

# Analysis of Population of Soil Microflora in Cultures of Black Pine Depending of Infection of *Fomes Annosus*

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## Abstract

Abstract section. This paper presents the microflora in the cultures of black pine. The aim of the work is based on experimental sample of land, to carry out the research in healthy and infected cultures of black pine, and to determine the effect of pathogenic fungi "Fomes annosus".

The effect of fungi is followed by a different soil depth, and in the root zone of pine. Furthermore, our goal was to reveal behavior of fungi in old and young crops. The tests themselves are done on nutritive substrates and land suspensions. The researches yielded satisfactory definite results, that will be the basis for further monitoring and research.

**Keywords:** soil, microorganisms, culture, pine, microflora.

## 1. Introduction

The land is very dynamic environment where turbulent biochemical processes continually happen, conditioned by the huge potential of soil microorganisms that make the process of decomposition of forest litter, humus synthesis, and its mineralization. By making a study, each biocenosis is characterized by a certain microbiocenosis [2] and that in silvibiocenois fungi of the genus *Fomes*, certain place is occupied as decomposers of ligneous materials [11] which is due to the very complex chemical composition difficult to decompose. Of course it is qualitative composition of microorganisms in silvibiocenois conditioned by the nature of the organic matter in forest litter, and its population of microecological environmental conditions [8] so the change of to these factors may completely change, the relationship between individual members of microbiocenosis. Silvicultural measures (cleaned and thinning) are changing the micro ecological conditions in silvibiocenois, and ingestion of other species and inadequate fertilization, biological balance even more moves, which might affect the populations of soil microorganisms.

Taken into account all of these, the task of studying soil of microflora was set, its dynamics and

relationships, different groups of microorganisms see it in any circumstances value of soil pathogenic role of fungi *Fomes annosus* comes to the fore.

## 2. Material and Methods

On the experimental fields in the forests and plantations of *Pinus Nigra*, in central region of Serbia, the tests were conducted on perennial populations of microflora in soil and rhizosphere in healthy and infected stands in which the pathogenic fungus of *Fomes annosus* fact expressed varying intensity.

Land and rhizosphere microflora was tested on agary nutrient seeding soil, by applying soil dilution of 1: 1000. Land agar was used for the total number of microorganisms [4] for fungi, and the agar synthetic agrochemicals Krasiljnikov actinomycetes and Edgie's agar was used for aligotrophic microorganisms. In the rhizosphere microflora, two zones were investigated: the land that clings to the hair roots and rhizosphere microflora of root veins.

## 3. Results and Discussions

Condition of soil microflora in the stands of black pine in central region of Serbia, (I Series): As this is a land of light mechanical composition-brown loam, with a lot of low humus content. [7], the total number of microorganisms in soil is very high in the

