Summary Report of Training Course of Microbial Resources Information Management and Utilization for Developing Countries – TUB Microbial Culture Collection (DACT #496)

Personal introduction

My name is Brigitta Kónya. I come from Europe, Hungary, from the city of Budapest. I graduated from the Budapest University of Technology and Economics (BUTE) Faculty of Chemical Technology and Biotechnology. I hold a Bachelor's degree in Environmental Engineering and a Master's degree in Chemical Engineering, Specialization of Analytical and Structural Chemistry. I finished the university studies in 2014. I have also been an employee at my university at the Department of Applied Biotechnology and Food Science, Industrial Microbiology and Enzymology Laboratory as a research assistant since 2009. We maintain TUB Microbial Culture Collection. My main tasks involve isolation of different microorganisms (especially filamentous fungi and actinomycetes) from soil samples (worldwide), fermentation experiments, enzyme activity measurements, determination of secondary metabolites from fermentation samples by HPLC, LC-MS, UV-VIS spectrophotometer. Participation in scientific papers:

1. Weinberg, Z.G., Szakacs, G., Chen, Y., Pinto, R., Bernstein, S., Konya, B., Sela, S. Inhibition of Escherichia coli in cultivated cattle manure. Journal of Animal Science 92: 2336-2341 (May 2014) IF: 2.1

2. Binod, P., Szakacs, G., Konya, B., Pandey, A. Biosynthesis of nanosilver particles by fungal strains. (2014, submitted)

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TUB Microbial Culture Collection (Acronym: DACT #496)

ABSTRACT

TUB Microbial Culture Collection is established in 1976 at Budapest University of Technology and Economics, Hungary. We joined to World Data Center for Microorganisms (WDCM) in 1981. We have ca. 4600 microorganisms. Our research topics are production and application of different microbial enzymes with filamentous fungi, yeasts, actinomycetes and bacteria. We collaborate pharmacheutical and biotech companies, perform researches with scientists in USA, Canada, Mexico, South-Africa, India, Malaysia, Israel, Finland, Sweden, UK, The Netherlands, Austria. We also participated in EU Framework Projects.

Key words: TUB, DACT, Hungary, Brigitta Konya

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1. Brief introduction of your Culture Collection.

Introduction

Our culture collection is established in 1976 at Budapest University of Technology and Economics, Department of Applied Biotechnology and Food Science, Laboratory of Industrial Microbiology. We joined to World Data Center for Microorganisms (WDCM) in 1981.

Coremia of Penicillium claviforme

Preservation and Maintanance

Our staff takes care of TUB Microbial Culture Collection (4600 microorganisms). The acronym is DACT according to WFCC Global Catalogue of Microorganisms. This name comes from the Department of Applied Biotechnology and Food Science (DACT). TUB stands for Technical University of Budapest, the former name of the university. (Web site: www.tub-collection.com). We are working on different microbiological and fermentation topics, including submerged and solid state fermentation, such as microbial enzymes, secondary metabolites, environmental microbiology, biotransformation. In addition 550 soil samples are stored (worldwide) for isolation and screening programmes.

Our staff:

- George Szakacs, PhD, Senior Research Scientist
- Brigitta Konya, MSc, Environmental engineer, Chemical engineer
- Karolina Toth, MSc, Bioengineer
- Zsuzsanna Ferencz, MSc, Bioengineer
- Anett Toth, BSc, student

Microorganisms and soil collection

We have ca. 4600 microorganisms. The main groups are filamentous fungi, yeasts, actinomycetes and bacteria. We store different soil samples worldwide. Therefore, we can make isolation worldwide. We receive

samples from extreme environmental conditions such as salty soils, alkaline soils, acidic soils, or sludge from the Adriatic sea, 40 meters deep. To name a few examples, Italy, Japan, Germany, Australia, Egypt, Peru all provide samples to our collection. First, we make an isolation from the environmental sample followed by purification and finally, we make the lyophilization and store them in ampoules. We prefer freeze-drying: storage by lyophilization (viability: 8-50 years).

Thermophilic actinomycetes

Collaborations

We cooperated with ATCC (= American Type Culture Collection). We have sent 140 strains to ATCC. We also collaborate pharmacheutical

companies, analytical laboratories where I make analytical measurements. I use Ultraviolet–visible spectroscopy (UV-VIS), Polyacrylamide gel electrophoresis (PAGE), High-performance liquid chromatography (HPLC), and Mass spectrometry (MS) methods.

