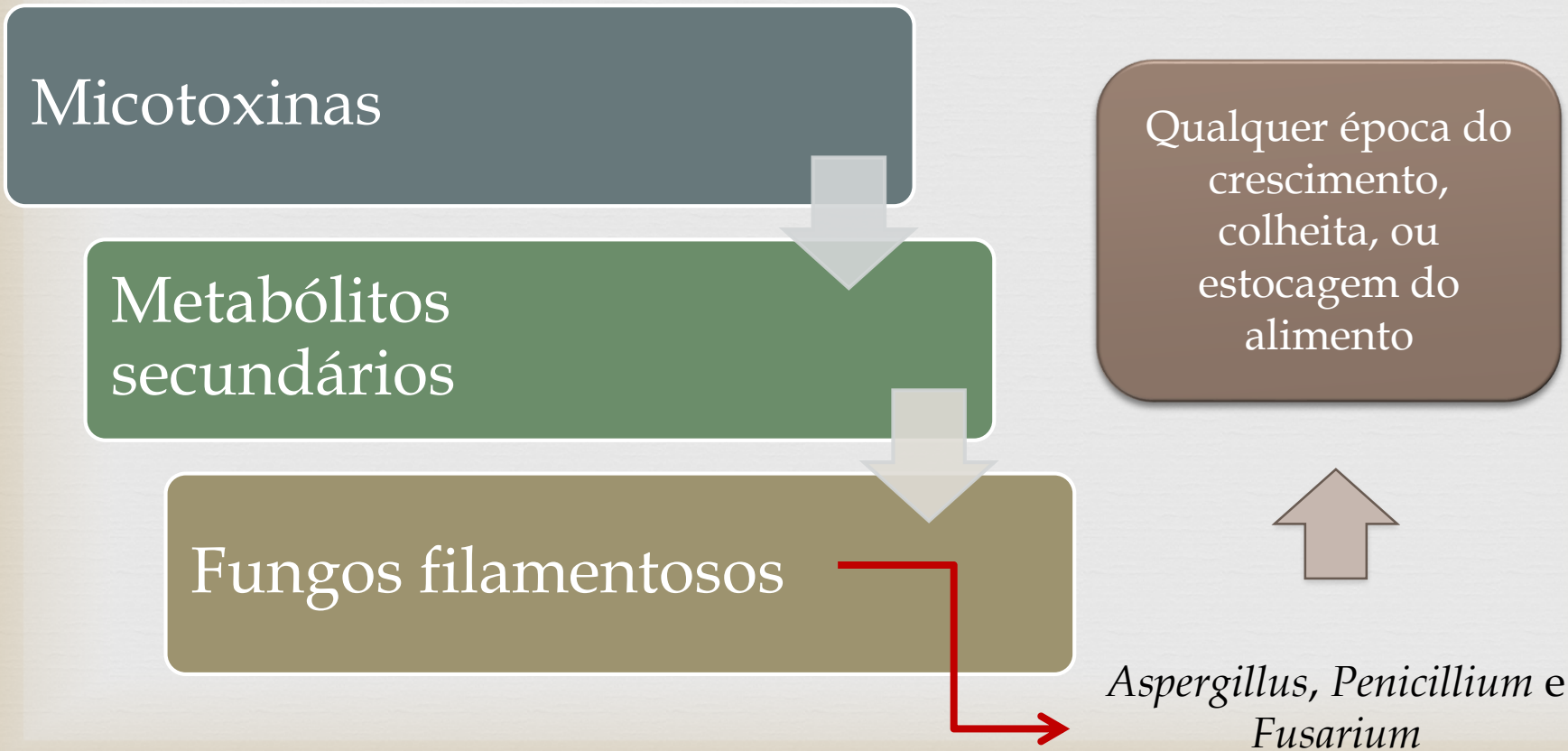
Fungos ocratoxigênicos e ocratoxina A em solos, folhas, uvas e vinhos do Vale do São Francisco

Prof Luís Roberto Batista - UFLA

SEMINÁRIO
Indicação Geográfica para os Vinhos Finos do Vale do São Francisco - Petrolina
17 e 18 de outubro de 2017
Local: Auditório do Senac, Petrolina-PE

Micotoxinas em Alimentos

- Micotoxinas em alimentos:



Micotoxinas em Alimentos

OTA – Micotoxina

Aspergillus e *Penicillium*

Cereais

Amido

Café, cacau, cerveja, uva e derivados, entre outros.

