Busta n. 3 - Quesito in materia di accertamento delle conoscenze tecniche

Quesito:

Metodi di identificazione molecolare impiegati per i microrganismi procariotici ed eucariotici e agenti virali

foods

MDPI

Review

A Comprehensive Review on Bio-Preservation of Bread: An Approach to Adopt Wholesome Strategies

Mizanur Rahman [1,*], Raihanul Islam [1], Shariful Hasan [1], Wahidu Zzaman [1], Md Rahmatuzzaman Rana [1], Shafi Ahmed [2], Mukta Roy [1], Asm Sayem [1], Abdul Matin [3], António Raposo [4,*], Renata Puppin Zandonadi [5], Raquel Braz Assunção Botelho [5] and Atiqur Rahman Sunny [6,7,*]

1 Department of Food Engineering and Tea Technology, Shahjalal University of Science and Technology, Sylhet 3100, Bangladesh; raihanul08@student.sust.edu (R.I.); sharifulh.nahid@gmail.com (S.H.); wahid-ttc@sust.edu (W.Z.); rzaman-fet@sust.edu (M.R.R.); muktaroy-fet@sust.edu (M.R.); asm.sayem-fet@sust.edu (A.S.)
2 Department of Agro Product Processing Technology, Jashore University of Science and Technology, Jashore 7400, Bangladesh; shafi.fet@gmail.com or shafi@just.edu.bd
3 Department of Food Processing and Engineering, Chattogram Veterinary and Animal Sciences University, Chittagong 4203, Bangladesh; abmatin@cvasu.ac.bd
4 CBIOS (Research Center for Biosciences and Health Technologies), Universidade Lusófona de Humanidades e Tecnologias, Campo Grande 376, 1749-024 Lisboa, Portugal
5 Department of Nutrition, Campus Darcy Ribeiro, University of Brasilia, Asa Norte, Distrito Federal, Brasília 70910-900, Brazil; renatapz@unb.br (R.P.Z.); raquelbotelho@unb.br (R.B.A.B.)
6 Department of Genetic Engineering and Biotechnology, Shahjalal University of Science and Technology, Sylhet 3100, Bangladesh
7 Suchana Project, WorldFish, Bangladesh Office, Gulshan, Dhaka 1213, Bangladesh
* Correspondence: mizan-fet@sust.edu (M.R.); antonio.raposo@ulusofona.pt (A.R.); a.rsunny@cgiar.org (A.R.S.)

Citation: Rahman, M.; Islam, R.; Hasan, S.; Zzaman, W.; Rana, M.R.; Ahmed, S.; Roy, M.; Sayem, A.; Matin, A.; Raposo, A.; et al. A Comprehensive Review on Bio-Preservation of Bread: An Approach to Adopt Wholesome Strategies. *Foods* **2022**, *11*, 319. https://doi.org/10.3390/foods11030319

Academic Editor: Maria Grazia Volpe

Received: 8 December 2021
Accepted: 17 January 2022
Published: 24 January 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Abstract: Bread is a food that is commonly recognized as a very convenient type of food, but it is also easily prone to microbial attack. As a result of bread spoilage, a significant economic loss occurs to both consumers and producers. For years, the bakery industry has sought to identify treatments that make bread safe and with an extended shelf-life to address this economic and safety concern, including replacing harmful chemical preservatives. New frontiers, on the other hand, have recently been explored. Alternative methods of bread preservation, such as microbial fermentation, utilization of plant and animal derivatives, nanofibers, and other innovative technologies, have yielded promising results. This review summarizes numerous research findings regarding the bio-preservation of bread and suggests potential applications of these techniques. Among these techniques, microbial fermentation using lactic acid bacteria strains and yeast has drawn significant interest nowadays because of their outstanding antifungal activity and shelf-life extending capacity. For example, bread slices with *Lactobacillus plantarum* LB1 and *Lactobacillus rossiae* LB5 inhibited fungal development for up to 21 days with the lowest contamination score. Moreover, various essential oils and plant extracts, such as lemongrass oil and garlic extracts, demonstrated promising results in reducing fungal growth on bread and other bakery products. In addition, different emerging bio-preservation strategies such as the utilization of whey, nanofibers, active packaging, and modified atmospheric packaging have gained considerable interest in recent days.

