Available at www.ijcasonline.com ISSN:2349 – 0594

International Journal of Modern Chemistry and Applied Science

International Journal of Modern Chemistry and Applied Science, 2016, 3(4),457-464

Isolation, Identification and Characterization of Plastic degrader fungal Species from Municipal Solid waste

BirhanuGizaw and Zerihun Tsegaye

Microbial Biodiversity Directorate, Ethiopian Biodiversity institute, P.o.box 30726 Addis Ababa, Ethiopia.
Corresponding author; gbirhanu@ibc.gov.et, Tel: +251911862561/0933578070

Abstract: Plastic causes serious pollution to the environment. The study aimed to identify and characterize plastic degrader fungi from municipal solid waste by using Biolog Micro station. Soil samples were collected from waste dumping site. The fungi strain was screened on growth media and read by the Micro Station Reader. Results were recorded and processed for identification by micro log3 software ver. 4.20.05. Biolog microstation read 55.17% % $\leq$0.5similarity index value result read *Aspergillus carneus,Aspergillus restrictus, Aspergillus ochraceus , Penicillium brevicompactum, Penicillium roqueforti, Penicillium digitatum, Fusarium javanicum, Aspergillus fresenii, Aspergillus terricola var.terricola, Penicillium solitum, Fusarium juruanum, Fusarium chlamydosporumvar. chlamydosporum* . 31.03% $\geq$ 0.5 similarity index value read are yeast species *Pichia norvegensis, Candida glaebosa, Cryptococcus lutelus, Rhodotrula aurentica A,Cryptococcus albidus var albidus , Rhodotrula aurantica A, Pichia Mexicana, Tricosporon begilli B, Fellomyces fuzhouensis, Trichosporon inkin.* 13.79% of yeast has $\leq$ 0.5 similarity index value, *Wingea robertsiae, Rhodotrula aurentica A, Pichia guilliermondii A, Debermyomyces hansenii* C. Seven selected fungal species were tested for ability of degrading polythene plastics (LDPE) at 40 days intervals. 4.004%, 0.629%, 0.1124% percentage degradation recorded in *Penicillium roqueforti , Aspergillus carneus* and *Aspergillus ochraceus* respectively and relatively, <0.07% low degradation recorded in *Fusarium javanicum Penicillium brevicompactum, Aspergillus restrictus, Penicillium digitatum.* For plastic waste management in the biotechnological process, *Penicillium roqueforti , Aspergillus carneus* and *Aspergillus ochraceus* are promising candidate degrader fungi and it is also important to study fungal diversity associated with municipal solid waste for further biotechnological application in waste management.

Key words: Biolog, Degrader, Fungi, Micro Station, Plastic, Waste

1. INTRODUCTION

With increase in the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household. This waste is ultimately thrown into municipal waste collection centers into the landfills and dumps. Solid waste can be divided into different categories according to its origin and risk to human and environmental health, municipal waste , commercial and non-hazardous industrial wastes; hazardous (toxic) industrial wastes; construction and demolition waste; health care wastes, human and animal wastes, incinerator wastes, organic waste.(Tchobanoglous *et al*., 1993). The estimated quantity of Municipal Solid Waste (MSW) generated worldwide is 1.7 – 1.9 billion metric tons. (Chalmin and Gaillochet , 2009). In Ethiopia in major cities huge wastes are dumped for example in Addis Ababa more than 200,000 tone are collected each year, In Gonder town 41976290 Kg of waste generated annually. (Mohhamod, 2015). According to the report made by SBPDD of Dessie town in 2010, the total solid waste generated in 2010 is estimated to be 32188 m^3. From this amount only 11569 m^3 (36%) of solid wastes were collected and disposed but the remaining large proportion of the solid wastes (64%) were left uncollected. Sources of Waste Generated 76% households, 18% institutions, commercial, factories, hotels, 6% is street sweeping. These municipal solid wastes composed of biodegradable and non-biodegradable waste consisting of high and low density polyethylene and organic lignocellulose waste. Plastic materials have gained widespread use as they have been increasingly used in food, clothing, shelter, transportation, construction, medical and leisure industries. Plastics include polythene, propylene, polystyrene, polyurethane, nylon etc. polyethylene either LDPE (low density polyethylene) or HDPE (high density polyethylene) is a thermo plastic made by monomers of ethylene, used primarily as thin films and packaging sheets (Shristi et al., 2007). Plastics are composed of petroleum based materials called resins (e.g., polythene and polypropylene) materials that are resistant to biodegradation. A general estimate of worldwide plastic waste generation is annually about 57 million tons (Shristi et al., 2007). However, plastic materials have several disadvantages, the most important being that they do not break down in the environment. Due to their buoyancy, long term persistence and ubiquity in the marine environment, plastic waste poses a variety of hazards to marine life and terrestrial ecosystem (Spear et al., 1995). Plastic causes pollution and global warming not only because of increase in the problem of waste disposal and land filling but also release CO_2 and dioxins due to burning. Commonly used methods for plastic disposal were proved to be inadequate for effective plastic waste management, and hence there is growing concern for use of efficient microorganisms meant for biodegradation of non-degradable synthetic polymer. With such huge polyethylene getting accumulated in the environment, their disposal evokes a big ecological issue. Because of its xenobiotic origin and recalcitrant nature, its biodegradation is problematic and thus accumulates in the environment for a long time. In several studies, fungi were considered favorable for the degradation of low density polyethylene plastic