Europa e Brasil

2 µg/L

Risco de Ocratoxina A em vinhos

Produção do vinho tinto

Cascas

↓

Contato com o mosto

↓

Etapas de esmagamento e fermentação

↓

OTA

↓

Bebida

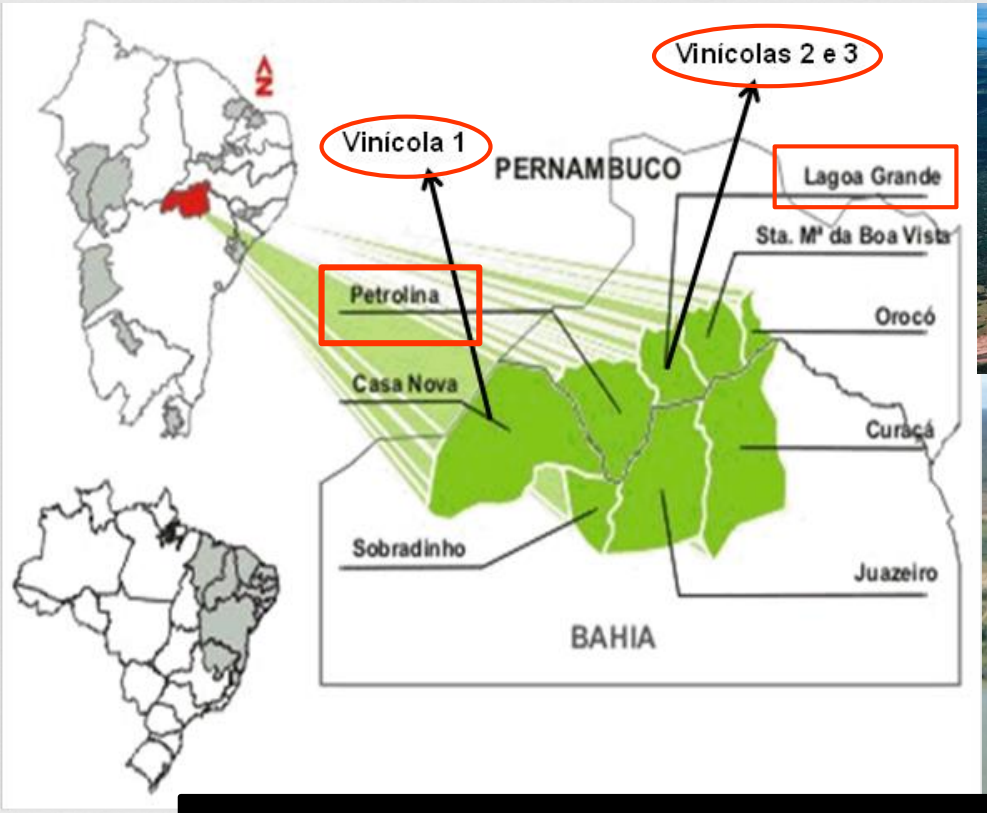
Produção de Ocratoxina A por fungos do gênero *Aspergillus*

OTA

Resveratrol

- Temperatura;
- Localização;
- Aw;
- Luz UV;
- Processo de vinificação;
- Infestação fúngica;
- Solo de cultivo.

ÁREA DE ESTUDO



Latitude	9ºS
Longitude	40ºW
Temperatura média anual (ºC)	27
Precipitação anual (mm)	500
Tipo de clima	Tropical Semi-Árido

UNIVERSIDADE FEDERAL DE LAVRAS

Números do projeto (2013-2017)

Números do projeto (2013-2017)	
Estudante de Pós-doutorado (2015-2016)	1
Estudante de Iniciação Ciêntífica	7
Dissertações de Mestrado	3
Tese de Doutorado	2
Resumos em Eventos Científicos Nacionais	15
Rsumos em Eventos Científicos Internacionais	5
Artigos Ciêntíficos Em Elaboração	3
Artigos Ciêntíficos Publicados	4
Número de fungos isolados e identificados	2356
Números de fungos preservados	210
Número de Amostras Analisadas	120

RECENTES RESULTADOS APRESENTADOS EM EVENTOS CIÊNTÍFICOS

- FREIRE, L.; **PASSAMANI, F. R. F.** ; FREIRE, C. A. ; SCHABO, D. C. ; BATISTA, L. R. . INFLUÊNCIA DE FATORES ABIÓTICOS NA PRODUÇÃO DE OCRATOXINA A POR ASPERGILLUS CARBONARIUS. In: VII CONGRESSO LATINO-AMERICANO E XII CONGRESSO BRASILEIRO DE HIGIENISTAS DE ALIMENTOS, 2015, BÚZIOS. HIGIENE ALIMENTAR, 2015.

- FREIRE, l.; **PASSAMANI, F. R. F.**, PRADO, G.; BATISTA, L. R. INFLUÊNCIA DAS VARIEDADES DE UVAS VINÍFERAS E DA SAFRA NA INCIDÊNCIA FÚNGICA. In: Congresso Latino-Americano de Micologia, Florianópolis, Brasil, 2016.

- FREIRE, l.; **PASSAMANI, F. R. F.**, PEREIRA, G. E.; BATISTA, L. R.. DIVERSIDADE DE ESPÉCIES DE *ASPERGILLUS* E *PENICILLIUM* EM SOLOS DE VINHEDOS DA REGIÃO TROPICAL SEMIÁRIDA DO BRASIL. In: Congresso Latino-Americano de Micologia, Florianópolis, Brasil, 2016.

- FREIRE, LUÍSA; PASSAMANI, F. R. F.; Thomas, A. B.; NASSUR, R. C. M. R.; SILVA, L. M.; PASCHOAL, F. N.; Pereira, G. E.; PRADO, G.; **BATISTA, L. R..** Influence of physical and chemical characteristics of wine grapes on the incidence of Penicillium and Aspergillus fungi in grapes and ochratoxin A in wines. In: 7Th Congress of European Microbiologists, 2017, Valência-Espanha. 7Th Congress of European Microbiologists. 2017.

