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STUDIES ON DIVERSITY OF FUNGI ON DECOMPOSING LEAVES OF TAXUS BACCATA

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Abstract: *Leaf surface mycoflora of decomposing leaves of Taxus baccata was studied by three techniques viz. dilution plate technique, washed disks method and moist chamber mrthod. a total of sixty- four fungal species were isolated from decomposing leaves of Taxus baccata. A perusal of the results indicates that fungal flora on decomposing leaves of Taxus baccata varied with the decomposition process and the variations might be due to variations in the meterological factor A total of sixty four fungal species were isolated from decomposing leaves of Taxus baccata by applying all the three methods. Out of which five fungal species belonged to Zygomycotina, one species to Ascomycotina and Basidiomycotina members were absent and 90.63% of total fungal population constituted Deuteromycotina. Total number of fungal species decreases with increase in rainfall and again there is slight effect of environmental temperature was observed. It might be possible that decomposition process takes place under the ground so there is less effect of environmental temperature on total number of fungal species isolated.*

Keywords: *Taxus baccata, dilution plate, washed disks, moist chamber, deuteromycotina*

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INTRODUCTION:

Studies of Ward (1952) initiated the work on colonization of fungi on decomposing plant materials. The patterns of colonization of senescing and dead tissue has been discussed by Hudson (1968) and Garrot (1970). Fungi are the primary colonizers on organic debris whereas bacteria and actinomycetes primarily appear as secondary colonizers. Several studies have been made on fungal succession on litter of deciduous and evergreen trees (Witkamp, 1966; Dickinson, 1967; Hudson,1968; Rai, 1973; Osono and Takedo, 2002; King and Heath, 1967; King et. al, 2004; Osono, 2005; Osono and Takeda, 2005). Ruscoe (1971) has pointed out that leaves may be colonized by pollutants of parasites and saprophytes which form the initial stages of the succession of litter. Pugh (1958) studied the role of micro- organisms in cellulose decomposition. Though micro- organisms securely lodged on the leaf surface but fail to germinate and colonize on this environment and these form the casual element (Leben, 1965). Their inability to grow on leaf surface may be attributed to physical factors (Ruinen, 1970), due to lack of essential nutrients (Barnes, 1969; Diem, 1969), to host specificity (Last and Deighton, 1965; Kerling, 1958; Holloman, 1967).

Coniferous needles are highly selective substrate for microbial colonization. Many fungi which colonize needles, whether as parasites or saprophytes are specific to this substrate whereas many species, common on other leaves are reported on needles with lesser frequency. William (1963), Williams and Parkinson (1964) have reported comprehensive survey of the fungal flora of coniferous forest of England. Only a certain set of fungal species initiate succession on leaf litter in each forest type. Possibly they are adapted to occupy aerial environment of senesced leaves in the forest e.g. *Phoma hibernica*, *Cladosporium cladosporioides*. Certain pioneers colonize the substrate regardless of the season when it is placed in litter bags, indicating a high level of functional specialization.

Although ecological investigation on litter decomposition of various tree species has been done by several workers, but comparatively less attention has been paid so far on fungal succession during the decay process. The available literature on this aspect Shukla (1976); Shukla et. al (1978); Pandey and Khulbe (1984); Singh and Singh (1984); Rai and Kumar (1988); but almost no work has been done so far on fungal succession during decomposition of litter of *Taxus baccata*.

