

Original article

EDN FDUGKQ

DOI 10.24419/LHI.2304-3083.2024.3.01

## Seasonal Adaptation of Photosynthetic Pigment Complex of Scots Pine with Different Types of Seed Scale Apophysis in Conditions of Constant Excessive Moisture in Soils of Northern Taiga

**Sergey N. Tarkhanov**<sup>1</sup>

*Doctor of Biological Sciences*

**Ekaterina A. Pinaevskaya**<sup>2</sup>

*Candidate of Biological Sciences*

**Yuliya E. Aganina**<sup>3</sup>

**Aleksandr S. Pakhov**<sup>4</sup>

**Abstract.** The article deals with the adaptive changes in the content of chlorophylls and carotenoids in conifers of pine species with «flat» (*f. plana* Christ) and «convex» (*f. gibba* Christ) types of seed scale apophysis in shrubby-sphagnum pine forests of the Northern Dvina estuary. It is shown that hot and dry weather in July 2018 had a negative effect on the synthesis of green pigments in the needles of both pine trees with «flat» and «convex» apophysis types, which may be related to the depression of photoassimilation in these conditions. A favourable temperature regime in autumn in both 2014 and 2018 promoted the accumulation of green pigments in the conifers of trees of different forms. With the average monthly air temperature in June-July 2014 close to the long-term average, the autumn increase in total green pigments was less significant compared to 2018. The increase in the value of chlorophyll a and b ratio in the current year's conifers in August-September 2018 indicates the negative impact of environmental factors on the LHC of pine needle chloroplasts under conditions of constant excessive soil moisture. The content of chlorophyll a, the sum of chlorophylls a and b and the total content of photosynthetic pigments in conifers at the end of the growing season 2014 and 2018 in the form with «convex» apophysis is significantly higher compared to the form with «flat» apophysis. In pine trees with different types of apophysis, a significant decrease in the content of chlorophyll a, the sum of chlorophylls a and b and the total content of photosynthetic pigments in the conifers of newly formed shoots was revealed at a significant decrease in air temperature in November (up to -1 °C) compared to October, which contributes to a decrease in the absorbed solar energy before overwintering. In both forms with «flat» and «convex» types of apophysis, the content of carotenoids sharply increases in late September and October-November compared to other months. Before winter, their share in relation to green pigments is maximal, which leads to strengthening of defence reactions of trees of these forms under seasonal climate conditions.

**Key words:** *Pinus sylvestris* L., forms with «flat» and «convex» apophysis, needles of newly formed shoots, photosynthetic pigments (chlorophylls a and b, carotenoids), seasonal dynamics, permanent excessive soil moisture.

**For citation:** Tarkhanov S., Pinaevskaya E., Aganina Yu., Pakhov A. Seasonal Adaptation of Photosynthetic Pigment Complex of Scots Pine with Different Types of Seed Scales Apophysis under Conditions of Constant Excessive Moisture in Soils of the Northern Taiga. – Text : electronic // *Forestry Information*. 2024. № 3. P. 21–33. DOI 10.24419/LHI.2304-3083.2024.3.01. <https://elibrary.ru/fdugkq>.

<sup>1</sup> N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences, Head of Laboratory of Ecology of Subarctic Forest Ecosystems (Arkhangelsk, Russian Federation), [tarkse@yandex.ru](mailto:tarkse@yandex.ru)

<sup>2</sup> N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences, Senior Researcher of Laboratory of Subarctic Forest Ecosystems (Arkhangelsk, Russian Federation), [aviatorov8@mail.ru](mailto:aviatorov8@mail.ru)

<sup>3</sup> N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences, Junior Researcher of Laboratory of Subarctic Forest Ecosystems (Arkhangelsk, Russian Federation), [julja-a30@rambler.ru](mailto:julja-a30@rambler.ru)

<sup>4</sup> N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences, Junior Researcher of Laboratory of Subarctic Forest Ecosystems (Arkhangelsk, Russian Federation), [aleksander.pakhoff@yandex.ru](mailto:aleksander.pakhoff@yandex.ru)