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Trichoderma

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(// : // :)

Trichoderma

RBSF

DNA

Trichoderma

5.8S	ITS1	rDNA	ITS			
	ITS			ITS4	ITS1	ITS2

TrichOKEY 2

T. hamatum *T. atroviride* *T. virens* *Trichoderma harzianum*
T. asperellum *brevicompactum*
T. virens *T. harzianum* *Trichoderma*

T. harzianum *Trichoderma*

T. virens

T. atroviride

Trichoderma harzianum ITS :
T. virens

(Kubicek *et al.*, 2003)

« »

(Druzhinina & Kubicek, 2005)

(Druzhinina &

.Kubicek, 2005)

(Druzhinina *et al.*,

(Harman *et al.*, 2004)

(1998) Gams & Bissett .2006)

(Ospina-Giraldo *et al.*, 1999)

(Kredics *et*

.*al.*, 2003)

Hypocrea

(2003) Bissett *et al.*

(Samuels, 2006)

(2006) Samuels .

()

(Bissett *et al.*, 2003)

(1969) Rifai

(Druzhinina & Kubicek, !

(2006) Samuels .2005)

DNA

(1984, 1991a-c, Bissett

1992)

(1969) Rifai

DNA

Longibrachiatum

Saturnisporum Trichoderma Pachybasium

Hypocreanum

(Samuels, 2006)

Druzhinina *et al.*

DNA

(2005)

1. Species aggregate

2. Section

... *Trichoderma*

:

ITS2 ITS1

rDNA

(2004) Craus *et al.*

TrichOKEY 2.0

T. brevicompactum

(ISTH) *Hypocrea Trichoderma*

(<http://www.isth.info/tools/molkey/index.php>)

TrichOKEY

ITS1

ITS2

(Lewis & Papavizas,

.1991)

()

(Monte, 2001)

(Samuels,

.2006)

(Harman & Kubicek, 1998)

(Druzhinina & Kubicek, 2005)

T. reesei

(Martinez *et al.*, 2008)

T. atroviride

(<http://gebine.ugu-psf.org>)

(2002, 2004) Zafari *et al.*

Nazmi Roudsari *et al.*

(2007)

1. Species-specific

()
 °C PDA
 (°C)
 °C
DNA
 DNA (Davet & Rouxel, 2000)
 GenElute Plant Genomic DNA Miniprep Kit (Sigma, USA) MgSO₄ / KH₂ PO₄
ITS
 rDNA ITS /
 ITS2 5.8S ITS1
 (White *et al.*, 1990) ITS4 ITS1
PCR
 KCl (10X) *Taq* Buffer
 2 mM 25 mM MgCl₂
 / / dNTPs
Taq DNA polymerase
 DNA
 (Hermosa *et al.*, 2000) L
 (Dhingra & Sinclair, 1995)
 T3 Thermocycler
 : (Biometra, Germany)
 °C
 °C () °C () °C
 °C ()
PCR
 GenElute PCR Clean-up Kit (Sigma, USA)
 ABI 3730 xl DNA sequencer (Applied Biosystems, USA) °C

2. Colony forming unit (cfu)/g
 3. Internal transcribed spacer

1. Dilution plate

... *Trichoderma* :

ITS

text

Clustal X 2.0

ITS

T. hamatum *T. atroviride*

T. virens

PDA

T. harzianum

°C

ITS

()

(EU821780-EU821801)

± °C

T. atroviride *T. asperellum*

T. harzianum *T. hamatum* *T. brevicompactum*

%

T. virens

***Trichoderma asperellum* Samuels, Lieckf. & Nirenberg**

(CH-2)

Trichoderma *T. asperellum*

Hamatum Pachybasium A

(/ cm)

()

Gams & (1984, 1991a-c, 1992) Bissett

(1999) Samuels *et al* (1998) Bissett

(2004) Kraus *et al*

*Tricho*KEY 2

/ / × / /

ITS

× /

()