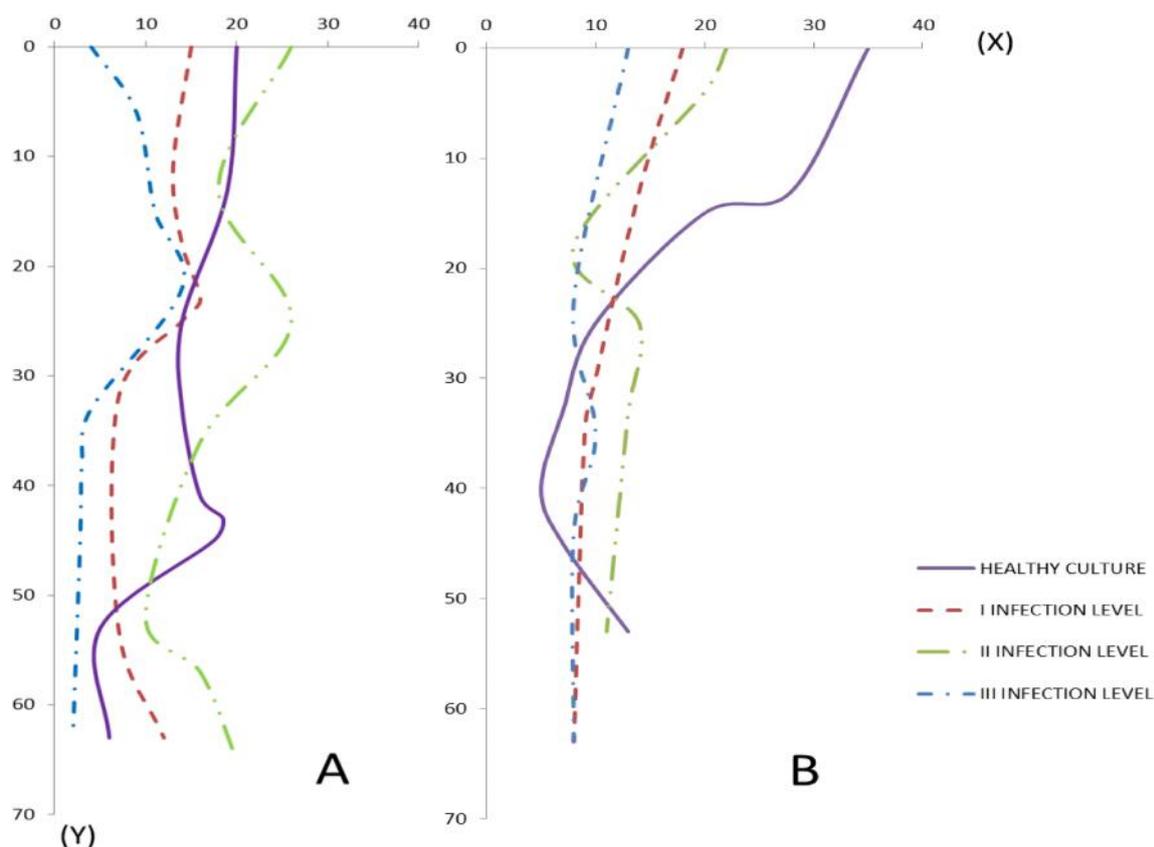
surface horizon of up to 13 cm depth (Figure 1), regardless of the degree of contamination of the stand. With the depth of the total number of microorganisms rapidly decreases, but is up to 40 cm depth its still changeable. At greater depths, the total number of microorganisms rapidly decreases, but is up to 40 cm depth is still variable. At greater depth of microorganisms is very low. In healthy stands and *the stands of the first degree of infestation*, the total number of microorganisms is uniform throughout the profile, without rapid transitions. In the stands of *II and III degree of infestation*, the total number of microorganisms was slightly increased in the surface horizons to 3 cm, while with increasing depth rapidly decreases with some fluctuation in the horizon of 13-40 cm. (Figure. 1)

The stands of II and III degree of infestation, the total number of amonifical microorganisms, which depends on the amount and state of the organic matter in the soil, it is considerably bigger up to 3 cm

of the depth, and rapidly decreases with the depth. In healthy soil under stands and stands, and the degree of infection, the number of microorganisms is less amonifical but uniform up to 40 cm depth. Such uniform number of amonifical organisms, depth profiles in health contents indicates that, organic matter is distributed evenly and that there is no delay in its decomposition.

The population of oligotrophic microorganisms is significantly higher in soil infested stands, while in the soil healthy stands of these microorganisms , the number is extremely low and coincides with the number of amonifical microorganisms.

In healthy stands of soil, the population of fungi is extremely high in the horizon of up to 13 cm depth. At greater depths, the population of these microorganisms is decreasing and is equated with the number of these microorganisms in soil infested stands, which is a relatively low profile over the entire length (Figure .1)



**Figure 1.** Move actinomycetes ( A) and mushroom (B) in the cultures of black pine in the area central region of Serbia, ( 33 years old culture)..Depth land, in cm ( Y), Number of microorganisms in 000-(X)

