

# *L'impatto delle biotecnologie microbiche per una rivoluzione agroindustriale*

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Università di Perugia  
(<http://dsa3.unipg.it>)*

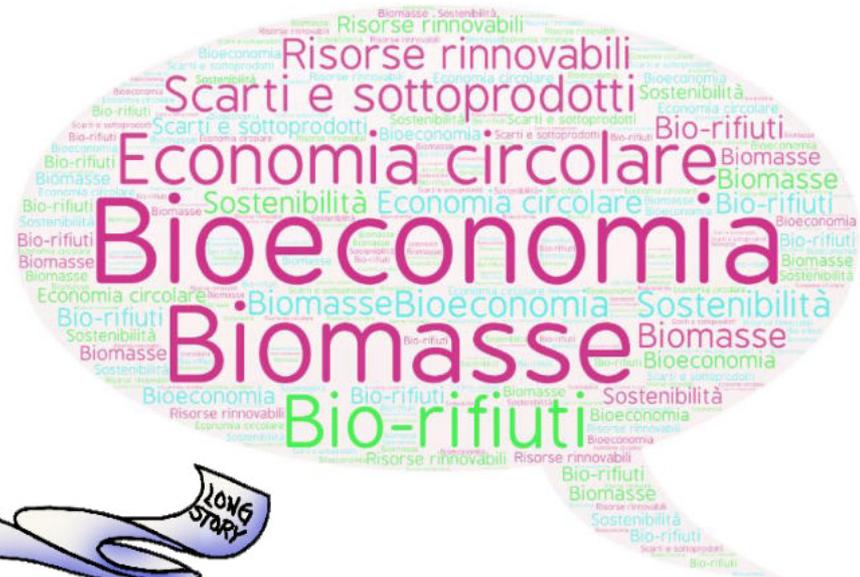
*Collezione dei Lieviti Industriali DBVPG  
([www.dbvpg.unipg.it](http://www.dbvpg.unipg.it))*

*Centro Interuniversitario di Ricerca sull'Inquinamento e l'Ambiente "Felli"  
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# Sommario

1. Definizione di biotecnologia
2. Il comparto “biotech” in Italia
3. Biotecnologie microbiche e biodiversità
4. Biodiversità: il mondo dei microrganismi
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6. Biodiversità microbica non-coltivabile
7. Biodiversità microbica coltivabile
8. Esempi di biotecnologie microbiche
9. Dalla ricerca alla bioeconomia
10. Alcuni casi-studio UNIPG
11. Un po’ di humor...



phillipmartin.info



## 2. Il comparto “biotech” in Italia (1)

### I principali indicatori

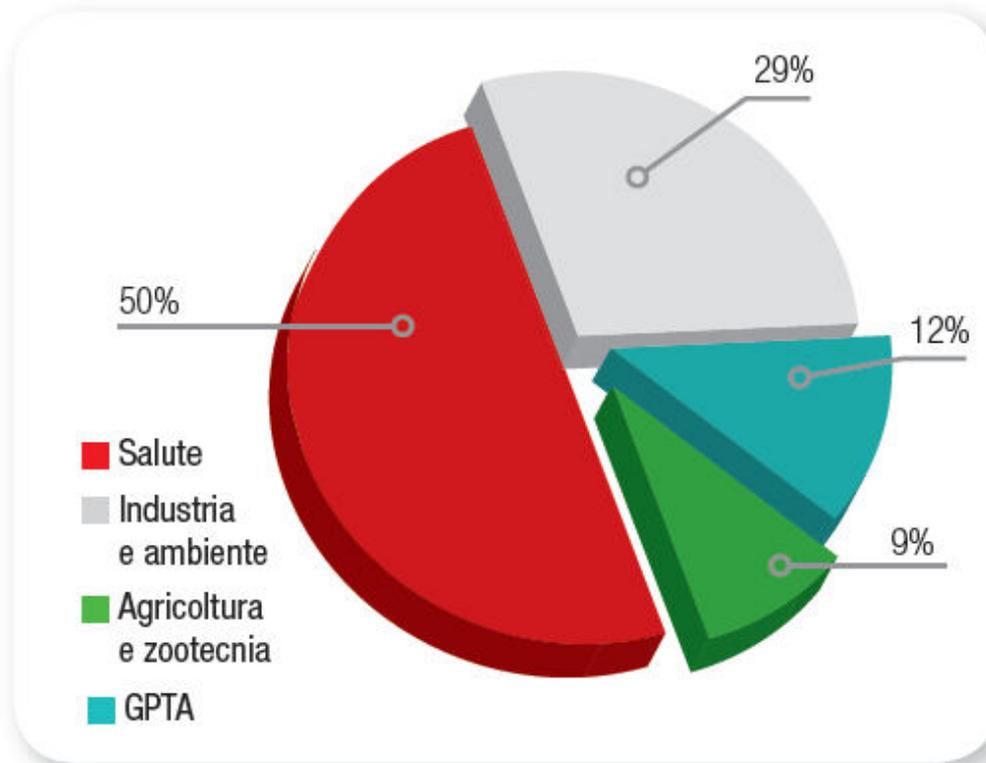
	<b>Totale imprese</b>	<b>Imprese dedicate alla R&amp;S biotech</b>	<b>... di cui, imprese a capitale italiano</b>
Numero imprese	641	360	334
Fatturato biotech*	11.572.414	3.415.647	874.606
Investimenti R&S totali*°	2.056.734	507.764	240.196
Investimenti R&S biotech*°	723.828	479.969	226.648
Addetti Biotech	12.950	5.392	4.197
Addetti R&S biotech	4.317	2.903	1.933

\*Valori in migliaia di euro €/000

°Totale intra-muros più extra-muros

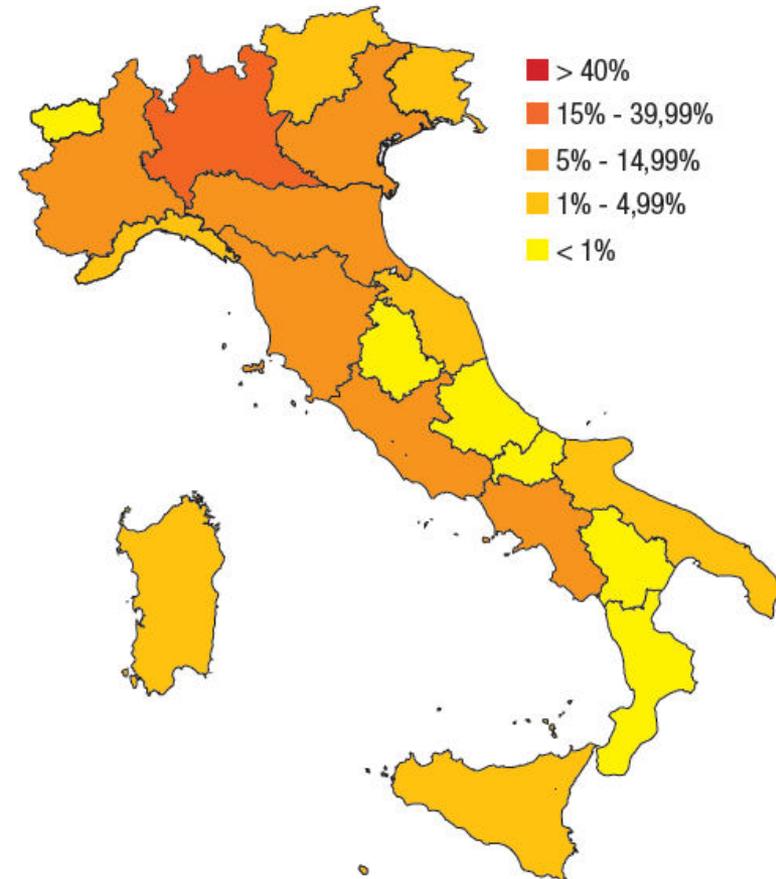
## 2. Il comparto “biotech” in Italia (2)

Distribuzione percentuale imprese



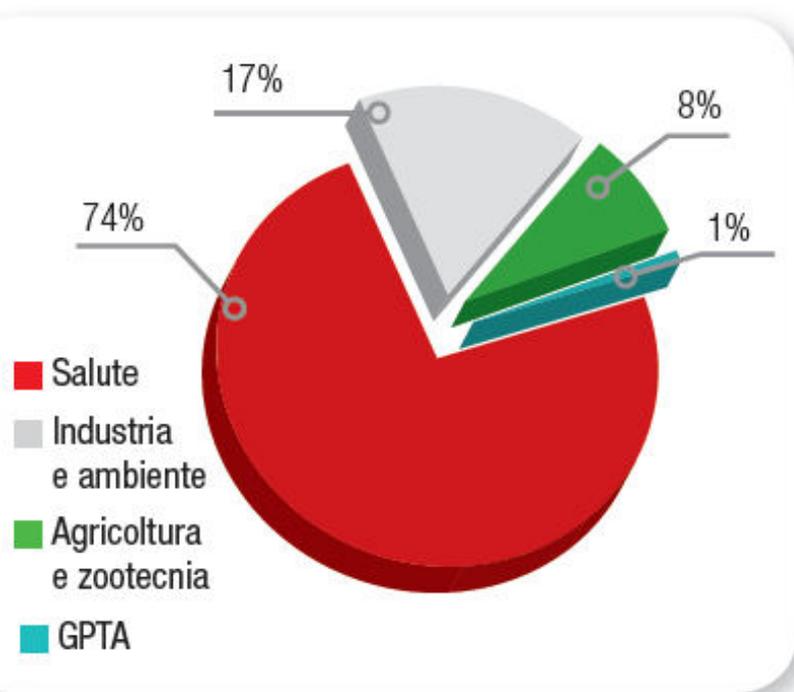
GPTA = genomica, proteomica, tecnologie abilitanti

Imprese biotech, sedi legali



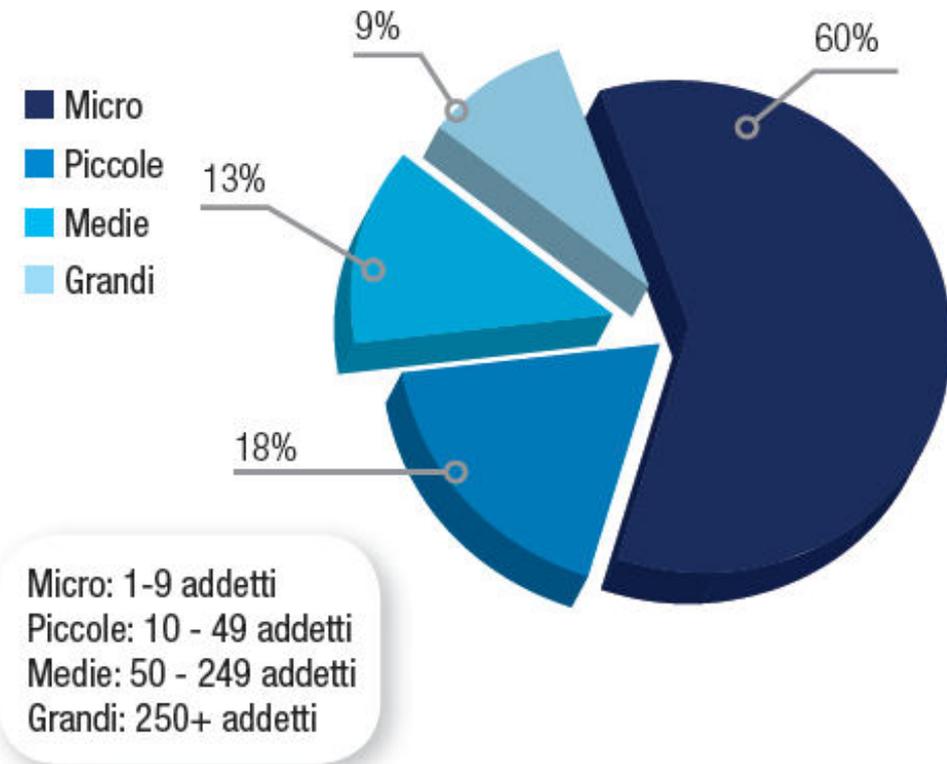
## 2. Il comparto “biotech” in Italia (3)

Distribuzione percentuale fatturato biotech



GPTA = genomica, proteomica, tecnologie abilitanti

Distribuzione percentuale imprese



### 3. Biotecnologie microbiche e biodiversità (1)

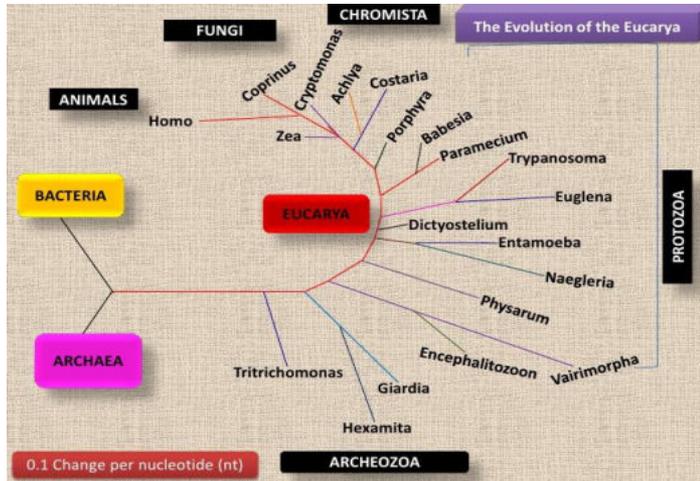
#### Concetto di biodiversità: alcune definizioni di base...