Taxonomia Polifásica

FISIOLOGIA
Temperatura, pH, CREA

METABOLITOS SECUNDÁRIOS

MORFOLOGIA
Micro e macromorfologia

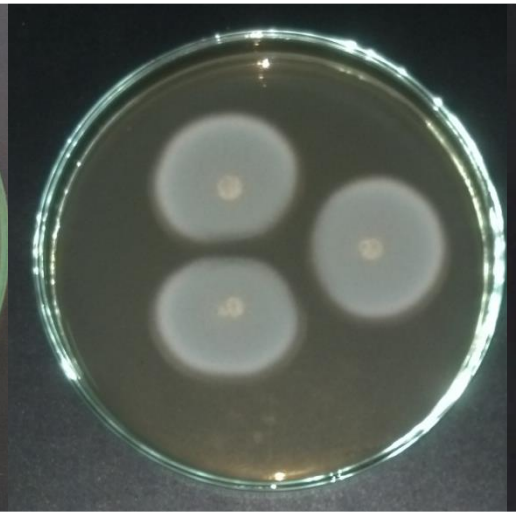
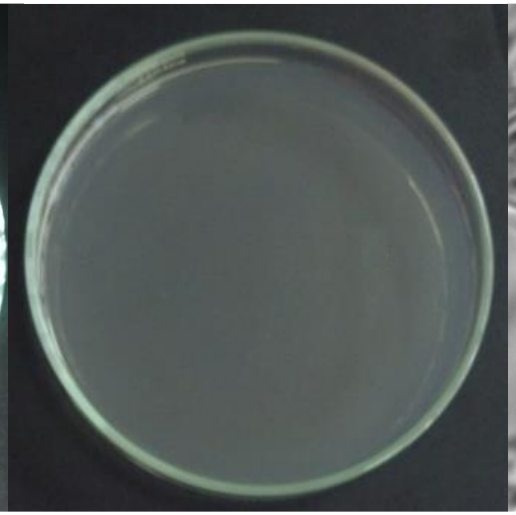
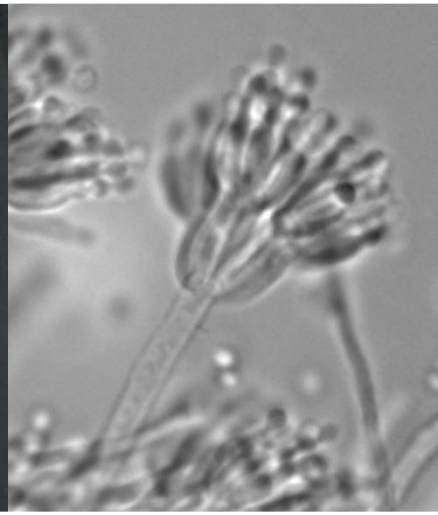
ECOLOGIA
Hospedeiro e origem geográfica

DNA
(ITS, β-TUBULINA, CALMODULINA

GENOMA

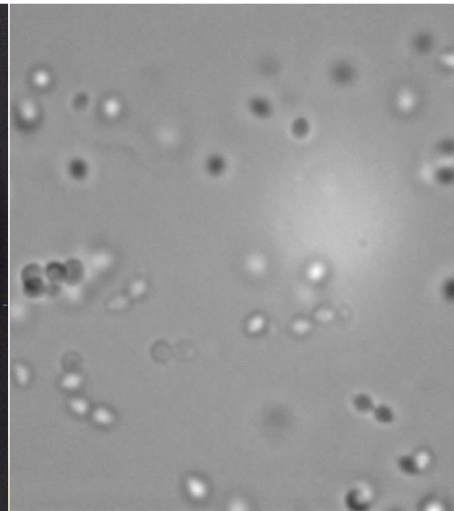
Taxonomia Polifásica

CYA 25 | MEA 25 | CYA 37 | Microcopia

CYA 30 | YES 25 | CREA 25



Espécies do gênero *Aspergillus* Seção *Nigri*

A. carbonarius

A. niger

A. tubingensis

A. japonicus

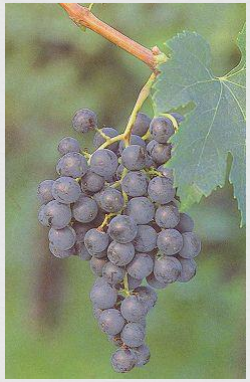
A. aculeatus

VARIEDADES ESTUDADAS

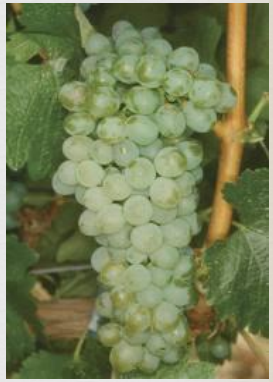
Syrah

Petit Verdot

Cabernet Sauvignon



Merlot



Chenin Blan

Moscato canelli

Tempranillo

ELSEVIER

International Journal of Food Microbiology

Volume 241, 16 January 2017, Pages 181-190

Influence of physical and chemical characteristics of wine grapes on the incidence of *Penicillium* and *Aspergillus* fungi in grapes and ochratoxin A in wines

Luísa Freire [a], Fabiana Reinis Franca Passamani [a], Ariela Betsy Thomas [a], Rita de Cássia Mirela Resende Nassur [b], Lais Mesquita Silva [a], Fabiano Narciso Paschoal [c], Giuliano Elias Pereira [b], Guilherme Prado [c], Luís Roberto Batista [a]

