



**RELATION OF THE WOOD-ROTTING BASIDIOMYCETES, ISOLATED
FROM TUGAY FORESTS OF AZERBAIJAN**

Ganbarov Kh.G., Suleymanova G.Ch., Hasanova S.A. and Babayeva I.T.

Microbiology department, biology faculty, Baku State University, Azerbaijan

Abstract

*This article is devoted to the relation of filamentous cultures of wood-rotting basidial fungi, isolated from Tugay forests near Kura river in Azerbaijan, to temperature. It is shown that *Trametes cervina*, *T.hirsuta* and *T.pubescens* are relatively heat-loving, for which the optimal temperature is 35⁰C. For *Fomes fomentarius*, *Fomitopsis pinicola*, *Inonotus hispidus*, *Lenzites betulina*, *Phellinus igniarius*, *Ph.torulosis*, *Schizophyllum commune* and *Trametes gibbosa* the optimal growth temperature is 30⁰C. *Trametes cervinus*, *Trametes pubescens* and *Schizophyllum commune* had the highest growth rate.*

Keywords: *wood-rotting basidial fungi, temperature, filamentous cultures, growth coefficient*

I. INTRODUCTION

The study of such physiological factors as temperature, acidity and environmental humidity is, on one hand, crucial in comprehending the role of the wood-rotting (xylotrophic) basidial fungi in forest biocenose processes, as they are able to develop and canker the timber in nature, provided there is an appropriate temperature, acidity and environment humidity [7,9]. On the other hand, awareness of xylotrophic fungi physiology lets us use them as producers of essential metabolites, including enzymes [1, 6, 8,11].

Using of such factors as temperature, acidity, aeration and the content of carbon and nitrogen resources and other nutritious elements, conditions necessary for the cultivation of filamentous fungi are optimized. This is the way the process of continuous cultivation of mycelium of edible fungi can be enhanced [2, 4].

It is known that xylotrophic basidial fungi are mesophilic in their relation to temperature and 25-30⁰C is an optimal temperature for them. Nevertheless, some fungi are able to grow intensively even exposed to the temperature of 37 и 40⁰C. In addition, there are some exceptions, for instance, the highest temperature recorded for *Schizophyllum commune* fungi was 40⁰C. Ambiguous relation that basidium fungi express towards temperature is for some degree due to ecological regions, from where they have been collected [5, 10]. Consequently, the study of relation of wood-rotting basidial fungi to temperature is very important.

The main aim of the given scientific research is the study of relation of filamentous cultures wood-rotting basidial fungi to temperature. As it was mentioned above the basidial fungi were isolated from Tugay forests near Kura river in Azerbaijan.

II. MATERIALS AND METHODS

Filamentous cultures wood-rotting basidial fungi are received from fruit bodies. The fruit bodies of fungi were gathered from different types of woody vegetable substrates on the area near-Kura Tugay forests in Azerbaijan. In order to get pure filamentous cultures, the collection of fruit bodies was conducted in dry weather, usually in May-June and September-October, during the

period of their mass growth. We choose relatively young and dry carpophores and the isolation was held on the day of cropping or these fruit bodies have been stored in a refrigerator for 1-5-days. Before isolation the fruit bodies were cleaned from plant residues, then treated with 96⁰ ethyl alcohol and left in a laminar box under the UI (ultraviolet irradiation) for 20 minutes. Afterwards, some pieces of “tissue” 5-10 mm each were torn off from different areas and moved aseptically to wort-agar with pH 5,5 and incubated at the temperature of 26 – 28⁰C.

In case if pieces of fruit bodies were not filamentous at wort-agars, they were carried to the medium, consisting of plant substrates, grained and moistened by the mineral solution up to 60% (sawdust, sawdust+ bran, in the ratio 1:1). Some fungi were isolated from substrate mycelium and the grown culture was moved to wort-agar medium.

In case of contamination of cultures by mold, the isolation was continued till pure cultures were received. Bacteriological contamination was suppressed by means of antibiotics or their combinations (penicillin, monomicin, ampicillin, oksocillin, by applying 4000-5000 unit/litre).

The pure cultures were mainly stored at wort-agar in pH 5,5 and sub-cultured once in 6 months.

