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Popularity of species of polypores which are parasitic upon oaks in coppice oakeries of the South-Western Central Russian Upland in Russian Federation.

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ABSTRACT

The article deals with research of popularity of polypores species (*Polyporaceae* sensu lato), which are parasitic upon living English oaks *Quercus robur* L. in coppice oakeries of the South-Western Central Russian Upland in the context of their eco-biological peculiarities. It was demonstrated that the most popular species are those for which an oak is a principal host, not an accidental one. These species also have effective parasitic properties and are able to spread in forest stands, from tree to tree.

Keywords: polypores, *Quercus robur* L., coppice forest stand, obligate parasite, facultative saprotroph, facultative parasite, popularity.

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INTRODUCTION

Polypores *Polyporaceae* s. l. is a group of basidium fungi which is traditionally discriminated on the basis of formal resemblance, including species of wood destroyers, having sessile (or rarer extended) fruit bodies and tube (or labyrinth-like or gill-bearing) hymenophore. Many of them are parasites housing on living trees of forest-making species, or pathogens – agents of root, butt or trunk rot. Rot’s development can lead to attenuation, drying, wind breakage or windfall of stressed trees.

On living trees *Quercus robur* L., which is the main forest-making species of autochthonous forest steppe oakeries in Eastern Europe, in conditions of Central Russian Upland, we can find nearly 10 species of polypores [1-3], belonging to orders *Agaricales*, *Hymenochaetales*, *Polyporales* (class *Agaricomycetes*, division *Basidiomycota* [4]). Among them there are obligate parasites, facultative saprotrophs and facultative parasites. Most of polypores which are parasitic upon oaks in local oakeries [1-3] are met on species of genus *Quercus* L. in Europe [5] and North America [6-8]. In South-Western Central Russian Upland not all of them are uniformly spread in coppice oakeries because of difference in eco-biological characteristics. This work summarizes empirical data for popularity of known species of polypores in the context of their bioecology peculiarities, which we obtained in 2008-2013.

METHOD

We carried out field studies using traditional methods [9] in coppice oak forest stands (mature and approaching maturity) in mountain, ravine, above-flood-plain and bench oakeries of South-Western Central Russian Upland (considered within the limits of administrative boundaries of Belgorod region in Russia and adjacent Kharkiv region in Ukraine). Popularity of polypores species was determined as part of trees affected by them in investigated forest stands, expressed as a percentage [9]. Affecting of each accounting tree by polypore species was determined by presence of fruit bodies and their remains, and inclusive of indirect indicators of affection.

MAIN PART

The researches we conducted showed that the most popular species in oakeries of the investigated region are beefsteak fungus *Fistulina hepatica* (Schaeff.) With. and sulphur polypore *Laetiporus sulphureus* (Bull.) Murrill. (Fig.). The first species is an agent of the heart butt rot, which gets into trunk and spreads in roots. The second one is an agent of the butt trunk heart rot. Both species are characteristic consorts of oaks and are met in all types of investigated oakeries. Popularity of *F. hepatica* on living oaks in different forest stands of different oakeries is 0.5-12.5 %, on average – 3.6 % (fig.). Popularity of *L. sulphureus* on living oaks in different forest stands of different oakeries is 0.5-6.0 %, on average – 2.7 % (fig.).