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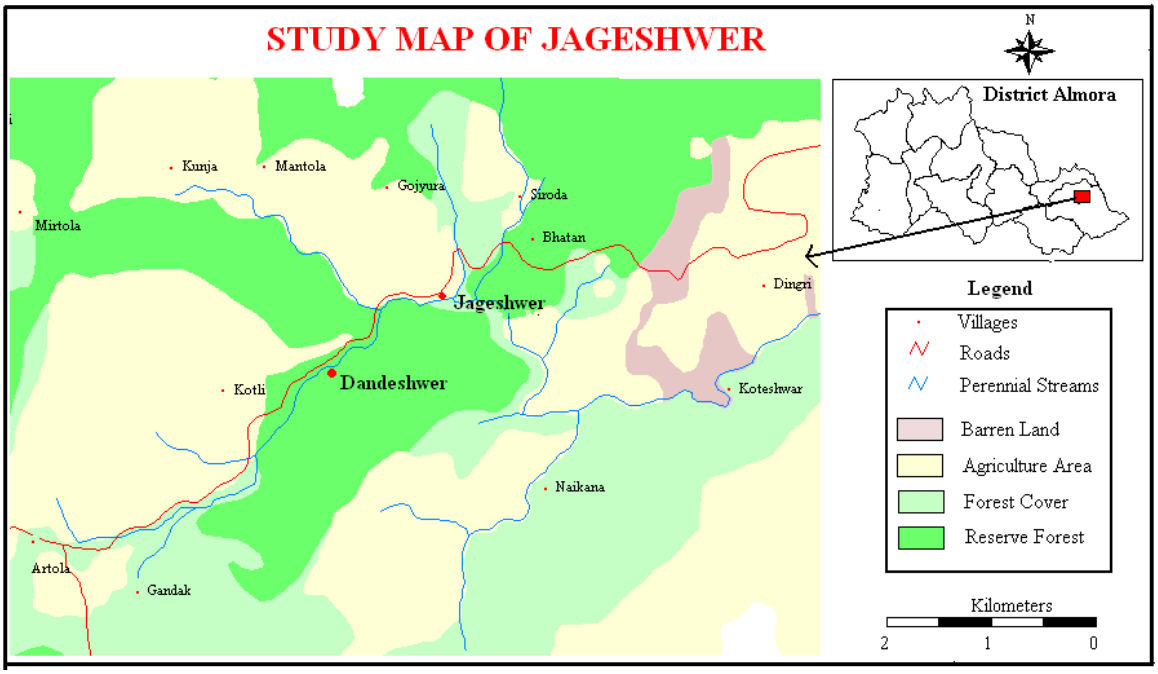
SITE DESCRIPTION:

Himalayas constitute one of the most important botanical regions of the world. These have been divided by Champian and Seth (1968) into two categories viz. (i) Eastern Himalaya and (ii) Western Himalaya. **Jageshwar** comes under the mountain region of Western Himalayas, and it is one of the most important religious places of Kumaun hills (Map I).



Jageshwar, 38 Km from Almora, is situated in a beautiful narrow valley along the banks of Jatayu river at an attitude of 1800m, surrounded by magnificant deodar forest. There are majestic old temples of Lord Shiva, Dandeshwar, Lord Mrityunjoy and Goddess etc. signifying its religious importance. Bridh Jageshwar and Jhakarsaim are situated on the top of hills surrounding narrow valley of Jageshwar. Dandeshwar is architecturally more or less similar to Bal Jageshwar. The whole area is covered with different types of dense or small patches of forests**.,** *Quercus leucotrichophora, Q. semicarpifolia* are common these, but among all these the most dense and dominated species is *Cedrus deodara, Taxus baccata* trees are growing along with deodar forest trees.

MATERIALS AND METHODS:

Decomposition of *Taxus baccata* was studied with litter bag method (Crossley and Hoglund, 1962). Freshly fallen leaves were collected from forest floor of the Jageshwar forest. The

leaves were air dried at room temperature for 1 week. The litter (10 g) was enclosed in a litter bag. The litter decomposition study was carried out at the sites from 1st Jan, 2007 to Dec, 2007. Ten grams of dried leaves were placed in 20*20 cm ^{2} nylon mesh bag (mesh size 2mm) closed firmly by inserting metal pins. A total of 60 bags were prepared and 60 bags containing *T. baccata* leaf litter were placed under *T. baccata* tree in Dandeshwar area of Jageshwar forest. Five bags were picked randomly each month starting from Jan., 07, brought to the laboratory and extraneous material was removed. The litter the bags were used for mycofloral analysis.

Isolation of Mycoflora:

Mycoflora of decomposed leaves of *T. baccata* was screened at monthly intervals from Jan, 07 to Dec., 07 both qualitatively and quantitatively. The mycoflora was analyzed with the help of three techniques:

Dilution Plate Technique (Waksman, 1922):

Leaf piece of 5mm. length were cut with the help of sterilized scissors. 100 Leaf pieces were shaken in 100 ml sterilized water in 250 ml Erlenmeyer flask for 15-20 minutes with the help of mechanical shaker. The suspension was further diluted by mixing 10 ml original solution with 90 ml. of sterilized water, for dilution plate technique 1:100 and 1:1000 dilution was used because micro fungi associated with decaying substrate were found much higher in comparison to living leaf surface.

