

ЭКОЛОГИЯ

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COMPLEX ECOLOGICAL ASSESSMENT OF AEROINDUSTRIAL LOADING IN THE AREA OF CEMENT ENTERPRISE INFLUENCE**G. Valter, Associate Professor, Candidate of Biology Science, Ye. Voronova, Associate Professor, A. Perekhrest, master, KhNAHU**

Abstract. *Dynamic changes of major components of forest ecosystems in relation to distance from the plant as a loading factor on the environment are considered.*

Key words: *maximum permissible concentration (MPC), forest ecosystem, impact, buffer, field zone.*

КОМПЛЕКСНАЯ ЭКОЛОГИЧЕСКАЯ ОЦЕНКА АЭРОТЕХНОГЕННОЙ НАГРУЗКИ В ЗОНЕ ВЛИЯНИЯ ЦЕМЕНТНОГО ПРОИЗВОДСТВА**Г.А. Вальтер, доцент, к.б.н., Е.М. Воронова, доцент, А.С. Перехрест, магистр, ХНАДУ**

Аннотация. *Рассмотрена динамика изменения основных компонентов лесной экосистемы в зависимости от расстояния до завода как фактор нагрузки на окружающую среду.*

Ключевые слова: *предельно допустимая концентрация (ПДК), лесная экосистема, импактная, буферная и фоновая зона.*

КОМПЛЕКСНА ЕКОЛОГІЧНА ОЦІНКА АЕРОТЕХНОГЕННОГО НАВАНТАЖЕННЯ В ЗОНІ ВПЛИВУ ЦЕМЕНТНОГО ВИРОБНИЦТВА**Г.А. Вальтер, доцент, к.б.н., Є.М. Воронова, доцент, А.С. Перехрест, магістр, ХНАДУ**

Анотація. *Розглянуто динаміку зміни основних компонентів лісової екосистеми залежно від відстані до заводу як фактор навантаження на навколишнє середовище.*

Ключові слова: *гранично допустима концентрація (ГДК), лісова екосистема, імпактна, буферна і фонові зона.*

Introduction

Higher vegetation plays a key role in most terrestrial ecosystems. As primary generators plants determine all natural balance points of substance and energy.

Pathological accumulation of the litter bedding is a criterion of incompleteness of biogeochemical cycles owing to which productivity and resistance of ecosystems decrease. A thick layer of a litter bedding can hamper the development of grass-shrub layer and resumption of stand [1].

Analysis of publications

The current system of the environment monitoring is based on the norms of maximum permissible concentration (MPC) of pollutants. These standards are determined in laboratory experiments on isolated populations but not for a real impact on biota and their complex systems of MAC being universal but not regional ones. Disadvantages of MAC have long been known and the problem is not so much in criticism of the obsolete approach how to develop a specific set of methods that can replace the existing ones.

Based on the data received it will be possible to do the following:

- to offer value-oriented maximum permissible loading on forest ecosystems;
- to build a logistic curve «dose – effect» for the individual components of forest ecosystems;
- to determine the minimum and maximum levels of excess of emission contaminates against the field ones.

The purpose and problem statement

The aim of this work was to determine degradation degree of oak plantations in the area of aeroindustrial pollution by cement production emissions and to research the state of these plantations, their sensitivity to pollution and power of phytotoxic effects on the growth and stand of trees performance.

This being achieved, it was necessary to solve the following:

- to investigate the sanitary condition of these plantations;
- to analyze the sensitivity to pollution (in terms of growth, productivity, growing, woody shrub and herbaceous layers);
- to characterize the changes in the state of the litter bedding.

Estimation of the ecosystem transformation in zone of aerotechnogenic loading

Vegetation transformation as a result of technogenic pollution radically changes the appearance of the ecosystem and causes the change of its inner world.

Pollutant emissions of the constructions of cement complexes modify the geochemical field of large areas. Sedimentation of cement dust on the earth's surface leads to the pollution of the alkaline sediments, soils, litter bedding having perform a significant threat to forest plantations. The researches were conducted on the territory of JSC «Doncement» which strongly pollutes atmosphere with alkaline cement dust, nitrogen oxides and sulfur.

The research was performed on 28 test areas (25x25 m) located in the impact (1 km from the plant) buffer (5 km) and field (10 km) zones. It was held a forest valuation description of trees, stand definition of height and age of five sample trees, measurement of crown density and completeness of stand in each testing area. In the

maximum development period of phytomass there were taken slashes from 5 pads (50x50 cm) in each test area.

At approaching to the plant it was registered a negative dynamics of living conditions of the stand thus it was registered a consequentially worsening of living conditions of the regular stand: reduced compactness of crowns and density of undergrowth increase of deadwood share. Crown density in the buffer zone is not changed and renewal options remain at the field level. This is probably connected with better development of the remained trees, with reducing intra-specific competition conditions.

The nature of the plant association being changed, the living soil cover in the buffer zone undergoes considerable changes. The share of cereals in the species diversity remains at the field level. Perhaps it is connected with a decrease in crown density and a corresponding change in light schedule.

In the impact zone progresses transformation of phytocenosis: less density and completeness of stand, compactness of crowns. Increase in the proportion of dead woods testifies the intensification of death processes of tree layers. In the given territory it is registered a decrease in density of seedlings and natural regeneration down to zero values in testing areas. The absence of the normal renewal can be connected with the general decrease in seed performance and deterioration of conditions for seed germination due to soil toxicity increasing powerful development of moss cover and the accumulation of a thick (up to 11 cm) layer of the litter bedding. In such zone there marked a considerable reduction in grass species diversity (15–18 species), the average number of species in the test area (before 4–12). There seen a change in association with grass-horsetail and then moss- horsetail. Transformation of the herb-shrub layer is typical for the loss forest species. There registered an increase in particle meadow species in species, wealth and biomass. Replacement of forest species is probably caused by the change in light schedule. Respectively it is registered a decrease in the share of herbs, in the species wealth and biomass.

Concerning the dynamics of changes in thickness of the litter bedding according to the distance to the plant [2–5], there are three sequentially arranged sections:

- 1) a zone of the field state in distance from 10 to 8 km (slight varying of thickness near the middle – 1,0–3 cm);
- 2) a zone of maximum accumulation is from 5 to 3 miles (stabilization of middle at a high level – 4,5–6,5 cm);
- 3) a zone of power reduction is from 3 to 0 km (reduction of thickness of the litter bedding as a result of melting waters washout almost complete degradation of grass and a decrease in entry of litterfall).

Reduction of the litter bedding thickness in close proximity to the plant is due to the increased erosion processes as a result of degradation of herb-shrub layers.

Conclusion

Identified are main pollutants emitted into the atmosphere: nitrogen oxides, inorganic dust containing $\text{SiO}_2 < 20\%$, inorganic dust containing 20–70 % SiO_2 , carbon monoxide.

It is seen from the fact that there is a negative mutation both of dynamics of all major components of the forest ecosystem (woody and herbaceous-shrub layer, litter bedding), depending on the distance from the plant. Established are both the dependence and reasons of such mutations.

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