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Original Paper

Mesophilic Mycobiota of Composted Sorghum Wastes in Egypt

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Abstract

Seven composted heaps in addition to the control heap (without microbiological inoculation) were inoculated with six highly ligno-cellulolytic microorganisms singly or in mixed forms as accelerators of the decomposition process for 60 days until compost maturity at room temperature. Throughout composting process at different interval periods (15, 30, 45 & 60 days), mycological survey was performed to select the most effective composts for research continuation. Nineteen fungal species belonging to 9 genera plus to one sterile mycelia were isolated from composted heaps on Czapek's-dextrose and potato-dextrose agar media using dilution-plate method accounting collectively 1696 x 10^4 cfu/g.The total fungal count of all treatments ranged between 113 – 545 x 10^4 cfu/g and it increased with microbial inoculation. *Aspergillus, Penicillium* and *Fusarium* were the most prevalent genera in composting process.*A. niger,A. fumigatus* and *P. chrysogenum* were the most predominant species. *Mucor racemosus, Fusarium solani*, *A. terreus,A. flavus,Emericella nidulans*, *A. foetidus,A. subsessils* and *F. incarnatum* were isolated in moderate frequencies of occurrence. While, *Trichoderma hamatum,P. brevicompactum*, *A. sydowii*, *A. ochraceous,* and *Saccharomyces cervisiae* were isolated in low frequencies of occurrence.

Key words: cereal wastes, mesophilic fungi, compositing, sorghum waste, recycling.

Introduction

Cereal crops are mostly grasses cultivated for their edible seeds (actually a fruit called a caryopsis). Cereal grains are grown in greater quantities worldwide than any other type of crop and provide more food energy to the human race than any other crop (http://en.wikipedia.org/wiki/Grains). The seven principal cereals grown in the world are wheat, maize, rice, barley, oats, rye and sorghum. Nowadays, cereals provide a very significant proportion of both human and animal diets. Wheat and rice are the most important crops worldwide as they account for over 50% of the world's cereal production. In the UK, wheat is the cereal most commonly used for the manufacture of food products, although many other types of cereals (e.g. maize, sorghum and barley) are used. The starchy carbohydrates which are provided by cereals are essential in human nutrition. Rice is a stable diet for half the world's population, the remaining half cultivating the other cereals pending on climate and soil (Arvanitoyannis and Tserkezou, 2008).

Egypt is famous for a huge number of sorghum wastes, there are more than 336.2 thousands feddan per year cultivated by sorghum (FAO, 2013) distributed all over Egypt. Large quantity of sorghum wastes becomes a great problem leads to different environmental pollutions. Disposal of such quantities could solve potential pollution problems and result in the loss of relatively valuable resources, suitable for meeting a variety of national needs. Sorghum waste is considered a suitable raw material for recycling because it is produced in large quantities in relatively localized areas. Compost is considered as a suitable means for

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disposal and recycling such large quantities of wastes (El-Shafei *et al*., 2008).

Most Egyptian soils especially sandy calcareous soils in newly reclaimed areas are usually deficient in organic matter, nitrogen, available and micronutrients. Therefore, the chemical fertilizers have been intensively used as alternative source of organic fertilizers. The intensive use of chemical fertilizers has been found to increase the pollution of soil, water and food. Therefore using agricultural wastes as soil amendments on farmland instead of burning is an attractive alternative because it allows for some cost recovery, improves soil physical properties and recycles the carbon into the soil (Abdel-Motaal, 2004).

Crop biofertilization in the last few decades becomes appositive alternative to chemical fertilization. Biofertilizers are safe for human, animal and environment that reduce the great pollution occurs in our environment. Also, they are responsible for soil humus formation, improving nutrients growth, yield as well as physical and chemical properties of plants and their productions (Hammam, 2003, Ahmed *et al*., 2005, and El-Shenawi *et al*., 2008).

Organic fertilizers not only increases the organic matter in the soil but also enhances the available P, K and most micronutrients through their effects on lowering soil pH. Using these fertilizers improve water use effecting. Also, organic nitrogen fertilizers are responsible for avoiding all forms of pollution that may result from conventional agriculture techniques. In addition, the high cost of inorganic fertilizers is considered a big problem effacing fruit crops growers and to their roles on health problem and environmental pollution (Nijjar, 1985 and Miller *et al*., 1990, Yang *et al.,* 2013).