One ml suspension was added to each of the 9 cm sterilized Petri-dish to which approximately 20 ml sterilized and cooled Czapek's agar medium + streptomycin was added aseptically. ($MgSo_4$-0.50g; KH_2Po_4-1.0g; $NaNO_3$-2.0g; $FeSo_4$-0.01; Kcl-0.50g; Sucrose-30.00g; Agar-20.00g; distilled water-1 liter; pH nearly 5.5; these all autoclaved at 15 lb pressure/sq inch for 15 minutes. Streptomycin 30 ug/ml was added after autoclaving when temperature of the medium becomes 35^{o}C). Petri-dishes were incubated at 25±1^{o}C for a week. Colonies of individuals fungi were identified recorded and results were expressed in terms of fungi/cm^2 by applying the following formula:

$$\text{Fungi/cm}^2 \text{ for leaf piece} = \frac{\text{Total no. of fungi in 100 ml.}}{\text{Total area of leaf pieces}}$$

Total area of leaf piece = No. of piece X area of leaf piece

Washed Disks Method (Harley and Waid, 1955):

After treating for dilution plate technique the pieces were serially washed ten times in successive changes of sterilized distilled water and dried over sterilized filter paper. Five pieces were inoculated into each of the ten Petri-dishes containing approximately 20 ml sterilized Czapek's agar medium then the Petri-dishes were incubated at 25±1^{o}C for a week and after which fungal colonies were identified and their percentage of occurrence was calculated by applying the following formula:

Percentage occurrence of fungal species

$$= \frac{\text{occurrence of a species on no. of pieces}}{\text{Total no. of pieces}} \times 100$$

Moist Chamber Method (Keyworth, 1951):

Leaf pieces of 5mm. length were cut from different portions of different leaves with the help of sterilized scissors. Fifty disks were inoculated in moist chambers by using 10 Petri-dishes containing three layered sterilized blotting paper. Five disks were inoculated into each Petri-dish and then incubated at 25±1^{o}C for 10 days. After which fungi were identified and their percentage of occurrence was calculated.

Statistical Analysis of the Data:

The data obtained under the present investigation were subjected to two way analysis of variance (ANOVA) without replication to test for the significance of variance ('F' value) (Pillai and Sinha, 1968).

RESULTS AND DISCUSSION:

Mycoflora associated with decomposing leaves of *Taxus baccata*:

The results are summarized in table 1.1 to 1.5 and Fig 1. It is clear from the results that a total of sixty- four fungal species were isolated from decomposing leaves of *Taxus baccata*. A perusal of the results indicates that fungal flora on decomposing leaves of *Taxus baccata* varied with the decomposition process and the variations might be due to variations in the meterological factors.

Quantitative varions in fungi:

A total of sixty four fungal species were isolated from decomposing leaves of *Taxus baccata* by applying all the three methods. Out of which five fungal species belonged to

Zygomycotina, one species to Ascomycotina and Basidiomycotina members were absent and 90.63% of total fungal population constituted Deuteromycotina.

In all twenty four fungal species were isolated by applying dilution plate technique (1:100), of which five were of Zygomycotina, while Ascomycotina and Basidiomycotina members were altogether absent and rest 79.17% of total fungal population belonged to Deuteromycotina (Table 1.1). Twenty fungal species were isolated by using dilution plate technique (1: 1000) of which three fungal species was belonged to Zygomycotina and rest 85% of total fungal population were belonged to Deuteromycotina members. A total of twenty seven fungal species were observed by applying washed disks method, out of which three fungal species belonged to Deuteromycotina, one species to Ascomycotina and rest 85.19% of total fungal population belonged to Deuteromycotina (Table 1.3) whereas highest number of i.e. thirty five fungal species were isolated by using moist chamber method, among which one species belonged to Ascomycotina. Zygomycotina and Basidiomycotina members were altogether absent and rest 97.14% of total fungal populations were of Deuteromycotina members (Table 1.4).