(LDPE) due to their higher ability to formhydrophobic enzyme proteins, which helped the fungal species in attachment to the polymer surface (Seneviratne et al., 2006) .Most of the biodegradation studies on plastics and organic wastes are being carried out using microorganisms which contributes to the biological productivity either directly or indirectly. (Webb et al. 2000) studied the fungal colonization and bio deterioration of plasticized polyvinylchloride in in situ and ex situ conditions and suggested that microbial succession may occur during the long periods of exposure in in situ conditions. They also identified *Aureobasidium pullulans* which was the principle colonizing fungus group of yeast and yeast like fungi, including *Rhodotorula aurantica* and *Kluyveromyces species, Mucor circinilloides* and *Aspergillus flavus* isolated from municipal landfill area, showed promising degradation of low density polythene Plastics (Pramila and Vijaya, 2011). Number of fungi isolates were identified from the surface of polyester PU foam as a sole carbon source, buried for 28 days, from the genera Emericella, Trichoderma, Aspergillus, Fusarium, Gliocladium and Penicillium(Bentham, 1987). *Geomyces pannorum* was found to be the predominant fungi consisting 22-100% of the polyester PUR degrading fungi (Barratt et al., 2003). Therefore the accumulation of plastics in the environment becomes a matter of great concern leading to long-term environment, economic and waste management problems in Ethiopia major city. In order to overcome these problems, significant attention has been placed on biodegradable polymers, and also, on the identification of microorganisms with degradative potential upon polymeric materials. The present study aiming at isolation, identification and characterization of plastic waste degrader fungi from Municipal solid waste in Ethiopian major city that would be considered a good candidate with high potential for bio-fuel production, biogas, compost making and other bio product in addition to its solid waste management for plastic and non-plastic waste removal application.

2.MATERIALS AND METHODS

Study Area

The study were conducted at municipal solid waste dumping site in Amhara, Tigraye and Oromya regional state particularly Adama, Awodye, Diredewa, Harar, BahirDar, Gonder, Mekele. The area is located approximately 290 km to 900km far from Addis Ababa. Sample collected at altitude ranges 1200- 2100 m.a.s.l. All referencing study area is located in map (Fig1).

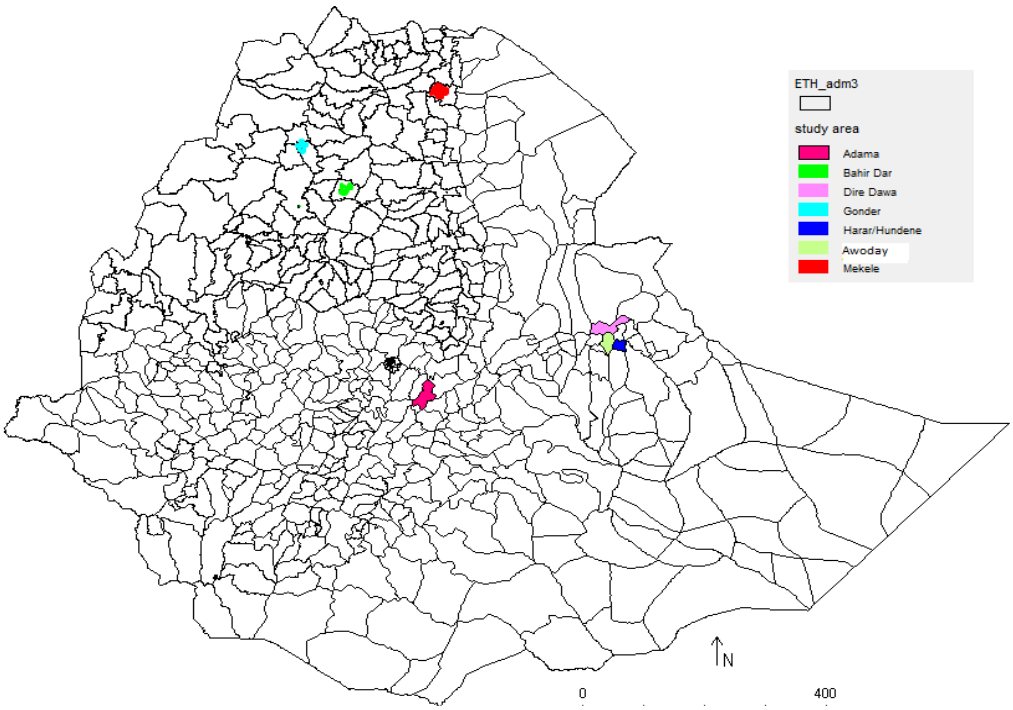


Fig.1. Map of study area

Sample Collection

558 soil samples were collected through drillings at 9 different points distributed at the center and periphery of a square quadrant of municipal solid waste dumping site, at 5, 10, and 15cm depths from 20m^2 of 62 quadrants (4mx5m). Approximately 15g of soil were taken from each depth of sampling point and a total of 135g composite soil per sampling quadrant were stored in sterile sample tube and transported to Addis Ababa Microbial directorate laboratory in Ethiopian biodiversity institute and kept in +4 ^oC until processed.