Composting defined as the biological degradation of organic materials to a humus-like substance by natural microbiological processes constantly carried out in nature (Ancuta *et al*., 2011). Also, Mini *et al*. (1999) summarized the composting process as the biological decomposition of organic wastes under controlled conditions to a state which is sufficiently stable for utilization. Animal and human wastes, crop residues, as well as aquatic plants are considered the main resources available for composting. The crop residues, readily mineralizeable organic carbon, protein, cellulose, hemicellulose, lipids, and lignin could be the main resources for composting (Gaur, 1986, Gabhane *et al.*, 2012).

Materials and Methods

Collection of sorghum wastes samples:

Sorghum plant wastes such as leaves, stems, roots, ears were collected from different sorghum farms in Sohag Governorate to study different physical and chemical properties, microflora (fungi and bacteria), possibility using as natural compost and enrichment it with other organic manures such as farmyard and chicken manure.

Determination of moisture content:

Twenty-five grams of freshly collected sorghum wastes, farmyard manure, chicken manure and mixture of them (original compost heap sample) were dried in oven at **105°C** for about 24 hours, and then reweighed. The percentage of moisture content was then calculated according to the following equation:

$$\% \textbf{ moisture content} = \frac{A - B}{A} \times 100$$

Where:
A = weigh before drying
B = weigh of dried sorghum wastes

Isolation of fungi from different treatments of composting process of sorghum wastes

Dilution-plate method:-

The dilution-plate method was used for isolation of fungi from different treatment periods of composting process of sorghum wastes as described by Johnson *et al.* (1959). Total counts of mesophilic fungi were determined by using potato-dextrose agar medium and Czapek’s-dextrose agar medium supplemented byrose-bengal (15 ppm) (SubbaRoa, 1984).Ten plates were used for each sample and incubated at 28±2°C (five plates for each medium) for 7 days, during which the developing colonies were identified and counted (expressed as colony forming unit "cfu" per g dry sample). The average number of colonies per plate was multiplied by the dilution factor to obtain the number per gm. dry weight in the original samples**.**

Identification of fungal genera and species:

The fungal isolates were tentatively identified microscopically on the basis of their critical morphological structure (Moubasher, 1993). Isolates that failed to produce reproductive structures after 3-4 weeks of incubation were referred to as sterile mycelia, and divided into morphospecies according to their culture characteristics.

The following references were used for the identification of fungal genera and species (purely morphologically, based on microscopical characters**).**Raper and Thom (1949), Raper and Fennell (1965), Booth (1971 & 1977), Christensen and Raper (1978), Brycekendrick *et al*. (1980), Pitt (1985), Lawrence (1989), Klich and Pitt (1992), Moubasher (1993), Leslie and Summercell (2006),

Preparation of compost

Inoculating microorganisms:

Inoculating molds and yeast were isolated from sorghum wastes on potato-dextrose agar medium (PDA) at 28°C, while *Bacillus* sp. was isolated from the same material on nutrient agar medium at 45°C.

Inoculum preparation:

Moulds and yeast inocula were prepared by inoculation of spore suspensions 250 ml of *A. niger*, *Mucor racemosus*, *Tichoderma hamatum*, sterile myceliaand *Saccharomyces cervisia*, separately, under aseptic condition. Inoculated *Bacillus* sp. was prepared by inoculation of sterilized 250 ml nutrient broth for 48 hours at 45°C under aseptic conditions.

Preparation of composted heaps:

The experiment was carried out at the laboratory of physiology of fungi, Faculty of Science, Sohag University to investigate the possibility of using different ligno-cellulolytic microorganisms as a starter for composting of sorghum wastes (S.W) with farmyard and chicken manure to accelerate the process of decomposition and production of high quality compost rich with many essential elements, which was also targeted during this investigating.

Raw shredded sorghum wastes (S.W) were enriched with water (50-60%) according to Turpeinen (2007) before formulating the heaps and arranged in composting beds, mixed with chicken manure (CM) and farmyard manure (FYM) in ratio of 1:1:1 and added the inoculums. Each compost heap was 30kg.