Condition of soil microflora in the stands of black pine in, central region of Serbia, (II series): The stands of black pine, with varying *degrees of infestation of I, II, III*, in which experimental areas,

are set and develop on the brown-podzolic soils. These soils are deep, of light mechanical composition, with a high content and the percentage of coarse sand, with a strong pronounced acidity and a high percentage of humus to a depth of 20-30 cm.[ 5 ]

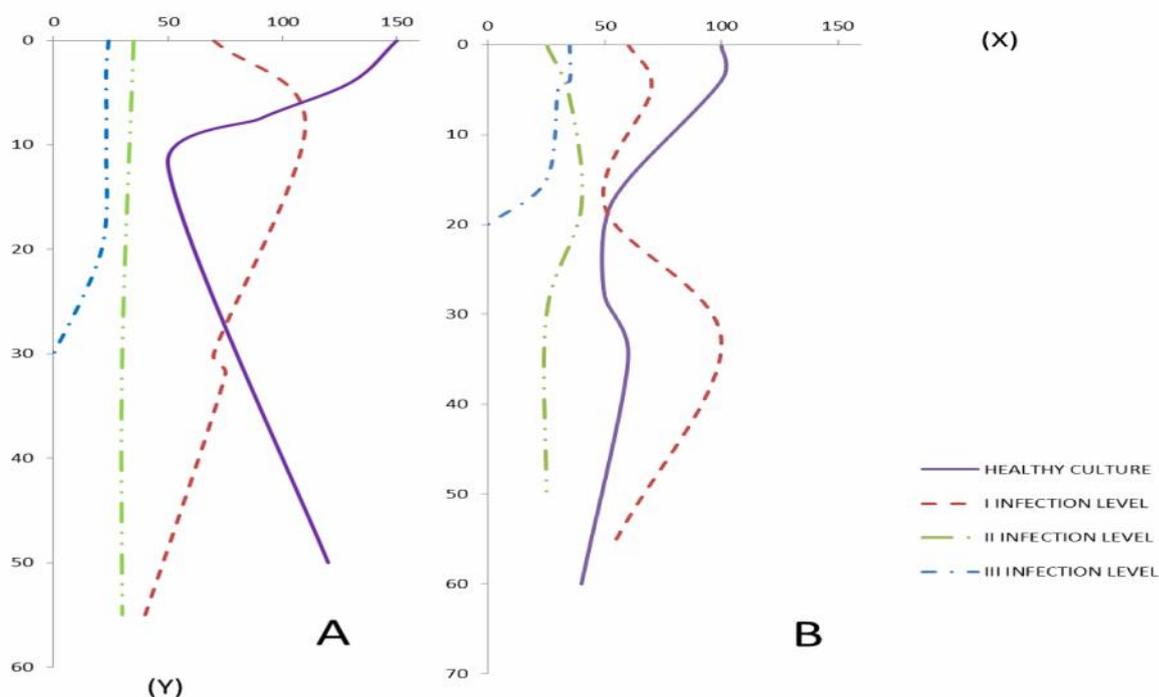
According to the microbiological analysis of land in the stands, very low biogeny, and the differences in the total number of microorganisms between healthy and infected stands are minimal (Figure . 2) and the number amonifical microorganisms is very low in these soils, and the differences in the number of amonifical microorganisms according to the degree of infection is minimal.

In healthy soils and those with low number of infected stands, oligonitrophilous microorganisms is very low, but it is extremely high in soils heavily infested and infected sastjina, because in the horizon of up to 20 cm depth , the number of oligonitrophilous number of micro-organisms reaches 8 to 9 million.

Such a high population of microorganisms mentioned indicates that in infected stands of black pine even more pronounced limited nitrogen nutrition rather than , for example, in the stands of white pine.

The population of actinomicity is markedly higher than in the soil with healthy and poorly infected stands (Figure 2) because they are severely infected stands actinomycetes registered to a depth of up to 20 cm, and in a minimum number. Significantly higher number of actinomycetes in healthy and with poorly expressed stands indicating complete decomposition of organic matter in the soil, because it is known that actinomycetes participating in decomposition of organic matter, which certainly affects the quality of humus and the content of available elements of nutrition.

