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# ABUNDANCE AND DIVERSITY OF FUNGI UNDER THREETREE SPECIES IN SHABU-LAFIA NASARAWA STATE, NIGERIA

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*ABSTRACT*

***The study was carried out to assess the abundance and diversity of soil fungi under the canopies of different tree species (T. grandis, G. arborea and K. senegalensis). The plantation was stratified in to three strata according to species. In each of the strata 4 transects line of 100m were laid. On each transect 4 plots of 4x4m were systematically located at 25m interval, this gives a total of 16 plots in each strata, and 48 plots in the plantation. Five plots were randomly selected per strata making a total of fifteen soil samples. In each plot, five soil sample were taken, four of the five soils samples were collected at the four corners of the plot while one soil sample was collected at the center. The soil was mixed up to form one composite sample per plot and this was repeated throughout the plantation plots. The soil samples were collected at the depth of 15cm each and the collected soil samples were taken to the laboratory for soil analysis. The data collected was analyzed using analysis of variance (ANOVA)and species diversity indices.A total of 8 soil fungi were recorded, only 4 species were found in Khaya senegalensis, Tectona grandis and Gmelina arborea. Aspergillus nudulans, Aspergillus niger, Aspergillus fumigatus, Penilline fungus and Mucorales fungus from the soil sample were significantly influenced by the tree species (T. grandis, G. arborea and K. senegalensis)at 5% probability(0.035*, 0.040*, 0.008**, 0.005*, and 0.050** respectively).The study recorded species richness value of 1.987 and diversity index value of 1.987.The result of the study also shows significant correlation between Aspergillus fumigatus and Penilline fungus with the value of 0.542*. It was established that, the tree species under the study has the ability to support growth of different soil fungi species. Different tree species affect the abundance of soil fungi differently. It is evidence from this study that, the tree species (T. grandis, G. arborea and K. senegalensis) should be recommended to the farmers among tree species for agroforestry practice and improving ecosystem functioning.***

**Key word:** Fungi, Abundance, Diversity, *T. grandis*, *G. arborea* and *K. senegalensis*

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## INTRODUCTION

Soil microorganisms played key roles in nutrient cycling. In particular, fungi act as obligate root symbiotants, decomposers or pathogens of other organisms (Tedersoo *et al*., 2016). Fungi belong to a large group of eukaryotic organisms, they are simple, filamentous organisms comprises of masses of thread-like hyphae which constitute the body (mycelium) of the fungus. Fungi are important soil microorganisms, forming Symbiotic associations with plant, and mediate the nutrient and energy flux between plants and soil in many ecosystems (Shi *et al*., 2018). They make up the majority of the saprotrophic heterotrophic organisms in many forest soils, most especially in acidic soil with more humus content (Kinmins, 2004). Forest ecosystems are among some of the most diverse environments for the growth and development of varieties of flora and fauna. This is achieved by the influence of trees on the environment through processes such as addition of organic matter,

watershed management, nutrient cycling and carbon sequestration (Usman *et al.,* 2020).

Some Scholars estimated that, there are between 1.5 and 5 million species of fungi (Hawksworth and Lucking, 2017). However, Larsen *et al.,* (2017) asserts that the number may be higher than 150 million. If these estimates are correct, then at present, less than 5% of existing fungi have been described and named (Mueller and Schmit, 2007), and the majority of global fungal diversity remains undocumented (Andersone*t al*., 2014 and Taylor *et al*., 2014). Furthermore, fungal communities and their structures remain poorly recognized in many ecosystems (Tedersoo, 2014). Through, resource availability and niche differentiation, increase in plant biomass and species richness favours the accumulation of soil microbial and faunal biomass and abundance that accommodate greater number of species. Such bottom-up relationships among diversity of food-web organisms occur both aboveground and belowground and are reflected along the trophic cascades (Scherber *et al*., 2010; Eisenhauer *et al*., 2013; Porazinska *et al*., 2003).