A combination between raw materials and microorganisms under the study were constructed in different separated eight treatments as the following:

TA: Sorghum broken wastes SBW (control-1).
TB: SBW + CM+FYM (control-2).
TC: SBW + CM + FYM + *Aspergillus niger* +sterile mycelia + *Trichoderma hamatum* + *Mucor racemosus* + *Bacillus* sp.
TD: SBW + CM + FYM + *Trichoderma hamatum* + *Bacillus* sp.
TE: SBW + CM + FYM + *Aspergillus niger* + *Bacillus* sp.
TF: SBW + CM + FYM + sterile mycelia + *Bacillus* sp.
TG: SBW + CM + FYM + *Mucor racemosus* + *Bacillus* sp.
TH: SBW + CM + FYM + *Saccharomyces cervisiae* + *Bacillus* sp.

During composting, materials were manually mixed every week throughout the composting period for air circulation and temperature homogeneity. Three compost samples of each heap were taken every 15 days to determine the chemical properties. The moisture levels of the heaps were measured gravimetrically every week and appropriate amount of water was sprinkled onto the heap to increase the moisture content up to 60% (Turpeinen, 2007).

Results and Discussion:

Based on oven-dry method, the average moisture content percentage of sorghum wastes was 3.9 – 4.4%. Whereas, the average moisture content percentages of farmyard manure and chicken manure were 10.9 – 11.6 and 5.2- 5.8, respectively. Also, the average moisture content percentage of mixture of them (original compost heap sample) was 18.2 – 18.4.

In this study, many strains of ligno-cellulose decomposing organisms such as *Aspergillus niger*, *Trichoderma hamatum*, *Mucor racemosus*, sterile mycelia, *Bacillus* sp. and *Saccharomyces cervisiae* were usedas inoculums into compost heaps as microbial enrichment to accelerate composting process for efficient recycling and breakdown of sorghum wastes and additive materials to obtain the best compst that can produce high yield with the best characters of wheat plant (Giza, 168) as plant test.

The following reports and results are in full agreement with this application. This applied method was effective in recycling of plant and organic wastes as reported by (Martin and Gershuny, 1992). that there are two ways in which may influence a compost heap: (1) by introducing strains of microorganisms that are effective in breaking down of organic matter and (2) by increasing the nitrogen and other nutrients content of heap. (Diaz *et al.* 1993). reported that the most active organisms in the composting process are bacteria, fungi and actinomycetes. In respect to microbial enrichment of compost, (Tengerdy and Szakacs, 2003). reported that enrichment of the process of ligno-cellulose composting with *Aspergillus* and *Trichoderma* strains greatly increased the availability of different nutrients as compared with control (non inoculated treatment).

In respect to microbial enrichment of compost, also, (Gaur, 1987; Omima Abdel-Monsef, 2010 and Liu *et al*., 2011). reported that efficient cellulolytic fungi such as *Aspergillus, Trichoderma* and *Penicillium* accelerated composting for efficient recycling of crop wastes with high C/N ratio and reduced the composting period by about one month. (Requena *et al.*, 1997). had found that the inoculation of turnip compost with ligno-cellulolytic microorganisms (*Trichoderma viride* or *Bacillus* sp.) increased the degree of humification of organic matter and improve its quality as soil amendments. (Tengerdy and Szakacs 2003). reported that enrichment of the process of ligno-cellulose composting with *Aspergillus* and *Trichoderma* strains greatly increased the availability of different nutrients as compared with control (non inoculated treatment).

(Kumar *et al.*,2008). indicated that to make the process of lignin degradation economically viable, inoculation with ligno-cellulolytic microorganisms may prove beneficial. Since no single organism produces all the enzymes necessary for bioconversion of ligno-cellulose to optimum level, there is need to use a consortium of ligno-cellulolytic microorganisms, which can act synergistically for rapid bioconversion of agriculture residues without any chemical pretreatment.

In the present study, 19 fungal species belonging to 9 genera plus to sterile mycelia were isolated from compost heaps composed of sorghum wastes and the additive materials during eight different treatments at 28^{o}C on Czapek's and PDA media using dilution-plate method accounting collectively 1696 x 10^4 cfu/g. The total fungal count of all treatments ranged between 113 x 10^4 – 545 x 10^4 cfu/g as shown in Table (1).