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https://doi.org/10.1016/j.ijfoodmicro.2016.10.027

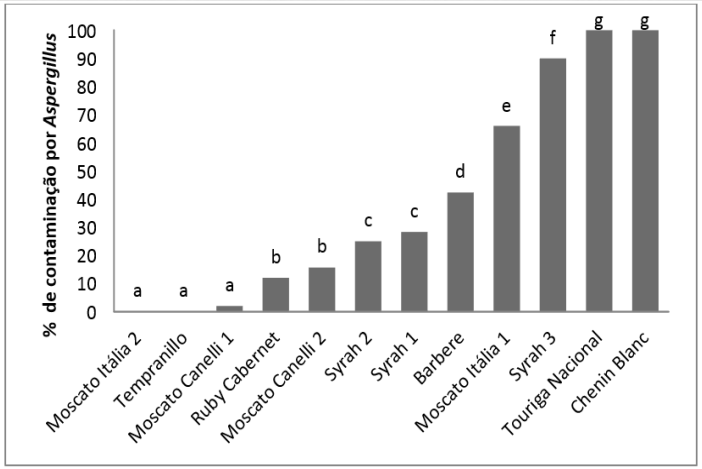

Gráfico 1 – Percentual de contaminação de uvas viníferas por fungos do gênero *Aspergillus* e as respectivas proporções médias de colonização. Letras diferentes mostram diferença estatatística siginificante a p<0,05.

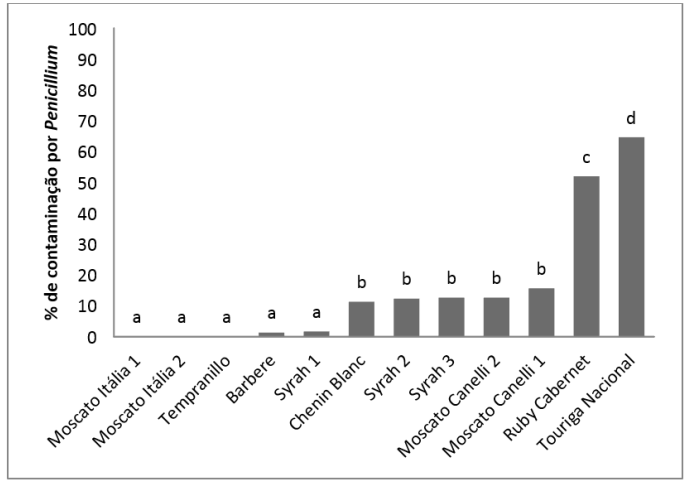

Gráfico 2 – Percentual de contaminação de uvas viníferas por fungos do gênero *Penicillium* e as respectivas proporções médias de colonização. Letras diferentes mostram diferença estatatística siginificante a p<0,05.

Journal of the Science of Food and Agriculture
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Research Article

Detection of ochratoxin A in tropical wine and grape juice from Brazil

Michelle F Terra, Guilherme Prado, Giuliano E Pereira, Hugo J Ematné, Luís R Batista

First published: 27 July 2012 Full publication history
DOI: 10.1002/jsfa.5817 View/save citation
Cited by (CrossRef): 13 articles Check for updates | Citation tools

View issue TOC
Volume 93, Issue 4
15 March 2013
Pages 890–894

Correspondence to: Luís R Batista, Departamento de Ciência dos Alimentos, Universidade Federal de Lavras, Caixa Postal 3037, CEP 37200-000, Lavras, Minas Gerais, Brazil. E-mail: luisrb@dca.ufla.br

Abstract

BACKGROUND: Ochratoxin A (OTA) is the main mycotoxin found in grapes, wines and grape juices and is considered one of the most harmful contaminants to human health. In this study, samples of tropical wines and grape juices from different grape varieties grown in Brazil were analysed for their OTA content by high-performance liquid chromatography.

RESULTS: The detection and quantification limits for OTA were 0.01 and 0.03 μg L^{-1} respectively. OTA was detected in 13 (38.24%) of the samples analysed, with concentrations ranging from < 0.03 to 0.62 μg L^{-1}. OTA was not detected in any of the grape juice samples. Most of the red wine samples proved to be contaminated with OTA (75%), while only one white wine sample was contaminated. However, the OTA levels detected in all samples were well below the maximum tolerable limit (2 μg L^{-1}) in wine and grape juice established by the

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https://doi.org/10.4315/0362-028X.JFP-16-037

Research Papers

Effect of Fungicides on Growth and Ochratoxin A Production by *Aspergillus carbonarius* from Brazilian Wine Grapes

MICHELLE F. TERRA,[1] NATHASHA de A. LIRA[1] FABIANA R. F. PASSAMANI,[1] WILDER DOUGLAS SANTIAGO,[2] MARIA das GRAÇAS CARDOSO[2] LUÍS ROBERTO BATISTA[1*]
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ABSTRACT

Prevention in the field of mycotoxin-producing fungi is the most effective strategy for controlling the presence of mycotoxins in foods. Chemical fungicides are widely used to protect crops, so their implications on mycotoxin production need to be considered. Therefore, the aim of this study was to evaluate the effect in vitro and on grapes of five fungicides commonly used

Journal of Food Protection, Vol. 77, No. 11, 2014, Pages 1947–1952
doi:10.4315/0362-028X.JFP-13-495