Natural and indigenous forest land are under pressure from land use changes such as agricultural expansion, urbanization, grazing, fuelwood extraction and forest plantations of non-native trees species, often resulting in fragmentation of the landscape (Assédé *et al.,* 2020). Plant–soil feedback is an important mechanism that can maintain species diversity and explain patterns of tree-species relative abundance in forests (Mangan *et al.,* 2010). Different tree species vary in the litter quantity and quality, and consequently influence the soil fungi community for utilizing these substrates (Bodeker *et al*., 2016). Carbon to nitrogen (N) ratio, lignin and cellulose concentration, as well as pH are important litter characteristics affecting soil fungi (Purahong *et al*., 2016). The decomposition rate of standard root litter significantly lower in plant communities with grasses than without grasses, suggesting that different plant communities harbor different saprophytic fungal communities (Chen *et al*., 2017). The richness of plant species of particular site may also affect the root litter quality (De Deyn*et al*., 2011; Lunghini *et al*., 2013; Santonja*et al*., 2017; Schuldt *et al*., 2018). Highly diverse plant communities may harbour more ecological niches to be occupied by saprotrophic fungi due to an increased diversity of organic substrates entering soils (Grayston *et al*., 1998; Meier *et al*., 2008; Waldrop *et al*., 2006; Zak *et al.,* 2003). Although soil microbes play a critical role in regulating ecological processes relevant to nutrient cycling and carbon in forest ecosystems, the distribution patterns of soil microbes with changes in plant species is not well studied (Chen *et al.* 2022). Therefore, this study focused on investigating the effect of different tree species (*Tectona grandis, Gmalina arborea,* and *Khaya senegalensis*) on the abundance and diversity of fungi.

## MATERIALS AND METHODS

### Study Sites

The experiment was carried out at Teak, Gmelina and Mahogany plantation sites of the Department of Forestry and Wildlife Management, Faculty of Agriculture Shabu-Lafia campus Nasarawa State University Keffi. The plantation is situated at latitude $08^0$, 33N and longitude $08^0$ 33E in the Guinea savannah zone of North Central Nigeria at an altitude of about 177m above the sea level. The mean monthly maximum temperature range is between $35.06^0$ C to $36.40^0$C and $20.16^0$C to $20.50^0$C respectively while relative humidity and rainfall are 74.67% and 168.90mm respectively (Jayeoba, 2013).