1. Accession number

2. Clade

3. Ampuliform

Trichoderma brevicompactum Kraus, Kubicek & Gams

T. brevicompactum
Lutea Lone Lineages
(cm)

***Trichoderma atroviride* Karst**

Trichoderma *T. atroviride*
H. atroviridis Viride
(/ cm)

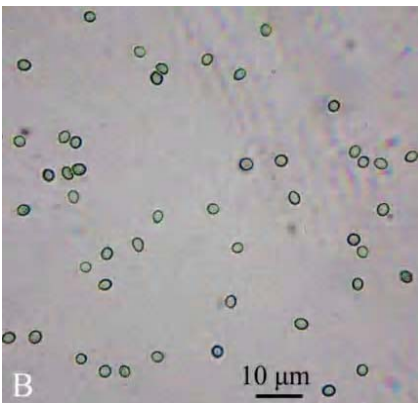
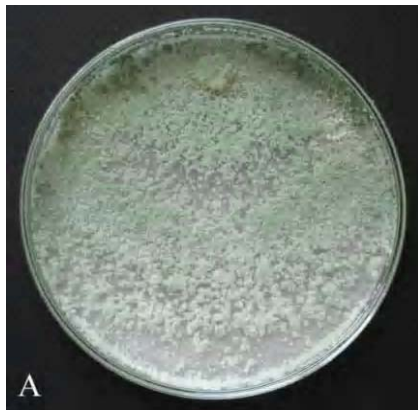
/ x / /

/ / x /

/ x / /

() / / x

1. Lageniform

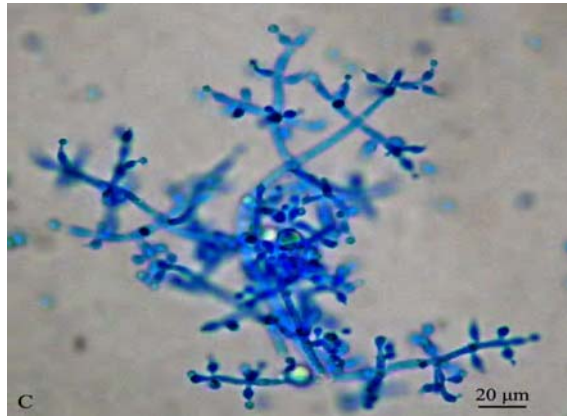
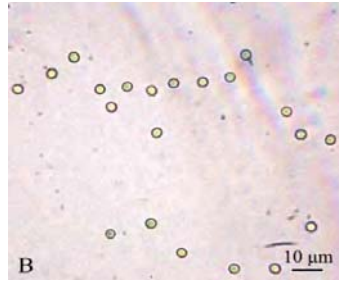
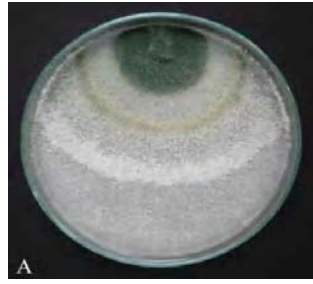


T. asperellum



(C) (B) (A)

... *Trichoderma*



T. atroviride

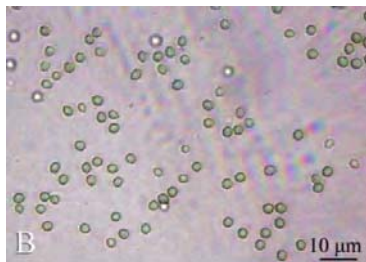
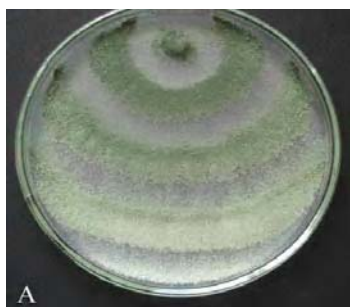
(C)

(B)

(A)