Research topics

The research topics in our lab in the last 20 years are the following:

1. Basic materials for drugs (pharmaceuticals) as microbial secondary metabolites (lovastatin, cyclosporine, echinocandin).

2. Production and application of different microbial enzymes (cellulase, hemicellulase, phytase, protease, amylase, chitinase, pectinase, etc.).

3. Production and/or separation of R and S enantiomeric compounds from racemic mixtures by microorganisms and/or microbial enzymes. Where the organic chemistry and biotechnology meet each other.

4. Biotransformation of steroid and non-steroid compounds.

Silver nanoparticles production

Nanotechnology became an incredibly dynamic research field in the last 15 years. Microbes can be used also for production of nanoparticles. Our current study demonstrates a simple biotechnological process for the synthesis of nanosilver particles using fungal strains. It shows the possibilities to develop an ecofriendly as well as cost effective method for the production of nanosilver by biological route.

Livestock breeding

Some harmful bacteria are living in cattle manure, as E.coli, Salmonella etc., and cause illness for cows for example mastitis. A common practice on Israeli dairy barns comprises daily cultivation of the manure with soil, like a composting method. Cultivation is a mechanical process used to break up and till the manure bedding and it results a drier and aerated bedding and cleaner cows, which consequently reduces the incidence of mastitis. We hypothesized that microorganisms which are antagonistic to E. coli develop in the cultivated manure are responsible for this phenomenon. Identifying the mechanisms by which the antagonistic fungi affect the survival of E. coli in manure could be exploited for improvement of the animal health and for limiting the transmission of zoonotic pathogens to food and water.

Agricultural Research

Ensiling is an essential method in agriculture for winter feed. To produce folder plant for ruminants (like cows): the silage need lactic acid bacteria (LAB) and anaerobic condition. LAB are used in fermented food products like yogurt, cheese, pickles, etc.

1. One hypothesis is that specific LAB strains interact with rumen microorganisms to enhance rumen functionality and animal performance (live-weight gain, milk production).

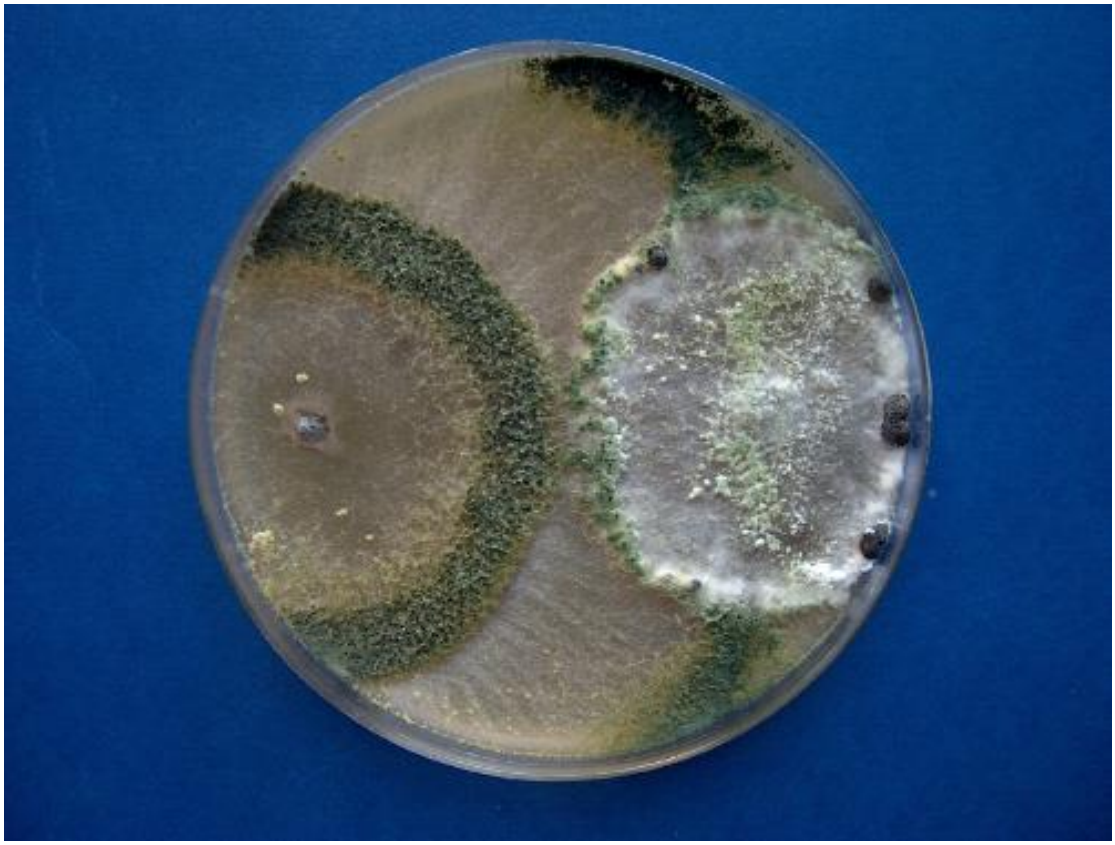
2. Another possibility is that LAB, which are used as inoculants for silage , inhibit detrimental microorganisms in the silage. In this regard it is well