The number of fungi was also significantly higher in the soil of healthy and infected poor stands of the entire length of the profile. In heavily infected stands, fungi were recorded only in the horizon of up to 10 cm depth (Figure 2).



**Figure 2.** Move actinomycetes ( A) and mushroom (B) in the cultures of black pine in the area central region of Serbia, (55 years old culture).Depth land, in cm ( Y), Number of microorganisms in 000-(X)

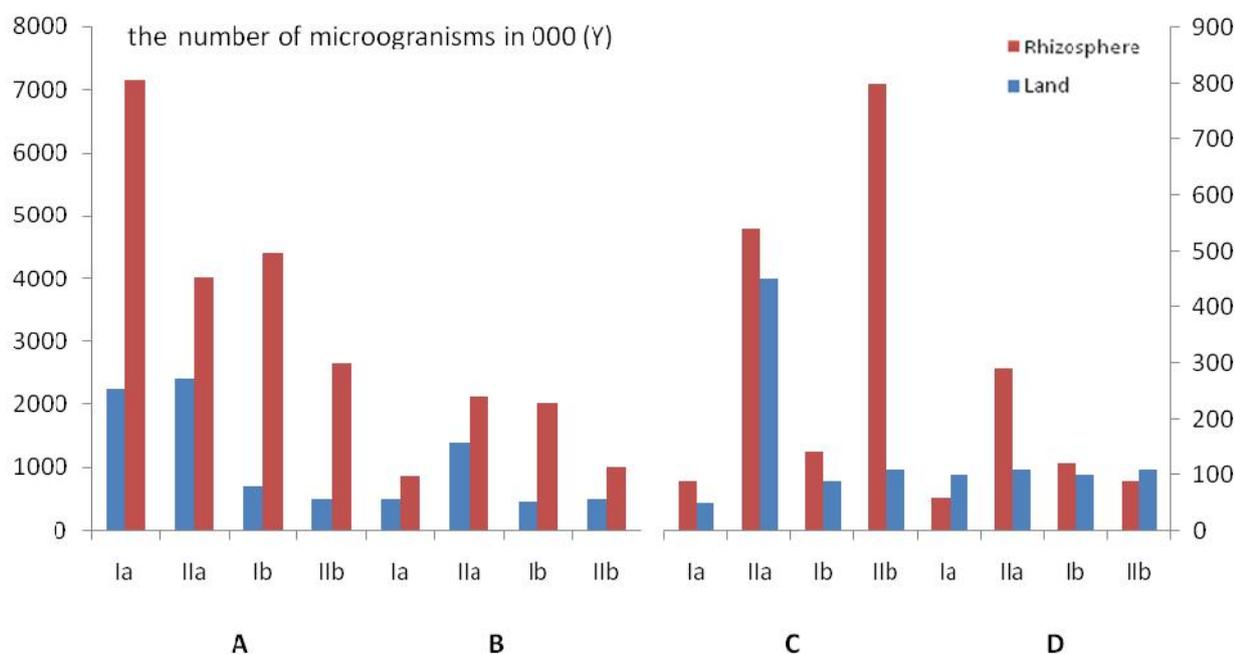
The presented data on the number of microorganism suggest that the overall biological value under black pine stands in Šumadija is relatively low. Difference in population between healthy soil of micro-organisms and infected stands were reflected in a large population of amonifical organisms in

soil infested stands, which points to that the land is organogenic and that a large proportion of nutrients, blocked in organic form. Much smaller number of fungi and actinomycetes contributes to it, particularly involved in decomposition of mineralization of organic matter and humus.

Huge population of oligonitrophilous microorganisms in soil infested stands, indicates unfavorable nitrogen regime, because it is known that these microorganisms develop in the soil with a little readily available nitrogen, since they are able to take ammonification under adverse conditions [ 1 ] and in the toughest conditions for nitric nutrition, to compensate this element by nitrification [ 3 ] Low nitrogen content in podzolic soils are indicated yet [ 9 ] In 1971, Lidejševska claimed infested stands of black pine the low content of nitrogen and nickel, a high content of phosphorus, but according to the same author, the impact of nutrients but in determining it. the resistance of Pinus species to the fungus , Fomes annosus was. evident but not the leading ones.

