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## **RELATIONS BETWEEN PHYSICAL AND CHEMICAL PROPERTIES OF MELANINE PIGMENTS IN WOOD DECAYING FUNGI AND THEIR ANTIOXIDANT ACTIVITY\***

**Keywords:** melanin, wood decaying fungi, antioxidant activity, elemental composition.

Melanins are high molecular weight heteropolymers of an irregular chemical structure [1, 2]. They are synthesized in fungi by enzymatic oxidation, autooxidation and polycondensation of simple phenolic precursors. As a result, melanins differ in physicochemical properties [3]. The high content of paramagnetic centers allows melanins to deactivate the natural radicals formed in a number of physical and chemical processes due to the large electron absorption capacity of these compounds [4].

The purpose of the work is to study the physicochemical properties of melanins in a number of fungi and their antioxidant activity.

The object of the study were the melanin pigments extracted from the fruiting bodies of fungi that cause brown rot - the edged tinder, and white rot - of the real, flat, false, oak false, as well as sterile mowed, chaga. Melanin pigments from fruiting bodies were obtained by alkaline extraction according to the previously described

method [1]. Spectrophotometric measurements were performed on a “Cary 50 Bio” (Australia). The antioxidant activity (AOA) of melanins was studied using the standard model of reduction of the ABTS<sup>•+</sup> radical cation using the previously described procedure [4].

The results of the elemental composition study, spectral properties and antioxidant activity of melanins from fruit bodies of fungi are presented in the table.

Table

Physicochemical characteristics of melanins from fungi  
and their antioxidant activity (AOA)

Fungi species, substrate	Elemental composition, %					E 0,001%, l = 1cm		AOA, mM trolox/g melanin
	C	H	N	O	H/C	UV 240 nm	UV 465 nm	
<i>Fomitopsis pinicola</i> (pine)	63,4	8,7	1,4	18,9	0,14	0,050	0,001	0,07
<i>Fomitopsis pinicola</i> (birch)	65,9	9,0	1,5	18,1	0,14	0,081	0,008	0,21
<i>Ganoderma applanatum</i> (poplar)	46,3	6,4	6,0	30,8	0,14	0,130	0,013	0,66
<i>Fomes fomentarius</i> (birch)	47,4	6,2	5,7	34,9	0,13	0,157	0,023	0,49
<i>Inonotus obliquus</i> (birch)	49,4	4,8	0,6	38,7	0,10	0,300	0,028	0,92
<i>Phellinus igniarius</i> (birch)	42,5	5,0	2,0	38,3	0,12	0,196	0,028	1,64
<i>Phellinus igniarius</i> (Manchurian walnut)	41,3	5,5	4,9	36,3	0,13	0,135	0,017	0,50
<i>Phellinus robustus</i> (oak)	38,5	4,7	3,2	38,7	0,12	0,213	0,026	0,65

An increase in optical density in the series of pigments studied correlated with an increase in bond unsaturation, as evidenced by a decrease in the H/C ratio (Table). Along with this, the increase in light absorption in UV corresponds to an increase in the oxygen content in pigments, which is due to the developed system of conjugated double bonds, as well as the presence of oxygen-containing chromophores [2, 3]. AOA determination of melanins by the TEAC method in the ABTS<sup>•+</sup> model radical-cation reduction system showed that AOA correlate with the physicochemical properties of the studied melanins. The highest AOA is possessed by melanins obtained from chaga (*Inonotus obliquus*) and false tinder (*Ganoderma applanatum*).

#### References

1. Belova N. V. // Mycology and phytopathology (Rus). 2004. Vol. 38. № 2. P. 1–7.
2. Gorovoy L. F. // Advances in medical mycology (Rus). 2004. Vol. 1. P. 271–273.

3. *Borschevskaya M. I., Vasilyeva S. I. // Issues of medical chemistry (Rus). 1998. Vol. 45. № 1. P. 13–23.*
4. *Sushinskaya N. V., Kurchenko V. P. // Proceedings of the Belarusian State University. 2006. Part 1. P. 143–154.*

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## **FUNGI, SOURCE OF BIOLOGICALLY ACTIVE SUBSTANCES WITH IMPORTANT APPLICATION IN AGRICULTURAL FIELDS\***

**Keywords:** fungal crude extract, wood decomposing mushroom, biologically active compounds, seed germination, tomato.

Eleven species (dried fruit bodies) *Fomitopsis pinicola*, *Cerrena unicolor*, *Piptoporus betulinus*, *Daedaleopsis tricolor*, *Stereum subtomentosum*, *Funalia trogii*, *Phellinus cinereus*, *Trametes versicolor*, *T. pubescens*, *T. gibbosa* and *Ganoderma applanatum* were used to extract biologically active compounds (BACs) in crude extracts (CE). which may further be studied to evaluate their impact on rate of seeds germination, biosynthesis of photosynthetic pigments, biomass formation and of length of tomato seedlings (*Solanum lycopersicum*, cv. *Dubrava*).

Fruiting bodies of above-mentioned fungi were used in series of extractions, 500 mg of dried ground biomass and solvents consisting of 80 %, 60 %, 40 % ethanol and  $\text{diH}_2\text{O}$ . CEs were used for the quantitative measurement of free amino acids [1], total phenolic compounds [2], total soluble proteins [3]. Qualitative assay of amino acids was using ascending paper chromatography and LC-MS chromatography (UPLC-QToF Xevo Waters). Seeds of tomato cultivar (*Solanum lycopersicum*, cv. *Dubrava*) were grown on Petri dishes which were moistened with CEs, the control seeds were moistened using distilled water ( $\text{diH}_2\text{O}$ ). After thirteen days of growth from sowing