Keywords: bakery products; bio-preservatives; shelf-life; mold spoilage; antifungal activity; microbial fermentation; active packaging

1. Introduction

For thousands of years, bread is still one of the dominant food sources of the human diet, with the manufacturing of yeast-based and sourdough bread being one of the earliest biotechnological mechanisms [1]. Amidst its medium growth rate (122,000 t in 2007 to 129 t in 2016), it earned approximately $358 billion in global revenue in 2016 [2]. It is also a

Busta n. 2 - Prova su utilizzo strumenti informatici

Quesito:

Hai osservato la germinazione di 150 conidi per ciascun ceppo e per ciascuna delle 3 replicazioni. Calcola la percentuale di germinazione e le corrispettive medie

Busta n. 7 - Quesito in materia di accertamento delle conoscenze tecniche

Quesito:

Preparazione di un vetrino a fresco per l'osservazione di struttura al microscopio ottico

BUSTA N. 2

ANNUAL REVIEWS

Annual Review of Microbiology

Regulation of Biofilm Exopolysaccharide Biosynthesis and Degradation in *Pseudomonas aeruginosa*

Luyan Z. Ma,[1] Di Wang,[1] Yiwei Liu,[2] Zhenyu Zhang,[1] and Daniel J. Wozniak[2]

[1]State Key Laboratory of Microbial Resources, Institute of Microbiology, Chinese Academy of Sciences, Beijing, China; email: luyanma27@im.ac.cn

[2]Department of Microbial Infection and Immunity and Department of Microbiology, Ohio State University, Columbus, Ohio, USA

Annu. Rev. Microbiol. 2022. 76:413–33

First published as a Review in Advance on June 2, 2022

The *Annual Review of Microbiology* is online at micro.annualreviews.org

https://doi.org/10.1146/annurev-micro-041320-111355

Keywords

Pseudomonas aeruginosa, exopolysaccharide, biofilm, regulator, glycoside hydrolases, biofilm matrix

Abstract

Microbial communities enmeshed in a matrix of macromolecules, termed as biofilms, are the natural setting of bacteria. Exopolysaccharide is a critical matrix component of biofilms. Here, we focus on biofilm matrix exopolysaccharides in *Pseudomonas aeruginosa*. This opportunistic pathogen can adapt to a wide range of environments and can form biofilms or aggregates in a variety of surfaces or environments, such as the lungs of people with cystic fibrosis, catheters, wounds, and contact lenses. The ability to synthesize multiple exopolysaccharides is one of the advantages that facilitate bacterial survival in different environments. *P. aeruginosa* can produce several exopolysaccharides, including alginate, Psl, Pel, and lipopolysaccharide. In this review, we highlight the roles of each exopolysaccharide in *P. aeruginosa* biofilm development and how bacteria coordinate the biosynthesis of multiple exopolysaccharides and bacterial motility. In addition, we present advances in antibiofilm strategies targeting matrix exopolysaccharides, with a focus on glycoside hydrolases.

Busta n. 9 - Prova su utilizzo strumenti informatici

Quesito:

Costruisci un grafico a barre mettendo nelle ordinate i valori OD 600 e nelle ascisse i ceppi batterici e poi inverti la serie di dati (scambia righe/colonne)

Busta n. 1 - Quesito in materia di accertamento delle conoscenze tecniche

Quesito:

Principali tecniche di conservazione dei microrganismi procariotici ed eucariotici

BUSTA N. 5

Science of the Total Environment 842 (2022) 156641

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Review

Current advances and research prospects for agricultural and industrial uses of microbial strains available in world collections

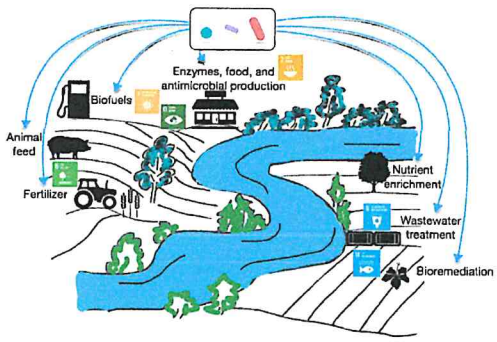
Uttpal Anand [a], Anukool Vaishnav [b,c,d], Sushil K. Sharma [e,*], Jagajjit Sahu [f], Sarfaraz Ahmad [g], Kumari Sunita [h], S. Suresh [i], Abhijit Dey [j], Elza Bontempi [k], Amit Kishore Singh [l], Jarosław Proćków [m,**], Awadhesh Kumar Shukla [n,**]