- **Biodiversità**: *“La varietà di specie di piante, animali o microrganismi nell’ecosistema nel quale vivono e interagiscono”*
- **Diversità genetica**: *“La varietà di geni all’interno di una determinata specie”*
- **Diversità ecosistemica**: *“La varietà di ecosistemi in una determinate area”*
- **Biodiversità microbica**: *“La varietà di specie microbiche nell’ecosistema nel quale vivono e interagiscono”*



ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

## 4. Biotecnologie microbiche e biodiversità (2)



Studiata  
Descritta

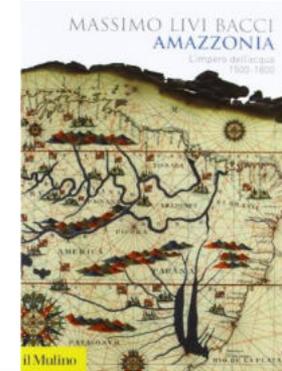


### Biodiversità microbica

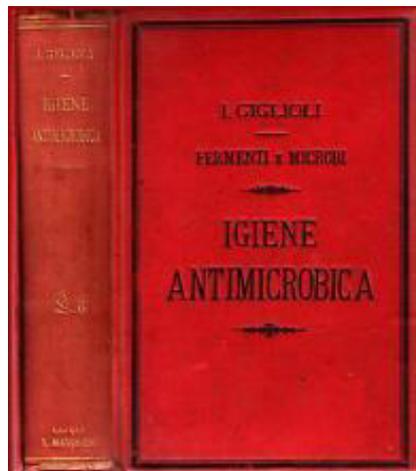
- Enorme (ma largamente inesplorato) serbatoio di risorse biologiche e genetiche
- Sfruttamento di nuovi geni d enzimi
- Oltre il 99% della biodiversità microbica non è attualmente coltivabile con le tecniche standard di laboratorio  
(**biodiversità microbica non-coltivabile**)

### 3. Biotecnologie microbiche e biodiversità (3)

- ❑ Vasti territori in Africa, Asia, Australia, Sud America, Artide e Antartide sono sotto-studiate
- ❑ Habitats (talvolta estremi) inesplorati → fonti ricchissime di biodiversità ancora da scoprire



# 4. Biodiversità: il mondo dei microrganismi (1)



## 4. Biodiversità: il mondo dei microrganismi (2)

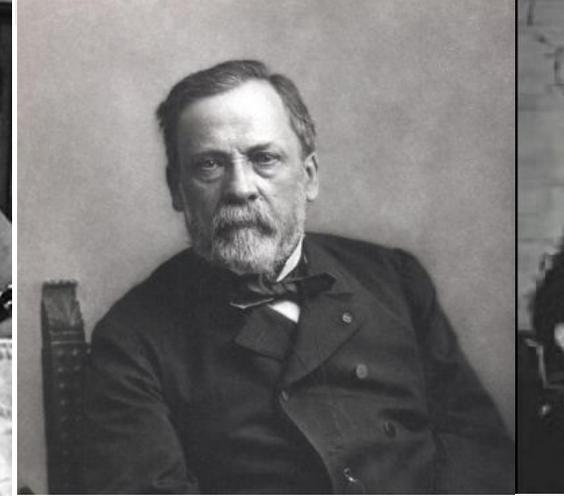
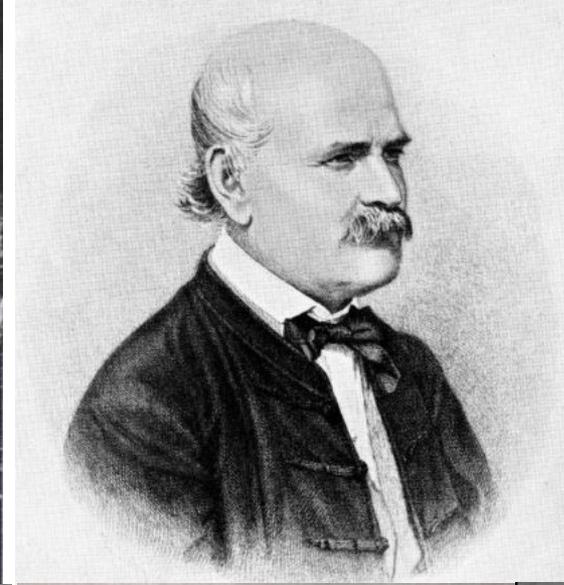
### Microrganismi: solo nemici?



**STANLEY KUBRICK**  
**SHINING**

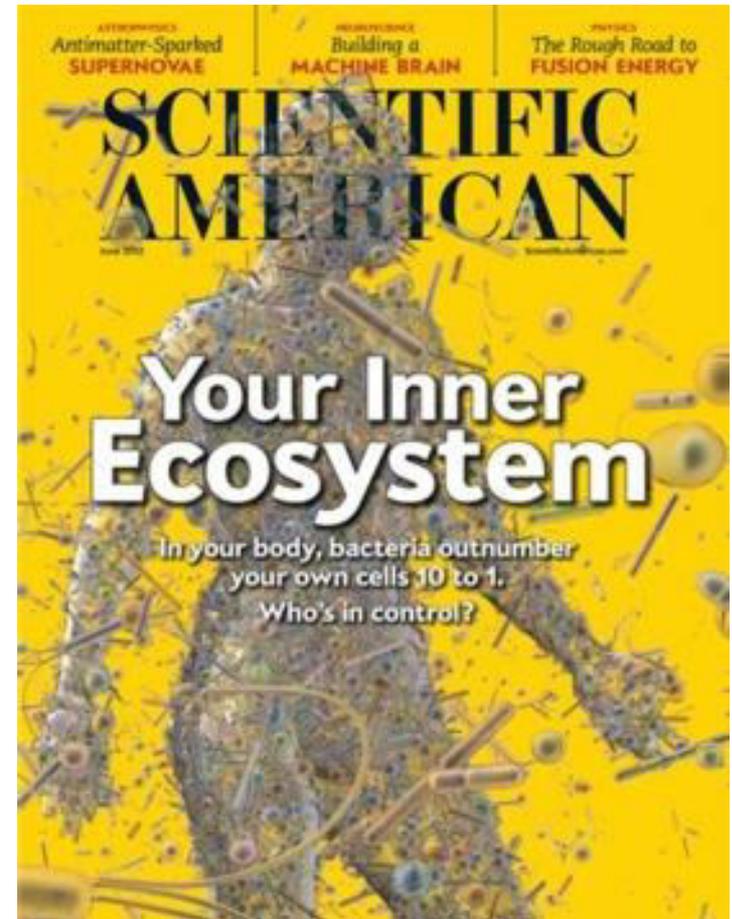
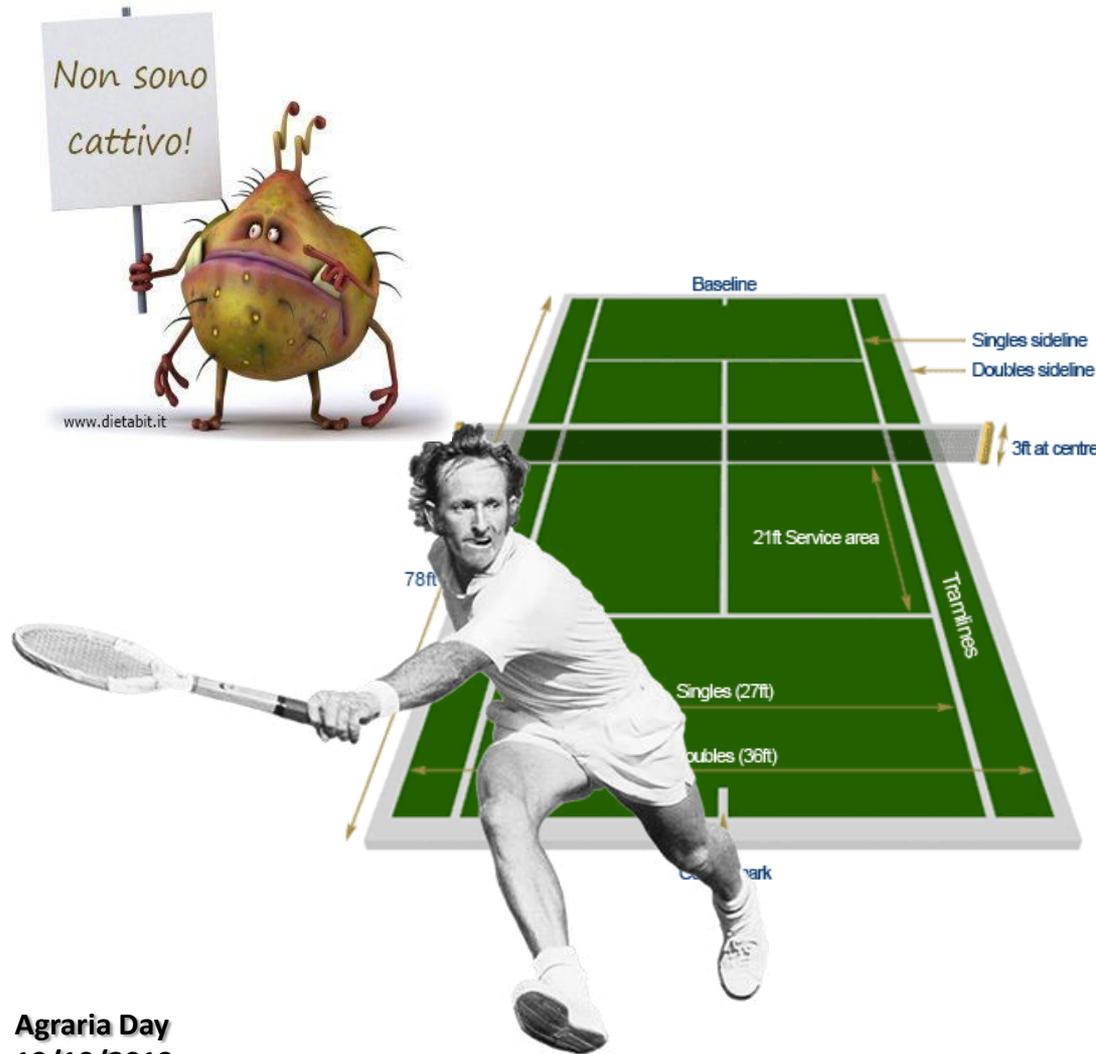


