

On the Issue of Environment-oriented Measures to Eliminate the Causes and Reduce the Effects of Technogenic Impact on the Territory

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The authors investigated the dynamics of tannin content in the leaves of woody plants (in the maple kind) in man-made environments. Results of the study were interpreted in this work as suggestions for the public on improvement of urban area. The indicated activities are defined as passive methods - measures to reduce the effects of technogenic impact on the territory. The article presents and active ways as well - measures to eliminate the causes of man-made development.

Key words: Ecology, Sustainable development, Technogenic conditions, Intense intellection.

One of the main indicators of the ecological status of nature-territorial complexes (NTC) is the magnitude of technogenic impact on the territory. Technogenic load characterizes the degree of a man-made exploration of the natural environment (NE) and the level of its contamination by the products of a human life. Complex of negative factors of technological urban environment leads to a decrease in 2-3 times of urban plants' lifetime¹⁻⁴. It is also noteworthy due to the technogenic impact on the territory the global deterioration of population's health, the decline of natural fertility and fast and exhausting usage of non-renewable natural resources.

The dedicated conditionality of

environmental problems determines the urgency of changing the type of thinking from extensive to intensive one. Technogenic impact on the area is regarded to be a critical characteristic that requires rethinking of the causes and cures of accumulated problems.

The article presents as itself a number of items of a general nature about the interdependence of ecological problems.

Environmental protection measures to eliminate the causes and reduce the effects of technogenic impact on the area are examined here in the context of the public recognition of the need for sustainable ecological and economic development.

Methods

Tannins play an important role in the adaptation of woody plants at the physiological level. Tannins are a group of phenolic compounds of a plant origin. Phenolic compounds affect the

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processes of the growth and development. Tannin content in the leaves of woody plants is not enough examined⁵.

The aim of this examination was to study the dynamics of tannin content in the leaves of woody plants in the maple kind (*Acer L.*) in the conditions of a man-made environment.

Object of research

Maple platanoides or platanovidny (*Acer platanoides L.*) and ash-leaved or American one (*Acer negundo L.*) which grow in the city of Naberezhnye Chelny (Republic Tatarstan, Russia) in the various plantations of environmental categories: roadside plantings; as conditional control zones (CCZ) the areas of Naberezhnochelninskiy forest (30 km from the city of Naberezhnye Chelny on the road M-7) and the park "Grenada" of the city were selected.

The content of the condensed tannins in the leaves of a maple and an ash-leaved maple was measured three times during the vegetation season (June, July, August), using permanganometric method (Leventhal method in the Kursanov's modification). Mathematical handling of materials was held by using the statistical package «Statistica 5.5».

The main part

The tannin content in the leaves of woody plants are strongly influenced by the specific characteristics (P - level of significance, $P < 10^{-5}$), the terms of location ($P = 5.9 \times 10^{-5}$), the timing of the vegetation season ($P < 10^{-5}$), as well as their interaction ($P < 10^{-5}$).

Regardless to the growth zone the maximum number of tannins was detected in the leaves at the end of the active vegetation season, and was as follows: an acer platanoides had 1.59%; an ash-leaved maple had 1.37%.

During the vegetation season with various degrees of intensity, there was a significant increase in the concentration of tannins in the leaves in the maple kind (Table. 1)

Table 1. Tannin content in the leaves of woody plants during the vegetation season, %

Species	June	July	August
Maple platanoides	0.86	1.08	1.59
Ash-leaved maple	0.68	1.12	1.37

From June to August we can see a gradual increase in the content of this metabolite in the leaves in the maple platanoides (*Acer platanoides L.*), and in the ash-leaved maple (*Acer negundo L.*), that indicates the increased metabolic activity (Fig. 1).

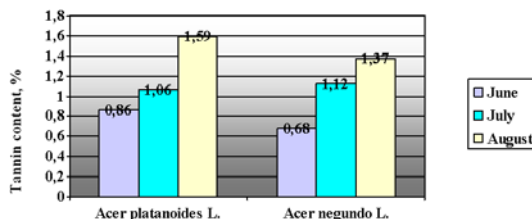


Fig. 1. The content of tannins in the leaves of woody plants during the vegetation season, %

At the end of the vegetation season (August) a strong growth can be seen in the tannin content in the leaves of maple platanoides, that is up to 0.73% and to 0.51% accordingly to the tannin content in June and July, this increase can be explained by the reaction of plants to the stress factors.

In the roadside planting the tannin content in leaves of maple platanoides was higher up to 0.14% compared to the CCZ. In the area of conditional control zones tannin content in the leaves of ash-leaved maple was less than 0.14% as compared to the truck landings (Table. 2).

