ANTIFUNGAL ACTIVITIES OF MYCELIA AND CULTURE FILTRATE OF FOUR OYSTER MUSHROOM SPECIES (*PLEUROTUS* SPP.) AGAINST PATHOGENIC FUNGI

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Introduction

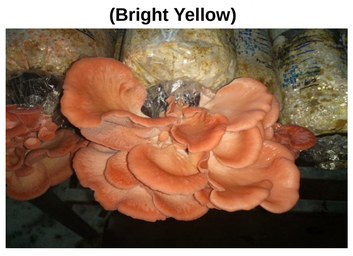
This study is important as it enables the use of spent mushroom substrate for biocontrol against fungal pathogens and button mushroom (*Agaricus bisporus*) pathogens. Oyster mushroom is an edible mushroom. It can be cultivated on a wide variety of substrates containing lignin and cellulose. It has nutritional and medicinal properties (Gregori *et al.*, 2007). *Trichoderma harzianum* causes extensive losses in the cultivation of oyster and button mushroom species and it is isolated from mushroom farms, while other *Trichoderma* species are common contaminants of spawn, compost, and wood in commercial mushroom growing facilities (Castle *et al.*, 1998; Angelini *et al.*, 2008). At the same time *T. harzianum* is an effective bio control agent for several plants fungal diseases (Abdel-Fattah *et al.*, 2007). High temperature typically stimulates the growth rate and antagonistic activity of *Pleurotus tuberregium*, particularly against *Fusarium culmorum* and *T. harzianum*. The fungal contaminant *T. harzianum* may not be able to cause economic loss in the commercial cultivation of *P. tuberregium* and mycelium of *P. tuberregium* was able to overgrow completely some pathogenic fungi (Badalyan *et al.*, 2008).

Materials & Methods

***P. ostreatus* (Grey)**

***P. ostreatus* (White)**

***P. cornucopiae var. citrinopileatus* (Bright Yellow)**



***P. salmoneostramineus* (Pink)**

Mushroom Strains

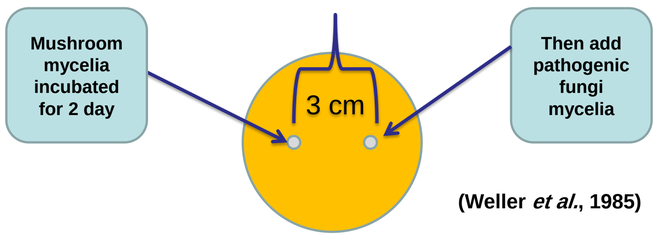
- ***Pleurotus ostreatus* G (Grey)**
- ***Pleurotus ostreatus* W (White)**
- ***Pleurotus cornucopiae* var. *citrinopileatus* Y (Bright Yellow)**
- ***Pleurotus salmoneostramineus* PK (Pink)**
- ***Mushroom Box Company, Monmouth, UK**

Pathogenic Fungi

- ***Trichoderma harzianum* (T)**
- ***Verticillium* sp. (V)**
- ***Pythium* sp. (P)**
- ***Plant Pathology and Fungi Lab., College of Science, University of Anbar**

Weller Method

Interaction between the Mycelia of 4 Species of *Pleurotus* spp. and 3 Pathogenic Fungi



(Weller *et al.*, 1985)

Antifungal Activities of Culture filtrates of Oyster Mushrooms against Fungal Pathogens

A. Collection of Liquid Culture Filtrate

-Incubated for 21 days in PDB at 25 C
-Collect culture filtrate
-Autoclaved
-Add 50% fresh PDB with 50% culture filtrate
-Fresh PDB as control

B. (PIMG) Percent Inhibition of Mycelial Growth in solid media (PDA) by add agar to 50%:50%(v:v) fresh and culture filtrate