## 4. Biodiversità: il mondo dei microrganismi (3)



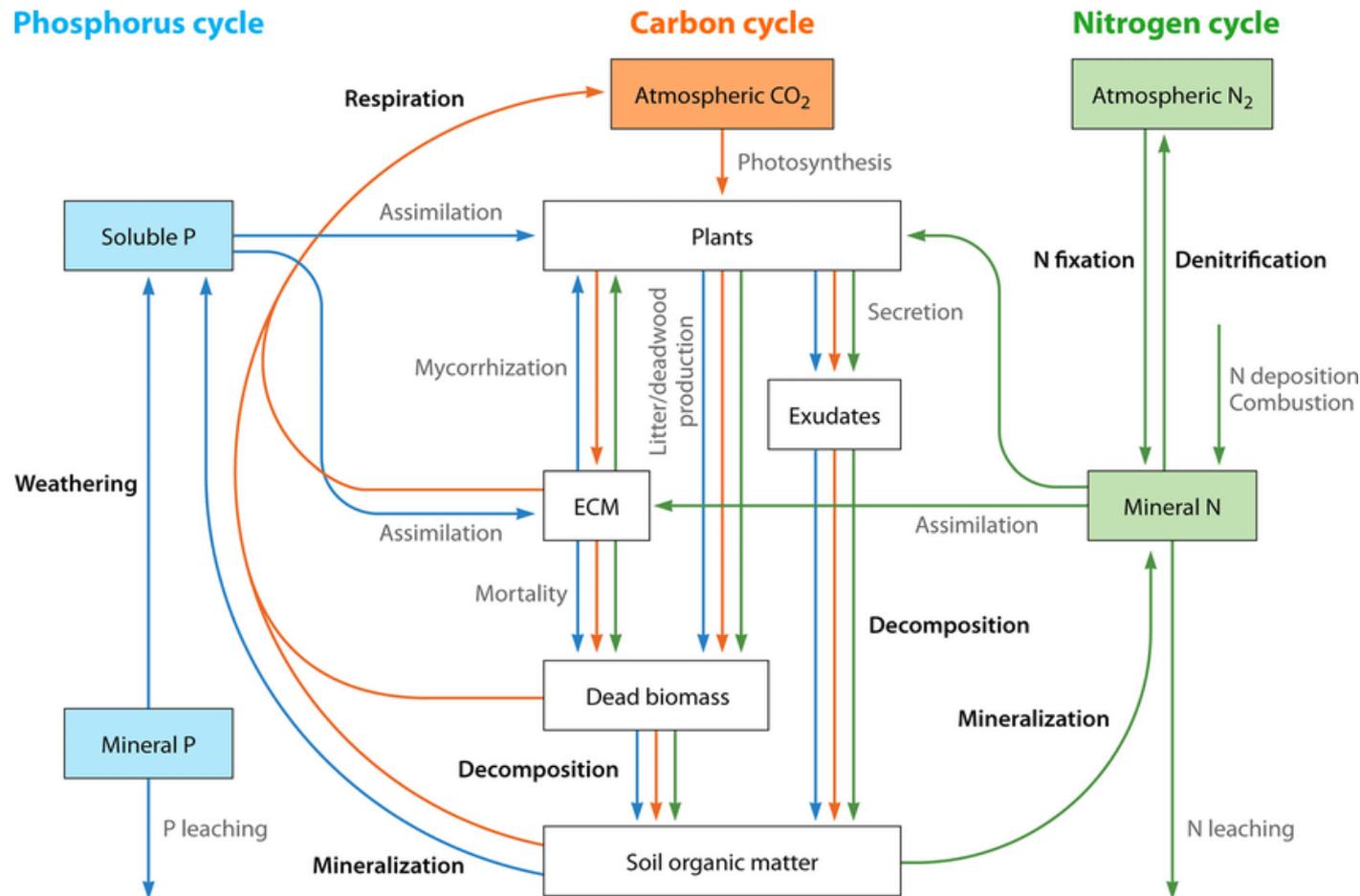
## 4. Biodiversità: il mondo dei microrganismi (4)

Microrganismi *“utili”* = microrganismi *“pro-tecnologici”*



## 4. Biodiversità: il mondo dei microrganismi (5)

Senza i microrganismi non esisterebbe la vita sulla terra...



## 4. Biodiversità: il mondo dei microrganismi (6)

LA RIVISTA DI ENIGMISTICA PRIMA PER FONDAZIONE E PER DIFFUSIONE

# LA SETTIMANA ENIGMISTICA

16 Aprile 2011

N. 4125 Anno 80

Euro 1,50

Numero

Settimanale  
2004

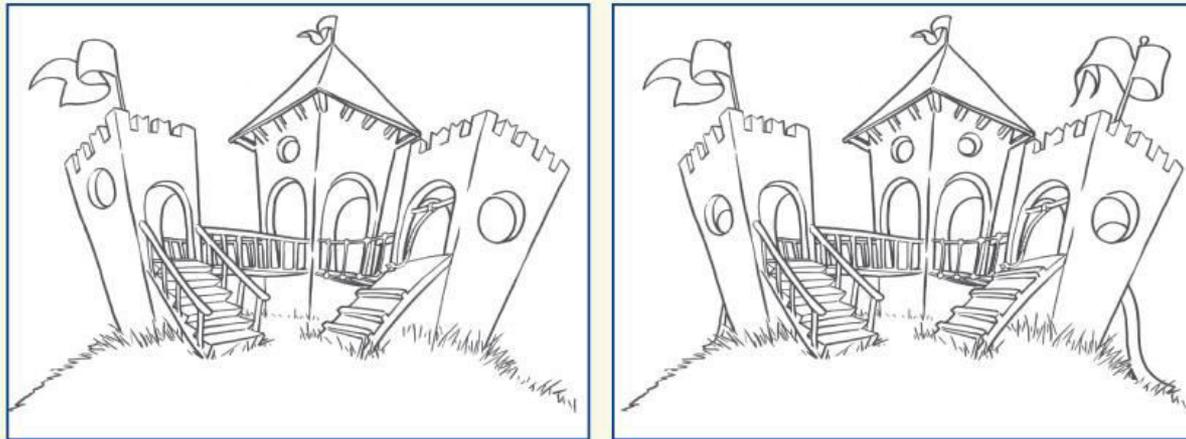
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ESCE IL SABATO

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Palazzo Vittoria  
Piazza Cinque Giornate 10  
20129 - Milano

Direzione, Redazione e  
Abbonamenti: 02-55.190.591  
Distribuzione: 02-660.301  
info@set-enigmistica.it

### LE DIFFERENZE

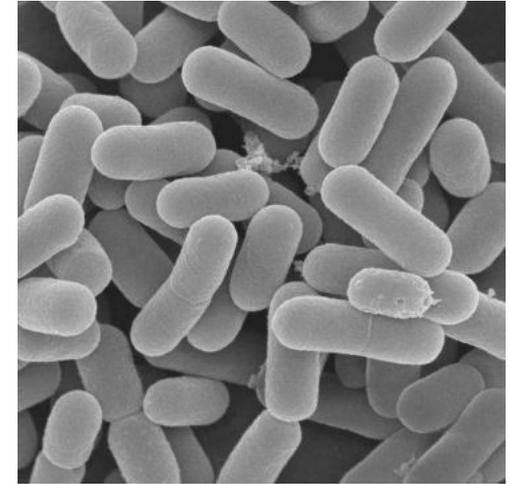


IN QUESTI DUE DISEGNI, APPARENTEMENTE UGUALI, CI SONO BEN 9 DIFFERENZE!  
SE RIESCI A TROVARNE 4 SEI BRAVINO, SE NE TROVI 7 SEI MOLTO BRAVO E SE LE TROVI  
TUTTE E 9 SEI UN CAMPIONE!!!

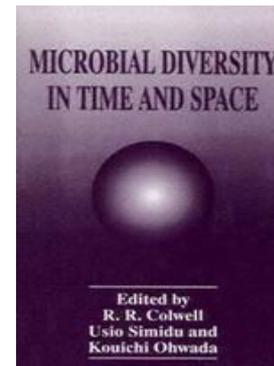
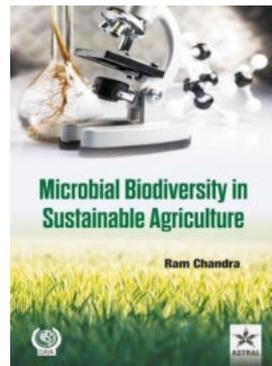
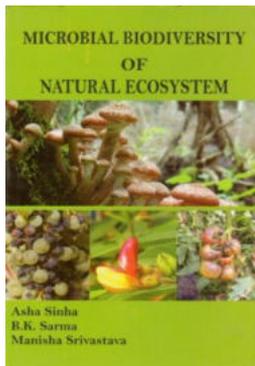
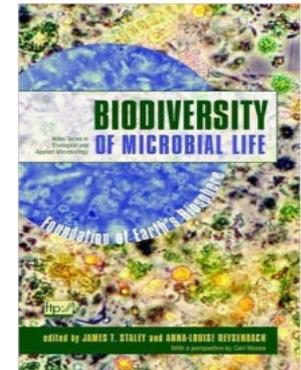
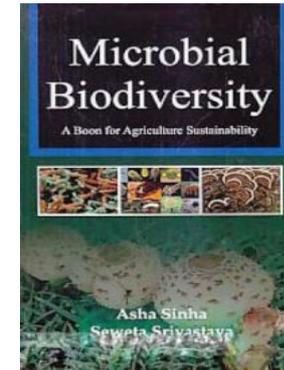
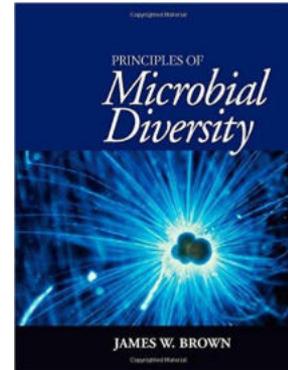
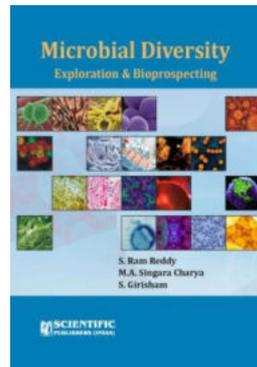
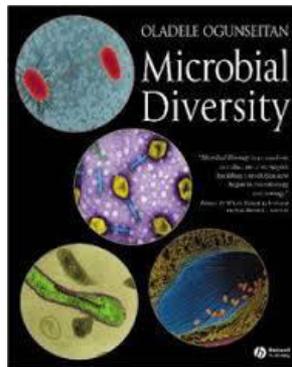
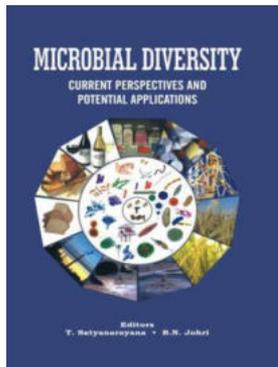
## 4. Biodiversità: il mondo dei microrganismi (7)