Isolation and Screening of Soil fungi associated with Plastic and lignocellulose Waste

18g of soil sample were transferred into a conical flask containing 82ml of sterile distilled water. The soil shaken and serially diluted up to 10^{-5} and cultured on 3 growth media Czapek s dox agar, potato dextrose agar (39g/L) and malt extract agar through spread plat techniques. Plates were incubated at 26-30°C for 4-7 days. All grown fungal species sub-cultured to get pure colonies for morphological identification and transferred to biolog universal agar for identification and characterization by Biolog Micro station.

Macro morphological Identification

The pure colonial characteristics such as shape, colony color , hyphal color, exudates, edge, colony reverses, translucency, elevation, size and surface texture were recorded and photo were taken .

Micro Morphological Identification

Pure fungal cultures stained with lacto phenol cotton blue solution and examined microscopically (using ×40 objectives). Cellular morphology such as type of hyphae, asexual reproductive structures, shape of conidial heads, conidial color were identified according to propose of Sime and Abbotte 2002 was used and Photograph were taken.

Identification of fungi species using Biolog microstation

Fungi were subculture to Biolog Universal growth agar and incubated at 26 °C for 48h. Pure colony of fungi suspension were prepared in 9ml sterile distilled water and adjusted to 47/75T using Biolog YT/FF turbidiameter respectively. 100 µ L of inoculums was dispensed to each wells of the biolog YT/ FF Micro Plate tagged with 96 dehydrated carbon, and incubated at 26 °C 24-72h. The FF/YT Micro Plate measures both metabolic reactions as well as turbidity growth to produce identifications. FF/YT Micro Plate were read by the Micro Station Reader at 24 h, 48 h, and 72 h at a single wavelength of 590 nm. The Biolog software micro log3 ver. 4.20.05 compared the results obtained with the test strain to the database and provided identification based on distance value of match and separation score produces similarity index value and probability (Biolog1993).

Determination of Polyethylene Plastic Degradation

Low density Polyethylene plastic (LDPP) weighed, washed by sterile distilled water and sprayed with 70% alcohol. Finally inserted into Erlenmeyer flask containing 100 mL Czapec broth. Aseptically 2 loops fungal isolates from municipal solid waste were inoculated to the Czapec broth and incubated in an incubator shaker at room temperature, with agitation of 130 rpm 40 days. Polyethylene plastic that has been incubated for 40 days washed with sterile distilled water and then sprayed with alcohol, dried air and was weighed at 40 days intervals. The percentage of degradation of polyethylene plastic by the fungus were be calculated the following formula.

$$\%\text{Degradation} = \frac{\text{Initial weight-final weight}}{\text{Initial weight}} \times 100\%$$

Statistical Analysis

Data were gathered form different municipal solid waste damping site for fungal diversity using biolog identification result and for low density plastic degradation at 40 days intervals for selected 7 fungus species calculated for their mean of weight loss analyzed using percentage frequency of one way ANOVA.

3. RESULT

Macro and Micromorphology characteristics of plastic degrader fungi

Their shape, size, elevation, reverse side, mycelium color, margin and color of the colony were observed on biolog universal growth agar. Macro morphological results were noted for plastic degradation fungi down in summarized table 1. And their cellular morphology were stained by using lacto phenol blue and observed by microscope. Its conidia shape, conidia color, haphal morphology were noted. Table 2 Summarize the result.

Percentage frequency of fungal species isolated from municipal waste in all damping site

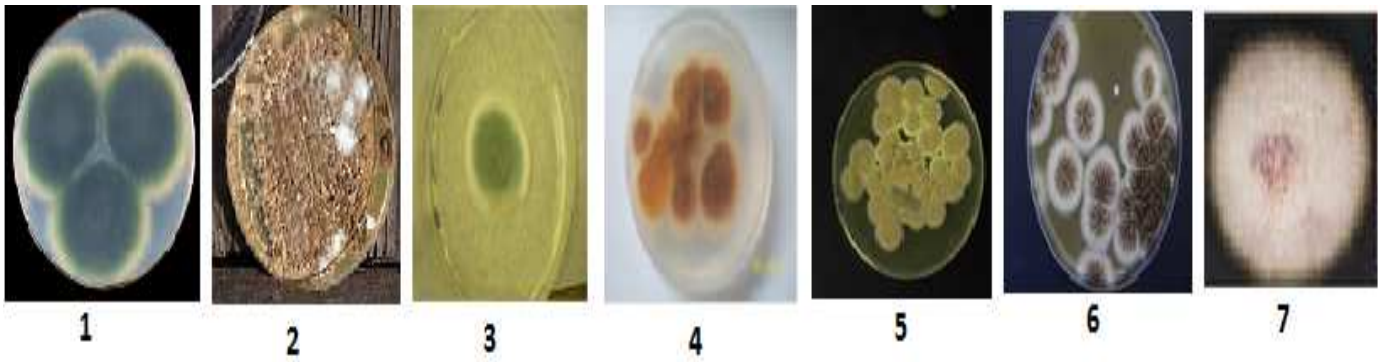
A total of 750 fungal colonies were grown and counted on different growth media and identified in order to detect the incidence frequencies of the microorganisms encountered. 55% were non filamentous fungi and 45% were filamentous fungi. From filamentous fungi, Aspergillus species were dominated (48%), Pencillium species, (36%), Fusarium species (16%).