Effect of Temperature, Water Activity, and pH on Growth and Production of Ochratoxin A by *Aspergillus niger* and *Aspergillus carbonarius* from Brazilian Grapes

FABIANA REINIS FRANCA PASSAMANI,[1]* THAIS HERNANDES,[2] NOELLY ALVES LOPES,[3] SABRINA CARVALHO BASTOS,[1] WILDER DOUGLAS SANTIAGO,[4] MARIA DAS GRAÇAS CARDOSO,[4] AND LUÍS ROBERTO BATISTA[1]

[1]*Department of Food Science,* [3]*Department of Biology, and* [4]*Department of Chemistry, Federal University of Lavras, Lavras, Minas Gerais, 37200-000, Brazil; and* [2]*School of Nutrition, Federal University of Mato Grosso, Cuiabá, Mato Grosso, 78060-900, Brazil*

MS 13-495: Received 18 November 2013/Accepted 24 June 2014

ABSTRACT

The growth of ochratoxigenic fungus and the presence of ochratoxin A (OTA) in grapes and their derivatives can be caused by a wide range of physical, chemical, and biological factors. The determination of interactions between these factors and fungal species from different climatic regions is important in designing models for minimizing the risk of OTA in wine and grape juice. This study evaluated the influence of temperature, water activity (a_w), and pH on the development and production of OTA in a semisynthetic grape culture medium by *Aspergillus carbonarius* and *Aspergillus niger* strains. To analyze the growth conditions and production of OTA, an experimental design was conducted using response surface methodology as a tool to assess the effects of these abiotic variables on fungal behavior. *A. carbonarius* showed the highest growth at temperatures from 20 to 33°C, a_w between 0.95 and 0.98, and pH levels between 5 and 6.5. Similarly, for *A. niger,* temperatures between 24 and 37°C, a_w greater than 0.95, and pH levels between 4 and 6.5 were optimal. The greatest toxin concentrations for *A. carbonarius* and *A. niger* (10 μg/g and 7.0 μg/g, respectively) were found at 15°C, a_w 0.99, and pH 5.35. The lowest pH was found to contribute to greater OTA production. These results show that the evaluated fungi are able to grow and produce OTA in a wide range of temperature, a_w, and pH. However, the optimal conditions for toxin production are generally different from those optimal for fungal growth. The knowledge of optimal conditions for fungal growth and production of OTA, and of the stages of cultivation in which these conditions are optimal, allows a more precise assessment of the potential risk to health from consumption of products derived from grapes.

In Brazil, the cultivation of wine grapes is increasingly important, with several regions of the country, with different climates, involved in this activity. The sub-medium region of the São Francisco Valley, northeastern Brazil, stands out as a pioneer in the production of grapes and wine under

Balkan endemic nephropathy, a disease found in the rural areas of Bulgaria, Romania, Serbia, Croatia, and Bosnia *(17). Aspergillus carbonarius* is one of the main species responsible for OTA contamination in grapes, with higher production of OTA than other members of *Aspergillus*

AVALIAÇÃO DO CRESCIMENTO DE *Aspergillus carbonarius* EM DIFERENTES TEMPERATURAS E ATIVIDADES DE ÁGUA

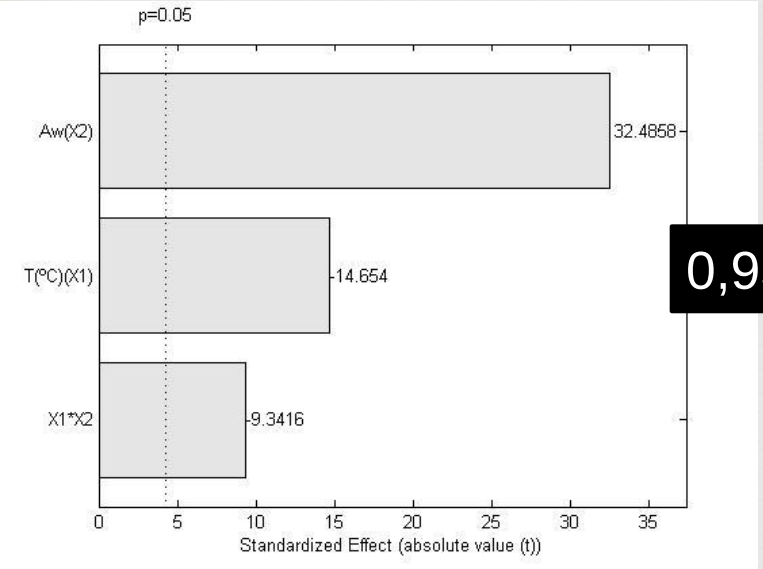
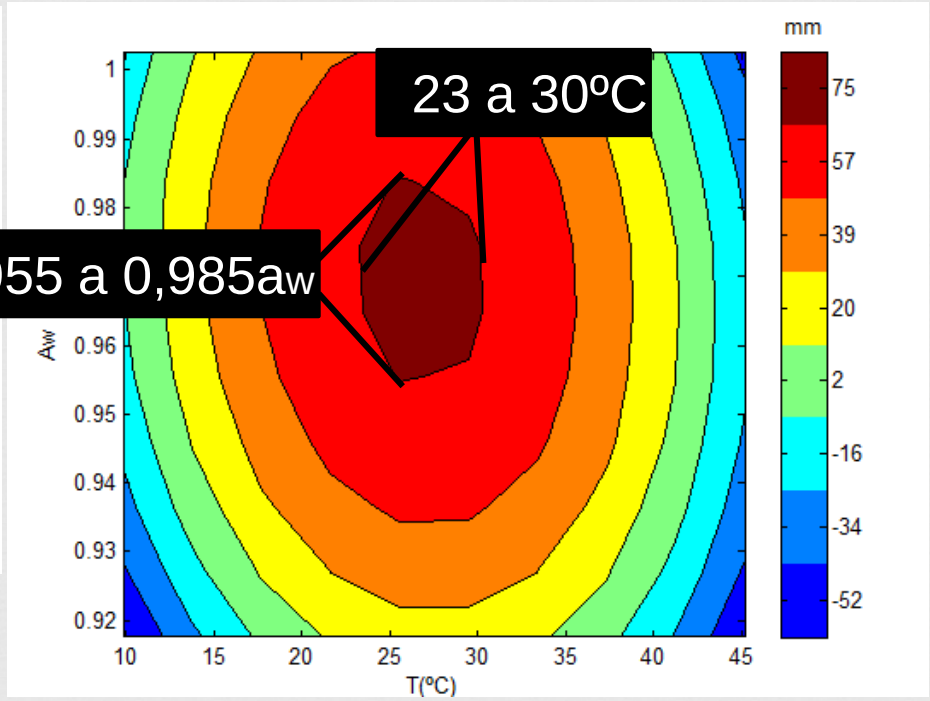