> 99%



## 5. Biodiversità microbica (1)



**E ancora tanti altri...**

## 5. Biodiversità microbica (2)

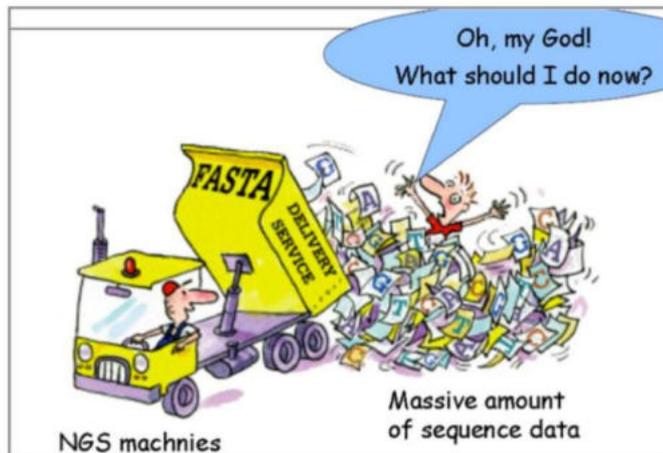
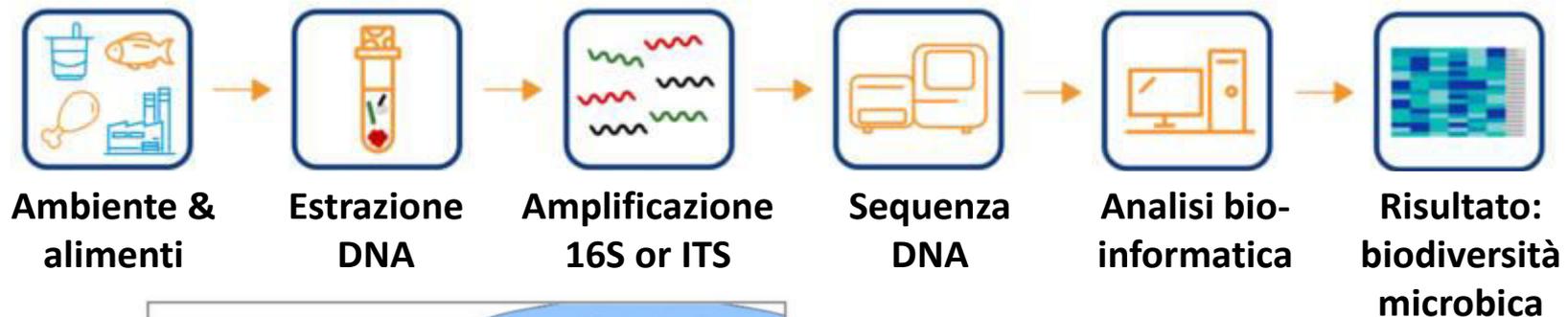
The screenshot shows the Amazon.it search results for the query "microbial diversity". The search bar at the top contains the text "microbial diversity". Below the search bar, the results are displayed. A red circle highlights the text "1-16 dei 130 risultati in 'microbial diversity'", with a red arrow pointing to the first search result. The first result is the book "Microbial Diversity of Fishes (English Edition)" by K. Dhvendaran, published on 29 ago. 2013, priced at EUR 71.68. The second result is "Microbial Diversity in Time and Space" by R. R. Colwell and K. Ohwada, published on 4 ott. 2013, priced at EUR 171.19. The third result is "Microbial Diversity: Form and Function in Prokaryotes 1st edition by Oladele Ogunseitan (2004) Paperback" priced at EUR 269.34. The fourth result is "Microbial Diversity and Functions (English Edition)" published on 19 apr. 2015.

**130 libri contenenti le parole "Microbial Diversity" nel titolo negli ultimi 10 anni**

## 6. Biodiversità microbica non-coltivabile (1)

Metodi “culture-independent” per lo studio della biodiversità microbica

### METABARCODING & RANDOM SHOTGUN



- ❖ Risultati non sembrano facili da interpretare
- ❖ Importanza di database aggiornati disponibili online

## 6. Biodiversità microbica non-coltivabile (2)

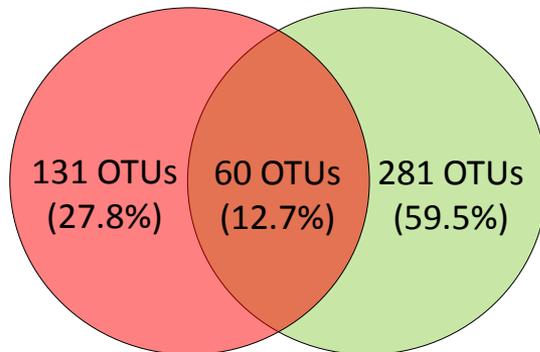
### Informazioni su:

- Diversità genetica
- Struttura e distribuzione delle popolazioni microbiche
- Ruolo ecologico del “microbiota”
- .....

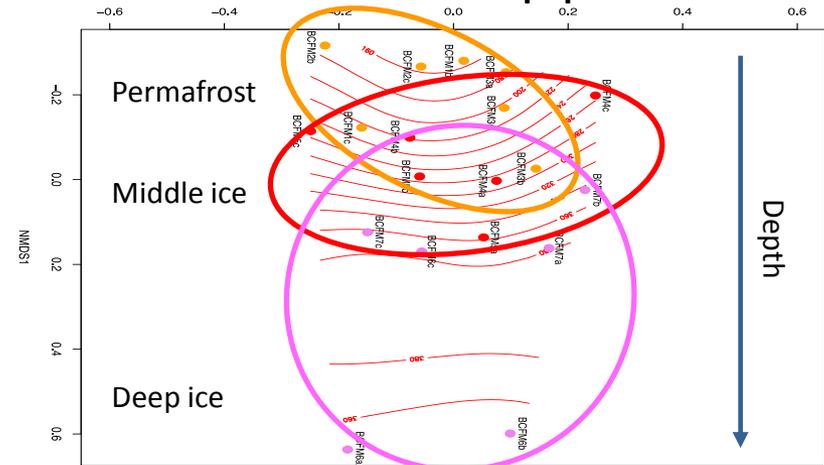
### Indici di biodiversità

	BCL1	BCL2	BCL3
Richness	639 81	1639 1123	723 260
Shannon	2.95 0.25	2.00 0.15	2.82 0.44

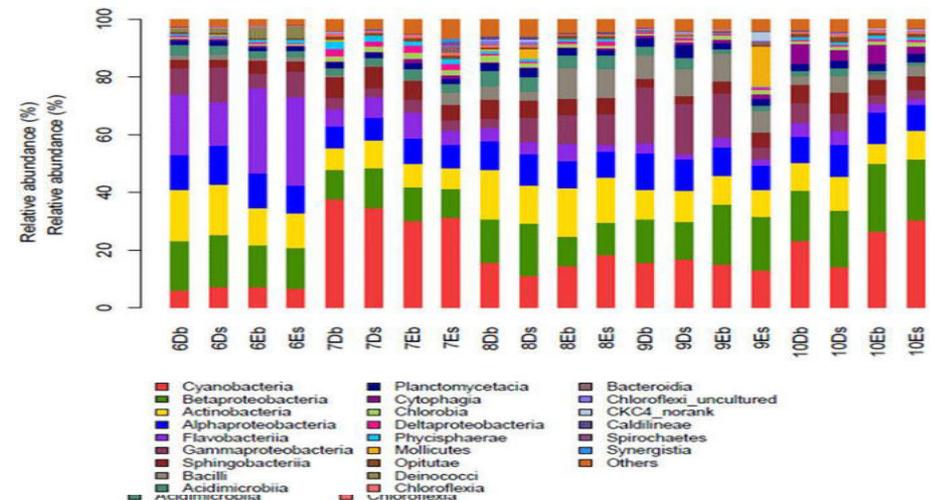
### Specialistic and common OTUs



### Distribuzione delle popolazioni

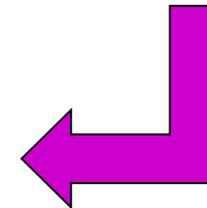
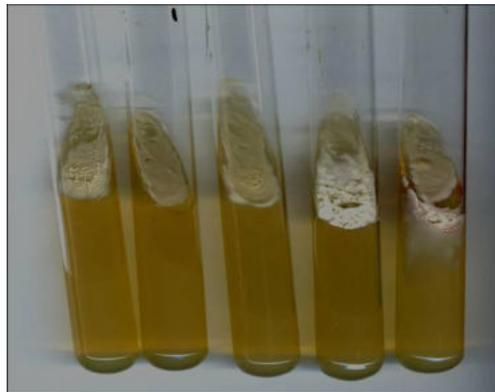
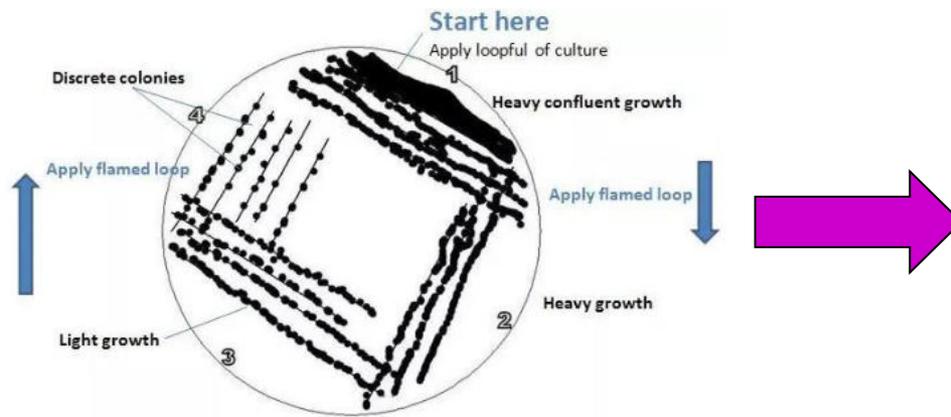


### Struttura delle comunità microbiche



# 7. Biodiversità microbica coltivabile (1)

## Isolamento e conservazione



## 7. Biodiversità microbica coltivabile (2)

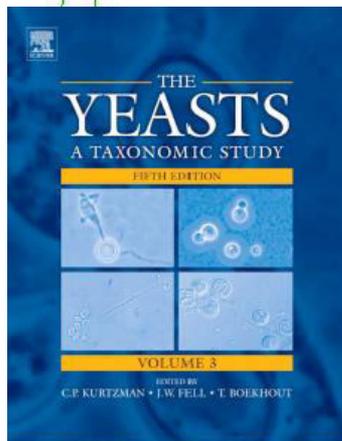
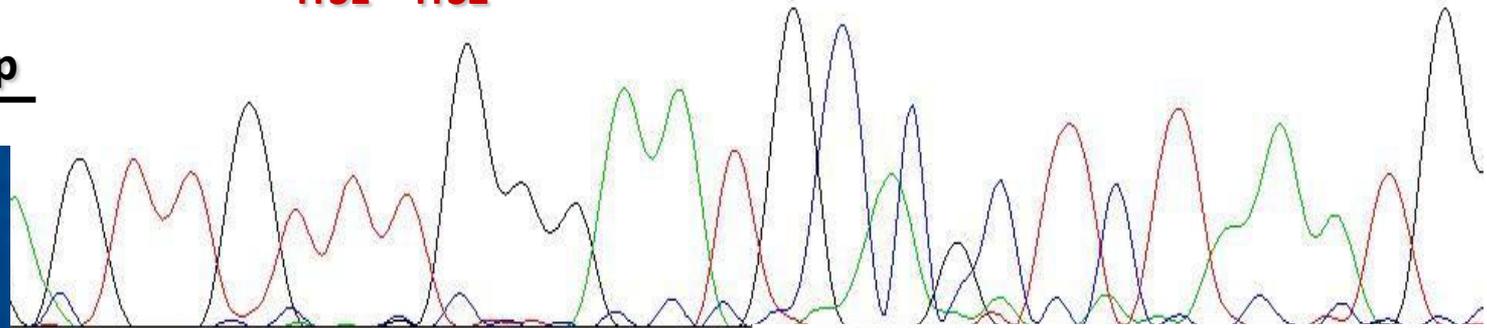
### Identificazione molecolare: sequenziamento delle regioni D1/D2 del 26S rRNA gene & ITS (1 & 2)

A G T C G A G T T G T T T G G G A A T G C C G C T C T A A A T G



ITS1    ITS2

600 bp



available online at [www.studonmycology.org](http://www.studonmycology.org) Studies in Mycology 81: 85–147.