Identification of Fungi Species Using Biolog Micro Station

FF/YT Micro Plate was read by the Micro Station Reader at 24 h, 48 h, and 72 h at a single wavelength of 590 nm, results were recorded by micro plate reader and processed for identification by micro log3 software ver. 4.20.05 (Biolog, Hayward, CA). A similarity index calculated based on the reaction profiles. (Biolog1993). By comparing with the fungi database (MicroLogTMSystem Release 4.2 User Guide 2001, Biolog).The result revealed that fungi species were identified associated with municipal

Table. 1. Macro morphology of isolated filamentous fungi

Species	Surface color	Margins	Reverse side	Elevations
Aspergillus ochraceus	Brown appearance	Velvety smooth	uncolored	Flat
Aspergillus restrictus	Blackish green-gray	Velvety Smooth	uncolored to dark gray green	Flat
Aspergillus carneus	Yellow green-gray	wrinkled	Dull yellow brown to victoria lake	Flat
Penicillium brevicompactum	Brown	wrinkled	White Brown	Flat
Penicillium roqueforti	Blackish green	Smooth velvety	White green	Flat
Penicillium digitatum	yellow-green floccose texture	Smooth velvety	olive green	Flat
Fusarium javanicum	White pink	Smooth hairy	white	Flat

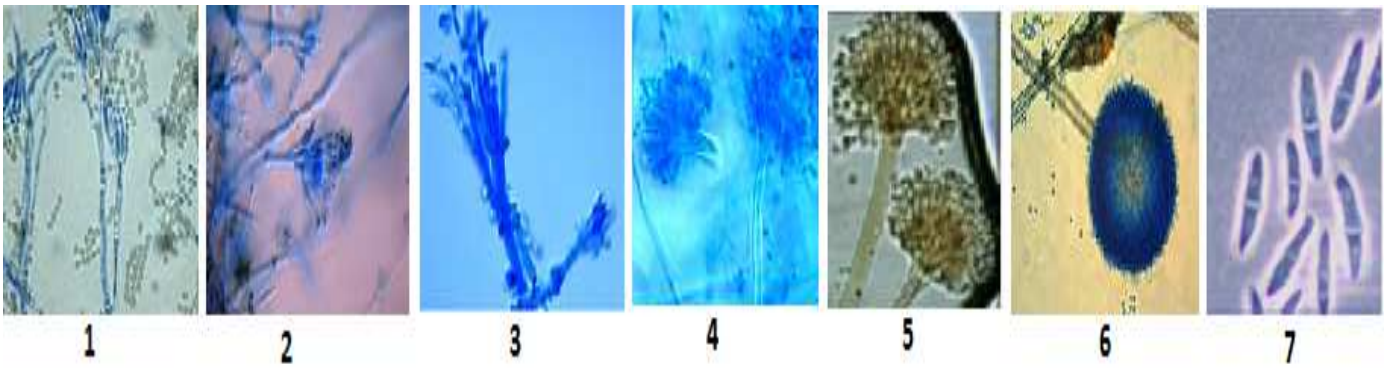


1. *Penicillium roqueforti 2. Penicillium brevicompactum 3. Penicillium digitatum 4. Aspergillus ochraceus 5. Aspergillus carneus (V.Tiegham)Blockwitz 6. Aspergillus restrictus 7. Fusarium javanicum*

Fig.2. Cultural morphology

Table.2. Micromorphology of filamentous fungi

Species	Hyphae	Seration	Condia Heads color	Condia Heads/shape
Aspergillus carneus	Septum and pore with Woronin bodie	Mono seretted	Globose to radiate or rarely splitting into loose columns, deep olive or black	Columnar conidial heads
Aspergillus restrictus	Septated	Mono seretted	Covered in slime, blackish green-gray	Conida are nearly spherical to elliptical and are rough and spinulose.
Aspergillus ochraceus	Septated	Biserated globese elongated	Cream color, pinkish buff or near dark olive-buff	Distinct globose conidia head , Radiate
Penicillium brevicompactum	Septated	Biserated	White color	Apically inflated
Penicillium roqueforti	Septated	Mono seretted	White green	Round shape
Penicillium digitatum	septate hyphae	flask-shaped to cylindrical	White brown conidia	chains of single-celled conidia
Fusarium javanicum	Non septated	Sereted	White brown	Selender macro conidia



1.Penicillium roqueforti 2.Penicillium brevicompactum 3. Penicillium digitatum 4. Aspergillus restrictus 5. Aspergillus carneus 6. Aspergillus ochraceus 7.Fusarium javanicum

Fig.3. Cellular morphology

Table .3. Percentage frequency of filamentous and non-filamentous fungi from biolog read