The soil and rhizosphere of infected stands where the nitrogen regime even number microorganisms, the antagonist is much smaller which allows a greater population fungus, Fomes annosus [ 10 ] This conclusion is confirmed even [ 6 ] since the introduction of nitrogen fertilizers in the soil with the altered conditions of nitrogen nutrition, increased antibiotic activity of microorganisms antagonista to the fungus Fomes annosus.

Finally, we can conclude that, according to the results of our investigation thing that regime and nitrogen nutrition extremely high population oligonitrophilous microorganisms in soil infested stands should be given special attention.



**Figure 3.** Movements in the number of microorganisms in the rhizosphere, in the culture of the black pine-under crops in the area

- central region of Serbia -(A) total number of microorganisms; (B) amonificational microoorganisms; (C) actinomycets; (D) fungi I - infected trunk; II - healthy trunk; a - a trunk within; b - a trunk in remote area.

Analysis of the rhizosphere microflora in infected and healthy stands:

The rhizosphere is the most active and most dynamic part of the land in which complicated interrelationships of plants and microorganisms occur.

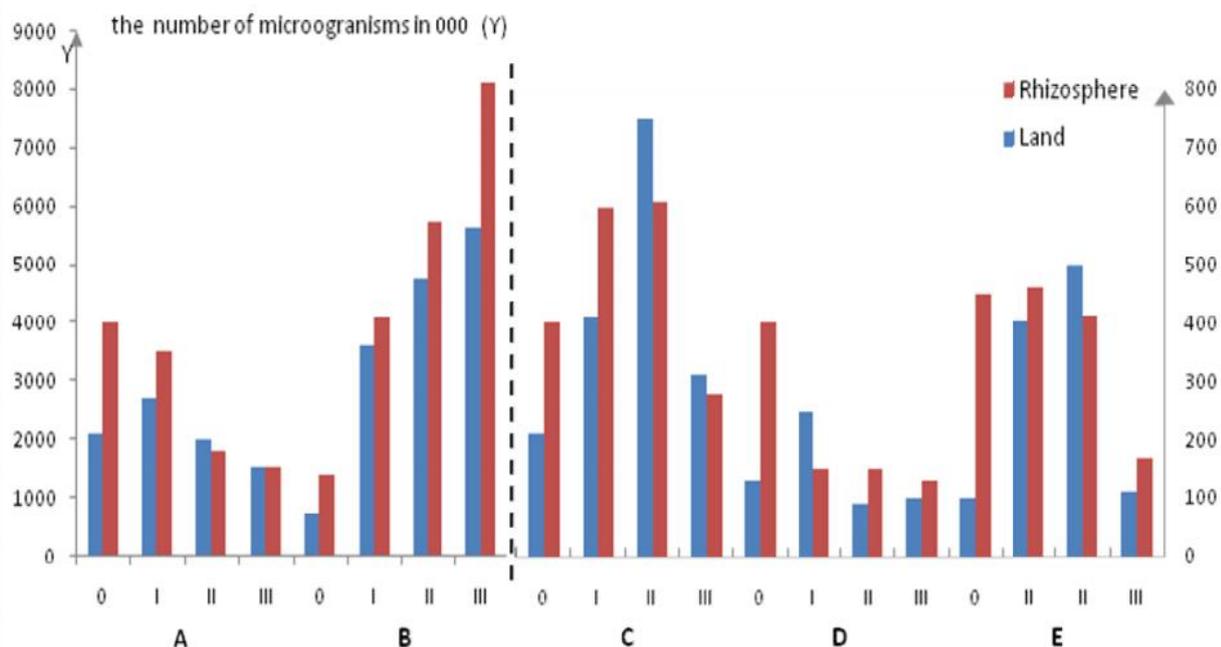
Big differences in the number of individual groups and rhizosphere microorganism of investigated trunks show that, under the influence of root, total number of microorganisms increased significantly. Still a

stronger effect in healthy trees, especially when it comes to fungi and actinomycetes. The data (Figure 3 and 4) show that, the number of fungi and actinomycetes significantly higher in healthy trees, whether they are within or remote. These data suggest that the interaction of the roots of healthy trees and soil microorganisms active, which results in a very high population of microorganisms which increases resistance to disease.