+	Compost Treatments																General total count	%	NCI	OR
	TA		TB		TC		TD		TE		TF		TG		TH					
	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI				
Total count	113		118		137		234		545		258		163		`128		1696			
Aspergillus	78	8	59	8	77	8	99	8	168	8	78	8	93	8	57	8	709	41.80	64	H
A. niger	46	7	25	8	16	5	42	7	56	7	19	7	23	8	13	6	240	14.15	55	H
A. fumigatus	8	3	-	-	11	6	22	7	52	6	25	5	37	8	-	-	155	9.14	36	H
A. terreus	8	3	7	4	7	2	-	-	-	-	-	-	24	8	-	-	46	2.71	25	M
A. flavus	-	-	11	4	43	7	14	6	-	-	21	7	-	-	27	8	116	6.84	24	M
A. foetidus	16	4	16	5	-	-	-	-	-	-	13	5	-	-	17	7	62	3.66	21	M
A. subsessils	-	-	-	-	-	-	13	5	13	3	-	-	-	-	-	-	26	1.53	16	M
A. sydowii	-	-	-	-	-	-	-	-	38	6	-	-	9	5	-	-	47	2.77	11	L
A. ochraceous	-	-	-	-	-	-	8	4	9	4	-	-	-	-	-	-	17	1.00	8	L
Penicillium	-	-	15	6	15	5	19	5	186	8	20	8	-	-	27	8	282	16.63	40	H
P. chrysogenum	-	-	-	-	15	5	19	5	133	8	20	8	-	-	12	7	199	11.73	33	H

Table. 1. Comparison of total counts and number of cases of isolation of mesophilic mycoflora of compost heaps isolated during different treatments of composting process.using dilution-plate method at 28^{O}C.

Total countof fungiincreased with microbial inoculation which accelerate decomposing wastes and additive materials tomicronutrientsthatencouraged and activated fungal growth.Total count of fungi and number of species recorded the maximumvaluesin treatment D(545 x 10^4 cfu/g and 5 genera & 10 species). While the lowest total counts were recorded in treatment A (113 x 10^4 cfu/g), without any microbial inoculation, which considered as control, treatment B (118 x 10^4 cfu/g) and treatment H (128 x 10^4 cfu/g) as stated in Table (1), Figs 1 (A & B).

Fungal genera and species	**Compost Treatments**																**General total count**	**%**	**NCI**	**O R**
	TA		TB		TC		TD		TE		TF		TG		TH					
	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI				
P. brevicompactum	-	-	15	6	-	-	-	-	53	5	-	-	-	-	-	-	68	4.01	11	L
P. restrictum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	7	15	0.89	7	R
Fusarium	13	5	-	-	4	2	34	8	-	-	57	8	21	8	13	6	142	8.37	37	H
F. solani	13	5	-	-	-	-	34	8	-	-	28	8	21	8	-	-	96	5.66	29	M
F. incarnatum	-	-	-	-	4	2	-	-	-	-	29	8	-	-	13	6	46	2.71	16	M
Sterile mycelia	3	2	13	6	13	6	13	6	-	-	102	7	11	6	-	-	155	9.14	33	H
Mucor racemosus	5	3	19	8	5	2	13	4	122	8	1	1	25	6	-	-	190	11.20	32	M
Emericella nidulans	14	5	12	6	-	-	-	-	37	6	-	-	-	-	14	6	77	4.54	23	M
Trichoderma hamatum	-	-	-	-	23	7	56	8	-	-	-	-	-	-	-	-	79	4.66	15	L
Saccharomyces cervisiae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	8	17	1.00	8	L
Rhizopus stolonifer	-	-	-	-	-	-	-	-	32	7	-	-	-	-	-	-	32	1.89	7	R

Table. 1. Continued

These results are similar to those obtained by Omima Abdel-Monsef (2010). Anastasi *et al., (*2005) found that the total fungal load was up to 8.2 x10^5 cfu/g. Also, (Thambirajah *et al*., 1995). reported that the number of mesophilic fungi was 10^6 cfu/g in mature compost.

The most common fungal genera and species were belonging to *Aspergillus*, *Penicillium* and *Fusarium* species. *Aspergillus* (709 x 10^4, 41.8% of general total count & 64 cases with high frequency of occurrence), *Penicillium* (282 x 10^4, 16.63% of general total count & 40 cases out of 64 tested, with high frequency of occurrence), *Fusarium* (142 x 10^4, 8.37% of general total count & 37cases out of 64 tested with high frequency of occurrence)in addition to sterile mycelia (155 x 10^4 , 9.14% of general total count & 33 cases out of 64 tested with high frequency of occurrence)were the most prevalent genera isolated in composting process as stated in Table (1), Figs 1 (A & B).