	Index value	**Fungus species**	**Similarity**	**Distance**	**Waste damping site area**
1	Filamentous fungi ≤0.5 simlarity index (55.17%)	*Aspergillus carneus (V.Tiegham)Blockwitz*	0.343	11.24	Adama
2		*Aspergillus restrictusG.Sm*	0.317	11.87	Awoday
3		*Aspergillus ochraceus K.WilhelmBGB*	0.133	15.36	Awoday
4		*Aspergillus fresenii subramaniam*	00.617	5.64	BahirDar
5		*Aspergillus terricola var.terricola*	0.417	9.61	BahirDar
6		*Penicillium brevicompactumDierckxBGC*	0.048/0.165	19.31/16.47	Adama/Gonder
7		*Penicillium roquefortiThomBGE*	0.001	30.84	Awoday
8		*Penicillium digitatum(Pers.Fr)Sacc.BGA*	0.001	31.61	Adama
9		*Penicillium solitum Westling BGA*	0.294	12.42	BahirDar
10		*Pencillium argillaceum stolk etal*	0.002	28.68	Jimma
11		*Fusarium javanicum*	0.000	38.58	Awoday
12		*Fusarium udume Butter*	0.000	43.98	Jimma
13		*Fusarium chlamydosporumvar. chlamydosporum wollenw*	0.173	0.173	Gonder
14		*Fusarium juruanum*	0.034/0.004	19.48/24.97	BahirDar/Harar
15		*Trichoderma aureovirida rafai*	0.000	37.35	Jimma
16		*Trichoderma piluiferum Webster & Rofi*	0.000	35.10	Jimma
17	Yeast ≥ Similarity index (31.03 %)	*Pichia norvegensis*	0.549	5.88	Diredewa
18		*Candida glaebosa*	0.753	2.22	Diredewa
19		*Cryptococcus lutelus*	0.809/0.724/0.529	2.85/4.18/5.51	Harar/Diredewa/Jimma
20		*Rhodotrula aurentica A*	0.534/0.57/0.583/	5.24/6.68/6.47	Mekele/Awoday/Jimma
21		*Cryptococcus albidus var albidus*	0.561	8.87	Deredewa
22		*Pichia mexicana*	0.534/0.462	6,97/8.52	Jimma/Diredewa
23		*Tricosporon begilli B*	0.5	8,00	Jimma
24		*Fellomyces fuzhouensis*	0.532	7.38	Diredewa
25		*Trichosporon inkin*	0.534	1.87	Jimma
26	Yeast ≤ Similarity index (13.4%)	*Pichia guilliermondii A*	0.302	10.42	Mekele
27		*Wingea robertsiae*	0.310	11.90	Jimma
28		*Debermyomyces hansenii C*	0.154	14.20	Jimma
29		*Rhodotrula aurentica A*	0.461	8.74	Deredwa

solid waste where plastic waste is very high. Therefore BiologMicro station identified 16 filamentous fungi and 12 yeast species. Filamentous fungi ≤0.5 simlarity index (55.17%), Yeast ≥ Similarity index (31.03 %), Yeast ≤ Similarity index (13.4%) (Table 3).

Species isolated in different city per waste damping site and their comparative percentage

Among identified fungal species, the percentage frequency along waste damping site were compared, there fore Jimma waste damping site comprise (32,25%) *Wingea robertsiae, Pichia mexicana, Tricosporon begilli B, Debermyomyces hansenii C, Trichosporon inkin, Pencillium argillaceum stolk etal, Trichoderma piluiferum Webster & Rofi, Fusarium udume Butter, Trichoderma aureovirida rafai, , Rhodotrula aurantica A.* Diredewa waste damping site comprise (22.58%), *Pichia norvegensis, Candida glaebosa, Cryptococcus lutelus , Rhodotrula aurentica A, Cryptococcus albidus var albidus, Pichia mexicana, Fellomyces fuzhouensis*. Awoday waste damping site comprise (12.9%) *Aspergillus restrictusG.Sm, Aspergillus ochraceus K.WilhelmBGB, Penicillium roquefortiThomBGE, Fusarium javanicum,* *Rhodotrula aurantica ABahirdar* waste damping site *(12.90%),Aspergillus fresenii subramaniam, Aspergillus terricola va.terricola, Penicillium solitum Westling BGA Fusarium juruanum,* Gonder waste damping site comprise (9.67%) , *Penicillium brevicompactumDierckxBGC, Fusarium chlamydosporumvar. chlamydosporum wollenw, Penicillium brevicompactumDierckxBGC,* Mekele waste damping site (6.45%)Rhodotrula aurantica A, Wingea robertsiae, Adama waste damping comprise (6.45%) *Aspergilluscarneus (V.Tiegham)Blockwitz, Penicillium digitatum (Pers.Fr) Sacc.BGA* .Harare waste damping site comprise (3.22%) *Fusarium juruanum.*

Evaluation test for 7 filamentous fungus for their degradation ability

The pre-weighed low density polyethylene (LDPE) strips of 2 cm diameter were aseptically transferred to the conical flask containing 100ml Czapec Broth separately inoculated with the selected fungal strains. Control was maintained with low density polyethylene (LDPE) strip in the microbe free medium. 3 flasks were maintained for each treatment and left in a shaker. 7 filamentous fungal species *Aspergillus carneus, Aspergillus restrictus, Aspergillus*

ochraceus, Penicillium brevicompactum, Penicillium roqueforti ,Penicillium digitatum, Fusarium javanicum were tested in the laboratory at 40 days intervals for their ability of degrading the low density polythene plastics were recorded. These microbes were separately allowed to degrade the low density polythene plastics under shaker cultures for a 40 days .The results are shown in Table 4.