C. (PIMW) Percent Inhibition of Biomass production of pathogenic fungi in LIQUID MEDIA (PDB)

Discussion & Results

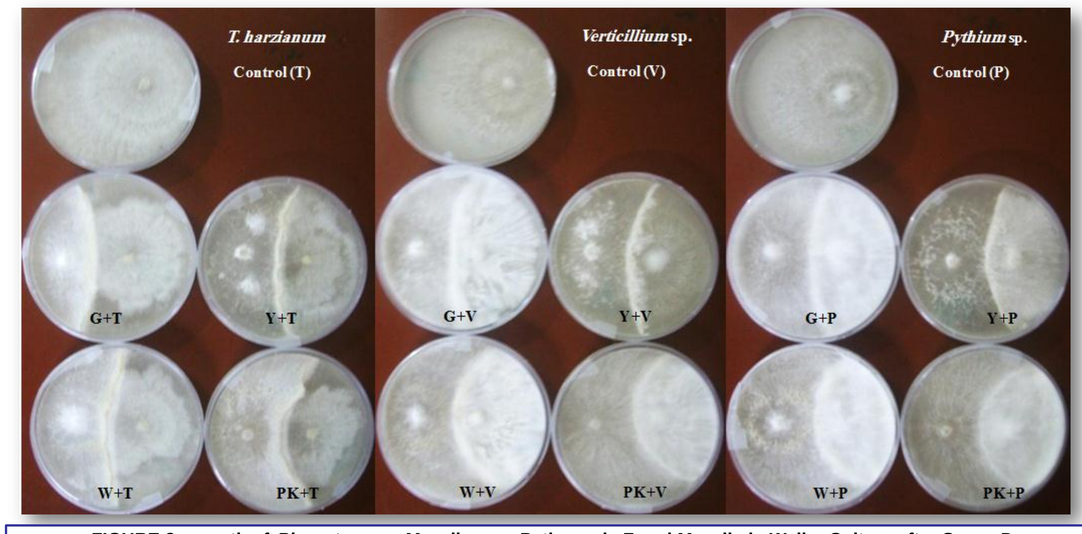
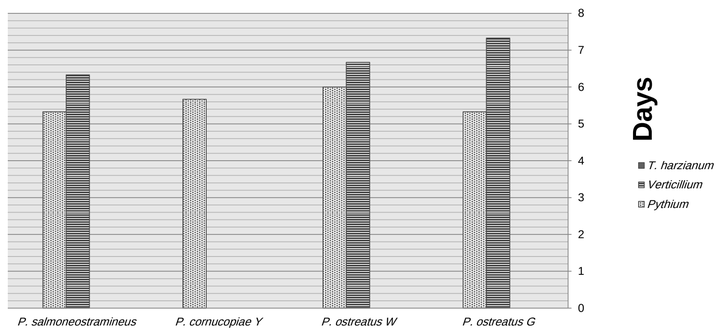


FIGURE 2: growth of *Pleurotus* spp. Mycelia over Pathogenic Fungi Mycelia in Weller Culture after Seven Days
G+T: *P. ostreatus* G with *T. harzianum*, W+T: *P. ostreatus* W with *T. harzianum*, Y+T: *P. cornucopiae* with *T. harzianum*, PK+T: *P. salmoneo….* with *T. harzianum.*
G+V: *P. ostreatus* G with *Verticillium*, W+V: *P. ostreatus* W with *Verticillium*, Y+V: *P. cornucopiae* with *Verticillium*, PK+V: *P. salmoneostramineus* with *Verticillium.*
G+P: *P. ostreatus* G with *Pythium*, W+P: *P. ostreatus* W with *Pythium*, Y+P: *P. cornucopiae* with *Pythium*, PK+P: *P. salmoneostramineus* with *Pythium.*

Table 1: Percent Inhibition of *Pleurotus* spp. Mycelia against Pathogenic Fungi on PDA after Four Days by Weller Method in Petri Dishes 9 mm

Pathogenic Fungi (PF)	*Pleurotus* spp. oyster mushroom (OM) mycelia (OM)				Mean PF
	P. ostreatus Grey	*P. ostreatus* White	*P. cornucopiae* Yellow	*P. salmoneostramineus* Pink	
T. harzianum	46.15	47.18	49.74	50.77	48.46
Verticillium sp.	49.21	54.50	52.38	55.56	52.91
Pythium sp.	50.79	54.50	52.91	54.50	53.18
Mean OM	48.72	52.06	51.68	53.61	51.52
LSD P> 0.05	PF=1.123 , OM=1.297 , PF * OM=2.246				