Diagrama de Pareto com efeito da temperatura (X1) e atividade de água (X2).



Curva de contorno para crescimento em função das interações entre temperatura e atividade de água

AVALIAÇÃO DA PRODUÇÃO DE OTA POR *Aspergillus carbonarius* EM DIFERENTES TEMPERATURAS E ATIVIDADES DE ÁGUA

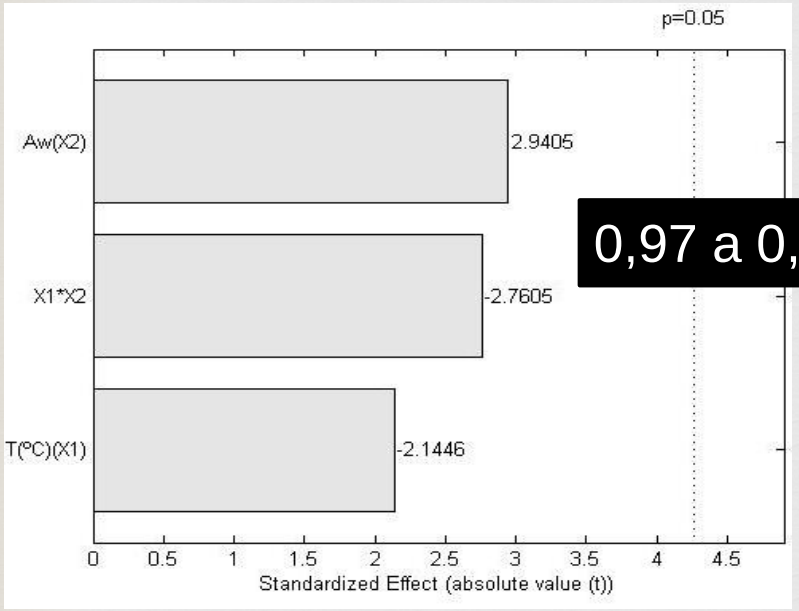
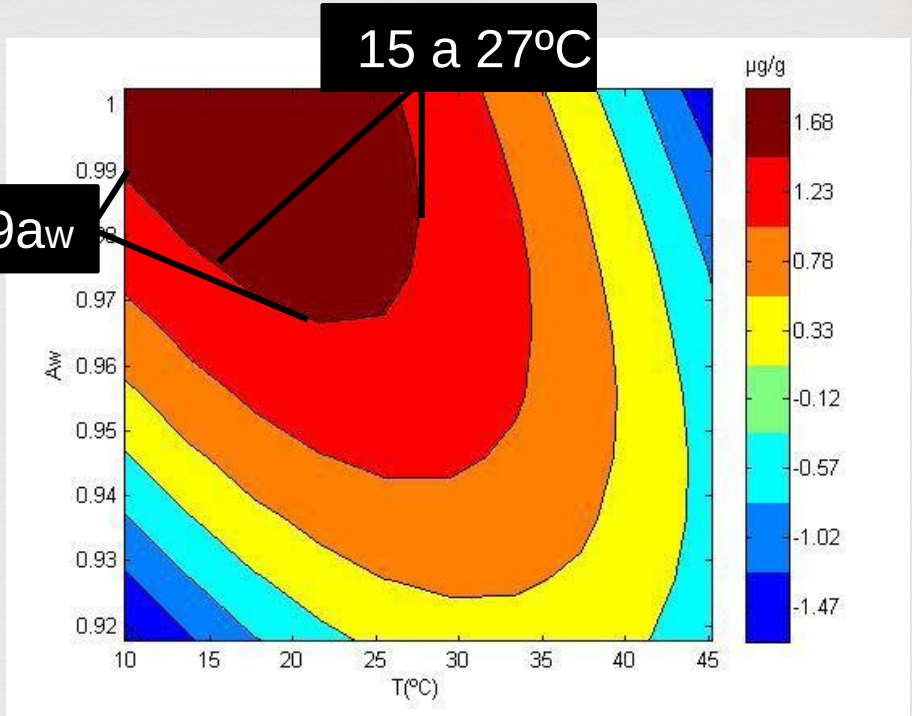