The effect that the rhizosphere of infected trees is achieved on oligonitrophilic microorganisms is very high, but the number of these organisms reaches about

9 million (Figure 4). This indicates that in the sphere of the narrowest roots sphere of infected trees

nitrogen regime was exacerbated, which certainly has consequences on nitrogen nutrition of plants.



**Figure 4.** Movements in the number of microorganisms in the rhizosphere, in the culture of the black pine-older cultures in the area - central region of Serbia- (*Y*—the number of microorganisms in 000)

(A) total number of microorganisms; (B) oligonitrofile microorganisms; (C) amonifactional; (D) actinomycetes; (E) fungi  
 0 - healthy trunk; I - first degree on infection; II - the second degree of infection; III - degree of infection.

It can be concluded that the effect of the roots of healthy trees of black pine is very high, and it is reflected in the increased population of total microflora, fungi and actinomycetes in the area of the root. Only the number oligonitrophilous of microorganisms significantly increased in the sphere of the roots of infected trees. Qualitative analysis of the population of some groups of microorganisms in the soil and rhizosphere pointed to the outstanding differences in the composition of the population and land microflora on the infected and uninfected areas. The differences are as follows: population of fungal microflora and actinomycetes was significantly higher in soil and rhizosphere of healthy stands, while the number of oligonitrophilous microorganisms crucially higher in infected stands. The differences in the total number of microorganisms and amonifactional microorganisms are very small. Differences were significant in the qualitative composition of microflora and actinomycetes. All this indicates that the soil infected and healthy stands differ in biogeny and that among other things in the area, the causes of the expansion of the fungus *Fomes annosus* should be searched. Lots of healthy and infected stands with the

fungus, *Fomes annosus*, differ in population and the composition of soil microflora, and among other things also that the explanation for the expansion of the fungus. The total biogenic of the soil under the stands of black pine is average, if you include different habitats, average or relatively low, but only if it is viewed through some average values. The soil infested stands, a slightly greater number of amonifactional and oligonitrophilic microorganisms, were amounted in a large population, since fungi and actinomycetes occur in small numbers.

In the land of healthy stands, the total number of microorganisms is greater than amonifactional and oligonitrophilic microorganisms with low population, yet fungi and actinomycetes are present in large numbers.

In the qualitative composition of soil microflora, no outstanding difference between infected and healthy stands were found. Rizosferi effect of healthy black pine trees is very high and is reflected in the increased population of total microflora of fungi and actinomycetes in the area of the root.

#### 4. Conclusions

In the investigated territory, in central Serbia, in the analyzed cultures of black pine, it can be concluded the following:

- Plot healthy and infected stands with mushroom "Fomes annosus" differ in population and the composition of soil microflora, and among other things and how to look for causes of fungus expansion.

- Total biological value in - younger-infected- investigated culture (33 years old) is very low.

- In lands – older-infected- investigated culture (55 years), a slightly higher number of amonification microorganisms, compared to younger infected culture - and oligonitophilic microorganisms, compared to younger culture, occur in vast populations. Fungi and actinomycetes are represented in slightly greater numbers than in the younger culture.

What concerns healthy stands of age (33 years), the total number of microorganisms is greater than amonification and oligonitophilic microorganisms have low population. Mushrooms and actinomycetes are represented in higher numbers.

-At Healthy stands of age (55 years) the total number of microorganisms is here greater than amonifikacion and oligonitophilic microorganisms have a slightly higher population than younger Hi culture. Fungi and actinomycetes are represented here in even greater numbers.

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