

ASSESSMENT OF TECHNOGENIC STRESS ON THE ENVIRONMENT IN ZHYTOMYR BY METHOD OF BIOINDICATION

Bioindication is a relatively simple and comprehensive method of studying the state of the environment. The main advantage of the methods of bioindication is the high sensitivity to environmental violations. Bioindicators are organisms or communities of organisms, whose reactions are observed representatively to evaluate a situation, giving clues for the condition of the ecosystem. In our investigation we consider *Pinus sylvestris* and *Picea abies* as bioindicators because these coniferous trees are quite sensitive to various pollutants and can be observed during all seasons.

To conduct a morphometric indication of environmental quality in Zhytomyr, we used the following instruments:

- 1) Ruler – to measure needles length;
- 2) Caliper – to measure needles width;
- 3) Analytical balance – to weigh 100 needles;
- 4) Magnifying glass – to detect necrotic lesions.

The reaction of conifers to air pollution was investigated at different sites. The samples were selected from three recreational areas in Hydropark (site №1 - its central part; site №2 – footpaths zone; site №3 – the river zone), and from three industrial areas with heavy traffic (site №4 – sports complex "Dynamo"; site № 5 – Chudnovska street zone ; site №6 – gas station zone). The results of the study are given in table below.

Table. The main morphometric parameters of needles within the city of Zhytomyr

The sampling site	Species of Conifers	Length of needles, mm	The width of needles, mm	The weight of 100 needles, g	Necrosis	
					%	type of necrosis
Site №1	<i>Pinus sylvestris</i>	65	0,83	1,47	4,8	Apical
Site №2	<i>Pinus sylvestris</i>	64	0,68	1,289	7,7	Apical
Site №3	<i>Pinus sylvestris</i>	63	0,87	2,714	7,8	Apical
Site №4	<i>Picea abies</i>	18	0,82	0,48	3,9	Apical
Site №5	<i>Pinus sylvestris</i>	57	0,7	1,496	8,1	Apical
Site №6	<i>Pinus sylvestris</i>	76	1,09	2,838	9,6	Apical

The comparative analysis of needles morphometrics parameters both in industrial and recreational areas shows that:

- At site №1 the needle damage is 1.7 times less than at site №5;
- At sites №2 and 3 needle damage is 1.2 times less, than at site №6;
- At sites №5 and 6 needle width is 0.1 times is more than at the other sites;
- At sites needles damage is 1.3 times higher than that at the other sites;
- At site №6 the maximum width and length of needles as well as the maximum weight of 100 needles are observed;
- While the least one was observed that weight of 100 needles was the smallest at site №2;
- *Picea abies* has the smallest part of necromanic needles and all the other parameters (length, width and weight) are also the smallest.

That is, at area №6 which is highest necrosis of needles is the largest length, width and weight of the needles, compared to other areas.

We can conclude that the maximum damage was found at sites №5 and 6 due to intensive industrial and traffic load.