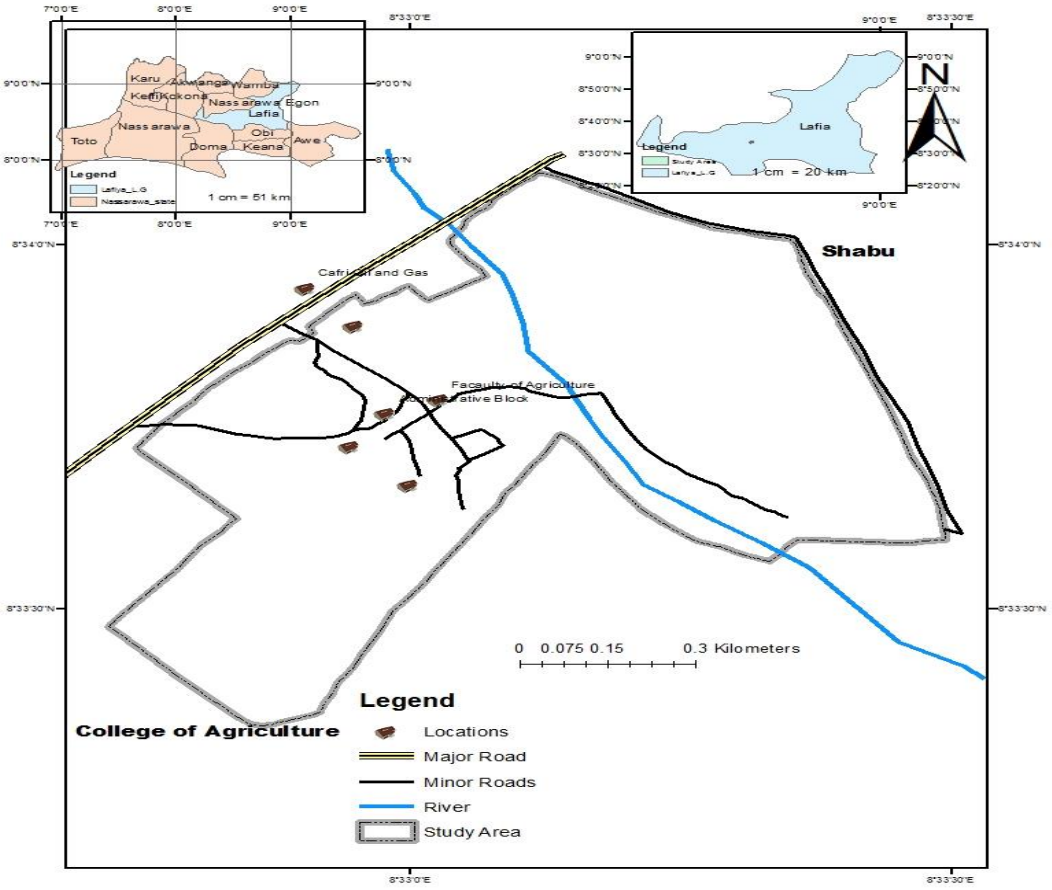


**Fig. 1:** Map of Lafia showing the Study Area

**Sampling Method**

The plantation was stratified in to three strata according to species. In each of the strata 4 transects line of 100m were laid. On each transect 4 plots of 4x4m were systematically located at 25m interval, this gives a total of 16 plots in each strata and 48 plots in the plantation.

**Soil Sample Collection**

Five plots were randomly selected per strata making a total of fifteen soil samples. In each plot, five soil sample were taken, four of the five soils samples were collected at the four corners of the plot while one soil sample was collected at the center. The five-soilsample collected per plot was mixed up to form one composite sample and this was repeated throughout the plantation. The soil samples were collected at the depth of 15cm each and the collected soil samples was put into a container and polythene for onward and taken to the laboratory for soil fungal analysis as adopted by Usman *et al*., (2020).

**Materials used in soil fungal analysis**

The materials used in the laboratory were Sabouraud dextrose agar, Conical flask, Incubator, distilled water, Patric dish, lactophinol, Cotton wool, Foil paper, masking tape, Glass rod, Beaker, microscope, microscopic slides, pipette, hot plate, autoclave, weighing balance, detergents.

**Soil Fungal Count**

The soil fungi were analyzed using serial dilution method in the laboratory as describe by Cheesbrough (1993). The soil sample was brought to the laboratory and serial dilution was carried out to reduce the microbial load so as to find it easy to obtain a pure culture. Five sterile test tubes were labeled ($10^{-1}$,$10^{-2}$, $10^{-3}$, $10^{-4}$ and $10^{-5}$). After labeling 9mls of distilled water was added to each test tube with sterile pipette, then a sterile pipette was used to pick 1mls of the sample and was added to the test tube labeled ($10^{-1}$) using a sterile pipette 1ml of the water in the test tube ($10^{-1}$) was taken after shaking, it

was then transferred to the test tube labeled ($10^{-2}$) 1ml was then taken from the test tube labeled ($10^{-2}$) after shaking it was then transferred to the test tube labeled ($10^{-3}$) from the test tube labeled ($10^{-3}$) 1ml of the sample was taken after shaking properly to the test tube labeled ($10^{-4}$) from the test tube labeled ($10^{-4}$) 1ml was taken to the test tube labeled ($10^{-5}$) after which it was properly shake, this process was repeated through all the 15 soil samples.

**Total Fungal Count (TFC)**

The total fungal count was done using filtration method after inoculation with Sabouraud dextrose agar (SDA) at $37^0$C for 7days. It was filter and media were prepared and fungi were identified using compound microscope as adopted by Usman *et al.*, (2020).

**Statistical Analysis**

The data collected was analyzed using analysis of variance (ANOVA) and significant mean difference of fungal abundance was separated using duncan multiple range at 0.05 probability level as described by (Steel *et al.*, 1997*)*. Shannon-Weiner diversity index (H), which is the measure of diversity within a site according to Shannon and Wiener (1949):

Shannon-Weiner diversity index (H)

$H = -\Sigma$ Pi In P..... …….1

Where Pi = S / N, S = number of individuals of one species; N = total number of all individuals in the site and In = logarithm to base

Species richness index (d), was use as a simple measure of species richness according to Margalef (1958):

Species richness index (D)

$D = \frac{S-1}{lnN}$……2

Where S = total number of species; N = total number of individuals in the site and Ln = natural logarithm.