Table.4 .Percentage mean degradation of low density plastics at 40 days intervals

	Species	Initial weight of Low Density Polyethylene Plastic(LDPP)	Mean of Final weight At 80 day measure	Mean weight of LDPP degraded	Percentage of degraded LDPP in 80 Days
1	*Aspergillus carneus*	0.4445	0.4417	0.0028	0.63%
2	*Aspergillus restrictus*	0.4445	0.4444	0.0002	0.05%
3	*Aspergillus ochraceus*	0.4445	0.444	0.0005	0.11%
4	*Penicillium brevicompactum*	0.4445	0.4444	0.0001	0.02%
5	*Penicillium roqueforti*	0.4445	0.4267	0.0178	4.00%
6	*Penicillium digitatum*	0.4445	0.4442	0.0003	0.07%
7	*Fusarium javanicum*	0.4445	0.4444	0.0001	0.02%

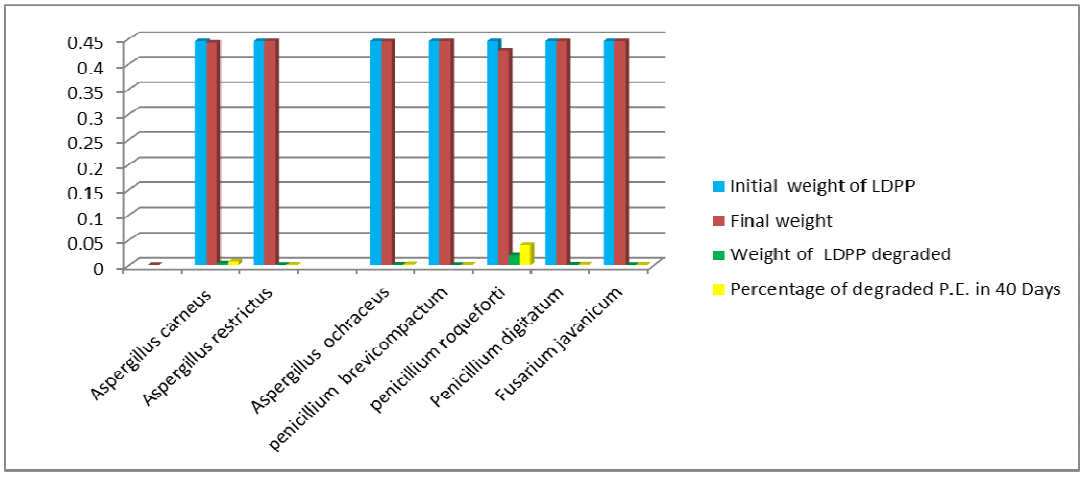


Fig.4. Graph showing their Percentage means degradation of low density plastics at 40 days intervals

4.DISSCUSION

Malt extract agar, potato dextrose agar, czapec dox agar and Biolog universal agar were used to isolate, identify and characterize fungi species from Municipal solid waste where lignocellulose and plastic waste is dominantly found in Ethiopia major city (Fig 1). The result revealed that all isolated strains morphologically had circular-to-ovoid shape; their color ranges from white-yellow to black green and from flat to raised elevation with three to seven days of growth at 26^{o}C-30^{o}C of incubation. Microscopic studies of showed that fungal hyphae were septate, hyaline and slightly brown in color. Conidiophores were found to be long with smooth walled small bi-seriate to large size globose vesicle and conidia were brown to black in color (Fig. 2 and 3).

The diversity study on waste degrader microbes within 1200-2100 m.a.s.l altitude ranges was carried out and a total of 750 fungal colonies were grown on different growth media. The colonies were counted and identified in order to detect the incidence frequencies of the microorganisms encountered. 55% were non filamentous fungi and 45% were filamentous fungi. Aspergillus species were dominated (48%), Pencillium species, (36%), Fusarium species (16%). This is corresponds with the work of Adeyemo et al., 2013., Aspergillus and Mucor species were found to be the most widely distributed on all type of municipal wastes. The fungi species cultured on Malt extract agar, Potato dextrose agar, Czapec dox agar transferred to Biolog universal agar media for Biolog Microstation identification. BiologMicro station is a new semi-automated computer linked technology for fungi identification, based on a 96 well micro titre tray containing a range of dehydrated carbon source for assimilation and oxidation test (Brocher, 1989); Biolog 1993).The profile of growth responses provides a metabolic fingerprints for each isolates (Brocher, 1989) and is compared to profile of the fungi species in the biolog data base to provide an identification. Micro plate was read after 24 to 72 h. A similarity index calculated based on the reaction profiles. The result revealed that 28 fungi species were identified associated with Municipal solid waste in plastic and lignocellulose degradation property in different Ethiopian major city. Therefore Biolog Microstation read identifies 16