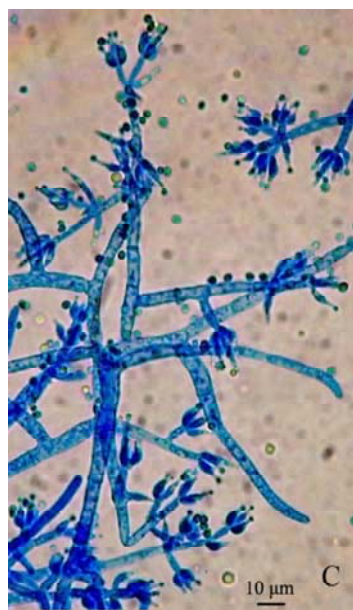
***Trichoderma hamatum* (Bonord.) Bainier**

A *Trichoderma* *T. hamatum*
 Hamatum Pachybasium
 .(/ cm)



T. brevicompactum

(C)



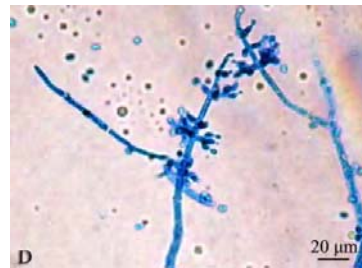
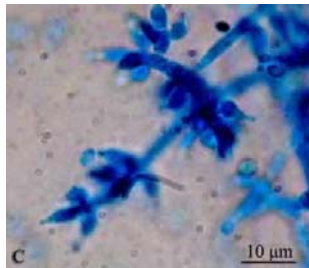
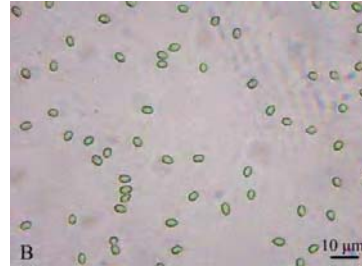
(B)

(A)

| x |

| | x |

() |



T. hamatum

(D C

(B

(A

***Trichoderma harzianum* Rifai**

Pachybasium

T. harzianum

Hypocrea

Harzianum

lixii

| x | |

| | x |

()

***Trichoderma virens* (Miller, Giddens & Foster)
von Arx**

Pachybasium

T. virens

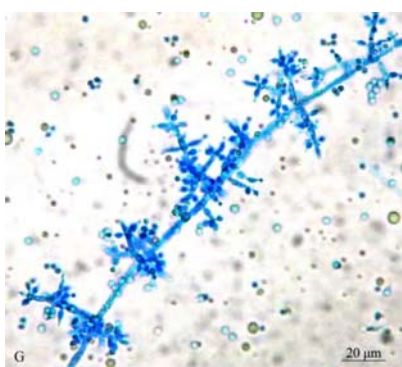
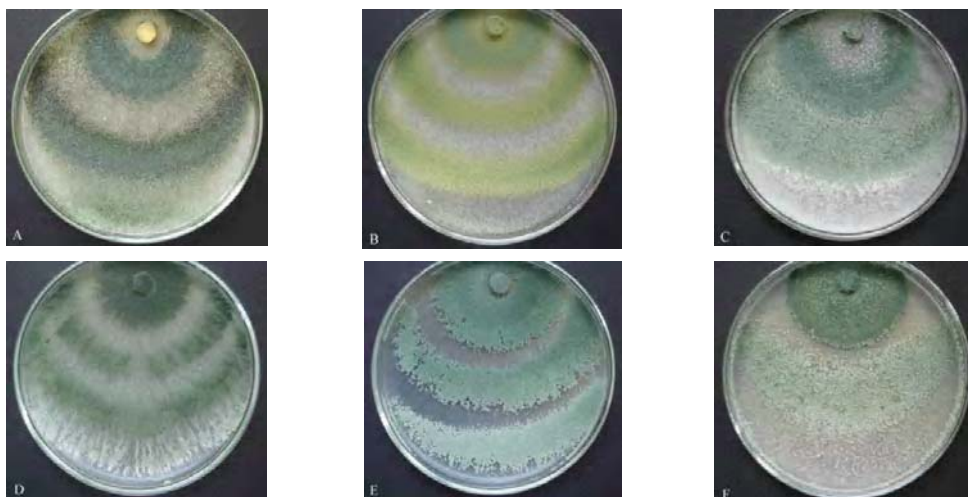
H. virens