Qualitative changes in fungal flora:

Three different isolation techniques were used to minimize the chance of omission of any fungal species from the substrate. *Fusarium oxysporum, Mucor sp.* were observed only by using dilution plate technique (1:100) whereas *Blastomyces sp.* was present by using dilution plate technique (1:1000) *Cunninghamella sp., Drepanoconis sp., Melanographium gramineum, Papulaspora sp., Periconia felina and Phycomyces* were observed only by using washed disks method, while *Bactrospermum obovatum, Diplococcum spicatum, Drechslera* state of *Helminthosporium clavariarum, Melanographium citri, Stachybotrys atra, S. verruculosa, S. labulata* and *S. echinulata* were observed only by using moist chamber method.

Pattern of distribution of different groups of fungi in the mycoflora:

Mycoflora associated with decomposing leaves of *Taxus baccata* showed varied distribution pattern of fungal species. It is evident from fig. 1 that Deuteromycotina members constituted major portion of mycoflora at each stage of colonization, chiefly represented by dematiaceous hyphomycetes.

a). Zygomycotina:

Zygomycotina representing four genera with six species constituting about 9.38% of total fungal population. This shows their little role in decomposition. *Mucor pusilus, M. sp., Mertierella subtilissima, M. sp.* and *Rhizopus nigricans* showed almost frequent occurrence throughout decomposition whereas *Cunninghamella elegans* was observed only by using washed disks method.

b). Ascomycotina:

This sub- division was represented by one genus with one species thus constituting about 1.56% of total fungal population, whereas Basidiomycotina members were altogether absent.

c). Deuteromycotina:

This sub- division constituted the major portion of the mycoflora representing about fifty-seven species and constituted about 89.06% of total fungal population.

The poor presence of Zygomycotina members on decomposing leaves of both the test plants showed their little role in decomposition: Webster (1956, 1957); Hudson and Webster (1958); Hudson (1962, 1968); Hayes (1965); Hogg and Hudson (1966); Yadav (1966); Rai (1973); Singh (1978); Panwar and Sharma (1983); Garg and Sharma (1984, 1985) also found this class as poorly represented on decaying plant parts. The dominant fungi *Cladosporium, Aspergillus, Alternaria, Trichoderma* were found almost regularly throughout the period of decomposition. The role of each fungus as initial colonists of freshly decaying plant parts has been noted by several investigators (Webster 1956, 1957; Hudson and Webster, 1958; Hudson, 1962; Sharma and Dwivedi, 1972; Singh, 1978; Pandey, 1988). The results (Fig. 2 a-c) indicate that with increasing humidity and rainfall, fungal population also increases. Lucas (1965) also noted the persistence of *A. longipes* on tobacco debris in the field. *Fusarium* and *Trichoderma sp*. were found in higher frequency in later stages emphasizing that this fungus plays an important role in decomposition. Pugh and Williams (1968) studied successional pattern of microfloral population of *Salsola* plant and observed *A. tenuis, Fusarium sp*. as dominant colonizers of mature and decaying plants. Fungal succession on decomposing leaves of both the test plants followed a pattern described by Hudson (1968). An early colonizer *Cladosporium sp.* was regarded as primary saprophytes according to Hudson (1968) whereas later colonizers such as *Trichoderma hamatum, Mucor*

hiemalis and *Absidia glauca* might correspond to secondary colonizers (Hudson, 1968; Osono and Takeda, 2001).

Table 1.5 shows statistical analysis of data subjected to two way analysis of variance in total number of fungal species isolated from decomposing leaves of *T. baccata* in relation to different methods used and sampling. Environment has a very great influence on effects of plant residues on pathogens during dormancy. Moisture, temperature, pH and aeration that favors multiplication of soil mycoflora supplied with plant residues will hasten the depletion of nutrients and encourage antagonism (Baker and Cook, 1979).

Fig 2 a, b and c shows relationship between total numbers of fungal species isolated from decomposing leaves of *T. baccata*. Total number of fungal species decreases with increase in rainfall and again there is slight effect of environmental temperature was observed. It might be possible that decomposition process takes place under the ground so there is less effect of environmental temperature on total number of fungal species isolated.

Competition for space may be involved in the possession of substrate by prior colonists as described by Bruhl and Lai (1968). Indeed the phenomenon seems fairly general that one organism already in the substrate, whether by rapid growth or by good fortune, will retain possession of the substrate even when confronted by vigorous saprophytes like *Fusarium* and *Trichoderma* species present on decomposing leaves play a central role in plant litter decomposition in forest ecosystem through nutrient cycling and humus formation in soil because they colonize the lignocelluloses matrix in litter that other organisms are unable to decompose (Swift et. al. 1979; Cooke and Rayner, 1984).

