GROWTH AND CELLULAR ULTRASTRUCTURE OF THE MYCELIAL PHASE OF FILAMENTOUS FUNGI ISOLATED FROM A PAPER INDUSTRY GROWN ON DI (2-ETHYL-HEXYL) PHTHALATE

José Luis Torres García[1], Adriana Madrid Ramírez[1], Miriam Ahuactzin Pérez[2], Gerardo Díaz Godínez[1,3], Rubén Díaz Godínez[1,3], *Carmen Sánchez[1,3]; [1]Maestría en Ciencias Biológicas, Universidad Autónoma de Tlaxcala, Tlaxcala, Tlax., C.P. 90062, México, [2]Facultad de Agrobiología, Universidad Autónoma de Tlaxcala, Ixtacuixtla, Tlax., C.P. 90120, México, [3]Centro de Investigación en Ciencias Biológicas, Universidad Autónoma de Tlaxcala, Ixtacuixtla, Tlax., C.P. 90120, México. Tel/Fax +52 2484815482, *Corresponding author* email: sanher6@hotmail.com*

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Introduction. Filamentous fungi are able to degrade lignocellulosic substrates. These fungi had two phases of growth; vegetative and reproductive. It has been reported that the wall of hyphae from the central zone of the colony that corresponds to mature hyphae (MH) was around twice the thickness of the wall from the periphery of the colony or young zone (YH)[1]. It has been reported that these fungi are able to grown on phthalates[2]. These are plasticizer that contributing to the environmental pollution[3]. The objective of this work was to evaluate the diameter of hyphae (DH), thickness from the cell wall (TCW) and growth of filamentous fungi grown on di (2-ethylhexyl) phthalate (DEHP).

Methods. Radial growth rate (u_r)[4] and biomass (Bm)[5] of filamentous fungi were evaluated in media containing mineral salts (MS) and different concentrations of DEHP (mg/l): 1) medium containing MS (without DEHP), 2) 500 of DEHP+MS and 3) 1000 of DEHP+MS. DH and TCW were evaluated using image analysis (Image Pro-Plus)[1].

Results. *Neurospora sitophila* had higher u_r than the other fungi. Strain P7 (in process of identification) had highest biomass **(Table 1)**, DH and TCW in media containing 1000 mg/l of DEHP **(Tables 2, 3)**.

Table 1. Radial growth rate and biomass of filamentous fungi grown on different concentrations of DEHP.

Strain	Culture media					
	u_r (mm/h)			Bm (g/cm^2)		
	SM	SM+500 mg/l DEHP	SM+1000 mg/l DEHP	SM	SM+500 mg/l DEHP	SM+1000 mg/l DEHP
Neurospora sitophila	1.06^a (0.525)	1.19^a (0.039)	1.05^a (0.017)	0.004^a (0.0006)	0.008^a (0.001)	0.012^b (0)
P7	0.75^a (0.005)	0.89^b (0.023)	0.55^c (0.009)	0.004^a (0.001)	0.010^b (0.002)	0.015^b (0.004)
Trichoderma atroviride	0.65^a (0.016)	0.50^b (0.048)	0.64^a (0.004)	0.002^a (0.0006)	0.004^b (0.0006)	0.005^b (0.001)
Hipocrea lixii	0.60^a (0.006)	0.66^a (0.001)	0.78^a (0.016)	0.003^a (0.0006)	0.003^a (0.001)	0.006^b (0.006)
Trichoderma harzianum	0.74^a (0.019)	0.44^b (0.072)	0.97^c (0.002)	0.008^a (0.006)	0.004^b (0.0004)	0.008^a (0.003)

Means with the same letter within a row are not significantly different. Data were evaluated using ANOVA and Tukey test. (P<0.01). Numbers in parenthesis correspond to SD of three separate experiments.

Table 2. Thickness from the cell wall of filamentous fungi grown on different concentrations of DEHP.

Strain	TCW (µm)					
	Culture media					
	SM		SM+500 mg/l DEHP		SM+1000 mg/l DEHP	
	YZ	MZ	YZ	MZ	YZ	MZ
Neurospora sitophila	0.233^e (0.002)	0.234^e (0.003)	0.274^d (0.002)	0.304^c (0.004)	0.284^c (0.003)	0.329^a (0.001)
P7	0.269^d (0.003)	0.264^e (0.003)	0.260^e (0.003)	0.307^b (0.005)	0.289^c (0.003)	0.346^a (0.002)
Trichoderma atroviride	0.232^e (0.002)	0.234^e (0.002)	0.252^d (0.003)	0.273^b (0.001)	0.258^c (0.002)	0.284^a (0.003)
Hypocrea lixii	0.233^e (0.002)	0.235^e (0.002)	0.256^d (0.002)	0.284^b (0.003)	0.268^c (0.001)	0.285^a (0.002)
Trichoderma harzianum	0.237^e (0.003)	0.235^e (0.003)	0.257^d (0.002)	0.272^c (0.003)	0.278^b (0.001)	0.280^a (0.001)

Means with the same letter within a row are not significantly different. Data were evaluated using ANOVA and Tukey test. (P<0.01). Numbers in parenthesis correspond to SD of three separate experiments.

Table 3. Diameter of hyphae of filamentous fungi grown on different concentrations of DEHP.

Strain	DH (µm)					
	Culture media					
	SM		SM+500 mg/l DEHP		SM+1000 mg/l DEHP	
	YZ	MZ	YZ	MZ	YZ	MZ
Neurospora sitophila	1.59^d (0.086)	1.94^b (0.038)	1.76^c (0.021)	1.88^c (0.026)	1.96^b (0.01)	2.11^a (0.015)
P7	1.59^e (0.015)	1.97^c (0.040)	1.85^d (0.053)	2.08^b (0.072)	1.99^c (0.026)	2.29^a (0.040)
Trichoderma atroviride	1.51^f (0.055)	1.71^d (0.036)	1.67^e (0.055)	1.89^b (0.079)	1.77^c (0.04)	1.97^a (0.040)
Hypocrea lixii	1.51^e (0.055)	1.71^c (0.036)	1.67^d (0.02)	1.89^b (0.015)	1.75^c (0.012)	1.97^a (0.035)
Trichoderma harzianum	1.51^f (0.055)	1.71^c (0.036)	1.62^e (0.02)	1.79^b (0.015)	1.65^d (0.012)	1.90^a (0.035)

Means with the same letter within a row are not significantly different. Data were evaluated using ANOVA and Tukey test. (P<0.01). Numbers in parenthesis correspond to SD of three separate experiments.

Conclusions. In general, the u_r, biomass, DH and TCW of the YZ and MZ were higher in media containing 1000 mg/l of DEHP than in the rest of the media for all fungi. These results suggest that these fungi are able to use DEHP as a sole source of carbon and energy.

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