[a] Department of Life Sciences, Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel
[b] Department of Biotechnology, Institute of Applied Sciences & Humanities, GLA University, Mathura, Uttar Pradesh 281406, India
[c] Department of Plant and Microbial Biology, University of Zürich, Zollikerstrasse 107, CH-8008 Zürich, Switzerland
[d] Plant-Soil Interaction Group, Agroscope (Reckenholz), Reckenholzstrasse 191, 8046 Zürich, Switzerland
[e] National Agriculturally Important Microbial Culture Collection (NAIMCC), ICAR-National Bureau of Agriculturally Important Microorganisms (ICAR-NBAIM), Mau 275 103, Uttar Pradesh, India
[f] GyanArras Academy, Gothapatna, Malipada, Bhubaneswar, Odisha 751029, India
[g] Department of Botany, Jai Prakash University, Saran, Chhapra 841301, Bihar, India
[h] Department of Botany, Faculty of Science, Deen Dayal Upadhyay Gorakhpur University, Gorakhpur, Uttar Pradesh 273009, India
[i] Department of Chemical Engineering, Maulana Azad National Institute of Technology, Bhopal 462 003, Madhya Pradesh, India
[j] Department of Life Sciences, Presidency University, 86/1 College Street, Kolkata 700073, West Bengal, India
[k] INSTM and Chemistry for Technologies Laboratory, Department of Mechanical and Industrial Engineering, University of Brescia, Via Branze, 38, 25123 Brescia, Italy
[l] Department of Botany, Bhagalpur National College, (A Constituent unit of Tilka Manjhi Bhagalpur University), Bhagalpur 812007, Bihar, India
[m] Department of Plant Biology, Institute of Environmental Biology, Wrocław University of Environmental and Life Sciences, Kożuchowska 5b, 51-631 Wrocław, Poland
[n] Department of Botany, K.S. Saket P.G. College, Ayodhya (affiliated to Dr. Rammanohar Lohia Avadh University, Ayodhya) 224123, Uttar Pradesh, India

HIGHLIGHTS

- As a source of authenticated biological material, culture collections are crucial in research.
- Collections under WFCC are a bank of around 3.0 million microbes.
- The use of conserved microbes is regulated by biodiversity and biosafety law.
- Preserved microbes are a bioresource for green products and technologies.
- Genetically engineered microorganisms are resources for bioremediation.

GRAPHICAL ABSTRACT



ARTICLE INFO

Editor: Ewa Korzeniewska

Keywords:
Microbial culture collection
Conserved microorganisms
World Federation for Culture Collections (WFCC)
Type strains

ABSTRACT

Microorganisms are an important component of the ecosystem and have an enormous impact on human lives. Moreover, microorganisms are considered to have desirable effects on other co-existing species in a variety of habitats, such as agriculture and industries. In this way, they also have enormous environmental applications. Hence, collections of microorganisms with specific traits are a crucial step in developing new technologies to harness the microbial potential. Microbial culture collections (MCCs) are a repository for the preservation of a large variety of microbial species distributed throughout the world. In this context, culture collections (CCs) and microbial biological resource centres (mBRCs) are vital for the safeguarding and circulation of biological resources, as well as for the progress of the life sciences. Ex situ

* Correspondence to: Sushil K. Sharma, ICAR-National Institute of Biotic Stress Management, Baronda, Raipur 493225, Chhattisgarh, India.
** Corresponding authors.
E-mail addresses: sks_micro@rediffmail.com sushil.sharma1@icar.gov.in (S.K. Sharma), jaroslaw.prockow@upwr.edu.pl (J. Proćków), awadhkshukla@gmail.com (A.K. Shukla).

http://dx.doi.org/10.1016/j.scitotenv.2022.156641
Received 17 January 2022; Received in revised form 8 June 2022; Accepted 8 June 2022
Available online 11 June 2022

Scientometrics
Nanotechnology

conservation of microorganisms tagged with specific traits in the collections is the crucial step in developing new technologies to harness their potential. Type strains are mainly used in taxonomic study, whereas reference strains are used for agricultural, biotechnological, pharmaceutical research and commercial work. Despite the tremendous potential in microbiological research, little effort has been made in the true sense to harness the potential of conserved microorganisms. This review highlights (1) the importance of available global microbial collections for man and (2) the use of these resources in different research and applications in agriculture, biotechnology, and industry. In addition, an extensive literature survey was carried out on preserved microorganisms from different collection centres using the Web of Science (WoS) and SCOPUS. This review also emphasizes knowledge gaps and future perspectives. Finally, this study provides a critical analysis of the current and future roles of microorganisms available in culture collections for different sustainable agricultural and industrial applications. This work highlights target-specific potential microbial strains that have multiple important metabolic and genetic traits for future research and use.

Contents

1. Introduction

Microbial culture collections (MCC), also known as Biological Resource Centres (BRC), are major suppliers of cultured microorganisms and their replicable parts such as DNA, genomes and plasmids and viable but not yet culturable microorganisms in biological or environmental matrices (Smith et al., 2014; Díaz et al., 2021). Smith et al. (2014) reported a concept that MCC or BRC generally includes "the provision of services and repositories of living cells, genomes of organisms, and information relating to heredity and functions of biological systems. The value of MCC is well documented by the Organization for Economic Cooperation and Development (OECD), which encourages and improves economic well-being and social welfare at an international level (Smith et al., 2014). MCC works mainly for two purposes, first, it plays a vital role in the conservation of agroecosystems through the isolation and preservation of microbial diversity, and second, it makes it easier for the study and preserved microorganisms to the public to generate biotechnological strategies (Díaz et al., 2021).