iv. Relative abundance of species (RA)

$RA = \frac{Number\ of\ individual\ Species}{Total\ Number\ of\ Trees}$……..3

v. Relative density of species (RD)

$RD = \frac{Number\ of\ Individual\ Species}{Total\ Number\ of\ Trees} \times 100$…….4

**RESULTS**

**Soil fungal Richness and Diversity**

The study recorded 8 species of fungi belonging to 5 genera and 4 families isolated and identified, they are: *Alternaria alternate (21.15%), Aspergillus flavus (*18.50 %*), Aspergillus niger(*14.10%*), Aspergillus nudulans* and *Cladophialophora carrionii* (13.22%) has the same relative density, *Mucorales fungi(*8.37%*)*, while *Aspergillus fumigates* and *Penicillin fungus (5.73%)* has the same relative density. The result of Shannon-Weiner index (H)ranges from1.987 to 1.696 and Margalef species richness index (d) range from1.534 to1.151.

**Table 1: Fungal Richness and Diversity**

| Location | Fungi | Abundance | R. A | R.D(%) | H | D |
|---|---|---|---|---|---|---|
| All Plantation | *Aspergillus nudulans* | 30 | 0.1322 | 13.22 | 1.987 | 1.290 |
| | *Aspergillus niger* | 32 | 0.1410 | 14.10 | | |
| | *Alternaria alternata* | 48 | 0.2115 | 21.15 | | |
| | *Cladophialophora carrionii* | 30 | 0.1322 | 13.22 | | |
| | *Aspergillus flavus* | 42 | 0.1850 | 18.50 | | |
| | *Aspergillus fumigates* | 13 | 0.0573 | 5.73 | | |
| | *Penicillin fungus* | 13 | 0.0573 | 5.73 | | |
| | *Mucorales fungi* | 19 | 0.0837 | 8.37 | | |
| *K. senegalensis* strata | *Aspergillus nudulans* | 8 | 0.16 | 16 | 1.891 | 1.534 |
| | *Aspergillus Niger* | 8 | 0.16 | 16 | | |
| | *Alternaria alternata* | 5 | 0.1 | 10 | | |
| | *Cladophialophora carrionii* | 9 | 0.18 | 18 | | |
| | *Aspergillus flavus* | 4 | 0.08 | 8 | | |
| | *Aspergillus fumigatus* | 5 | 0.1 | 10 | | |
| | *Mucorales fungus* | 11 | 0.22 | 22 | | |
| *T. grandis* strata | *Aspergillus nudulans* | 22 | 0.21 | 20.75 | 1.765 | 1.287 |
| | *Aspergillus Niger* | 10 | 0.09 | 9.434 | | |
| | *Alternaria alternata* | 34 | 0.32 | 32.08 | | |
| | *Cladophialophora carrionii* | 12 | 0.11 | 11.32 | | |
| | *Aspergillus flavus* | 16 | 0.15 | 15.09 | | |
| | *Penicilline fungus* | 4 | 0.04 | 3.77 | | |
| | *Mucorales fungus* | 8 | 0.08 | 7.55 | | |
| ***G. arborea*strata** | *Aspergillus Niger* | 20 | 0.26 | 25.97 | 1.696 | 1.151 |
| | *Alternaria alternata* | 9 | 0.12 | 11.69 | | |
| | *Cladophialophora carrionii* | 9 | 0.12 | 11.69 | | |
| | *Aspergillus flavus* | 22 | 0.29 | 28.57 | | |
| | *Aspergillus fumigatus* | 8 | 0.10 | 10.39 | | |
| | *Penicilline fungus* | 9 | 0.12 | 11.69 | | |