The relation of filamentous cultures of fungi to the temperature (20, 25, 30, 35, 40⁰C) has been studied in the wort-agar medium for 5 days and their growth was estimated by the growth coefficient [3]. The growth coefficient (GC) was detected in optimal temperature according to the equation:

$$GC = \frac{d \cdot h \cdot g}{t}$$

where d - is the colony diameter, h - is the colony height, mm, g – is the colony density (visually according to five-mark scale), t –is the colony age per day

All the experiments have been made four times and data were treated statistically [11].

III. RESULTS AND DISCUSSIONS

Filamentous cultures were isolated from fruit bodies of 12 species of wood-destroying basidial fungi and studied their relation to temperature. It has been revealed that *Fomes fomentarius*, *Fomitopsis pinicola*, *Lenzites betulina*, *Inonotus hispidus*, *Phellinus torulosus* and *Trametes gibbosa* have high degree of growth at the temperature of 25 and 30⁰C, but they do not grow at the temperature of 35⁰C. As the growth coefficient of *Fomes fomentarius*, *Fomitopsis pinicola*, *Lenzites betulina*, *Phellinus torulosus* and *Trametes gibbosa* have the growth rate, ranging in the interval of 9,2 – 14,0, they do not related to the growth speed. However, *Inonotus hispidus* has the highest growth speed and its growth coefficient was 25,2 (Table 1).

Phellinus igniarius had good growth speed at the temperature of 25⁰C and 30⁰C, but at the temperature of 35⁰C its growth rate was not so high. Nevertheless, at the temperature of 30⁰C fungus had high growth speed, and the growth coefficient was 46,4. *Trametes versicolor* and *Schizophyllum commune* also had high growth speed at the temperature of 25⁰C and 30⁰C, while their growth speed was not essential at the temperature of 40⁰C. The highest growth speed was noted at the temperature of 30⁰C, and the growth coefficient were 32,8 and 55,2, accordingly (table).

Trametes cervina, *T.hirsuta* and *T.pubescens* showed the best growth results at the temperature of 30⁰C – 35⁰C and had a visible growth at the temperature of 40⁰C. The highest growth speed of the mentioned above fungi was noted at the temperature of 35⁰C, and their growth coefficient was 54, 0; 34, 4 and 51,6, accordingly (Table 1).

According to their growth coefficient fungi cultures are subdivided into three groups. The first group includes *Trametes cervina*, *T.pubescens*, *Phellinus igniarius* and *Schizophyllum commune* with the growth coefficient 46,6 – 55,2. The second group covers *Trametes hirsuta*, *Trametes versicolor* and *Inonotus hispidus* with the growth coefficient 25, 6 – 34,4. *Fomes fomentarius*, *Fomitopsis pinirola*, *Lenzites betulina*, *Phellinus torulosus* and *Trametes gibbosa* are ascribed to the third group and have the growth coefficient 9,2 – 14,0.

Table 1
The growth of filamentous cultures of wood-rotting basidium fungi at different temperatures and their growth coefficient

N/N	Fungi	Temperature °C	Diameter of colony, mm	Growth coefficient (GC)
1	2	3	4	5
1.	<i>Fomes fomentarius</i> (L.:Fr.)Fr.	20	30 ± 2	9,2
		25	42 ± 2	
		30	46 ± 2	
		35	0,0	
		40	0,0	
2.	<i>Fomitopsis pinicola</i> (Sw:Fr) P.Karst.	20	48 ± 3	14,0
		25	64 ± 3	
		30	70 ± 5	
		35	0,0	
		40	0,0	
3.	<i>Inonotus hispidus</i> (Fr.) P.Karst.	20	18 ± 1	25,6
		25	28 ± 2	
		30	32 ± 2	
		35	0,0	
		40	0,0	
4.	<i>Lenzites betulina</i> (Fr.)Fr.	20	32 ± 2	10,4
		25	46 ± 3	
		30	52 ± 3	
		35	0,0	
		40	0,0	
5.	<i>Phellinus igniarius</i> (L.:Fr.) Quel.	20	33 ± 2	46,4
		25	52 ± 4	
		30	58 ± 3	
		35	5 ± 0,2	
		40	0,0	
6.	<i>Phellinus torulosus</i> (Pers.) Bourd.et Gols	20	23 ± 1	11,2
		25	28 ± 2	
		30	20 ± 1	
		35	0,0	
		40	0,0	
7.	<i>Schizophyllum commune</i> Fr.	20	42 ± 2	55,2
		25	84 ± 6	
		30	52 ± 3	
		35	68 ± 2	
		40	33 ± 1	
8.	<i>Trametes cervina</i> (Schwein.)Bres	20	60 ± 3	54,0
		25	73 ± 5	
		30	82 ± 6	
		35	90 ± 5	
		40	42 ± 1	
9.	<i>Trametes gibbosa</i> (Pers.) Fr.	20	38 ± 2	11,4
		25	53 ± 2	
		30	50 ± 3	
		35	0,0	
		40	0,0	