Virens

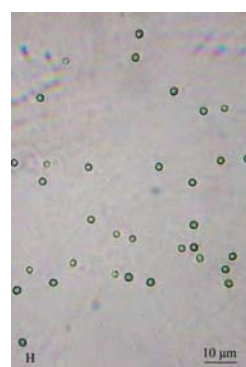
(cm)

... *Trichoderma*

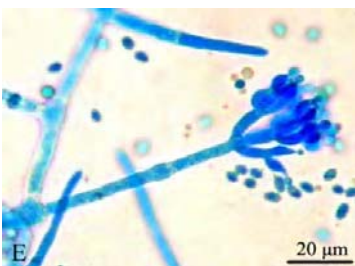
:



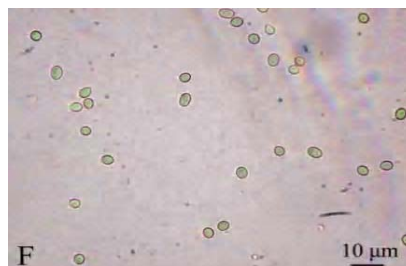
(H) (*T. harzianum*)



(A-F)



(F) (D-E *T. virens*)



(A-C)

$1 \times \times \text{cfu/g}$
 $1 \times \text{cfu/g}$

$1 \quad | \times | \quad |$

$| \quad | \times | \quad |$

$| \quad | \times |$

()

(1987) Nagamani & Mew

(Bissett, 1991b)

T. harzianum

()

T. hamatum *T. atroviride* *T. asperellum*

T. brevicompactum

()

(2002) Zafari *et al.*

(1995) Mostafa Kamal & Shahjahan

T. harzianum

T. koningii *T. hamatum*

T. harzianum

(2000) Cumagun & Lubeck

T. harzianum

T. harzianum

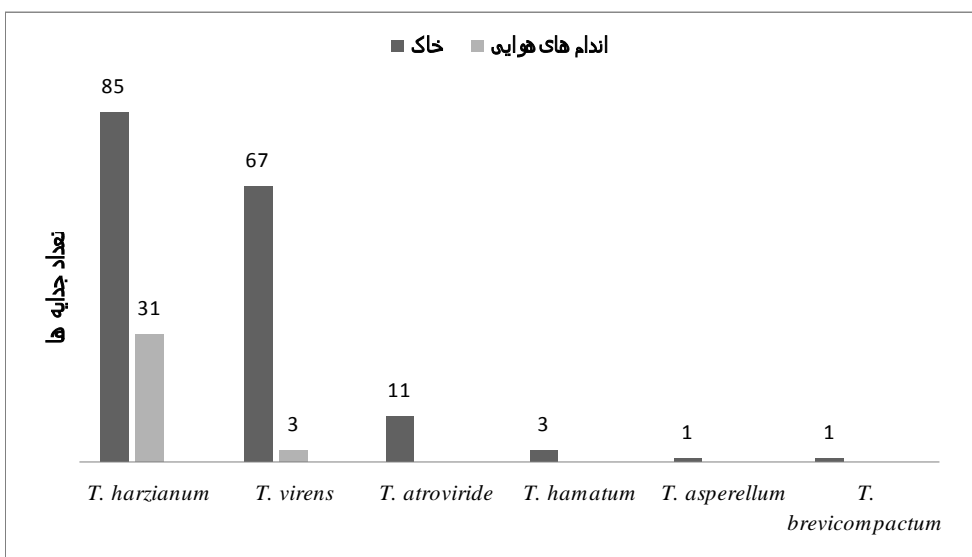
(Rifai, 1969)

()

ITS

(<http://www.mazandaranmet.ir>)

T. harzianum



(2003) Chaverri *et al.*

T. virens *T. harzianum*

T. harzianum

T. harzianum .

()

T. virens

T. virens

()

T. virens .

T. atroviride .

T. virens *T. harzianum*

Pachybasium

Trichoderma

T. hamatum

T. virens *T. harzianum*

T. brevicompactum *T. asperellum*

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