#### Towards an integrated phylogenetic classification of the Tremellomycetes

X.-Z. Liu<sup>1,2</sup>, Q.-M. Wang<sup>1,2</sup>, M. Göker<sup>3</sup>, M. Groenewald<sup>4</sup>, A.V. Kachalkin<sup>5</sup>, H.T. Lumbsch<sup>6</sup>, A.M. Milanes<sup>7</sup>, M. Wedin<sup>8</sup>, A.M. Yurkov<sup>9</sup>, T. Boekhout<sup>1,2,10</sup>, and F.-Y. Bai<sup>1,2</sup>

<sup>1</sup>State Key Laboratory for Mycology, Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, PR China; <sup>2</sup>CBS Fungal Biodiversity Centre (CBS-KNAW), Uppsalastråkan 8, Utrecht, The Netherlands; <sup>3</sup>Leibniz Institute DSMZ-German Collection of Microorganisms and Cell Cultures, Braunschweig 38124, Germany; <sup>4</sup>Faculty of Soil Science, Lomonosov Moscow State University Moscow 119991, Russia; <sup>5</sup>Science & Education, The Field Museum, 1400 S. Lake Shore Drive, Chicago, IL 60605, USA; <sup>6</sup>Departamento de Biología y Geología, Física y Química Inorgánica, Universidad Rey Juan Carlos, E-28933 Madrid, Spain; <sup>7</sup>Department of Botany, Swedish Museum of Natural History, P.O. Box 50007, SE-10415 Stockholm, Sweden; <sup>8</sup>Shanghai Key Laboratory of Molecular Medical Mycology, Changsheng Hospital, Second Military Medical University, Shanghai, PR China

\*Correspondence: F.-Y. Bai, [bai@im.ac.cn](mailto:bai@im.ac.cn); T. Boekhout, [tboekhout@CBS.KNAW.nl](mailto:tboekhout@CBS.KNAW.nl)

available online at [www.studonmycology.org](http://www.studonmycology.org)

Studies in Mycology 81: 149–189.

#### Phylogenetic classification of yeasts and related taxa within Pucciniomycotina

Q.-M. Wang<sup>1</sup>, A.M. Yurkov<sup>2</sup>, M. Göker<sup>3</sup>, H.T. Lumbsch<sup>4</sup>, S.D. Leavitt<sup>5</sup>, M. Groenewald<sup>6</sup>, B. Theelen<sup>7</sup>, X.-Z. Liu<sup>1</sup>, T. Boekhout<sup>1,8,9</sup>, and F.-Y. Bai<sup>1,4</sup>

<sup>1</sup>State Key Laboratory of Mycology, Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, China; <sup>2</sup>Leibniz Institute DSMZ – German Collection of Microorganisms and Cell Cultures, Braunschweig, Germany; <sup>3</sup>Science & Education, The Field Museum, 1400 S. Lake Shore Drive, Chicago, IL 60605, USA; <sup>4</sup>CBS Fungal Biodiversity Centre (CBS-KNAW), Uppsalastråkan 8, 3584 CT Utrecht, The Netherlands; <sup>5</sup>Shanghai Key Laboratory of Molecular Medical Mycology, Chengzheng Hospital, Second Military Medical University, Shanghai, China

\*Correspondence: T. Boekhout, [tboekhout@CBS.KNAW.nl](mailto:tboekhout@CBS.KNAW.nl); F.-Y. Bai, [bai@im.ac.cn](mailto:bai@im.ac.cn)

## 7. Biodiversità microbica coltivabile (3)

### Conservazione *ex-situ* (1)

#### Banca mondiale dei semi – Isole Svalbard, Norvegia



# 7. Biodiversità microbica coltivabile (4)

## Conservazione *ex-situ* (2)

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Industrial Yeasts Collection

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**NEWS**

3rd International Symposium on Green Chemistry

32nd International Specialized Symposium on Yeasts (ISSY32) Yeast Biodiversity and Biotechnology in the twenty-first Century

14th International Congress on Yeasts (ICY14) - Yeasts for Global Happiness

33rd International Specialized Symposium on Yeasts (ISSY33) Exploring and Engineering Yeasts

webmaster: roddy@systema.unipg.it

Department of Agricultural, Food and Environmental Science - University of Perugia - Borgo XX Giugno, 74, I-06122 Perugia, Italy

VISIT COUNTER

Totale: 17  
All\_Days: 26956

Welcome to the DBVPG Collection

The Industrial Yeasts Collection DBVPG is an academic biological resource centre (BRC) affiliated to ECCO (European Culture Collection Organization) and WFCC (World Federation of Culture Collections). The DBVPG Collection is specialized in the study and *ex-situ* conservation of yeasts and yeast-like microorganisms, distributes strains and offers services to the international scientific community and to other private Institutions

*"Fungi that asexually reproduce by budding or fission, which results in growth that is comprised mainly of single cells"*

Yeast definition from: *"The Yeasts. A Taxonomy Study"* Kurtzman C.P., Fell J.W. & Boekhout T. (eds.) Elsevier Amsterdam, 2011

8 items on 1 pages - Items/Page: 50

< 1 >

	DBVPG number	Species Name	Comments Type	Isolation source/salient information	Isolation Locality	Other International Collections
1.	<a href="#">4841</a>	Glaciozyma martinii Turchetti, Connell, Thomas-Hall & Boekhout		supraglacial sediments	Calderone glacier, Gran Sasso, Abruzzo, Italy	
2.	<a href="#">8018</a>	Glaciozyma martinii Turchetti, Connell, Thomas-Hall & Boekhout	T of Glaciozyma martinii Turchetti, Connell, Thomas-Hall & Boekhout	soil	Sothorn Victoria land, Antarctica	CBS 10620
3.	<a href="#">4726</a>	Glaciozyma watsonii Thomas-Hall, Connell, Boekhout & Turchetti	T of Glaciozyma watsonii	subglacial sediments	Forni glacier, Ortles-Cevedale group, Italian Alps, Sondrio, Italy (46°12'30N, 10°13'50E)	CBS 10986
4.	<a href="#">4760</a>	Glaciozyma watsonii Thomas-Hall, Connell, Boekhout & Turchetti		subglacial sediments	Sforzellina glacier, Ortles-Cevedale group, Italian Alps, Sondrio, Italy (46°12'00N; 10°13'00E)	CBS 11006

[www.dbvpg.unipg.it](http://www.dbvpg.unipg.it)

# 7. Biodiversità microbica coltivabile (4)

## Global ranking delle collezioni mondiali di lieviti **Conservazione *ex-situ* (3)**

Table 1 Culture collections with at least 500 strains of yeasts, in descending order of the number of publicly available strains

Acronyms	Name	Country	Number of yeast strains
NRRL	National Center for Agricultural Utilization Research, USDA	USA	14,500 <sup>a</sup>
ATCC	American Type Culture Collection	USA	10,000 <sup>b</sup>
CBS	Centraalbureau voor Schimmelcultures	Netherlands	7,000 <sup>c</sup>
UCD-FST	Phaff Yeast Culture Collection, University of California Davis	USA	6,108
<b>DBVPG</b>	<b>Department of Applied Biology, University of Perugia</b>	<b>Italy</b>	<b>5,160<sup>b</sup></b>
UWO-PS	Department of Plant Sciences, University of Western Ontario	Canada	5,000 <sup>d</sup>
NCYC	National Collection of Yeast Cultures	UK	4,000 <sup>b</sup>
OUT	Department of Biotechnology, Graduate School of Engineering, Osaka University	Japan	3,803 <sup>e</sup>
CCY	Culture Collection of Yeasts, Institute of Chemistry, Slovak ASCR	Slovakia	3,800 <sup>f</sup>
CICIM	The Culture and Information Centre of Industrial Microorganisms of China Universities, Southern Yangtze University	China	3,600 <sup>g</sup>
BCCM/IHEM	Scientific Institute of Public Health—Louis Pasteur	Belgium	3,453 <sup>b</sup>
JCM	Japan Collection of Microorganisms, Bioresource Center	Japan	3,375 <sup>b</sup>
YM	Yunnan Institute of Microbiology, Yunnan University	China	3,154 <sup>h</sup>
NBRC (formerly IFO)	NITE Biological Resource Center	Japan	3,081 <sup>b</sup>
UCD-V&E	Wine Yeast and Bacteria Collection, University of California Davis	USA	2,600 <sup>b</sup>
PYCC	Portuguese Yeast Culture Collection, Universidade Nova de Lisboa	Portugal	2,600 <sup>b</sup>
ACBR	Austrian Center of Biological Resources and Applied Mycology, University of Biological Resources and Applied Life Sciences	Austria	2,500 <sup>a</sup>
CECT	Coleccion Espanola de Cultivos Tipo	Spain	2,495 <sup>b</sup>
VKM	All-Russia Collection of Microorganisms	Russia	2,300 <sup>a</sup>
BCCM/MUCL	Mycothèque de l'Université catholique de Louvain	Belgium	2,200 <sup>a</sup>
LCC	Labatt Culture Collection	Canada	2,000 <sup>a</sup>
ZIM	Culture Collection of Industrial Microorganisms, University of Ljubljana	Slovenia	1,740 <sup>a</sup>
KCTC	Korean Collection for Type Cultures	South Korea	1,735 <sup>a</sup>
BCRC	Bioresource Collection and Research Center	Taiwan	1,564 <sup>a</sup>
NCAIM	National Collection of Agricultural and Industrial Microorganisms	Hungary	1,540 <sup>a</sup>
VITCC	VTT Technical Center	Finland	1,400 <sup>a</sup>
USRCB	Ukrainian Scientific-Research Cell Bank	Ukraine	1,339 <sup>a</sup>
AWRI MCC	The Australian Wine Research Institute	Australia	1,200 <sup>a</sup>
URM	Universidade Federal de Pernambuco, Micoteca do Departamento de Micologia	Brazil	946 <sup>a</sup>

J Ind Microbiol Biotechnol  
DOI 10.1007/s10295-011-1078-5

REVIEW

Yeast culture collections of the world: meeting the needs of industrial researchers

Kyria Boundy-Mills



**5th global position of DBVPG:** including «*generalist*» Collections (i.e. NRRL, ATCC, CBS, etc.)

**2nd global position of DBVPG:** among the «*specialist*» Collections (i.e. Collections preserving exclusively yeasts)

Yeast

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ISSY32 Special Issue

Yeast culture collections in the twenty-first century: new opportunities and challenges

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<sup>7</sup>CBS Fungal Biodiversity Centre (CBS-KNAW), Utrecht, The Netherlands

<sup>8</sup>Department of Agricultural, Food and Environmental Science, Industrial Yeasts Collection DBVPG, University of Perugia, Perugia, Italy

# 7. Biodiversità microbica coltivabile (5)

## Conservazione *ex-situ* (4)

### International Networks



**ECCO:** European Culture Collection Organization



**WFCC:** World Federation of Culture Collections

**Global Catalogue of Microorganisms**

Home  
Overview  
Data Standards  
Participants  
Join Us  
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**Statistics**

Strains: 288,190  
Species: 41,023  
Culture Collections: 60  
Countries and regions: 29

Statistic graph

Strain Name:  Search  
Strain Number:

Advanced Search | Species Tree Viewer | Map Viewer

Belarus	IRM
Belgium	BCCM/DCG, BCCM/HEM, BCCM/UMBP, BCCM/IMG, BCCM/MBCL, BCCM/ULC, ITM
France	CIP, CIRM-CF, CIRM-CFRP, CIRM-Lesvres
Germany	CCryo, DSMZ
Greece	DOA/HCFP
Hungary	DACT
Italy	DBVPG
Netherlands	CBS
Portugal	UMinho-MIM
Russia	VIM
Spain	CECT
U.K.	CCAP, IMI(CABI)
Ukraine	CBU-MACC, UCCAA