Fungal genera and species	**Compost Treatments**																General total count	%	NCI	O R
	TA		TB		TC		TD		TE		TF		TG		TH					
	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI	TC	NCI				
Scopulariopsis brevicaulis	-	-	-	-	-	-	-	-	-	-	-	-	13	3	-	-	13	0.77	3	R
Fungal genera & species	4 & 7 + sterile mycelia		4 & 7 + sterile mycelia		5 & 8 + sterile mycelia		5 & 9 + sterile mycelia		5 & 10		4 & 8 + sterile mycelia		4 & 7 + sterile mycelia		5 & 8					
Total fungal genera & species	9 genera & 19 species + sterile mycelia																			

Table. 1. Continued

TC: Total counts of fungi multiplied in 10^4
NCI: Number of cases of isolation
OR: Occurrence remarks:-
(H) High: more than 32 out of 64 cases tested.
(M) Moderate: 16- 32 out of 64 cases tested
(L) Low: 8-15 out of 64 cases tested.
(R) Rare: less than 8 out of 64 cases tested

These results are in agreement with Van Heerden *et al*., (2002). This may be due to the composition of raw material (SBW) that is built up from cellulose, hemicellulose and lignin, which favor the growth of these fungi under mesophilic conditions. This finding is greatly supported by results of (Astaraei 2008). who suggested that the presence of fungi such as *Aspergillus, Fusarium* and *Trichoderma* in organic litters can be attributed to high contents of cellulose and hemicellulose in most of organic litters.

In this study, it was observed that *A. niger* was the most dominant species in all treatments inoculated with the same fungus. *A. niger* accounting (240 x 10^4 cfu/g, 14.51% of total count & with high frequency of occurrence 55 cases out of 64 tested) and *A. fumigatus* matching (155 x 10^4 cfu/g, 9.14% & with high frequency of occurrence 36 cases out of 64 tested) and *P. chrysogenum* recorded (199 x 10^4 cfu/g, 11.73% of total count & with high frequency of occurrence 33 cases out of 64 tested) were the most predominant species as stated in Table (1), Figs 1 (A & B).

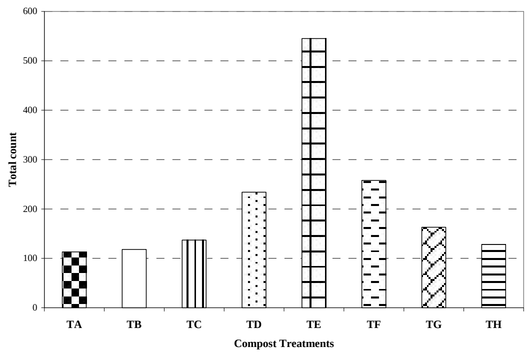

Fig. 1 (A). Comparison between total counts of mesophilic fungi of compost heaps isolated during different treatments of compostin process using dilution-plate method at 28°C.

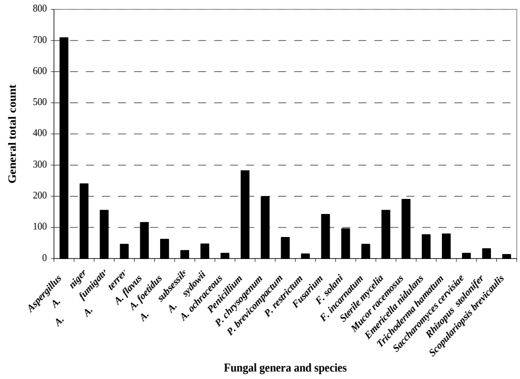

Fig. 1 (B). Comparison between different fungal genera and species of compost heaps isolated during different treatments of composting process using dilution-plate method at 28°C.

This flourish of *A. niger* may be due to the antagonistic activity that suppress the activity of other fungi in its own occurred area. This suggestion could be supported by Suarez-Estrella (2007) and Omima Abdel-Monsef (2010).

Also, Rai and Upadhyay (2002) observed that colonization of pigeon-pea substrate by *Fusarium udum* was highly suppressed by antagonism from *Penicillium citrinum, A. niger, Micromonospora globosa, A. flavus, A. terreus* and *Trichoderma viride* when these fungi were used in inoculation. On the other hand, (Adegunloye *et al*., 2007). reported that *A. niger* was the predominant fungus isolated from compost specially at the latter weeks. (Gray and Briddlestone, 1981). suggested that the presence of *A. niger* could have been aided by its ability to adapt to the moderately high temperature of the compost (25 - 30°C).