known that LAB produce a variety of antimicrobial substances such as bacteriocins.

The aim of the study was to determine antibacterial activity in LAB silage inoculants cultures.

International projects

Our main project was the DISCO project, supported by European Union (it is available on the following website: http://www.disco-project.eu/). Discovery of novel cellulases and hemicellulases and their reaction mechanisms for hydrolysis of lignocellulosic biomass, to produce bioethanol. The aims of the DISCO project are to develop more efficient and cost-effective enzyme tools to produce bioethanol from lignocellulosic biomass, and understand how these enzymes work. Lignocellulose is a complex of carbohydrate polymers (cellulose and hemicellolose) tightly bound to lignin and is a major constituent of a wide variety of materials including waste materials from agriculture, forestry, wood-based industries, and municipal solid waste.



Mycoparasitism of Trichoderma harzianum on Sclerotinia sclerotiorum

Trichoderma species at TUB culture collection

Altogether 1100 Trichoderma strains are stored as freeze-dried cultures. 15-20 replicate ampoules from each strain. Ca. 20,000 ampoules from Trichoderma species such as:

Trichoderma aggressivum, Trichoderma asperelloides, Trichoderma asperellum, Trichoderma atroviride, Trichoderma brevicompactum, Trichoderma cerinum, Trichoderma citrinoviride, Trichoderma effusum, ….., Trichoderma virens, Trichoderma viride, Trichoderma viridescens.

Papers where George Szakacs (TUB, Budapest) participates as co-author in the description of new Trichoderma species:

1. Bissett, J. et al. (2003). New species of Trichoderma from Asia.

Can. J. Bot. 81: 570-586

2. Samuels, G.J. et al. (2012). The Longibrachiatum Clade of Trichoderma: a revision with new species. Fungal Diversity 55: 77-108

Trichoderma gracile Samuels & Szakacs

References

Contractual research to European biotech companies (three times, between 2004-2009). Research collaborations with scientists in USA, Canada, Mexico, South-Africa, India, Malaysia, Israel, Finland, Sweden, UK, The Netherlands, Austria. Two times participation in EU Framework Projects:

- EU6 HIPERMAX
- EU7 DISCO see: www.disco-project.eu

The DISCO project is part funded by the Seventh Framework Programme for research and technological development (FP7), the European Union´s chief instrument for funding research over the period 2007 to 2013.

2. Benefit from the training courses.

I am pleased to be a part of Training Course of Microbial Resources Information Management and Utilization for Developing Countries. First of all, I would like to thank all the organizers and the host institution: WFCC-MIRCEN World Data Center for Microorganisms (WDCM);

CODATA Task Group on Advancing Informatics for Microbiology (TG-AIM); World Federation for Culture Collections (WFCC); and United Nations Educational, Scientific and Cultural Organization (UNESCO) for arranging this training course.

I hope you have appreciated my introduction and presentation. I am glad to participate in this program, it provided me a lot of knowledge, information about the WDCM and other culture collection around the world. It helped us to better promote share and apply our microbial resource information. It offered me the opportunity to interact, discuss and collaborate with people from other scientific institutes.

3. Suggestion on WDCM work.

I would be glad if you share the presentations to us as soon as possible, because it would help me practice and gain more knowledge on the topic discussed in the course. It would be really helpful if we can get name and contact information of all the participants and lecturers. I am really interested to participate in a course where we can have hands on training on modern microbiology and molecular techniques like freeze-drying, cryopreservation, sequencing etc.

4. Comments or suggestion on the training courses.

The lectures were informative, and the course was well planned. I think I wish a little bit more about patent information and applied biotechnology.

5. Suggestion on further cooperation between WDCM and your collections.

In the future I suggest keep in touch, share the information and advanced technology. Both parties should offer an internship and joint research for PhD students.