# 7. Biodiversità microbica coltivabile (6)

## Conservazione *ex-situ* (5)

### MIRRI in Europe



<https://www.mirri.org/home.html>

Partner\*  
 Collaborating Parties+



# 7. Biodiversità microbica coltivabile (7)

## Conservazione *ex-situ* (6)

## 8. Esempi di biotecnologie microbiche (1)

### Food e nutraceuticals (1)



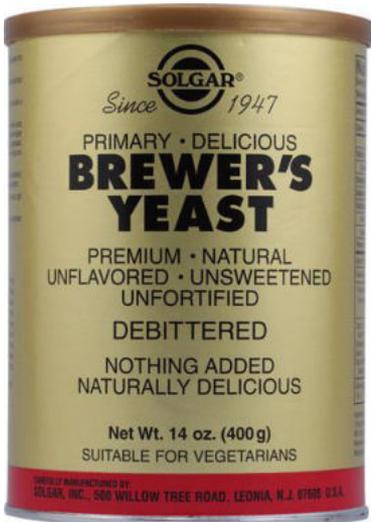
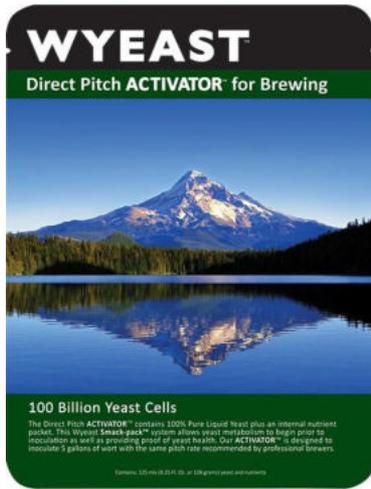
# 8. Esempi di biotecnologie microbiche (2)

## Food e nutraceuticals (2)



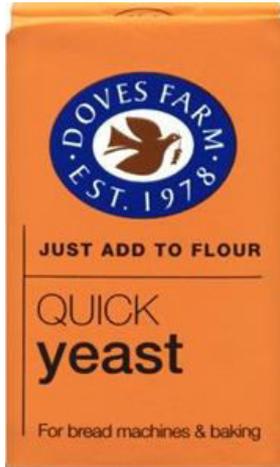
# 8. Esempi di biotecnologie microbiche (3)

## Food e nutraceuticals (3)



## 8. Esempi di biotecnologie microbiche (4)

### Food e nutraceuticals (4)



# 8. Esempi di biotecnologie microbiche (5)

## Food e nutraceutici (5)



# 8. Esempi di biotecnologie microbiche (6)

## Non-Food (1)



## 8. Esempi di biotecnologie microbiche (7)

### Non-Food (2)



## 9. Dalla ricerca alla bioeconomia (1)

Ricerca di base o ricerca applicata (“concreta...”)?



# 9. Dalla ricerca alla bioeconomia (2)

## IL RUOLO DELL'UNIVERSITÀ



## 9. Dalla ricerca alla bioeconomia (3)

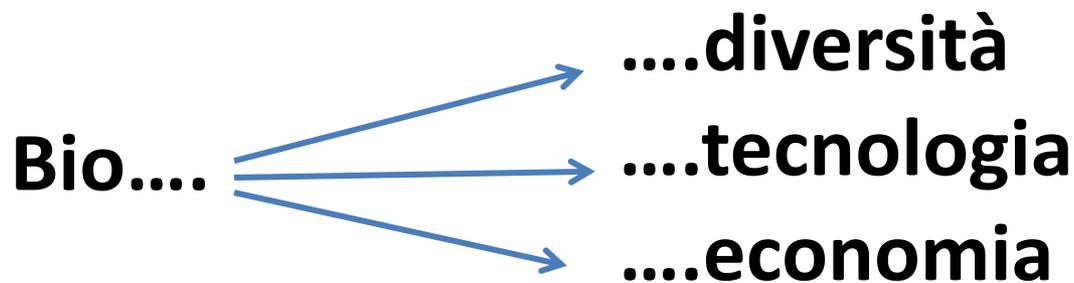


REVIEW ARTICLE

### Improving industrial yeast strains: exploiting natural and artificial diversity

Jan Steensels<sup>1,2</sup>, Tim Snoek<sup>1,2</sup>, Esther Meersman<sup>1,2</sup>, Martina Picca Nicolino<sup>1,2</sup>, Karin Voordeckers<sup>1,2</sup> & Kevin J. Verstrepen<sup>1,2</sup>

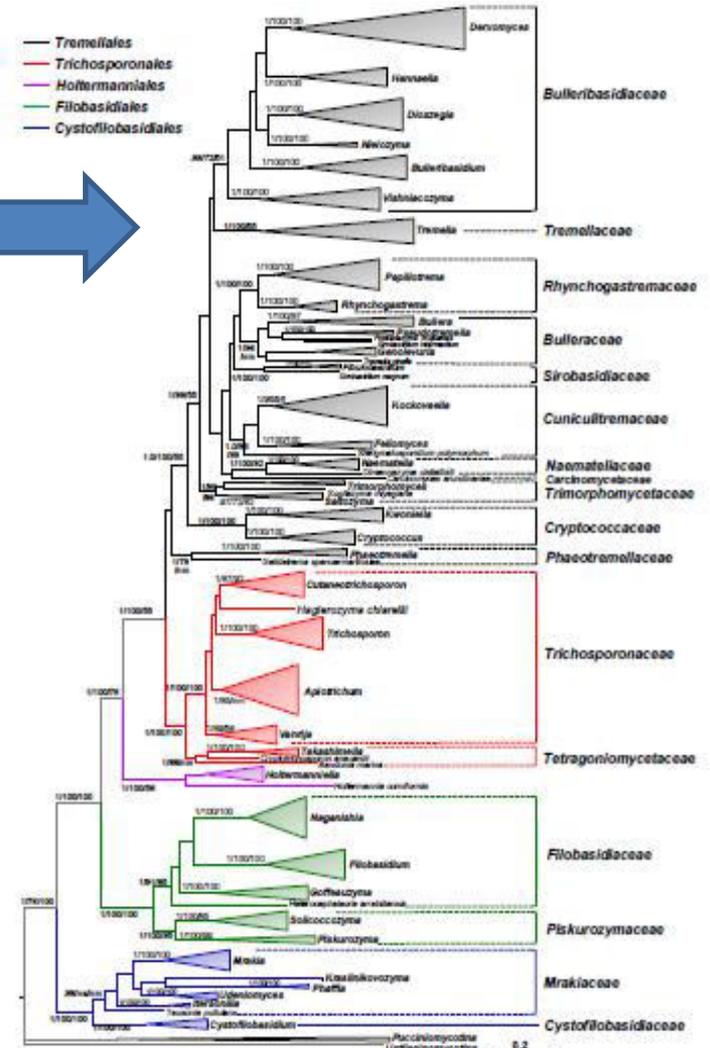
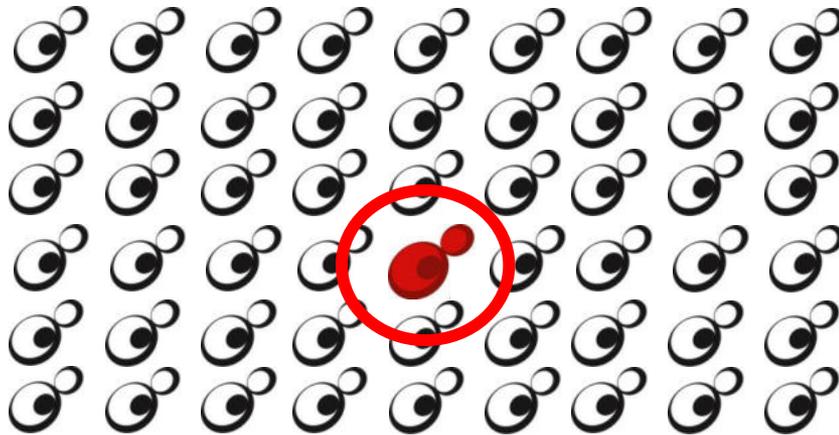
<sup>1</sup>Laboratory for Genetics and Genomics, Centre of Microbial and Plant Genetics (CMPG), KU Leuven, Leuven, Belgium; and <sup>2</sup>Laboratory for Systems Biology, VIB, Leuven, Belgium



# 9. Dalla ricerca alla bioeconomia (4)

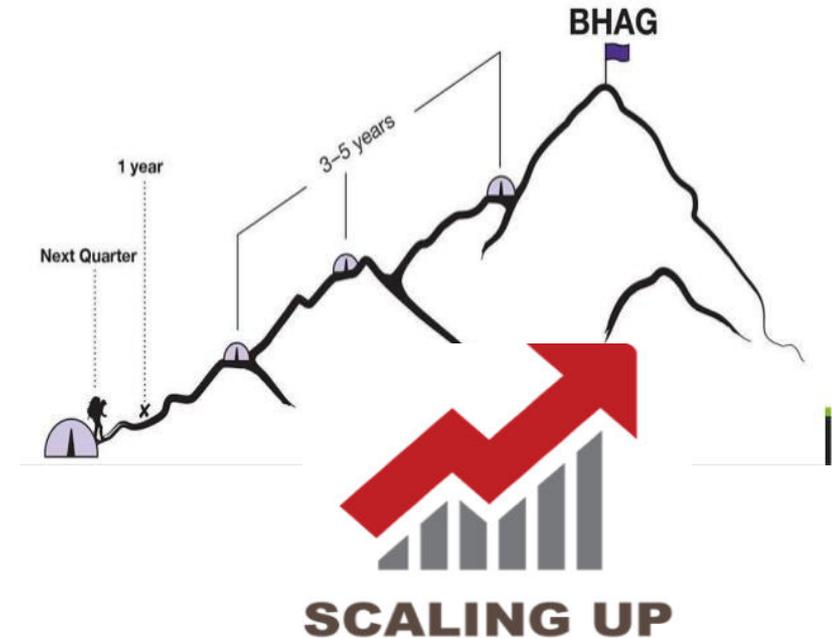
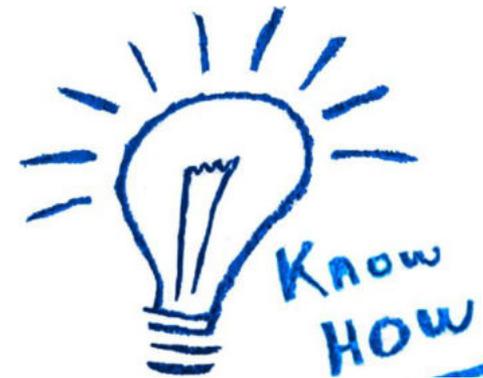
Tassonomia → ricerca di base

Ricerca applicata → screening e selezione



## 9. Dalla ricerca alla bioeconomia (5)

### IL RUOLO DELL'UNIVERSITÀ



**Penicillina: 1929 – 1944....**

# 10. Alcuni casi-studio UNIPG (1)

✓ Caso-studio # 1: enzimi attivi a differenti temperature da differenti microrganismi (1996 – 2015)