The first culture collection was established by Prof. Frantisek Král in 1890 at the German University of Prague. Later, several other culture collection centres were established like the Mycothèque de l'Université catholique de Louvain (MUCL) in 1894 in Belgium, the other Collection created in Holland named the Centraalbureau voor Schimmelcultures (CBS) in 1906. These two collections were specialized for fungi. Later, the American Type Culture Collection (ATCC) was established in the United States in the year 1925, which preserves different types of microorganisms (Sharma et al., 2017a,b; Díaz et al., 2021). Currently, the World Federation for Culture Collections (WFCC) is the main organization that synchronizes the activities of MCC globally (Sharma et al., 2017a,b). The WFCC generally aims to promote and support the establishment and monitoring of MCC by providing a platform and sharing information between affiliated culture collections and users (Díaz et al., 2021). It supports the World Data Centre for Microorganisms (WDCM) to compile the data of culture collection, its management, services and promotes the most recent research with an online international database (Sharma et al., 2017a,b). Currently, the WDCM lists 820 collections around the world, of which 303 are located in the Asia region, 259 in Europe, 208 in America, 42 in Oceania, and 19 in Africa (http://ccinfo.wdcm.org/statistics on 12 June 2022). In this way, it is worth mentioning that culture collections globally play a fundamental role in the preservation of microbial diversity, and the accessibility of axenic and stable, promising strains for a variety of applications in agriculture, environment, industrial and medical microbiology, etc. Recently, it was reported that currently a total of 3,348,121 microorganisms have been registered in the WDCM, of which 1,476, 133 are bacteria, 887,812 are fungi, 39,207 are viruses, and 37,923 are cell lines (http://ccinfo.wdcm.org on 12 June 2022).

Rapid exploitation of natural resources and environmental disturbances due to global climate change, soil degradation, and environmental pollution causes problems in the sustainable production of agricultural products and human health. In this context, microorganisms could be the main resources that must be utilized to solve the major challenges of the present day. Over the past 50 years, microorganisms have been exploited to solve essential challenges related to health, agriculture, food processing, and waste management (Thallinger et al., 2013; Singh et al., 2016; De Giani et al., 2021; Fu et al., 2021; Gilmour et al., 2021; Iyer et al., 2021; Kaur et al., 2021; Soh et al., 2021; Liu et al., 2022; Montaño López et al., 2022). In the last decade, the

Busta n. 1 - Prova su utilizzo strumenti informatici

Quesito:

Data una serie di dati che rappresentano l'effetto di diversi trattamenti sulla gravità di una malattia, inserisci la formula indicata, calcola l'indice e fai le medie per trattamento.

$$Indice. = \frac{\sum(classe * n. individui\ in\ ogni\ classe\ )}{N\ totale\ individui * classe\ più\ alta} * 100$$

Busta n. 2 - Quesito in materia di accertamento delle conoscenze tecniche

Quesito:

Metodi di conservazione utilizzate per i virus

BUSTA N. 4

ANNUAL REVIEWS

Annual Review of Microbiology

Understanding Fungi in Glacial and Hypersaline Environments

Cene Gostinčar and Nina Gunde-Cimerman

Department of Biology, Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenia; email: cene.gostincar@bf.uni-lj.si, nina.Gunde-Cimerman@bf.uni-lj.si

Annu. Rev. Microbiol. 2023. 77:89–109

First published as a Review in Advance on March 31, 2023

The *Annual Review of Microbiology* is online at micro.annualreviews.org

https://doi.org/10.1146/annurev-micro-032521-020922

Keywords

fungi, hypersaline water, glacial ice, halophilic, psychrophilic, extremophilic

Abstract

Hypersaline waters and glacial ice are inhospitable environments that have low water activity and high concentrations of osmolytes. They are inhabited by diverse microbial communities, of which extremotolerant and extremophilic fungi are essential components. Some fungi are specialized in only one of these two environments and can thrive in conditions that are lethal to most other life-forms. Others are generalists, highly adaptable species that occur in both environments and tolerate a wide range of extremes. Both groups efficiently balance cellular osmotic pressure and ion concentration, stabilize cell membranes, remodel cell walls, and neutralize intracellular oxidative stress. Some species use unusual reproductive strategies. Further investigation of these adaptations with new methods and carefully designed experiments under ecologically relevant conditions will help predict the role of fungi in hypersaline and glacial environments affected by climate change, decipher their stress resistance mechanisms and exploit their biotechnological potential.

Busta n. 8 - Prova su utilizzo strumenti informatici

Quesito:

Ordinare i dati della seguente tabella prima in ordine crescente per "Ragione sociale" e poi in ordine crescente per "Città". E' possibile eseguire questa operazione?