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Table: 1.1. Record of number of fungi/cm^2 on decomposing leaves of *T. baccata* by using dilution plate technique (1:100)

Fungal species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aspergillus niger	26	40	&	53	31	&	31	11	11	11	16	11
A. fumigatus	53	53	&	40	10	&	16	47	&	21	31	21
A. sp.	13	26	13	13	16	26	&	&	&	5	11	11
Cladosporium herbarum	&	&	16	26	16	16	21	21	5	16	5	31
C. cladosprioides	&	&	26	26	62	5	11	62	21	11	11	5
Fusarium moniliformae	&	&	8	&	&	16	16	16	31	&	&	&
F. oxysporum	&	&	&	&	&	26	16	26	16	11	&	&
Gliocladium roseum	&	&	&	&	&	&	&	&	16	&	&	&
Mucor pusilus	&	&	&	&	&	&	&	&	10	16	5	5
Mucor sp.	&	&	&	&	&	&	&	&	&	&	&	&
Mortierella subtilissima	&	&	3	&	&	5	&	&	5	5	3	11
M. sp.	&	&	&	&	&	&	&	&	&	&	&	&
Penicillium chrysogenum	95	66	68	92	130	21	31	26	66	129	21	26
P. citrinum	66	66	40	66	21	16	10	16	21	78	31	21
P. sp.	3	16	95	40	10	&	10	5	40	5	11	16
Rhizopus nigricans	&	&	8	16	5	&	&	&	5	5	11	16
Scytalidium lignicola	8	16	&	&	&	&	&	&	&	&	&	&
Stachybotrys alternans	&	&	&	&	&	&	&	&	&	&	&	&
S. theobromae	&	&	16	&	5	&	31	&	&	&	&	21
Trichurus sp.	&	&	&	&	&	5	&	&	&	&	&	&
Trichoderma album	&	&	&	&	&	&	10	16	31	5	94	11
T. pseudokoningi	&	&	&	94	311	21	16	16	21	11	78	5
Verticillium sp.	&	&	&	&	&	83	21	31	21	16	11	21
Vollutina sp.	&	&	&	&	&	&	&	&	&	&	&	&
White sterile mycelium	11	8	&	&	&	&	&	5	&	&	11	5
Total no. of fungal species	8	8	10	10	11	11	12	14	15	15	15	16

Table: 1.2. Record of number of fungi/cm^2 on decomposing leaves of *T. baccata* by using dilution plate technique (1:1000)

Fungal species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aspergillus niger	&	26	16	26	26	11	26	52	16	11	16	31
A. fumigatus	42	47	42	21	26	16	21	47	42	52	21	26
Acremonium vitis	&	&	&	16	11	5	11	&	&	&	&	&
Blastomyces sp.	5	11	&	&	&	&	16	&	&	&	&	&
Cladosporium herbarum	&	&	&	&	26	31	&	52	16	31	36	47
Caudelabrella sp.	&	&	&	&	&	5	&	16	11	5	36	5
Fusarium moniliformae	&	&	&	&	&	&	&	31		36	&	47
Gliocladium sp.	78		62	11	47	16	31	52	31	26	26	52
Mortierella subtilissima	&	&	&	11	&	&	&	&	5	5	5	5
Mucor pusilus	5	5	&	16	&	&	&	&	&	&	5	&
Renicillium chrysogenum	&	47	31	16	47	16	31	52	47	26	47	31
P. citrinum	&	16	21	21	16	21	21	16	26	11	31	21
Rhizopus nigricans	11	&	11	&	5	11	16	&	5	5	&	&
Scytalidium lignicola	&	&	&	&	&	&	&	21	5	&	11	11
Stachybotrys theobromae	&	&	&	&	&	&	&	&	&	&	&	&
S. alternans	&	&	&	&	&	&	&	&	&	&	&	&
Trichoderma pseudokoningi	26		26	11	26	16	26	16	16	26	16	47
Trichurus sp.	&	&	&	&	&	&	&	&	&	11	&	16
Verticillium sp.	62		47	26	11	21	47	62	47	16	21	26
Gilmaniella humicola	&	11	&	&	&	&	16	16	&	&	5	5
Total no. of fungal species	7	7	8	10	10	11	11	12	12	13	13	14