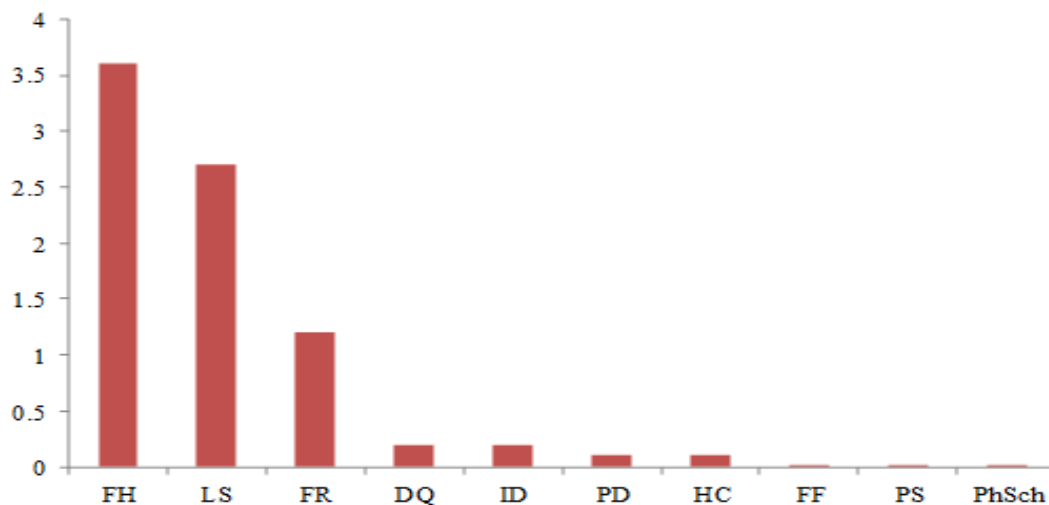


Figure: Popularity of species of parasitic polypores on living English oaks in oakeries of South-Western Central Russian Upland expressed as percentage. FH (*F. hepatica*), LS (*L. sulphureus*), FR (*F. robusta*), DQ (*D. quercina*), ID (*I. dryophila*), PD (*P. dryadeus*), HC (*H. croceus*), FF (*F. fomentarius*), PS (*P. squamosus*), PhSch (*Ph. schweinitzii*).

F. hepatica is a facultative saprotroph [10]. This species infests vigorous trees, and can evolve on dead standing trees and stumps. It forms one-year, quickly decaying fruit bodies, but at the same time bears fruit and forms spores equally well on both living and inert substrates. Vigorous trunks are infested by both basidiospores and vegetative mycelium of the pathogen. The last way of infesting prevails in coppice oakeries of the investigated region. If a parent tree has been infested by *F. hepatica pro vita*, then infection continues to evolve in the remained stump wood too. Trees of the next generation (daughter trunks of coppice bed) are infested by vegetative mycelium of the pathogen via infested parent stump. Mycelium of *F. hepatica* also spreads among trees of the one coppice generation, which have been revived from different parent stumps, but which communicate with each other with the help of big roots having heart wood.

L. sulphureus combines properties of both facultative saprotroph and facultative parasite [10]. It evolves on living trees, stumps and broken trunks equally well. In the context of bioecological peculiarities, *L. sulphureus* is close to *F. hepatica*, if it evolves mainly on the butt part of a tree belonging to coppice bed. In this case contamination spreads vegetatively, from infested trunk to vigorous one.

And if *L. sulphureus* evolves mainly in trunk part (that is quite often), it has some distinctions. In this case its (just as in case of all parasitic trunk species having one-year fruit bodies) spreading is limited with the time of fruit-bearing and spore-bearing and depends on air flow and migration of insects-mycetophages. Infestation of vigorous trees in case of trunk type of evolvement is possible only with the help of basidiospores. In some cases infectious source in the form of chlamydospores can be brought into vigorous trees with side drought by insects-xylophages, flown out of stressed trees.

Quite commonly on living oaks in forest stands of the investigated region we may see false oak tinder fungus *Fomitoporia robusta* (P. Karst.) Fiasson & Niemelä [= *Phellinus robustus* (P. Karst.) Bourdot & Galzin] – agent of heart or heart-sap trunk rot. It is found in all types of oakeries. Its popularity is 0.5-3.9 %, on average – 1.2 % (fig.). *F. robusta* is an obligate parasite of English oaks [10]. However, it can preserve life activity on inert substrate, for example windfallen trunks, but for only a small time after windfall, and with the lapse of time it ceases its life activity ultimately. This species forms perennial fruit bodies, bears spores abundantly and within a long period of time, as a rule only on living trees. Infestation of new trees is possible only via pathogen's basidiospores spread with the help of wind and rain.

