# ПУБЛИКАЦИИ ОСНОВНЫХ РЕЗУЛЬТАТОВ НАУЧНОЙ ДЕЯТЕЛЬНОСТИ СОТРУДНИКОВ ИНСТИТУТА ЕСТЕСТВЕННЫХ НАУК В РЕЙТИНГОВЫХ ЖУРНАЛАХ, ИНДЕКСИРУЕМЫХ В БАЗАХ ДАННЫХ WEB OF SCIENCE / SCOPUS ЗА ПЕРИОД С 2017 ПО 2020 гг.

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1. Olennikov, DN, Chirikova, NK, Kashchenko, NI, Gornostai, TG, Selyutina, IY, Zilfikarov, IN. Effect of Low Temperature Cultivation on the Phytochemical Profile and Bioactivity of Arctic Plants: A Case of Dracocephalum palmatum // INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES. – 2017. – Vol. 18. – Iss. 12. DOI: 10.3390/ijms18122579. База данных: Scopus/Web of Science. Квартиль: Q1-Q2.

Аннотация:

The influence of climatic factors, e.g., low temperature, on the phytochemical composition and bioactivity of the arctic plant Dracocephalum palmatum Steph. ax Willd. (palmate dragonhead), a traditional food and medical herb of Northern Siberia, was investigated. D. palmatum seedlings were grown in a greenhouse experiment at normal (20 degrees C, NT) and low (1 degrees C, LT) temperature levels and five groups of components that were lipophilic and hydrophilic in nature were characterized. The analyses indicated that D. palmatum under NT demonstrates high content of photosynthetic pigments, specific fatty acid (FA) profile with domination of saturated FA (53.3%) and the essential oil with trans-pinocamphone as a main component (37.9%). Phenolic compounds were identified using a combination of high performance liquid chromatography with diode array detection and electrospray ionization mass-spectrometric detection (HPLC-DAD-ESI-MS) techniques, as well as free carbohydrates and water soluble polysaccharides. For the first time, it was established that the cold acclimation of D. palmatum seedlings resulted in various changes in physiological and biochemical parameters such as membrane permeability, photosynthetic potential, membrane fluidity, leaf surface secretory function, reactive oxygen species-antioxidant balance, osmoregulator content and cell wall polymers. In brief, results showed that the adaptive strategy of D. palmatum under LT was realized on the accumulation of membrane or surface components with more fluid properties (unsaturated FA and essential oils), antioxidants (phenolic compounds and enzymes), osmoprotectants (free sugars) and cell wall components (polysaccharides). In addition, the occurrence of unusual flavonoids including two new isomeric malonyl esters of eriodictyol-7-O-glucoside was found in LT samples. Data thus obtained allow improving our understanding of ecophysiological mechanisms of cold adaptation of arctic plants.

2. Romy Zibulski1, Felix Wesener, Heinz Wilkes, Birgit Plessen, Luidmila A. Pestryakova, Ulrike Herzschuh. C  ∕ N ratio, stable isotope (δ13C, δ15N), and n-alkane patterns of brown mosses along hydrological gradients of low-centred polygons of the Siberian Arctic // Biogeosciences. – 2017. Iss. 14. DOI: 10.5194/bg-14-1617-2017. База данных: Scopus/Web of Science. Квартиль: Q1.

Аннотация:

Mosses are a major component of the arctic vegetation, particularly in wetlands. We present C ∕ N atomic ratio, δ13C and δ15N data of 400 brown-moss samples belonging to 10 species that were collected along hydrological gradients within polygonal mires located on the southern Taymyr Peninsula and the Lena River delta in northern Siberia. Additionally, n-alkane patterns of six of these species (16 samples) were investigated. The aim of the study is to see whether the inter- and intraspecific differences in C ∕ N, isotopic compositions and n-alkanes are indicative of habitat, particularly with respect to water level. Overall, we find high variability in all investigated parameters for two different moisture-related groups of moss species. The C ∕ N ratios range between 11 and 53 (median: 32) and show large variations at the intraspecific level. However, species preferring a dry habitat (xero-mesophilic mosses) show higher C ∕ N ratios than those preferring a wet habitat (meso-hygrophilic mosses). The δ13C values range between −37.0 and −22.5 ‰ (median  =  −27.8 ‰). The δ15N values range between −6.6 and +1.7 ‰ (median  =  −2.2 ‰). We find differences in δ13C and δ15N compositions between both habitat types. For some species of the meso-hygrophilic group, we suggest that a relationship between the individual habitat water level and isotopic composition can be inferred as a function of microbial symbiosis. The n-alkane distribution also shows differences primarily between xero-mesophilic and meso-hygrophilic mosses, i.e. having a dominance of n-alkanes with long (n-C29, n-C31) and intermediate (n-C25) chain lengths, respectively. Overall, our results reveal that C ∕ N ratios, isotopic signals and n-alkanes of studied brown-moss taxa from polygonal wetlands are characteristic of their habitat.

3. MaitaneIturrate-Garcia, Monique M.P.D. Heijmans, Fritz H.Schweingruber, Trofim C. Maximov, Pascal A.Niklaus, GabrielaSchaepman-Strub. Shrub growth rate and bark responses to soil warming and nutrient addition – A dendroecological approach in a field experiment // Dendrochronologia. – 2017. Vol. 45. Iss. 85. DOI: 10.1016/j.dendro.2017.07.001. База данных: Scopus/Web of Science. Квартиль: Q1-Q2.