Also, *Penicillium chrysogenum* was prevalent, its frequencies and total counts were flourished on PDA, it was isolated also on the same medium from FYM during composting process under mesophilic conditions. It was isolated from mushroom compost and vermicompost by (Anastasi *et al*., 2002;Omima Abdel-Monsef,2010).reported that, *P. chrysogenum* was the most common species on PDA in composting process with TC, TD, TE, TF and TH. She suggested that *P. chrysogenum* was coming from air to these treatments and plays a role in the producing of antibiotics. This observation was in agreement with Suarez-Estrella (2007) who, confirmed that *Penicillium* spp. and other fungi have been identified as biocontrol agents in compost amended substrates and he also reported that most species of *Penicillium* produce antibiotic metabolites. Domsch *et al.* (1993) recorded that *Penicillium* spp. can degrade cellulose, lignin and pectin.

Also, in this study, *Mucor racemosus* (190 x 10^4 cfu/g, 11.20% of total count & 32 cases out of 64 tested), *Fusarium solani* (96 x 10^4 cfu/g, 5.66% & 29 cases), *Aspergillus terreus* (46 x 10^4 cfu/g, 2.71% & 25 cases), *A. flavus* (116 x 10^4 cfu/g, 6.84% & 24 cases), *Emericella nidulans* (77 x 10^4 cfu/g, 4.54% & 23 cases) *A. foetidus* (62 x 10^4 cfu/g, 3.66% & 21 cases), *A. subsessils* (26 x 10^4 cfu/g, 1.53% & 21 cases) and *F. incarnatum* (46 x 10^4 cfu/g, 2.71 & 16 cases) were isolated in moderate frequencies of occurrence. While, *Trichoderma hamatum* (79 x 10^4 cfu/g, 4.66% of total count & 15 cases out of 64 tested), *Penicillium brevicompactum* (68 x 10^4 cfu/g, 4.01% of total count & 11 cases out of 64 tested) *Aspergillus sydowii* (47 x 10^4 cfu/g, 2.77% of total count & 11 cases out of 64 tested), *A. ochraceous* (17 x 10^4 cfu/g, 1.00% & 8 cases)and *Saccharomyces cervisiae* (17 x 10^4 cfu/g, 1.00% & 8 cases) were isolated in low frequencies of occurrence. Whereas, *Rhizopus stolonifer* (32 x 10^4 cfu/g, 1.89% of total count & 7 cases out of 64 tested), *P. restrictum* (15 x 10^4 cfu/g, 0.89% of total count & 7 cases out of 64 tested) and *Scopulariopsis brevicaulis* (13 x 10^4 cfu/g, 0.77% of total count & 3 cases out of 64 tested) were isolated in rare frequencies of occurrence as stated in Table (1), Figs 1 (A & B)..

Omima Abdel-Monsef (2010) reported that *Scopulariopsis brevicaulis* was isolated from date-palm residues and also isolated by Ryckeboer *et al.* (2003) from garden waste and municipal solid waste. The genus *Scopulariopsis* was mentioned by Tuomela *et al.* (2000) for its ability to degrade cellulose and lignin and also by Anastasi *et al.* (2002) to degrade keratin.

Results in this study are in harmony with the results recorded by Omima Abdel-Monsef (2010), who reported that in other treatments, other fungi e.g. *Aspergillus sydowii*, *A. flavus, A. ochraceus*, *Rhizopus stolonifer*, *Penicillium brevicompactum, P. purpurogenum, Mucorracemosus*, *Stachybotrys chartarum, Fusarium incarnatum,Chaetomium globosum* and *Cladosporium cladosporioides* were recorded in low counts.

Most of fungal genera isolated in this study during composting process like, *Emericella, Rhizopus* and *Stachybotrys* were reported as cellulose decomposers (Tuomela *et al*., 2000 and Rocha *et al*., 2002 and Omima Abdel-Monsef 2010). Domsch *et al.* (1993) and Tuomela *et al.* (2000) recorded that *Aspergillus* spp. and *Fusarium* spp. can degrade cellulose, hemicellulose and lignin.