Some species are less popular on living oaks in the region's oakeries: brown rot of oak *Daedalea quercina* (L.) Pers., oaken polypore *Inocutis dryophila* (Berk.) Fiasson & Niemelä [= *Inonotus dryophilus* (Berk.) Murrill], oakery root polypore *Pseudoinonotus dryadeus* (Pers.) T. Wagner & M. Fisch. [= *Inonotus dryadeus* (Pers.) Murrill], and also saffron polypore *Hapalopilus croceus* (Pers.) Donk. All these species are common for oak consortium. Their average popularity is (correspondingly): 0.2 %, 0.2 %, 0.1 % and 0.1 % (fig.). *D. quercina* is an agent of butt trunk heart or heart sap rot; it is a facultative parasite [8, 10] and tends to live in more anthropogenically transformed forest stands, where it is more often met on the inert substrate – stumps, cut and thrown trunks, their stubs. *D. quercina* forms one-year wintering fruit bodies, frequently a lot of them. Mostly places of vigorous tree's trunk's contact with inert substrate (for example, stump) occupied by the pathogen become the start of infestation. Presence of *I. dryophila*, *P. dryadeus*, *H. croceus* is more uniform in different oakeries and forest stands. *I. dryophila* and *H. croceus* are agents of heart trunk rot, *P. dryadeus* is an agent of root and butt heart-sap rot. The last three species are obligate parasites. They evolve on living trees well, where they form one-year fruit bodies, which bear spores within the limited time. Their development cycle on inert substrate (dead, windbroken, windfallen trees) is short. Spreading of all species is carried out via basidiospores.

In the region's oakeries such polypores species are popular to a lesser degree: tinder fungus *Fomes fomentarius* (L.) Fr., dryad's club saddle *Polyporus squamosus* (Huds.) Fr. and dyer's polypore *Phaeolus schweinitzii* (Fr.) Pat. – species which are not typical for oaks consortium in oakeries of South-Western Central Russian Upland. *F. fomentarius* and *P. squamosus* are facultative parasites. *Ph. schweinitzii* is a facultative saprotroph. Popularity of the specified species on living oaks in investigated oakeries' forest stands is 0.02 %, 0.01 %, 0.01 % correspondingly (fig.). Each of them is found sporadically on an oak under the conditions of its growing with species which are more usual hosts for the specified parasites. Thus, if in a forest stand there are (apart from oaks) aspens *Populus tremula* L. or common ashes *Fraxinus excelsior* L., which may be infested by *F. fomentarius* – a species which is usual for them, we may find this pathogen's fruit body on oaks.

Such things have been noticed in case of oak's growing with European white elms *Ulmus levis* Pall. and witch elms *Ulmus glabra* Huds. or common ash, for which *P. squamosus* is usual, and also in case of oak's growing with common pine *Pinus sylvestris* L., which is a usual host for *Ph. schweinitzii*.

CONCLUSION

Thus, the most popular polypores species on living oaks in coppice oakeries of South-Western Central Russian Upland are those for which oak is a principal, not facultative host; besides, they have effective parasitic properties and can spread in a forest stand from tree to tree effectively. In addition, the most popular species also evolve on substrate of different state successfully, which allows them to extend the sphere or their life space and to densify the infectious source.

RESUME

The most popular species of polypores on living English oaks in coppice oakeries of South-Western Central Russian Upland are facultative saprotrophs. They can digest substrate of different state and spread both vegetatively (via mycelium) and sexually (via basidiospores). Among them we can mention *Fistulina hepatica* and *Laetiporus sulphureus*. Popularity of the first species on living oaks in different forest stands of different oakeries is 0.5-12.5 % (on average – 3.6 %). Popularity of the second species on living oaks in different forest stands of different oakeries is 0.5-6.0 % (on average – 2.7 %).

Fomitoporia robusta, an obligate parasite, which is able to evolve for a short period of time on broken trunks, is nearly as popular as the two specified species. It forms perennial fruit bodies and bears spores abundantly and within a long period of time, spreading via basidiospores. Its popularity is 0.5-3.9 % (on average – 1.2 %).

Less popularity is possessed by a facultative parasite *Daedalea quercina* (average popularity 0.2 %), which prefers inert substrate. And also obligate parasites *Inocutis dryophila* (0.2 %), *Pseudoinonotus dryadeus* (0.1 %), *Hapalopilus croceus* (0.1 %), which form one-year fruit bodies, bear fruit and spores only on living trees, and spread via basidiospores.

In the course of the research we noticed following pathogens on English oaks which are unusual for them: tinder fungus *Fomes fomentarius*, dryad's club saddle *Polyporus squamosus*, dyer's polypore *Phaeolus schweinitzii*. Each of three specified species of polypores is sporadically met on oaks as facultative hosts under the conditions of their growing with species which are principal hosts for the specified parasites.

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