Аннотация:

Tundra shrubs are slow-growing species limited by low air temperature and scarce nutrient availability. However, shrub expansion has been widely observed in the Arctic during the last decades and attributed to climate warming. Shift in shrub growth, wood structure and abundance affects the surface albedo and permafrost thawing and these changes may feedback to climate. Despite the importance of shrub–climate feedbacks, uncertainties about shrub growth sensitivity to climate remain. Here, we explored the indirect effects of climate warming on shrub growth (vertical and radial), bark thickness, and bark investment in four arctic shrub species. We combined a field experiment addressing two suggested growth drivers – thawing depth and nutrient availability – with dendroecology in a Siberian tundra ecosystem. We used heating cables to increase the thawing depth. To enhance the nutrient availability, we fertilized the surface soil layers. We found that shrub growth was mainly limited by nutrient availability, as indicated by the fertilization treatment effects on shrub growth ring widths. We also found a bark thickness decrease with the combined soil heating and nutrient addition treatment and a negative correlation between bark investment and growth rate for two of the species. These findings suggest that tundra shrubs, especially deciduous species, will grow faster and taller driven by an increasing nutrient availability in the surface soil layers. However, shrubs might become more vulnerable to pests, herbivory, and climate extremes, such as frost or drought events, due to thinner bark and lower bark investment. Using dendroecological approaches in field experiments simulating projected climate scenarios for the Arctic, and an increasing number of study species and locations will reduce uncertainties related to shrub growth sensitivity to climate and other processes driving shrub dynamics.

4. Mareike Wieczorek, Stefan Kruse, Laura S. Epp, Alexei Kolmogorov, Anatoly N. Nikolaev, Ingo Heinrich, Florian Jeltsch, Lyudmila A. Pestryakova, Romy Zibulski, Ulrike Herzschuh. Dissimilar responses of larch stands in northern Siberia to increasing temperatures—a field and simulation based study // Ecology. – 2017. Vol. 98. – Iss: 9. DOI: 10.1002/ecy.1887. База данных: Scopus/Web of Science. Квартиль: Q1.

Аннотация:

Arctic and alpine treelines worldwide differ in their reactions to climate change. A northward advance of or densification within the treeline ecotone will likely influence climate–vegetation feedback mechanisms. In our study, which was conducted in the Taimyr Depression in the North Siberian Lowlands, w present a combined field- and model-based approach helping us to better understand the population processes involved in the responses of the whole treeline ecotone, spanning from closed forest to single-tree tundra, to climate warming. Using information on stand structure, tree age, and seed quality and quantity from seven sites, we investigate effects of intra-specific competition and seed availability on the specific impact of recent climate warming on larch stands. Field data show that tree density is highest in the forest-tundra, and average tree size decreases from closed forest to single-tree tundra. Age-structure analyses indicate that the trees in the closed forest and forest-tundra have been present for at least ~240 yr. At all sites except the most southerly ones, past establishment is positively correlated with regional temperature increase. In the single-tree tundra, however, a change in growth form from krummholz to erect trees, beginning ~130 yr ago, rather than establishment date has been recorded. Seed mass decreases from south to north, while seed quantity increases. Simulations with LAVESI (Larix Vegetation Simulator) further suggest that relative density changes strongly in response to a warming signal in the forest-tundra while intra-specific competition limits densification in the closed forest and seed limitation hinders densification in the single-tree tundra. We find striking differences in strength and timing of responses to recent climate warming. While forest‐tundra stands recently densified, recruitment is almost non-existent at the southern and northern end of the ecotone due to autecological processes. Palaeo-treelines may therefore be inappropriate to infer past temperature changes at a fine scale. Moreover, a lagged treeline response to past warming will, via feedback mechanisms, influence climate change in the future.

5. Leonid A. Nikiforov, Tatiana A. Okhlopkova, Iullia V. Kapitonova, Sardana A. Sleptsova, Aitalina A. Okhlopkova, Ee Le Shim, Jin-Ho Cho. Surfactant Effects on Structure and Mechanical Properties of Ultrahigh-Molecular-Weight Polyethylene/Layered Silicate Composites // Molecules. – 2017. Vol. 22. – Iss: 12. DOI: 10.3390/molecules22122149. База данных: Scopus/Web of Science. Квартиль: Q1-Q3.

Аннотация

In this study, the reinforcement of ultrahigh-molecular-weight polyethylene (UHMWPE) with biotite was investigated. The biotite filler was mechanically activated with different dry surfactants to improve its compatibility with UHMWPE and decrease agglomeration among biotite particles. Alkyldimethylbenzylammonium chloride (ADBAC) and cetyltrimethylammonium bromide (CTAB) were selected as cationic surfactants. The tensile strength of composites containing 1 wt % of CTAB-treated biotite was increased by 30% relative to those with untreated biotite, but was unchanged with ADBAC treatment of the same biotite content. The stereochemistry of the surfactant may be critical to the composite structure and mechanical properties of the material. The stereochemistry of CTAB was preferable to that of ADBAC in enhancing mechanical properties because the stereochemistry of ADBAC impedes favorable interactions with the biotite surface during mechanical activation.