**Distribution of soil fungi species in the *Khaya senegalensis, Tectona grandis* and *Gmelina arborea* plantations**

A total of 8 soil fungi isolated and identified to species level, those identified were *Aspergillus nudulans, Aspergillus niger, Alternaria alternata, Cladophialophora carrionii, Aspergillus flavus, Aspergillus fumigatus, Penicilline fungus*, and *Mucorales* fungus (Table 2). In *Khaya senegalensis* strata, 7 out of 8 soil fungi were recorded with *Mucorales* fungus having the highest mean value of $2.20\pm2.049^{b}$ while *Penicilline fungus was not recorded in the strata.* Similarly, *Tectona grandis* strata also recorded7 out of 8 soil fungi identified in the area with *Alternaria alternate* having the highest mean value of $6.80\pm6.648^{b}$ however, *Aspergillus fumigates* was not recorded in *T. grandis. Gmelina arborea* recorded the least number of soil fungi with 6 out of the 8 identified, *Aspergillus flavus* was the species with highest mean value of $4.40\pm3.975^{a}$. *Aspergillus nudulans and Mucorales* fungus were species that were absent in *G. arborea.* Table 2 revealed that only 4out of 8 species, *Aspergillus niger, Alternaria alternata, Cladophialophora carrionii*,and*Aspergillus flavus* were recorded in both *K. senegalensis, T. grandis* and *arborea.*



The result of the study as presented in table 3 indicated that *A. nudulans, A. niger, A. fumigatus, P. fungus* and *M. fungus* from the soil sample were significantly influenced by the tree species (*T. grandis, G. arborea* and *K.*

*senegalensis*) at 5% probability. However, *A. alternata, C. carrionii* and *A. flavus* shown no significant differences at 5% probability level ($0.07^{ns,}$ $0.661^{ns,}$ and $0.151^{ns}$ respectively).

**Relationship between the soil fungi species in the Plantation**

The result of the relationship between soil fungal species in the plantation revealed that, there was positive significant correlation between *A. niger* and *A. flavus* with the significant value of 0.642* ($p < 0.05$) table 4. The result of the study also shows that there was significant correlation between *Aspergillus fumigatus* and *Penilline fungus with the value of* $0.542^{*.}$ However, the result of the research indicated that there was no significant correlation between tree species and other soil fungi like *Aspergillus nudulans* and *Aspergillus niger(-0.289), Aspergillus nudulans* and *Alternaria alternata (*0.039), *Aspergillus nudulans* and *Cladophialophora carrionii (-0.030), Aspergillus nudulans* and *Aspergillus flavus (*-0.153), *Aspergillus nudulans* and *Aspergillus fumigates (*-0.369), *Aspergillus nudulans*and *Penilline fungus (*-0.398), *Aspergillus nudulans* and *Mucorales fungus (*0.184), *Aspergillus niger*and *Alternaria alternate* (-0.221), *Aspergillus niger* and *Cladophialophora carrionii (*-0.062), *Aspergillus niger*and *Aspergillus fumigatus* (0.213), *Aspergillus niger*and *Penilline fungus(*0.378), *Aspergillus niger*and *Mucorales fungus (*-0.297), *Alternaria alternata* and *Cladophialophora carrionii* (0.247), *Alternaria alternate* and *Aspergillus fumigatus(-0.049), Alternaria alternat a*nd *Aspergillus niger*and (-0.67), *Alternaria alternata*and *Penilline fungus (0.037), Alternaria alternata* and *Mucorales fungus(*0.213), *Cladophalophora carrionii and Aspergillus flavus( 0.032), Cladophalophora carrionii and Aspergillus fumigatus* (-0.279), *Cladophalophora carrionii* and *Penilline fungus* (-*0.*153), *Cladophalophora carrionii and Mucorales fungus( 0.295), Aspergillus flavus* and *Aspergillus fumigatus (-0.0*13), *Aspergillus flavus* and *Penilline fungus (-0.088), Aspergillus flavus* and *Penilline fungus (-0.364), Aspergillus fumigatus* and *Mucorales fungus(-0.23*1), *Penicilline fungus* and *Mucorales fungus* (-0.470).

**Table2: Mean and standard deviation values of fungi abundance as influence by the canopies of *Khaya senegalensis, Tectona grandis* and *Gmelina arborea***

