Features of Organization of Edible and Medicinal Symbiotrophic Macromycetes in Forest Ecosystems

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Organization of symbiotrophic macromycetes (SM) biota is determined by their individual interconnections with tree species, reception of carbohydrates from trees, and the SM functional role in forest ecosystems. Three hundred and seventy-five SM species connected with four forest forming tree species are known today in Karelia. Sixty percent are connected with only one tree species (monovalent), and the others with several tree species (polyvalent species of SM). Pine has 98 monovalent SM species, birch 68, spruce 41, and aspen 19. The best conditions for monovalent SM are in host–plant pure stands.

The main functional role of SM in forest ecosystems is minimization of the circulation of biogenic elements through the use of forest fall of early decay stage. The specific coenoses of micromycetes and bacteria (including nitrogen fixation) are formed near mycorrhizes. Their activity provides SM through mycorrhizes with a leading role in forest litter decay and an ability to use biogenic elements from minerals difficult of access. Another highly important role of SM biota in forest ecosystems is in the biological fixing of nitrogen in the upper soil level.

Vertical and horizontal structures of SM biota depend on realization of the above-stated functions. SM activity applies to the whole root-inhabitant soil layer. Part of the SM biota disappears with depth. We singled out three ecological niches. The first is the forest litter, the second the humus soil horizon, and the third the root-inhabited layer of soil under the humus horizon. SM biota of the first niche are represented by all SM species, the second one by all except the genus *Cortinarius*, and the third one by the genera *Amanita*, *Boletus*, *Gomphidius*, *Leccinum*, *Paxillus*, and *Suillus*.

The horizontal structure of SM has a mosaic pattern because of the heterogenic character of forest litter in chemical compound and the differentiation of SM in saprotrophy and competitive ability in different orders of litter decay. The genus *Cortinarius* lives in forest litter only and dominates in SM biota of virgin forests. Part of the SM biota consist of species in which the mycelium is active in mineral horizons but also can live in forest litter in the absence of competition with the genus *Cortinarius* and saprotrophic macromycetes. High natural and anthropogenic diversity is characteristic for SM horizontal structure. This is caused by disturbance of the litter decay pattern that results in changes in mobile nitrogen quantity. It was established in experiments that SM biota change their specific composition and fructification concomitant with an increase of mobile nitrogen content in the soil. An increase of mobile nitrogen content suppresses the fructification of many SM including the genus *Cortinarius*. A considerable part of SM intensifies or starts fructification at increase of mobile nitrogen content. A small group of nitrophilic macromycetes, in which fructification can intensify up to absolute dominance at increase of mobile nitrogen quantity, was singled out among them. Weakness or cessation of *Cortinarius* fructification is general in anthropogenic changes of SM biota. Simultaneously, the fructification of SM, with mycelia active both in forest litter and mineral soil horizons, often increases.

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