Table: 1.3. Frequency of fungal species on decomposing leaves of *T. baccata* by using washed disks method

Fungal species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aspergillus niger	45	40	&	&	30	35	20	25	30	25	5	&
As. fumigatus	15	35	10	15	25	&	10	10	15	20	10	25
Acremonium vitis	&	&	&	&	&	5	10	15	10	5	&	10
Bipoloris sp.	&	&	&	&	&	20	15	10	&	&	&	&
Cladosporium cladosporioides	&	&	15	20	5	&	&	&	&	&	15	25
Chaetopsina sp.	&	&	&	&	&	&	&	&	&	&	10	&

Cunninghamella sp.	&	&	&	&	&	&	&	&	&	&	&	5
Drepanoconis sp.	&	10	&	&	&	&	&	&	&	5	5	&
Echinobotrym sp.	&	&	&	&	&	&	&	&	&	&	&	25
F. moniliformae	&	&	&	&	&	15	&	&	20	10	10	5
Fusariella sp.	&	&	&	&	&	&	&	&	25	&	&	&
Genicularia sp.	&	&	&	&	&	&	&	&	&	&	20	5
Gliocladium roseum	&	&	&	&	&	&	40	&	25	10		25
Melanographium gramenium	&	&	&	&	&	&	&	&	&	&	&	15
Meria conidiospora	&	&	&	&	&	&	&	&	&	&	&	10
Myrothecium roridum	&	&	&	&	&	10	15	&	&	&	&	&
Mucor pusilus	&	&	&	&	&	&	10	10	5	&	&	&
Papulaspora sp.	20	&	&	&	5	&	&	&	&	&	&	&
Neurospora sp.	&	&	15	10	&	&	&	&	&	&	&	&
Periconia felina	&	15	&	&	&	&	&	&	&	10	&	&
Phoma humicola	&	20	15	10	5	10	15	10	15	10	5	15
Rhizopus nigricans	&	20	&	&	25	&	15	10	&	10	10	5
Phycomyces sp.	&	&	&	&	&	&	10	&	&	&	&	&
Trichurus sp.	&	&	&	&	&	&	&	&	&	&	&	10
Trichoderma album	30	&	&	&	&	&	&	25	&	10	&	25
Torula herbarum	&	45	&	&	35	30	&	&	30	5	10	&
Volutina sp.	&	&	&	&	&	&	&	&	&	&	5	15
Mortierella sp.	10	10	5	5	10	5	10	15	10	&	10	&
Drechslera sp.	15	&	10	15	10	5	&	&	&	5	&	&
Trichoderma pseudokoningi	&	55		40	30	25	35	30	35	15	35	10
Penicillium chrysogenum	&	&	25	20	&	&	10	15	10	5	15	10
P. sp.	&	&	15	10	10	&	&	&	5	10	5	5
White sterile mycelium	&	&	10	5	10	5	&	10	15	5	5	10
Total no. of fungal species	6	9	9	10	12	12	13	13	14	16	16	19

Table: 1.4. Frequency of fungal species on decomposing leaves of *T. baccata* by using moist chamber method