| | *Aspergillus nudulans* | *Aspergillus niger* | *Alternaria alternata* | *Cladophialophora carrionii* | *Aspergillus flavus* | *Aspergillus fumigates* | *Penicilline fungus* | *Mucorales fungus* |
|---|---|---|---|---|---|---|---|---|
| *K. senegalensis* | 1.60±0.894$^{ab}$ | 1.60±0.894$^{a}$ | 1.00±0.707$^{a}$ | 1.80±0.837$^{a}$ | 0.80±1.304$^{a}$ | 1.00±0.707$^{b}$ | 0.00±0.000$^{a}$ | 2.20±2.049$^{b}$ |
| *T. grandis* | 4.40 ±3.975$^{b}$ | 2.00±1.225$^{a}$ | 6.80±6.648$^{b}$ | 2.40±1.673$^{a}$ | 3.20±2.280$^{a}$ | 0.00±0.000$^{a}$ | 0.80±0.837$^{a}$ | 1.60±0.894$^{ab}$ |
| *G. arborea* | 0.00±0.000$^{a}$ | 4.00±1.871$^{b}$ | 1.80±0.837$^{ab}$ | 1.80±0.837$^{a}$ | 4.40±3.975$^{a}$ | 1.60±0.894$^{b}$ | 1.80±0.837$^{b}$ | 0.00±0.000$^{a}$ |
| Total | 2.00±2.878 | 2.53±1.685 | 3.20±4.475 | 2.00±1.134 | 2.80±2.981 | 0.87±0.915 | 0.87±0.990 | 1.27±1.534 |

**Table 3: ANOVA values of fungi abundance as influence by the canopies of *K. senegalensis, T. grandis* and *G. arborea***

| **Source of variation** | **Df** | ***A. nudulans*** | | ***A. niger*** | | ***A. alternata*** | | ***C. carionii*** | | ***A. flavus*** | | ***B. fumigatus*** | | ***P .fungus*** | | ***M. fungus*** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***B.*** | | | | | | | | | | | | | | | | | |
| **Treatment** | **2** | **F** | **Sig** | **F** | **Sig** | **F** | **Sig** | **F** | **Sig** | **F** | **Sig** | **F** | **Sig** | **F** | **Sig** | **F** | **Sig** |
| | | 4.482 | 0.035* | 4.427 | 0.040* | 3.264 | 0.074$^{ns}$ | 0.429 | 0.661$^{ns}$ | 2.220 | 0.151$^{ns}$ | 7.538 | 0.008** | 8.714 | 0.005** | 3.880 | 0.050** |

**Table 4: Correlations values of fungi abundance as influence by the canopies of *Khaya senegalensis, Tectona grandis* and *Gmelina arborea***

| | *Aspergillus nudulans* | *Aspergills niger* | *Alternaria alternata* | *Cladophalophoracarrionii* | *Aspergillus flavus* | *Aspergillus fumigatus* | *Penicilline fungus* | *Mucorales fungus* |
|---|---|---|---|---|---|---|---|---|
| *Aspergillus nudulans* | - | | | | | | | |
| *Aspergillus niger* | -0.289 | - | | | | | | |
| *Alternaria alternate* | 0.039 | -0.221 | - | | | | | |
| *Cladophialophora carrionii* | -0.030 | -0.062 | 0.247 | - | | | | |
| *Aspergillus flavus* | -0.153 | 0.642* | -0.049 | 0.032 | - | | | |
| *Aspergillus fumigatus* | -0.369 | 0.213 | -0.167 | -0.279 | -0.013 | - | | |
| *Penilline fungus* | -0.398 | 0.378 | 0.037 | -0.153 | -0.088 | 0.542* | - | |
| *Mucorales fungus* | 0.184 | -0.297 | 0.213 | 0.295 | -0.364 | -0.231 | -0.470 | - |

**DISCUSSION**

The influence of different tree species on soil fungal diversity and richness showed that various species of fungi where isolated and identified during laboratory analysis. The diversity and richness of the fungi were generally moderate, ranging from 1.987 to 1.696 and 1.534 to 1.151for fungal diversity and richness respectively. The non-significant variation in the fungal diversity and richness among the soil samples from the tree species could be attributed to the fact that soil covered of deciduous tropical tree species is reach in organic matter content. Leaf litter accumulation on the forest floor can lead to higher organic content and consequently good fungal diversity and richness in the soil because soil oganic carbon is key factor to soil fungi diversity. The result of this study is inconformity to that of Ogunmwonyi *et al*., (2008) and Okoh *et al* (1999). Good soil structure in the forest floor promoted macro-porosity and pore continuity thereby reducing nutrient losses via leaching and consequently improves fungal diversity and richness. Lawal *et al*., (2020) reported noted that reduced total porosity result in decreased oxygen content which may restrain the survival of fungal hence result in decreased soil fungal diversity and richness.