Diagrama de Pareto com efeito da temperatura (X1) e atividade de água(X2)



Curva de contorno para produção de OTA em função das interações entre temperatura e atividade de água

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Informações importantes

Aspergillus carbonarius

Maior produção de OTA nas uvas

Condições climáticas
Atividade de água (a_w)
Favoráveis

A. carbonarius
Crescimento:
T°: 20 °C a 33°C
Aw: 0,95 e 0,98
pH: 5 e 6,5

Toxina - (10 µg/g)
Aw: 0,99
T°: 15 °C
pH superior a 6,0

A. niger
Crescimento:
T°: 25 °C e 40 °C
Aw: superior a 0,96
pH: 4,0 e 6,5

Toxina - (7 µg/g)
Aw:0,98
T°: 15 °C

CLOUVEL et al., 2008; PASSAMANI, 2014.

CONSELHO DE GESTÃO DO PATRIMÔNIO GENÉTICO

EDITAIS DE CREDENCIAMENTOS

O Secretário Executivo Substituto do Conselho de Gestão do Patrimônio Genético, em seu nome e no uso das competências que lhe foram conferidas pela Deliberação nº 203, de 19 de julho de 2007, com fundamento na Medida Provisória nº 2.186-16, de 23 de agosto de 2001, e no Decreto nº 3.945, de 28 de setembro de 2001, credencia como instituição fiel depositária de amostras de componente do patrimônio genético o Instituto de Estudos do Mar Almirante Paulo Moreira - IEAPM do Ministério da Marinha, nos seguintes termos:

Nº do processo	02000.001559/2015-77
Instituição credenciada	Instituto de Estudos do Mar Almirante Paulo Moreira - IEAPM do Ministério da Marinha
CNPJ	10.573.118/0001-62
Coleção	Coleções IEAPM-PLAT; IEAPM-POR; IEAPM-ASC; IEAPM-CNID; IEAPM-MOL; IEAPM-ECHIN; IEAPM-BRYOZ; IEAPM-NEMAT e IEAPM-CRUST
Localidade das Coleções	Arraial do Cabo/RJ
Data da decisão de credenciamento	13/11/2015
Nº do credenciamento	142/2015/SECEX/CGEN

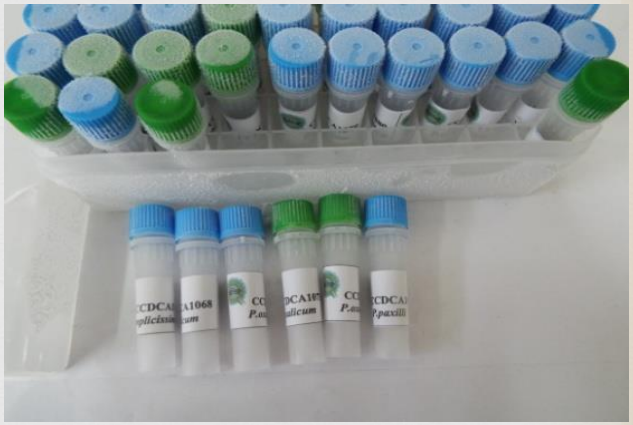
RAFAEL DE SÁ MARQUES

O Secretário Executivo do Conselho de Gestão do Patrimônio Genético, em seu nome e no uso das competências que lhe foram conferidas pela Deliberação nº 203, de 19 de julho de 2007, com fundamento na Medida Provisória nº 2.186-16, de 23 de agosto de 2001, e no Decreto nº 3.945, de 28 de setembro de 2001, credencia como instituição fiel depositária de amostras de componente do patrimônio genético a Universidade Federal de Lavras - UFLA, nos seguintes termos:

Nº do processo	02000.002608/2014-16
Instituição credenciada	Universidade Federal de Lavras - UFLA
CNPJ	22.078.679/0001-74
Coleção	Coleção de Cultura do Departamento de Ciências dos Alimentos - CCDCA
Localidade da Coleção	Lavras/MG
Data da decisão de credenciamento	5/11/2015
Nº do credenciamento	141/2015/SECEX/CGEN

Aviso de Credenciamento nº 141/2015/SECEX/CGEN publicado no D.O.U. nº 219, de 17.11.2015, seção 3, página 129.

Coleção de Cultura de Microrganismos do Departamento de Ciência dos Alimentos Universidade Federal de Lavras CCDCA/UFLA



Tubos criogênicos a – 80°C

Microbioma: Microbiota terroir, em vinhos regionais

ESTUDO EM DESENVOLVIMENTOS

Metagenômica (Uva, Solo e Folhas)

Dissertação com previsão de defesa para 02/2018 de Lorena Dutra (Ciência dos Alimentos – UFFA)

COMMENTARY

Microbial *terroir* for wine grapes

Jack A. Gilbert[a,b,1], **Daniel van der Lelie**[c], **and Iratxe Zarraonaindia**[a,d]