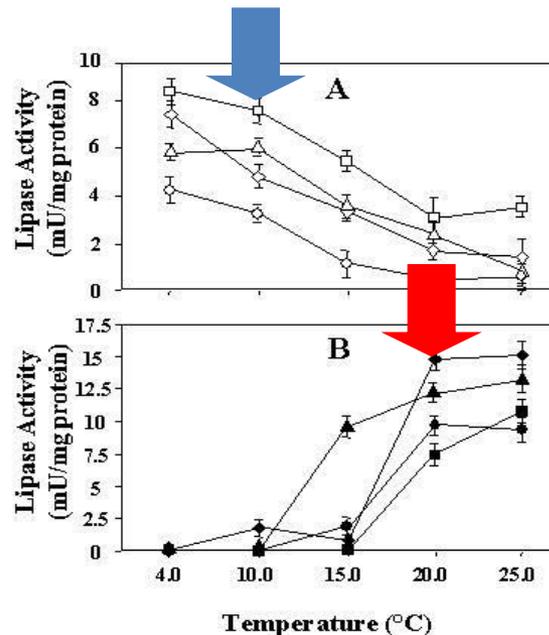
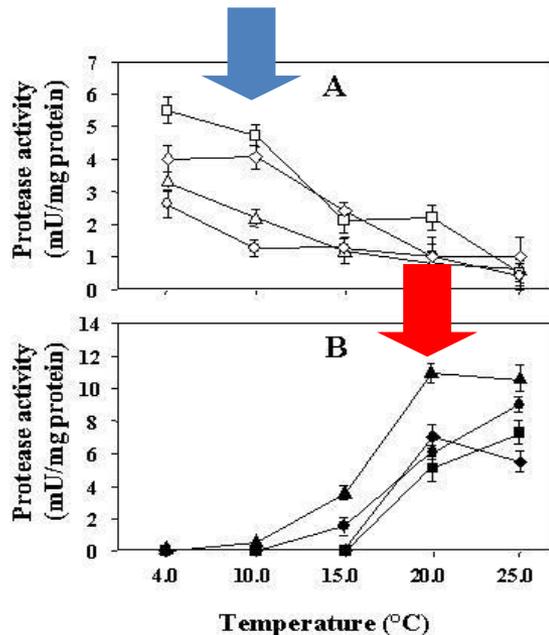


RESEARCH ARTICLE

## Yeast and yeast-like diversity in the southernmost glacier of Europe (Calderone Glacier, Apennines, Italy)

Eva Branda<sup>1</sup>, Benedetta Turchetti<sup>1</sup>, Guglielmina Diolaiuti<sup>2</sup>, Massimo Pecci<sup>3</sup>, Claudio Smiraglia<sup>2</sup> & Pietro Buzzini<sup>1</sup>

<sup>1</sup>Department of Applied Biology and Industrial Yeasts Collection DBVPG, University of Perugia, Italy; <sup>2</sup>Department of Health Sciences 'Ardito Desio', University of Milan, Italy; and <sup>3</sup>Italian Mountain Institute (IMI), Rome, Italy

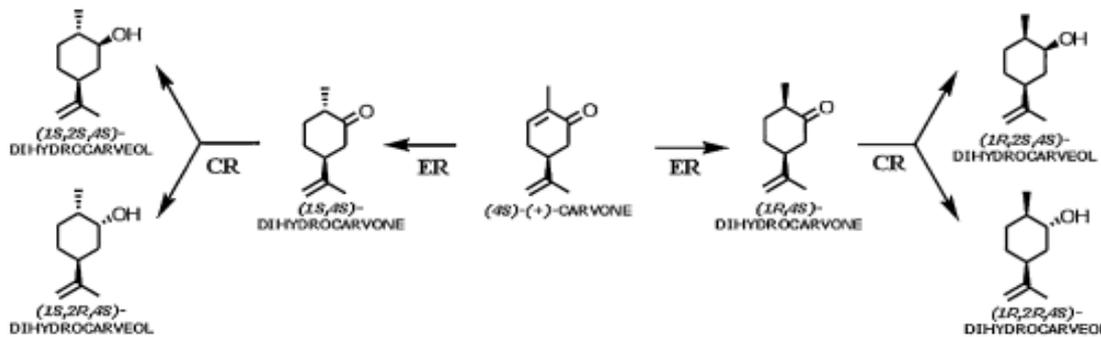


Attività enzimatiche a differenti temperature di enzimi isolate da:

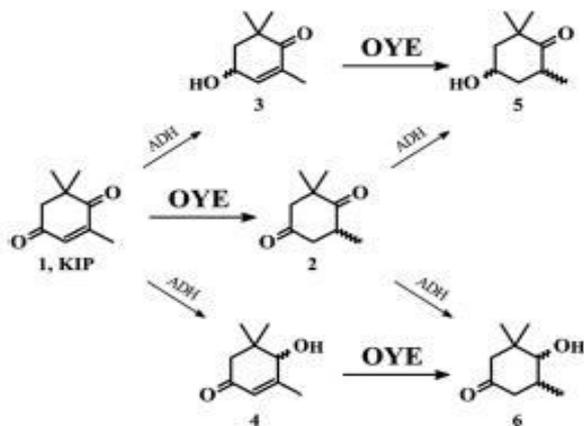
- lieviti adattati al freddo
- Lieviti adattati al caldo

## 10. Alcuni casi-studio UNIPG (2)

- ✓ Caso-studio # 2: biocatalisi di precursori di interesse farmaceutico (2004 – 2015)



- ✓ Abilità di ridurre composti  $\alpha,\beta$  insaturi
- ✓ Sintesi di “mattoni chimici” di interesse farmaceutico



Bioresource Technology 102 (2011) 3993–3998

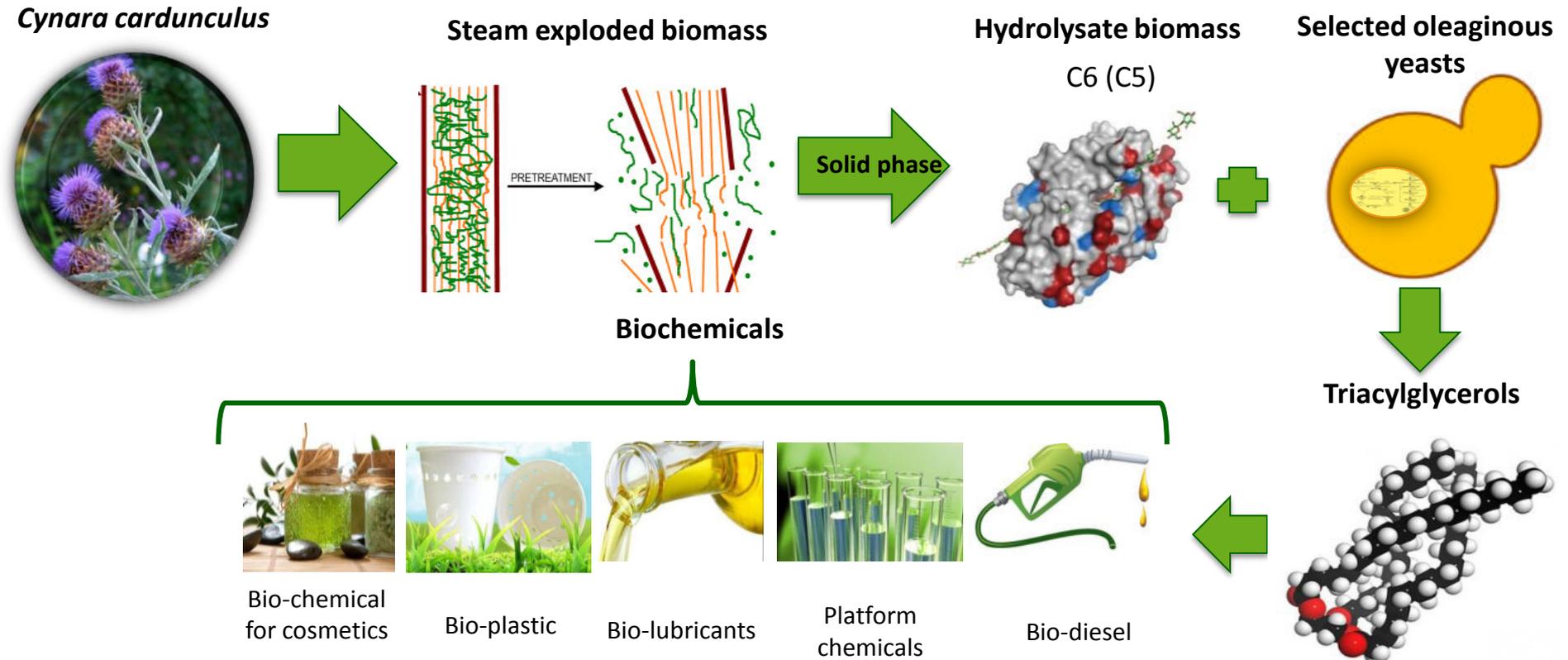


Bioreduction of  $\alpha,\beta$ -unsaturated ketones and aldehydes by non-conventional yeast (NCY) whole-cells

Marta Goretti<sup>a</sup>, Chiara Ponzoni<sup>b</sup>, Elisa Caselli<sup>b</sup>, Elisabetta Marchegiani<sup>a</sup>, Maria Rita Cramarossa<sup>b</sup>, Benedetta Turchetti<sup>a</sup>, Luca Forti<sup>b</sup>, Pietro Buzzini<sup>a,\*</sup>

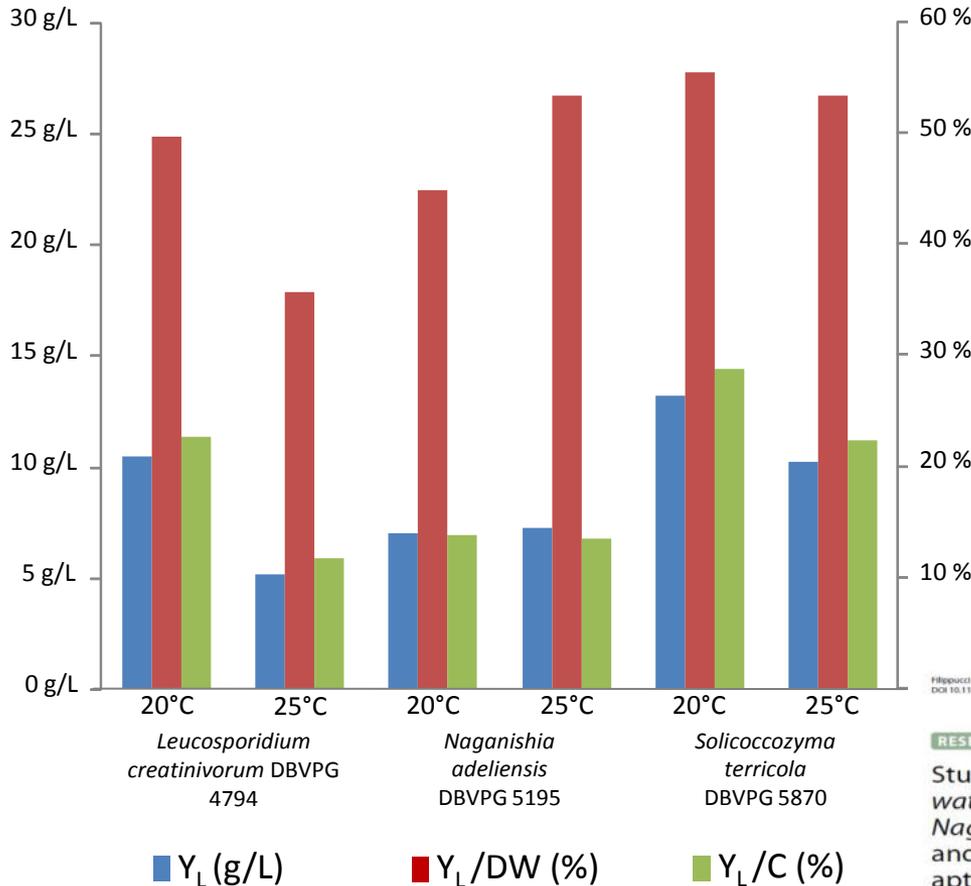
# 10. Alcuni casi-studio UNIPG (3)

✓ Caso-studio # 3: dalle lignocellulose agli oleochemicals (1)  
(2012 – oggi)