Fungal species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alternaria alternata	&	&	&	15	&	&	&	&	10	5	10	20
A. longipes	&	&	&	20	10	5	10	5	5	10	25	5
A. longissima	&	15	10	&	&	&	25	20	5	15	&	20
A. tenuissima	&	&	15	5	&	&	&	&	10	10	&	&
Bactrodesmium obovatum	&	&	&	&	&	&	&	&	&	&	5	&
Cordana pauciseptela	35	15	5	5	35	30	25	10	5	25	15	25
Chaetomium globosum	&	&	&	10	5	5	5	5	15	10	5	10
Chaetomium sp.	&	&	&	&	&	&	5	&	&	&	&	&
Candelabrella sp.	&	&	&	&	&	&	30	40	10	5	5	5
Cercorpora sp.	&	&	&	&	&	&	&	&	&	5	10	5
Chaetopsina sp.	&	&	&	&	&	&	&	&	&	15	5	5
Mucor sp.	10	&		&	&	&	&	&	25	5	5	15
Diplococcum spicatum	&	&	25	&	15	20	5	&	15	10	15	30
D. statte of Helminthosporium clavariarum	&	&	&	&	&	&	45	55	10	40	45	65
Epicoccum purpurescens	&	&	20	&	5	5	&	&	&	&	20	10
Echinobotrym sp.	&	&	&	&	&	&	&	40	60	&	&	15
Fusarium moniliformae	25	20	20	15	5	10	5	&	&	&	&	&
Genicularia sp.	&	&	&	&	&	&	15	5	&	10	15	&
Helicomina sp.	10	15	5	10	20	15	&	&	&	&	&	&
Melanographium citri	&	&	&	&	&	&	&	&	&	15	25	&
M. gramineum	&	&	&	&	&	&	&	&	&	&	10	20
Meria conidiospora	&	&	&		&	&	&	&	&	&	10	15
Phoma humicola	&	&	10	10	5	5	&	&	&	&	&	20
Stachybotrys atra	&	10	5	5	25	10	5	55	40	10	5	5
S. alternans	&	&	&	&	&	&	45	10	25	25	10	25
S. verruculosa	&	45	&	&	&	&	&	&	10	15	&	&
S. theobrormae	&	&	&	&	&	&	&	&	&	15	15	&
S. labulata	&	&	&	&	&	&	&		&	&	&	10
S. echinulata	&	&	&	&	&	&	&	5	30	&	&	5
Septonema sp.	&	&	&	&	&	&	&	5	5	&	15	10
Sordaria sp.	&	&	&	20	&	5	&	&	&	&	&	&
Trichothecium roseum	&	&	15	&	15	5	15	10	40	&	5	&

Scolecobasidium sp.	&	&	&	&	&	&	&	5	&	&	&	&
C. cladoporioides	10	15	5	10	15	10	&	5	&	&	&	5
Fusariella sp.	10	15	5	10	15	10	&	5	&	&	&	5
Sporoschisma sp.	&	&	&	&	&	5	&	&	&	&	&	&
Monodictys sp.	&	&	&	&	&	5	&	&	15	&	&	&
Endophragmiella theobromae	&	&	&	&	&	&	&	&	&	10	&	&
E. verruculosa	&	&	&	&	&	&	&	&	&	15	&	10
Total no. of fungal species	7	8	12	12	12	14	14	17	18	20	21	24

Table 1.5. ANOVA showing effect of different methods and months on isolation of total number of fungal species (*T. baccata)*

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	522.2292	11	47.47538	23.31814	1.88E-12	2.093254
Columns	112.5625	3	37.52083	18.42884	3.35E-07	2.891564
Error	67.1875	33	2.035985			
Total	701.9792	47				