N/N	Fungi	Temperature °C	Diameter of colony, mm	Growth coefficient (GC)
1	2	3	4	5
10.	<i>Trametes hirsuta</i> (Wulfen.: Rr) Pilat	20 25 30 35 40	62 ± 3 74 ± 3 87 ± 5 86 ± 5 36 ± 2	34,4
11.	<i>Trametes pubescens</i> (schumach.: Fr.)Pilat	20 25 30 35 40	40 ± 2 66 ± 3 74 ± 4 86 ± 3 59 ± 2	51,6
12.	<i>Trametes versicolor</i> (L.: Fr.) Pilat	20 25 30 35 40	62 ± 3 78 ± 3 82 ± 5 36 ± 1 10 ± 0,3	32,8

Trametes cervina (GC 54), *T.pubescens* (GC 51,6) and *Schizophyllum commune* (GC 55,2), have the highest growth speed. In comparison with the second and third group, their growth coefficient was 1,7 and 4,8 times higher, accordingly.

There is a special thermogram for fungi cultures that grew at the temperature of 20°C – 40°C. *Schizophyllum commune* and *Trametes versicolor* had the optimal growth at the temperature of 28°C, whereas *Trametes cervina*, *T.pubescens* and *T.hirsuta* had the optimal growth at the temperature of 35°C. Further increase of temperature fully inhibited to the fungi growth (fig.1).

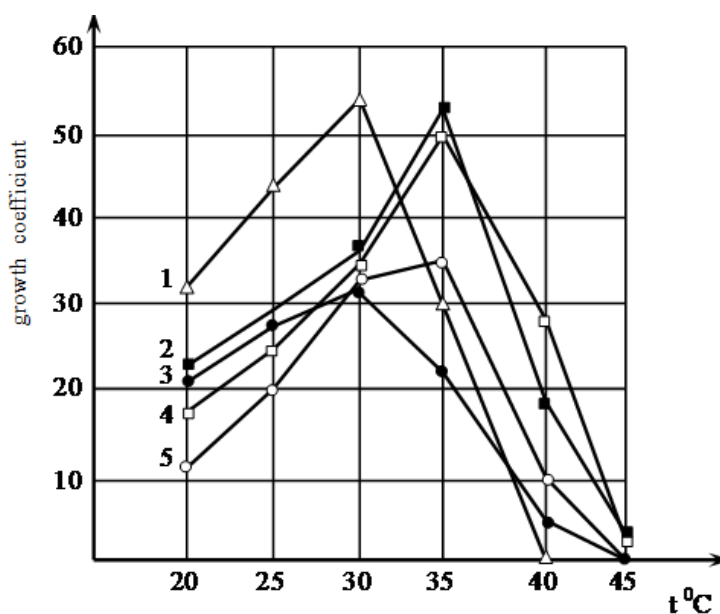


Figure 1. The thermogram of filamentous cultures of wood-rotting Basidiomycetes, growing in a large range of temperature: 1. *Schizophyllum commune*; 2. *Trametes cervina*; 3. *Trametes versicolor*; 4. *T. pubescens*; 5. *T. hirsuta*

The data results of this study differ from literary data, related to the optimal temperature of the growth for *Trametes zonatus* and *Trametes versicolor* which makes up 25°C – 26°C [12]. It is highly important to note that these authors did not take into consideration the density and height of colonies when they were studying the growth rate of fungi.

IV. CONCLUSION

It was shown in this study that *Trametes cervina*, *Trametes hirsuta* and *Trametes pubescens* are relatively thermostable and optimal temperature for them is 35⁰C. The optimal growth temperature for *Fomes fomentarius*, *Fomitopsis pinicola*, *Trametes gibbosa*, *T.versicolor*, *Inonotus hispidus*, *Lenzites betulina*, *Phellinus igniarius*, *Ph. torulosus* and *Schizophyllum commune* is 30⁰C. *Trametes cervina*, *Trametes pubescens* and *Schizophyllum commune* had the highest growth rate.

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