filamentous fungi and 12 yeast species, Filamentous fungi ≤ 0.5 simlarity index (55.17%), Yeast ≥ Similarity index (31.03 %), Yeast ≤ Similarity index (13.4%) (Table.3). All isolated and identified Fusarium spp, Pencillium spp, Aspergillus spp were reported by different literature that identified from municipal solid waste. Gautam et al., 2011 reported *Alternaria alternata, Alternaria sp., Acremonium butyri, A. clavatus, A. flavus, A. candidus, A. luchuensis, A. fumigatus, A. nidulans, A. niger, A. terreus, Aspergillus sp., Chaetomium sp., Chrysosporium sp., Cladosporium sp., Curvularia lunata, Curvularia sp., Drechslera sp., Fusarium oxysporum, Fusarium roseum, Gliocladium sp., Humicola sp., Mucor sp., Myrothecium sp., Paecilomyces sp., Penicillium digitatum, Penicillium sp., Rhizopus sp., Sclerotium rolfsii, Trichoderma viride, Trichoderma sp., Verticillium sp.,* are isolates of fungi from municipal solid waste and important cellulase enzyme producer. This research corresponds to Gautam et al., 2011and Kathiresan, 2003., reported fungal species include *Aspergillus niger, Aspergillus fumigates,* Mucor spp, Fusarium spp, Penicillium spp *Candida krusei,* isolated from the film surfaces of polythene and plastic bags. Webb et al., 2000 studied colonization of fungus and biodegradation of pPVC under in-situ and ex-situ conditions. Their study reported that after 80 weeks of exposure yeast and yeast like fungi, *Rhodotorula aurantiaca* and *Kluyveromyces spp*. was found to be established on pPVC. Ekundayo, 1977 also reported Aspergillus, Fusarium, Mucor, Penicillium, Rhizopus and a variety of yeasts have also been reported to be associated with waste biodegradation. In this study plastic degradation evaluation test in laboratory were carried out, pre-weighed low density polyethylene (LDPE) strips of 2 cm diameter and 0.4445g were aseptically transferred to the conical flask containing 100ml Czapec Broth separately inoculated with the selected fungal strains. Control was maintained with low density polyethylene (LDPE) strip in the microbe free medium. 3 flasks were maintained for each treatment and left in a shaker. 7 filamentous fungal species *Aspergillus carneus, Aspergillus restrictus, Aspergillus ochraceus, Penicillium brevicompactum, Penicillium roqueforti ,Penicillium digitatum, Fusarium javanicum* were tested at 40 days intervals for their ability of degrading the low density polythene plastics. Among the seven filamentous fungi 4.004%, 0.629%, 0.1124% percentage degradation recorded in *Penicillium roqueforti , Aspergillus carneus* and *Aspergillus ochraceus* respectively and relatively a less than 0.07%% low degradation recorded in *Fusarium javanicum, Penicillium brevicompactum, Aspergillus restrictus, Penicillium digitatum*. Polylactic acid (PLA) is a polymer frequently used in biodegradable plastics; its degradation by Fusarium moniliforme and by *Penicillium roqueforti* are Reported by Kim et al., 2003, Shimao ., 2001., Ghosh etal., 2013). Kathiresan ., 2003 reported *Aspergillus niger, A. ornatus, A. nidulans, A. cremeus, A. flavus, A. candidus and A. glaucus* were the predominant species, fungi were considered favorable for the degradation of LDPE due to their ability to form hydrophobic proteins that can attach to the polymer surface.Among Aspergillus species 1.204 %, 1.49%, 1.14% of weight loss of plastic degradation is recorded in *Aspergillus terreus; Emericella nidulans; Aspergillus wentii* respectively reported by (Poonam et al .,2013).However many Aspergillus and Pencillium species were a good plastic degrader mentioned by many literature, in this finding *Penicillium roqueforti* and *Aspergillus ochrochus* are corresponds to the work of Ghosh ; Ray 2013 and Neveen and Salama ., 2011 respectively showed plastic degradation. Whereas *Aspergillus carneus* are a species identified by this research fining important for plastic degradation. However other filamentous fungi isolated from solid municipal waste where plastic waste is abundant like, *Aspergillus restrictus, Penicillium brevico-mpactum,Penicillium digitatum, Fusarium javanicum* did not show such significant degradation on plastic materials within 40 days intervals under laboratory trials ,this might be time limitation , production of appropriate enzyme, the type of plastic . However all isolated filamentous and non-filamentous fungi are cellulose degrader and supported by different literature that could very important for other bio product production beside with their waste removal.

5. CONCLUSION

Both Filamentous and non-filamentous fungal species are isolated and characterized from municipal solid waste where cellulose and plastic waste is abundant in Ethiopian major city.