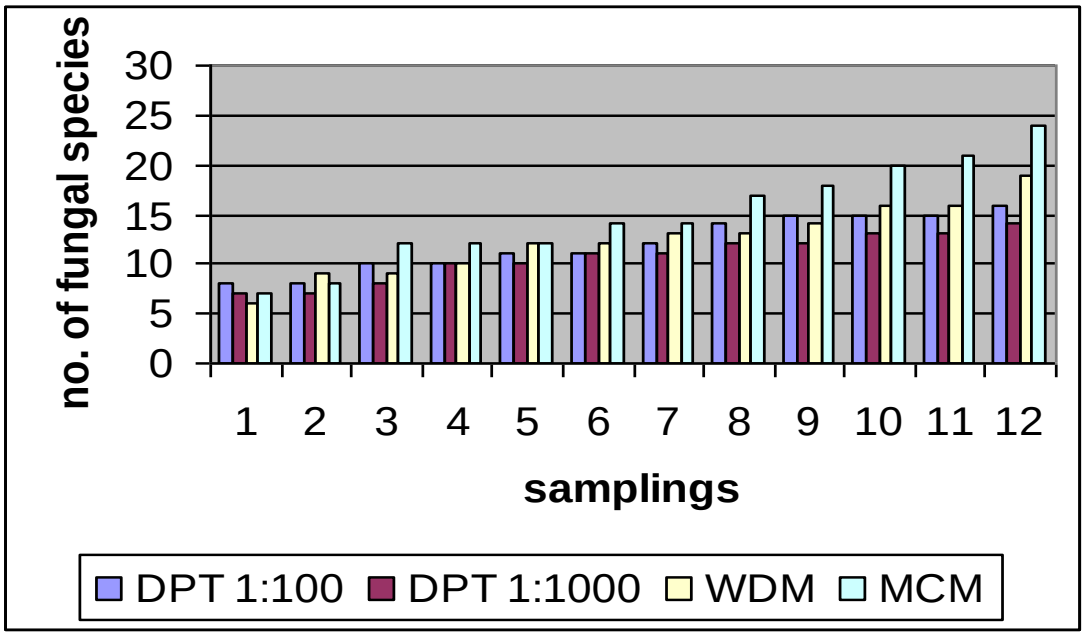

Fig. 1. Number of fungal species isolated from decomposing leaves of *T. baccata* by using different methods.

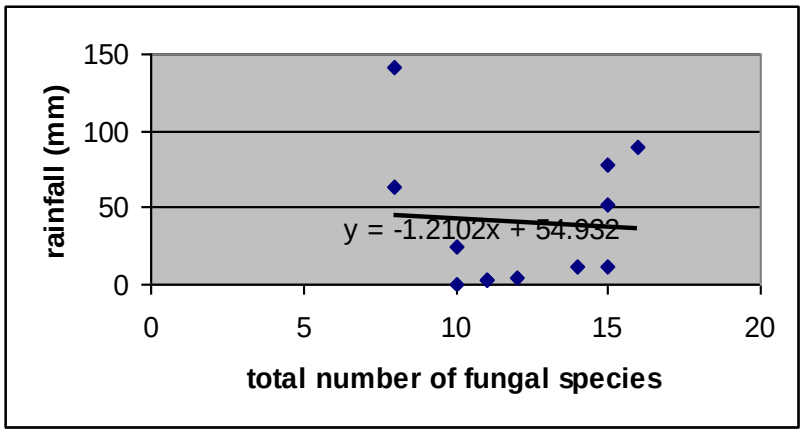

Fig. 2a

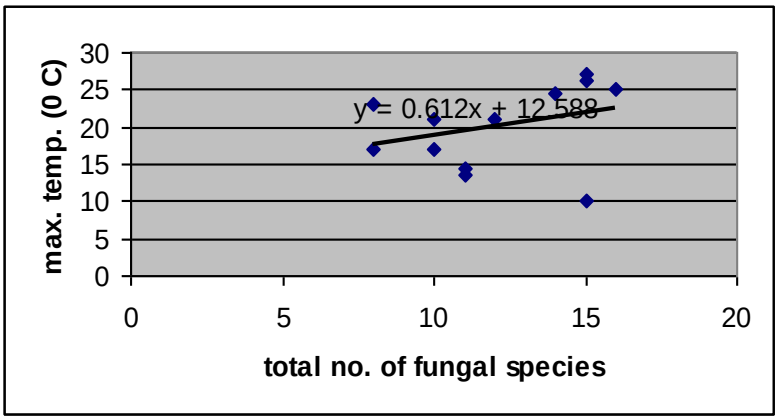

Fig. 2b

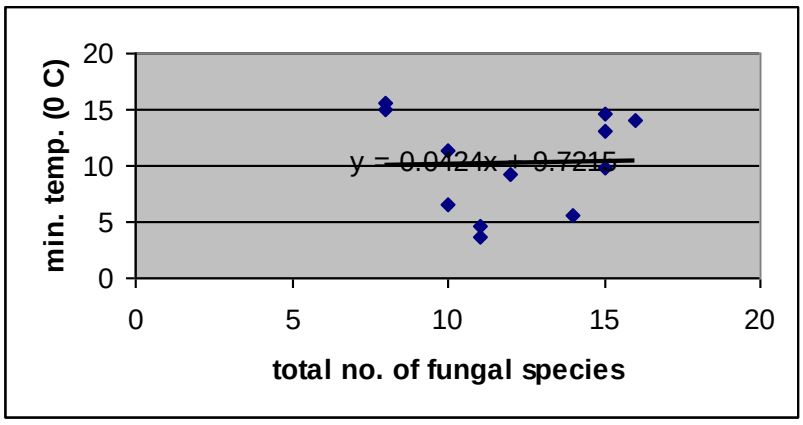

Fig. 2c

Relationship between total numbers of fungal species isolated from decomposing leaves of *T. baccata* with meteorological data

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