Growth of *Pleurotus* spp. Mycelia over Pathogenic Fungi Mycelia

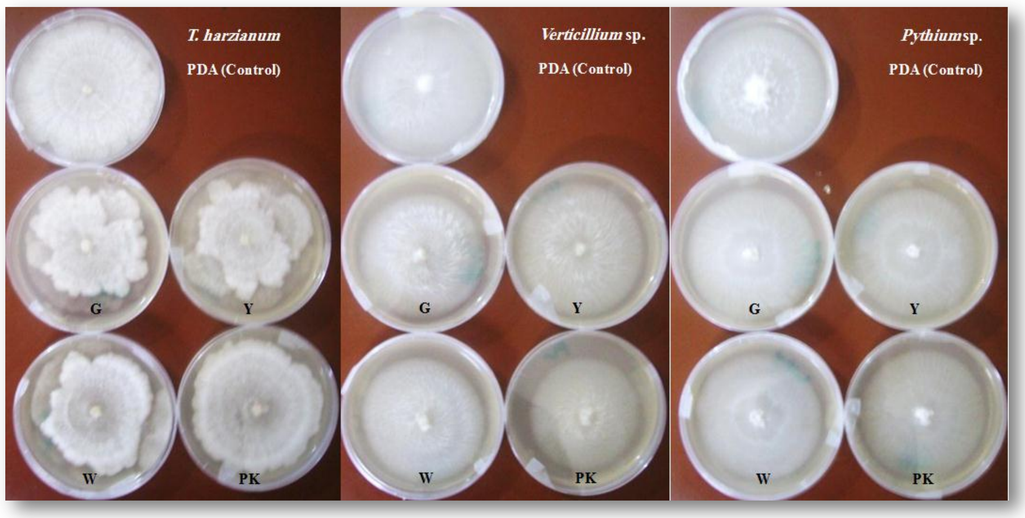


FIGURE 3: Mycelial Growth Pattern of Pathogenic Fungi on Solid Medium of *Pleurotus* spp. Culture Filtrate after Five Days
PDA: Fresh Potato Dextrose Agar 100% as Control, G: Solid Medium of *P. ostreatus* G Culture Filtrate with Fresh Potato Dextrose Broth 50%:50% (v/v), W: Solid Medium of *P. ostreatus* W Culture Filtrate with Fresh Potato Dextrose Broth 50%:50% (v/v), Y: Solid Medium of *P. cornucopiae* Culture Filtrate with Fresh Potato Dextrose Broth 50%:50% (v/v), PK: Solid Medium of *P. salmoneostramineus* Culture Filtrate with Fresh Potato Dextrose Broth 50%:50% (v/v).

TABLE 3: Percent Inhibition of *Pleurotus* spp. Culture Filtrate on Pathogenic Fungi in Agar Medium after Five Days

Pathogenic Fungi (PF)	Solid medium of Pleurotus spp. (oyster mushroom) culture filtrate (OM)				Mean PF
	P. ostreatus Grey	*P. ostreatus* White	*P. Cornucopiae* Yellow	*P. salmoneostramineus* Pink	
T. harzianum	11.60	6.40	6.00	4.40	7.10
Verticillium sp.	0.90	6.28	1.34	12.33	5.21
Pythium sp.	1.75	5.66	4.57	6.75	4.68
Mean OM	4.75	6.11	3.97	7.82	5.66
LSD P> 0.05	PF=0.817 , OM=0.943 , PF * OM=1.634				

TABLE 5: Percent Inhibition of *Pleurotus* spp. Culture Filtrate against Pathogenic Fungi in liquid Medium after Ten Days

Pathogenic Fungi (PF)	Liquid medium of Pleurotus spp. (oyster mushroom) culture filtrate				Mean PF
	P. ostreatus Grey	*P. ostreatus* White	*P. cornucopiae* Yellow	*P. salmoneostramineus* Pink	
T. harzianum	55.00	3.33	15.00	33.33	26.67
Verticillium sp.	43.94	31.82	13.64	50.00	34.85
Pythium sp.	33.33	12.70	31.74	19.05	24.20
Mean OM	44.09	15.95	20.13	34.13	28.57
LSD P> 0.05	PF=1.219 , OM=1.408 , PF * OM=2.439				

Conclusions

Antifungal activities of four *Pleurotus* spp. (oyster mushrooms) against three pathogenic fungi - *Trichoderma harzianum*, *Verticillium* sp. and *Pythium* sp. were evaluated by interaction between mushroom and pathogenic fungi mycelia. The best inhibitory activity of 55.56% was by *P. salmoneostramineus* against *Verticillium* sp., while least percent inhibition of 46.15% was by mycelia *of Pleurotus ostreatus* (grey) against *T. harzianum*. Then *Pleurotus ostreatus* (grey) grew over the mycelia of *Pythium* sp by 5.33 days while *P. cornucopiae* var. *citrinopileatus* mycelia did not grow over the mycelia of *Verticillium* sp. and *T. harzianum*. Antifungal activity of culture filtrate of *Pleurotus* spp. on agar media was variable.The highest inhibitionwas 12.33% followed 11.60% for *P. salmoneostramineus* and *P. ostreatus* (grey) against *Verticillium* sp. and *T. harzianum* respectively. Whereas a lower inhibition at 1.34% and 1.75% was observed for culture filtrate of *P. cornucopiae* and *P. ostreatus* (grey)against *Verticillium* sp. and *Pythium* sp.respectively. In liquid media, the highest inhibition was 55% and 50% by *P. ostreatus* (grey) and *P. salmoneostramineus* culture filtrate against *T. harzianum* and *Verticillium* sp. respectively, whereas low inhibition of 3.33% by *P. ostreatus* (white) against *T. harzianum*.

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Doi: 10.13140/2.1.4684.8322