університет біоресурсів і природокористування України, 2010. С. 252–253.
3. Озеленение населенных мест / А. И. Барбарич и др.; под общ. ред. А. И. Барбарича. Киев : Изд-во Академии Архитектуры УССР, 1952. 744 с.
4. de Candolle Alphonse. Géographie botanique raisonnée. Paris: V. Masson, 1855. T. 2. P. 610–1365.

UDK 581.19+577.161.3

PIGMENT CONTENT IN THE LEAVES OF TOBACCO VARIETIES UNDER THE INFLUENCE OF HEAVY METAL IONS

[1,2]Bronnikova L. I.

[1]Dnipro National University OlesHonchar Dnipro National University
[2]Institute of Plant Physiology and Genetics National Academy of Sciences of Ukraine
E-mail: zlenko_lora@ukr.net

Stress adaptation of agricultural plants has been and is a constant topic of fundamental and applied biology. The interest in this problem is clear. On the one hand, it is aimed at understanding the plant-environment (G/E) interaction; on the other hand, keeping in mind the constant need of the growing population, efforts are being intensified to create plants capable of withstanding abiotic stresses. However, excessive or even moderate abiotic stresses cause a decrease in plant productivity worldwide [1, 2].

It is known that abiotic stresses cause a complex of interrelated reactions that can occur simultaneously or alternately. If a substance characterized by high toxicity in relatively small amounts and therefore leading to significant cell damage is chosen as a modeling stress agent.

These characteristics are characteristic of heavy metal ions (HMI), especially the group of HMI that are toxic in residual amounts and are considered physiologically unnecessary. These HMI include: Ba^{2+}, Cd^{2+}, Hg^{2+}, Pb^{2+}, VO^{3-}, WO_4^{2-}.

It has been established that an excess of IPMs in leaves causes a decrease in their chlorophyll content, while their effect on the state of the pigment system is poorly understood [3].

The content of pigments and their condition determine the development and activity of the photosynthetic apparatus, as well as the productivity, viability and resistance of plants to unfavorable environmental conditions [1, 8].

The object of our research was tobacco plants of the Dubec and Samsun varieties, which reacted differently to the effects of heavy metal ions. Tobacco plants grown under control conditions served as a control. The chlorophyll content was determined by the method [4].

It is known that the reason for the decrease in chlorophyll content may be an increase in the hydrolytic activity of chlorophyllase [9]. Chlorophyllase is a component of the protein-lipid complex, and the nature of its action depends on its organization. Increased lipid peroxidation leads to microenvironment of the enzyme, which can affect the conformation.

The decrease in the amount of chlorophyll is not associated with the activation of the hydrolytic action of chlorophyllase. This phenomenon in the case of excessive exposure of the leaves of experimental plants to IPM may be caused by pigment degradation due to increased free radical oxidation of lipids in chloroplast membranes [5, 6, 7].

The decrease in chlorophyll concentration in the experimental variants due to the activation of these processes in the cell is observed under the influence of other factors.

It should be emphasized that in sensitive variants lipid peroxidation of chloroplast membranes is activated more than in tolerant ones, which corresponds to a lower chlorophyll content.

The damaging effect of IPM on chloroplast membranes due to the activation of lipid peroxidation is also manifested in the violation of the strength of chlorophyll bonding with plastid membranes.

The weakening of hydrophobic bonding in sensitive variants of experimental plants is observed.

References

1. Zhang H., Zhu J., Gong Z., Zhu J – K. 2022. Abiotic stress responses in plants. Nature reviews genetics. 23, P.104 – 119. https://doi.org/10.1038/s41576-021-004413-0
2. Kazemsouve M., Hatamian M., Tesfamaniam T. 2019. Plant dround stage influences heavy metal accumulation in leafy vegetables of garden cress and sweet basil. Chemical and

biological technologies in Agriculture. 25(6). https://doi.org/10.1186/s40538-019-0170-3
3. Angulo-Bezarano P.I., Puente – Rivera J., Cruz – Orteza R. 2021. Metal and metalloid toxity in plants: anpverriev on molecular aspects. Planta. 10(4):635. https://doi.org/10.3390/plants/0040635
4. Paes de Meloi B., AvelarCarpinetti P., Fraga O.T., Fiores V.S., De Camargos :L.F., De Silva Ferreiro. 2022. Abiotic stress in plants and their marcers: a practice view of plant stress and programmed cell death mechanisms. J. Plant. 11(9), 1100. https://doi.org/3390/plants1191100
5. Маменко Т. П., Коць С. Я. 2020. Пероксидне окиснення у формуванні та регуляції захисних реакцій у рослин. Український ботанічний журнал. 77(4), 331 – 343. https://doi.org/10.15407/ukrbotj.77/04/331
6. Бакун В., Пацула О., Терек О. 2011. Інтенсивність перекисного окислення ліпідів у рослин соняшнику і ріпаку за дії триптолему в умовах токсичного впливу іонів цинку та міді. Вісник Львівського національного університету імені Івана Франка. 55, 194 – 200.
7. Caesar J., TammA., RuckteschlerN., WeberB. 2017. Revisiting chlorophyll exstraction methods in biological soil crusts – methodology for determination of phlorophylla andphlorophyl a+b as comparted to previous method. Manuscript under reiew of journal Biogeosciences Discussion started. 1 - 15. https://doi.org/10.5194/bg-2017-396
8. Grajec H., Rydzynski D., Piotowic – Cieslak A., Herman A., Maciejczyk M., Wieczorek Z. 2020. Cadmium ion chlorophyll interaction – examination of special properties and structure of the cadmium – chlorophyll complex and their relevance to photosynthesis inhibition.Chemosphere. 261. 127434. https://doi.org/10.1016.chemosohere.2020.127434
9. Безсонова В.П. 1992. Вплив важких металів на пігментну систему листка. Український ботанічний журнал. 49(2), 63 – 66.