Table 2. The content of tannins in the leaves of woody plants growing in various functional areas of the city of Naberezhnye Chelny, %

Species	CCZ	Trunk landing
Maple platanoides	1.46	1.60
Ash-leaved	1.17	1.31

Based on the above said it can be noted that the highest tannin content of the leaves is observed in woody plants in the roadside plantings,

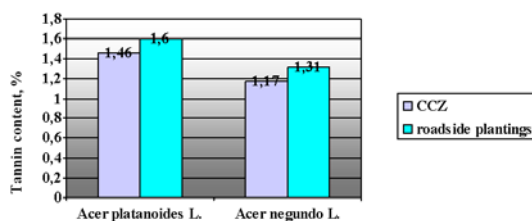


Fig. 2. The content of tannins in the leaves of woody plants growing in the various functional areas of the city of Naberezhnye Chelny %

which indicates the important role of tannins in the physiological adaptation to the different specific pollutants (Fig. 2).

Consequently, maple *platanoides* is the most adapted member of the maple kind. Studying the same way the dynamics of tannin content in the leaves of other species of flora, we can offer to the public a list of woody plants recommended for the landscaping urbanized area.

It should be noted, however, that the study does not acquit the agenda of the problem of technogenic impact to the area, but only reduces its consequences. In this way these events can be defined as passive ways.

Examine alternative measures that reduce human impacts on the area. Measures to eliminate the causes of a man-made development in the present study are called active modes. These measures should facilitate the transition from a technogenic (modern) type of ecological and economic development to a sustainable development.

The concept of sustainable development in its essence is not new and was developed in the 70-s of the last century. However, the type of environmental-economic development in Russia for a long time was considered to be a man-made (nature-destructive) type. The creation in 1988 (in Russia) of the Committee for The Environmental Protection (later transformed into the Ministry of Environmental Protection and Natural Resources of the Russian Federation) and the adoption in 1991 of a comprehensive law "On Environmental Protection" did not lead to quality improvements, as "Ideology" (an anthropocentric approach) has remained the same.

Sustainable development, according to the classification of the type of society and the level of socio-economic development, is the last stage of environmental-economic development of any country.

Transition from a man-made development to a sustainable one can help:

To change the education, which should form in the public mind an intense type of thinking; "... Analysis of the contemporary Russian society, especially in the transition state raises the question of new approaches to the study of the laws of its development. Existed stereotypes in education at some point have become irrelevant. ... Changing

of stereotypes in education has become a prerequisite of a human adaptation to the new economic situation"⁶.

To change production, the essence of which is to invest in the technological chain of production close to the processing and sale of goods to the consumer⁷;

To change science, specifically: "to strengthen the scientific basis for a sustainable development, improving of the scientific understanding of the processes, the improvement of long-term scientific assessments, the establishment of the scientific potential and evaluation"⁸.

The said changes should contribute to the ecological and economic development, social progress, forming a human responsibility for the nature.

Ecological-oriented science, education and production can be considered as the processes that determine the development of each other. In this way the integration of education, science and industry should be seen as an invariant in the complex of measures aimed at eliminating of the causes of technogenic impact on the territory and sustainable ecological and economic development in general⁹.

CONCLUSION

As a result of studying of the tannin content's dynamics we can draw the following conclusions: the concentration of tannins in the leaves of woody plants increases significantly during the period of active vegetation and the maximum value was observed in August in the conditions of an intensive technogenic load. Maple *platanoides* is the most resistant to the man-made environmental conditions and is the most adapted kind of an aboriginal group, and an ash-leaved maple, being an exotic species, is the least stable one.

These studies can be contributed to resolving the issue of gardening and landscaping loaded territory.

However, technogenic impact will not reduce. Its reduction is proposed in the study through a series of activities directed to the transition from a man-made development to a sustainable ecological and economic one. This is

the development, which should be reached.

It is characterized by the prudent usage of natural resources in the workplace and at home (there must be the lowest environmental capacity), as well as investing of the enterprises into the last stages of the natural-product hierarchy line (this corresponds to the intensive type of thinking [10]), and by the researches of sustainable development

Implications

The concentration of tannins in the leaves of woody plants increases significantly during the period of active vegetation and the maximum value was observed in August in conditions of an intensive technogenic load.

The study also allows to conclude that the differences in the content of tannin in representatives of the same kind (for example, maple *platanoides* (*Acer L.*) which is more resistant to the man-made environmental conditions. The received results make it possible to talk about the prospects for further researches in order to isolate the most resistant plants to the man-made environmental conditions and develop recommendations for a landscaping. The study, the ultimate goal of which is to resolve issues of gardening and landscaping as a whole in this study was referred to the activities reducing of the impact of a man-made development.

We carry to the actions of eliminating of the causes of technogenic impact on the territory the following: the formation of an intense type of thinking instead of the extensive one; investing to the last stages of the natural-product vertical line; financing of eco-oriented researches.

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