[a]*Institute for Genomic and Systems Biology, Argonne National Laboratory, Argonne, IL 60439;* [b]*Department of Ecology and Evolution, University of Chicago, Chicago, IL 60637;* [c]*Center of Excellence for Agricultural Biosolutions, FMC Corporation, Research Triangle Park, NC 27703; and* [d]*Ikerbasque, Basque Foundation for Science, 48011 Bilbao, Spain*

The viticulture industry has been selectively growing vine cultivars with different traits (grape size, shape, color, flavor, yield of fruit, and so forth) for millennia, and small variations in soil composition, water management, and fungi, respectively, from grape must (freshly pressed grape juice, containing the skins and seeds) from plants in eight vineyards representing four of the major wine growing regions in California. The authors

presence of phytotoxic contaminants), to preventing the growth or activity of plant pathogens through competition for space and nutrients, antibiosis, production of hydrolytic enzymes, inhibition of pathogen-produced enzymes or toxins, and through systemic induction of plant defense mechanisms (3, 4). The most widely studied group of plant-associated microorganisms live in the soil surrounding the roots or inside the roots themselves (endophytes); the interface between roots and soil is often considered the key

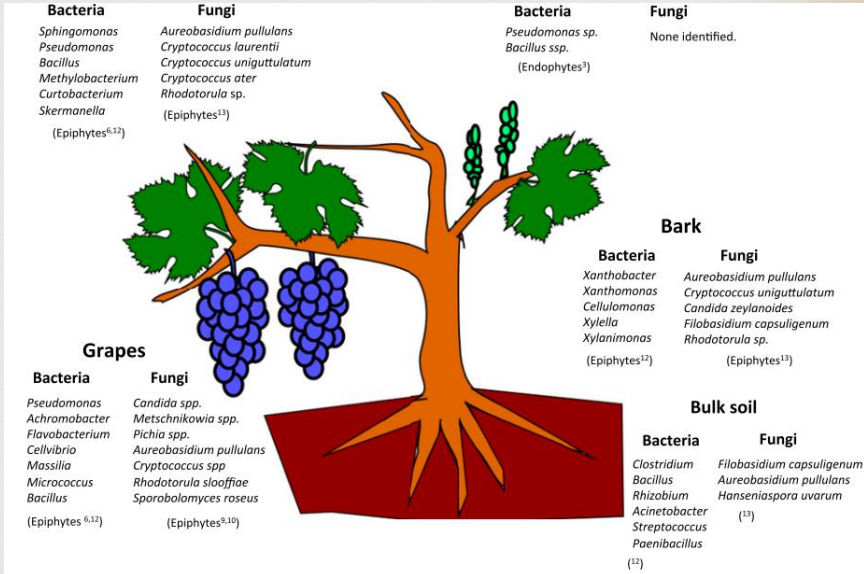


Fig. 1. Diagrammatic representation of some of characteristic bacteria and fungi known to show associations with the different tissues of *Vitis vinifera*.

AMERICAN SOCIETY FOR MICROBIOLOGY | mBio®

RESEARCH ARTICLE

Associations among Wine Grape Microbiome, Metabolome, and Fermentation Behavior Suggest Microbial Contribution to Regional Wine Characteristics

Nicholas A. Bokulich,[a,b,c]* Thomas S. Collins,[b,d]* Chad Masarweh,[a] Greg Allen,[e] Hildegarde Heymann,[b] Susan E. Ebeler,[b,d] David A. Mills[a,b,c]

Department of Food Science and Technology, University of California, Davis, California, USA[a]; Department of Viticulture and Enology, University of California, Davis, California, USA[b]; Foods for Health Institute, University of California, Davis, California, USA[c]; Food Safety and Measurement Facility, University of California, Davis, California, USA[d]; Far Niente and Nickel & Nickel Wineries, Oakville, California, USA[e]

* Present address: Nicholas A. Bokulich, Center for Microbial Genetics and Genomics, Northern Arizona University, Flagstaff, Arizona, USA; Thomas S. Collins, Viticulture and Enology Program, Washington State University, Richland, Washington, USA.

ABSTRACT **Regionally distinct wine characteristics (*terroir*) are an important aspect of wine production and consumer appreciation. Microbial activity is an integral part of wine production, and grape and wine microbiota present regionally defined patterns associated with vineyard and climatic conditions, but the degree to which these microbial patterns associate with the chemical composition of wine is unclear. Through a longitudinal survey of over 200 commercial wine fermentations, we demonstrate that both grape microbiota and wine metabolite profiles distinguish viticultural area designations and individual vineyards within Napa and Sonoma Counties, California. Associations among wine microbiota and fermentation characteristics suggest new links between microbiota, fermentation performance, and wine properties. The bacterial and fungal consortia of wine fermentations, composed from vineyard and winery sources, correlate with the chemical composition of the finished wines and predict metabolite abundances in finished wines using machine learning models. The use of postharvest microbiota as an early predictor of wine chemical composition is unprecedented and potentially poses a new paradigm for quality control of agricultural products. These findings add further evidence that microbial activity is associated with wine *terroir*.**

IMPORTANCE **Wine production is a multi-billion-dollar global industry for which microbial control and wine chemical composition are crucial aspects of quality. *Terroir* is an important feature of consumer appreciation and wine culture, but the many factors that contribute to *terroir* are nebulous. We show that grape and wine microbiota exhibit regional patterns that correlate with wine chemical composition, suggesting that the grape microbiome may influence *terroir*. In addition to enriching our un-**

Agradecimentos