is greater than leaf thickness. Therefore, in order to achieve a better effect of reducing the noise of urban areas, when selecting plant species in the landscape, species with a significant mass, a large area and a small thickness of leaves should be guided [3]. *Polulus* L., *Tilia* L., and *Acer* L. species, which are widely used in urban landscaping, belong to the most promising plant-absorbers of physical pollution.

References

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