Penicillium roqueforti , Aspergillus carneus and *Aspergillus ochraceus* showed plastic degradation with in 40days intervals will be a good candidate strain for biodegrading of plastics waste

Aspergillus ,Pencillium and yeasts species isolated from municipal solid waste are considered a good candidate with high potential for bio-fuel production, biogas, compost making and other bio product in addition to its solid waste management for plastic and non-plastic waste removal.

The present study gives the evidences for biodegradation of low density polyethylene by Microbial degradation of plastic is a promising ecofriendly strategy which represents a great opportunity to manage waste plastic materials with no adverse impacts.

6.RECCOMENDATION

- However there is no well-organized municipal waste management system, and sorting of all types of waste accordingly in different city of Ethiopia, there are different potential fungal strain isolated which could be important for degradation for both plastic and lignocellulose waste in converting of useful product.
- There are huge mass of municipal solid waste disposed to the environment with no use, there for Municipalities must work with researcher in converting of this mass of energy for compost making, biofuel and other bio product using microorganisms.
- Universities and research institute must carry out study in broad on municipal solid waste for their management and effective utilization instead of polluting environment and health problem for human and animals using potential microbes.
- Extensive research must carry out in selecting potential degrader microorganism for lignocellulos and plastic waste removal and effective useful utilization.

7. AKNOWELEDGMENT

It gives me a great pleasure to acknowledge Dr.Genene Tefera for his unreserved guidance and encouragement and support in providing and facilitating the

nessaccery equipment. And extremely greatful to acknowledge regional municipal leader of all city in the research area who helped me guiding the study area and finally goes to Ethiopian biodiversity institute, Microbial directorate and its research team for their un reserved support at field work especially Befikadu Teshome, Misganaw Wasie,and Endeshaw Abatneh, Lamesgen Zelalem.

8. BIBLIOGRAPHY

1. Adeyemo, I.A.; Sani, A. *J. Biology, Agriculture and Healthcare*. 66-71, 3, 2013.
2. Barratt, S.R.; Ennos, A.R.; Greenhalgh, M.; Robson, G.D.; Handley, P.S. *J. Appl .Microbiol*. 78-85,95, 2003.
3. Bentham, R. H.; Morton, L.H.G.; Allen, N.G. *J. Int Biodeterior*. 377-386,23,1987.
4. Biolog. YT Microplate instruction for use.Biolog,Inc. 1993.
5. Brocher ,B.R. Breath prints at microbial level.ASM News. 536-539, 55, 1989.
6. Chalmin, P.; Gaillochet, C. From Waste to Resource, An Abstract of World Waste Survey, Cyclope, Veolia Environmental Services, Edition Economica, France.2009.
7. Ekundayo, J.A. Environmental consequences of the pollution of the Lagos Lagoon.
8. Bulletin of the Science Association of Nigeria.290- 299, 3(2), 1977.
9. Gautam, P.S.; Bundela,P.S.; Pandey,A.K.; Jamaluddin.,;Awasthi, M.K.; Sarsaiya,S. Inter. J. Microb.1-13, 2012.
10. Ghosh,S.K.; Pal, S.; Ray, S. *Environ Sci Pollut. Res Int* . 4339-4355, 20, 2013.
11. Kathiresan, K. *Rev Biol Trop* . 629-634, 2003.
12. Kim, J.; Kim, H.S.; Chang, B.O.; Woo, S.I. *J. Environ Polym Degrad*. 9–18,2,1994.
13. Kumar, S.;Das, M. L.;Rebecca, J.; Sharmila, S. *J . Chem Pharm. Res*. 78-81 –194. 40 5(3),2013.
14. Mohhamod Gedefaw. *Inter. J. Sci & Tech Reser*. 1-9,4, 2015.
15. Neveen, S.;Geweely.; Salama A.O. *Afr. J. of Micro. Res*. 3273-3281, 5(20),2011.
16. Poonam, K. l.; Rajababu, V. ;Yogeshwari, J.; Patel, H. *Applied Ecology And Environmental Research.*441-449, 11(3), 2013.
17. Seneviratne, G.; Tennakoon, N.S.; Weerasekara, M.L.; Nanadasena , K.A. *Curr. Sci*. 20 -21, 90, 2006.
18. Shimao, M. (2001). Biodegradation of plastics. *J. Curr. Opin. Biotechnol*. 242-247, 12, 2001.
19. Shristi, K.K.; Hatha, A.A.M.; Christi, K.S. *Int. J. Trop. Biol*. 777-786, 55, 2007.
20. Sime, A.D.; Abbott, S.P. J. Mycologia **.** 1087-1088, 94,2002.
21. Spear, L.B.; Ainley, D.G.; Ribic, C.A. *Marine Environmental Research*. 123–146, 40, 1995.
22. Sudesh, S.H.; Abe, D.Y. *Afr. J. Microbiol. Res . Prog. Polymer Sci*. 1503-1555,25,2000.
23. Tchobanoglous, G.; Thiesen, H.; Vigil, S. Integrated solid waste management Engineering principles and management issues. McGraw-Hill. 949,1993.
24. Webb, J.S.; Nixon, M.;Eastwood, I.M.; Greenhalgh, M.;Robson, G.D.; Handley, P.S. *J. Appl. Environ. Microbiol.* 3194-3200, 66,2000.