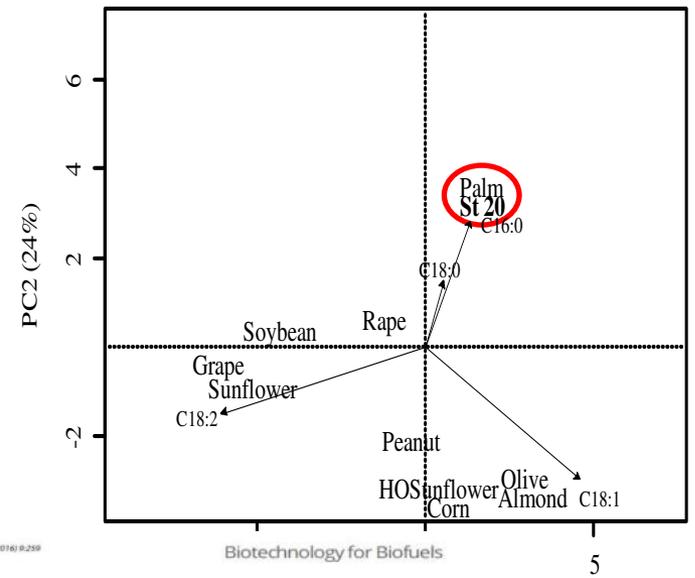


# 10. Alcuni casi-studio UNIPG (4)

## ✓ Caso-studio # 3: dalle lignocellulose agli oleochemicals (2)



## Olio di palma da lieviti?



Filippucci et al. *Biotechnol Biofuels* (2016) 9:239  
DOI 10.1186/s13068-016-0672-1

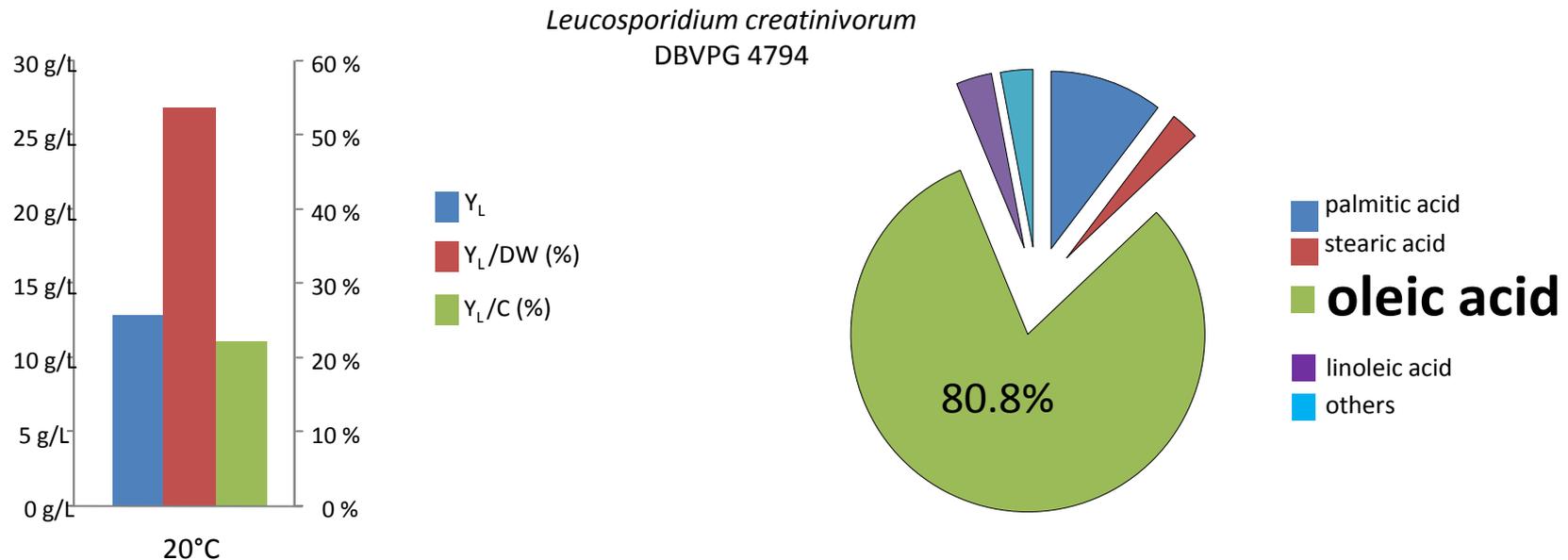
**RESEARCH** Open Access

**Study of *Holtermanniella wattica*, *Leucosporidium creatinivorum*, *Naganishia adeliensis*, *Solicoccozyma aerea*, and *Solicoccozyma terricola* for their lipogenic aptitude from different carbon sources**

Sara Filippucci<sup>1†</sup>, Giorgia Tasselli<sup>1†</sup>, Alessandro Scardua<sup>2</sup>, Simone Di Mauro<sup>3</sup>, Maria Rita Cramarossa<sup>3</sup>, Davide Perini<sup>3</sup>, Benedetta Turchetti<sup>3</sup>, Andrea Onofri<sup>3</sup>, Luca Forti<sup>3</sup> and Pietro Buzzini<sup>1†</sup>

## 10. Alcuni casi-studio UNIPG (5)

### ✓ Caso-studio # 3: dalle lignocellulose agli oleochemicals (3)



	T [°C]	OS [h]	CFPP [°C]	KV [mm <sup>2</sup> /s]	D [Kg/m <sup>3</sup> ]	SV [mg]	IV [mg]	CN	HHV [MJ/Kg]
Biodiesel EN 14214 (Patel et al. 2017)		≥6	variable	3.5 - 5	860 - 900	≥ 0.5	120 ≤	≥ 51	not specified
<i>Leucosporidium creatinivorum</i> DBVPG 4794 5L Bioreactor	20	35.55	-8.50	4.76	874.38	200.59	80.38	53.01	40.00

# 10. Alcuni casi-studio UNIPG (6)

## ✓ Caso-studio # 3: dalle lignocellulose agli oleochemicals (4)

# SPRING

*Sustainable Processes and Resources  
for Innovation and National Growth*

**Italian Cluster of Green Chemistry**

- Obiettivo principale →  
utilizzazione di biomasse vegetali  
e microbiche (lieviti) per lo  
sviluppo di nuovi biopolimeri

**Unità Operativa n. 1** - L'IMM - Centro di ricerca su Materiali innovativi Nanobioibridati

**Unità Operativa n. 2** - CIRIAF - Centro Interdisciplinare di Ricerca sull'Inquinamento e sull'Ambiente - "Misura Pista"

**Unità Operativa n. 4** - Dipartimento di Biologia Agricola e Colture dei Lavori Industriali DBVPG

**Unità Operativa n. 5** - CCB - Centro Chimica Funzionale UniPg/Polo Innovazione CCB

**Unità Operativa n. 6** - DICA - Dipartimento di Ingegneria Civile ed Ambientale

## 10. Alcuni casi-studio UNIPG (7)

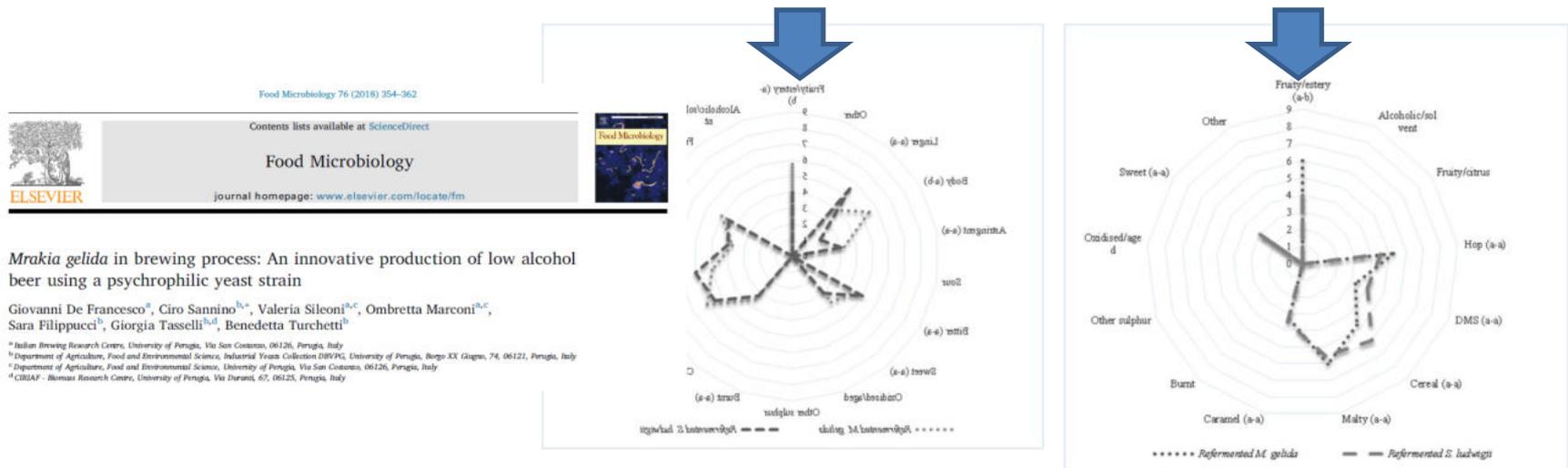
- ✓ Caso-studio # 4: “birra” a bassa gradazione alcolica (2015 – oggi)

*Mrakia gelida* → lievito adattato al freddo

Ridotto contenuto di etanolo (1.40%) e diacetile (5.04 µg/L)



Caratteristiche organolettiche della birra ottenuta da *M. gelida* comparate con quelle di una birra ottenuta tramite uno starter commerciale *Saccharomyces ludwigii* WSL17



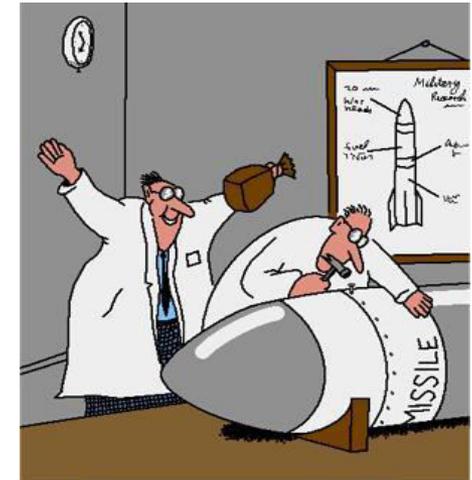
## 11. Un po' di humor...

**“Theory is when you know everything but nothing works.**

**Practice is when everything works but no one knows why.**

**In our lab, theory and practice are combined: nothing works and no one knows why.”**

2



### Scientist: Cats think you are just a big, stupid cat

Anthrozoologist John Bradshaw insists that cats really aren't terribly domesticated and think that humans are the same species as them, but oddly "non-hostile."



The Boring World Studio  
©2018 CompACT/YouTube Screened by Chris Makozzy/CNET

So that explains it

more funny stuff at FUNNYASDUCK.NET

# Grazie per l'attenzione!



## "Le Cappelle papale"

Giuseppe Gioacchino Belli

dai Sonetti (n. 1516 dell'ed. Vigolo)

*La cappella papale ch'è ssuccessa  
domenica passata a la Sistina,  
pe tutta la quaresima è ll'istessa  
com'è stata domenic' a mmatina.*



*Sempre er Papa viè ffora in portantina:  
sempre quarche Eminenza canta messa;  
e cquello che ppiù a ttutti j'interessa  
sc'è sempre la sù predica latina.*



*Li Cardinali sce stanno ariccorti  
cor barbozzo inchiodato sur breviario  
com'e ttanti cadaveri de morti.*

*E nun ve danno ppiù ssegno de vita  
sin che nun je s'accosta er caudatario  
a ddiije: Eminentissimo, è ffinita.*