The result of the abundance and distribution of fungi revealed that a total of eight (8) species were identified.The number identified in this study were lower than eleven (11) species of fungi reported by Ogunmwonyi *et al*., (2008) and higher than seven (7) species recorded by Usman *et al*.(2020).The dominance of *Aspergillus* genera over other genera of fungi observed in the study has been reported by many scholars (Lawal *et al*., 2020; Usman *et al.*, 2020;Grantina*et al.*, 2011;Ogunmwonyi*et al.*, 2008).Differences in the amount of fungal count in the different tree species were significant. This finding agrees with that of Theophilus *et al.*, (2020); Olujobi*et al*., (2017) and Grantina *et al.*, (2011). Aspergillus is a diverse genus of fungi occurring worldwide, species from this genus considered to primarily terricolus with important roles as decomposers of organic materials (Abdel-Azeem *et al.*, 2009). This implies that the significantly result of fungi obtained, especially *Aspergillus* species under the canopies of trees species in this study could be attributed to the presence of larger branches, and many fallen larger leave litters that makes the environment more suitable for the *Aspergilus* to thrive well. According to Breeze (2018) most of the fungal species are aerobic, that is they require atmospheric levels of oxygen to grow. One of the visible features of the trees species is having very large leave litter falls and low lignin level which allow decomposition of the leave litters to be easily there by making oxygen available which could probably also be the reasons why those particular species of fungi are higher. This finding, agrees with the finding of Klich (2002) in his study of biography of *Aspergillus* species in soil and litter where He reported no distinct pattern of species occurrence across different biomes of forest, wetland and cultivated land. Similarly, Usman *et al*. 2020 in their study on comparative assessment of the effects of two vegetation zone forests on soil microorganisms reported small variation in the number of fungi with the high forest having higher amount of this organisms. The abundance of *Aspergillus niger* and *Penicillium* fungus were recorded higher under the canopies cover of *Gmelina arborea*. Wakelin *et al.*, (2007) reported that *Penicillium* fungus is a phosphate solubilizing organisms. Several authors reported that soil microorganisms can dissolve insoluble phosphorus, which is not available to plants, and transform it into soluble phosphorus (Valverde *et al.*, 2006; Goldstein, 2007; Singh and Reddy, 2011).

The result of the study revealed that the abundance of *Mucoreles fungi* is higher under *Khaya senegalensis.* High amount of *M. fungus* in *K. senegalensis* could be attributed to the ability of the species to shaded leaves that act as a major source of nutrient for soil fungi trival. It could be that the falling leaf litter may be rich in some certain element such as carbon, hemicelluloses, pectin, lipids and proteins which is necessary for fungi mucoreles growth and reproduction. Also, this could be as a result of high pH value of the soil that is more or less neutral nature under *K. senegalensis* strata as reported by Soba *et al*., (2021) in their study on potential of three tree species on soil nutrient. This report confirmed the report made by Fierer *et al*., (2006) where they noted that most of the soil microorganisms thrives in pH value close to neutral. The findings of this research further

confirmed the submission of Lima *et al*., (2018) and Olujobi*et al.*, (2017).

The study revealed that there was positive significant correlation between *Aspergillus niger* and *Aspergillus flavus* with the significant value of 0.642* ($p< 0.05$). This implies that as the amount of *A. niger* increases so also the amount of *A. flavus* increases. Likewise decreases in the amount of *A. niger* lead to the decrease in *A. flavus*. Species of Aspergillus are typical examples of the fungal life style. They are most often found in terrestrial habitats and are commonly isolated from soil and associated plant litter. The decomposition process carried out by these moulds is important in driving natural cycling of chemical elements, particularly in the carbon cycle where they contribute to replenishment of the supply of carbon cycle where they contribute to replenishment of the supply of carbon dioxide and other inorganic compounds (Carroll and Wicklow, 1992).

## CONCLUSION AND RECOMMENDATION

In conclusion, different tree species under the study has ability to support growth of different soil fungi species. The tree species affect the abundance of soil fungi differently. It is evidence that from this study *K. senegalensis, T. grandis* and *G. arborea* should be recommended to the farmers among the tree species to be used in agroforestry practice because their significance role in ecosystem functioning.

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