Cladosporium, *Chaetomium* and *Mucor* were isolated in this study during compost ripening in low frequenctes. The ability of these fungi to degrade cellulose, hemicellulose and lignin was proved by Domsch *et al.* (1993) and Tuomela *et al.* (2000).

According to mycological survey of different composted heaps, composted heaps of treatments C, D, E, F and G were preliminary selected for several physical and chemical tests in addition to pot experiment using wheat plant (Giza 168) as test plant to select the best organic compost can be applied in soil and plant fertilization**.**

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الملخص العربى

فطريات التدويرالميكروبيولوجى لمخلفات الذرة الرفيعة إلى سماد عضوى فى مصر

تم إجراء سبع معاملات ميكروبيولوجية مختلفة لمخلفات الذرة الرفيعة المُضاف عليها سباخ المواشى و**زرق الدواجن بنسبٍ** متساويةٍ(**١: ١ : ١**)**بالإضافة للكنترول** (مخلفات الذرة فقط بدون أى معاملات ميكروبيولوجية) للإسراع فى عملية تحليل المخلفات وتحويلها إلى سمادعضوى (**كمبوست**)، وتم تسجيل نتائج نمو الفطريات أثناء عملية نضج الكمبوست عند فترات زمنية (١٥، ٣٠ ، ٤٥&٦٠ يوماً) على الوسطين الغذائين تشابكس-ديكستروز آجار و بطاطس -ديكستروز آجار باستخدام طريقة التخفيف المتسلسل عند درجة حرارة**٢٨م**ْ.وقد تم عزل وتعريف ١٩ نوعاً من الفطريات تنتمي إلى ٩ **أجناسٍ** بالإضافة إلى فطرٍ عقيم الميسيليوم من مختلف أنواع الكمبوست الثمانية وقد كان التعداد الكلى لهذه الفطريات المحبة لدرجة **الحرارة المتوسطة مجتمعةً**١٠^{٤} × ٦٩٦١**فطر/جم** .وتراوح التعداد الكلى للفطريات بين أكوام الكمبوست ما بين (**٥٤٥** -١١٣ × ١٠^{٤}**فطر/جم**)وقد تزايد التعداد الكلى في الأكوام المعاملة ميكروبيولوجياً حيث حللت الكائنات الميكروبية مكونات الكمبوست إلى مكوناتها البسيطة التي حفزت نمو الفطريات. وقد سُجل أعلى تعداد للفطريات وكذلك الأجناس والأنواع الفطرية في المعاملة **D**(١٠^{٤} × ٥٤٥**فطر /جم، ٥ أجناس و ٤ أنواع** فطرية)، بينما سُجل أقل تعداد للفطريات في المعاملة**A** (١٠^{٤} × ١١٣**فطر / جم**)، **المعاملة B** (١٠^{٤} × ١١٨**فطر /جم)والمعاملة H** (١٠^{٤} × ١٢٨**فطر /جم)**.كانت أكثر الأجناس الفطرية المعزولة انتشاراً بدرجاتٍ عالية التواجد أثناء عملية تسوية وإنضاج الكمبوست هى الأسبرجيليس ، البنيسيليوم والفيوزاريوم ب**الإضافة إلى فطرٍ** عقيم الميسيليوم. ولذا فقد كانت أكثر الأنواع الفطرية المعزولةانتشاراً بدرجاتٍ عالية التواجد هى أسبرجيليس نيجر، أسبرجيليس فيوميجاتس وبنيسيليوم كريزوجينيوم، بينما الأنواع الفطرية المتوسطة الانتشار هي ميوكور راسيموسيس، فيوزاريوم سولاناى، أسبرجيليس تيريوس، أسبرجيليس فلافس، إيميرسيلاّ نيديولانس، أسبرجيليس فيوتيديس، أسبرجيليس سوبسيسيلس وفيوزاريوم إينكارناتيوم .**و**تشـــيرنتائج الفحص الميكولوجى المُتحصل عليها إلى اختيار أنواع الكمبوست **C، D، E،&G F**ا**لإتمام مراحل وخطوات البحث الاخرى** وذلك لأنها أفضل الأنواع المختبرة ميكولوجياً مما يوضح مدى تحليل مكونات الكمبوست المعقدة إلى مكوناتها البسيطة التي يحتاجها النبات والتربة**.**