BRASCON – Brazilian Graduate Students Conference

BRASCON - Abstract Supplement

EDITORIAL

The **BRASCON – Abstract Supplement** is the official publication of the Brazilian Graduate Students Conference. This abstract supplement provides a glimpse into the most current research conducted with the participation of Brazilians' graduate students in full or partial enrollment at higher qualified universities of the United States.

All abstracts presented at the BRASCON 2016 conference, held March 11 – 12, in Cambridge, Massachusetts are included in this issue. This year, 45 abstracts will be presented in both oral and poser sessions. The abstracts are organized according to author's last name. Each abstract has an identification number (ID) to facilitate the localization.

The BRASCON aims to unite Brazilian graduate students and professionals in the United States, to enable the dissemination of scientific research, to create a platform for interaction between students, academia and industry, and to recognize talented students through publication and awards.

We look forward to sharing the research accomplishment of this event.

Carleara Ferreira da Rosa Silva, RN, MS, PhD Student at State University of New York at Buffalo
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2	Oliveira, Natalia Trajano[1]; Rezende, Pedro Milanez [1]; Li Li[2].	[1]Federal University of Lavras. [2]Cornell University	Zinc fertilization for biofortification of soybeans for human consumption
3	Rocha, Raquel de Oliveira; Wilson, Richard	University at Nebraska- Lincoln	Plant-fungal metabolic interplay at the leaf surface governs infection-related development by the rice blast fungus *Magnaporthe oryzae*
4	Silva, Pedro Ivo Guimarães Braga da[1] ; Senger, Ryan S[1].	[1]Virginia Tech	Anaerobic digestion and algae cultivation as a platform for high-value chemicals production
5	Sousa, Nathalia Almeida[1] Luz, Christian[1]; Arruda, Walquiria[2];; Humber, Richard[2].	[1]Federal University of Goias. [2] USDA-ARS Emerging Pests and Pathogens Research Unit	Infection dynamics of *Metarhizium anisopliae* on *Aedes aegypti* eggs, adults and non-nutritive substrates
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ID1

Abstract Title: Identification of Macrophage Reservoirs by Analysis of HIV-1 Viral Tropism

Authors: Viviane Machado de Mello Andrade, Dunja Babic, Ian Watkins, Mario Stevenson.
[1] University of Miami

Keywords: HIV-1, macrophages, reservoir

Despite advances in antiretroviral treatment, eradication of HIV is not possible due to viral persistence in cell reservoirs. When HIV-1-infected individuals stop antiretroviral therapy (ART), HIV-1 rebounds from lymphoid tissues (LT) and becomes detectable in peripheral blood, providing evidence for the presence of viral reservoirs. The majority of cells harboring latent HIV-1 are the CD4+ T cells. However, it is unknown whether other cell populations also harbor the latent infection. Although macrophages play an important role in sustaining HIV-1, little is known about the mechanisms that maintain viral persistence in the context of ART. Our goal is to identify the presence of macrophage reservoirs in LT of patients on ART, through viral tropism analysis. Envelope (env) sequences isolated from each patient sample were tested for their ability to infect primary macrophages. HIV-1 env sequences from ileum, lymph nodes and rectum were cloned into an expression vector, followed by co-transfection with a virus backbone lacking the env sequence. Env-pseudotyped viruses were tested for their ability to infect primary macrophages. Macrophage tropism was evaluated by qPCR and compared with lab-adapted macrophage-tropic (M-tropic) and non-M-tropic strains. We observed that a small subset of cloned envs showed moderate tropism for macrophages. The macrophage tropism observed corresponds to envs isolated from the rectum, suggesting compartmentalization of HIV-1 infection in this tissue. Thus, our results strengthen the evidences towards the presence of the macrophage reservoirs in individuals with suppressive viremia. Characterization of the macrophage reservoir may provide insights into the eradication of viral reservoirs, leading to potential strategies for a sterilizing cure.

ID 2

Abstract Title: Zinc fertilization for biofortification of soybeans for human consumption

Authors: Natália Trajano de Oliveira1, Pedro Milanez de Rezende[1], Li Li[2],
[1]Federal University of Lavras. [2]Cornell University

Keywords: Glycine max, green soybean, plant nutrition, micronutrient.

Reducing zinc (Zn) deficiency problem by diversification of human diets and agricultural interventions remain a significant challenge. The objective of this study was to investigate the effect of Zn fertilization strategies on biofortification of soybean grains intended for human consumption. Five Zn fertilization strategies were tested, soil-applied, foliar-applied in V4 (vegetative stage with four sets of unfolded trifoliolate leaves), foliar-applied in V8 (vegetative stage with eigth of unfolded trifoliolate leaves), foliar-applied in R4 (reproductive stage with full pod) and control (without Zn application) in three soybean cultivars (BRS 213, BRS MG 790A, and BRS Favorita RR). The experimental design was completely randomized in a factorial arrangement of 5 x 3 with four replications. Zn was applied at planting for soil treatment and at various developmental stages for foliar treatments. A number of physiological and biochemical traits were examined following Zn fertilization. They included plant height and first pod insertion, fresh weight of pods per plant, number of pods per plant, number of grains per plant; number of grains per pod; fresh weight of 100 grains, dry weight of 100 grains, and humidity, ash, protein, lipid, fiber, carbohydrate and Zn content in grains. The Zn fertilization with foliar-applied in R4 stage promoted greater Zn biofortification of soybeans. The three cultivars had various ability to accumulate Zn and BRS MG 790A contains highest increase of Zn in the grain. The use of fertilization with Zn also benefited the protein content in grain as well as the height and number of grains per plant of soybean cultivars. This strategy can contribute as a way to improve nutritional content in soybean grains as well as alternative to reducing human Zn deficiency problem.

ID 3

Abstract Title: P**lant-fungal metabolic interplay at the leaf surface governs infection-related development by the rice blast fungus *Magnaporthe oryzae***

Authors: Raquel de Oliveira Rocha (Doctoral Student), Richard Wilson, PhD.
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Keywords: Rice Blast; Appressoria; NDK

Magnaporthe oryzae is the most important pathogen of rice (Oryza sativa), responsible for annual losses of up to 30% of the world's rice harvest. At the start of foliar infection, the fungus breaches the plant cuticle by using a specialized infection structure, called an appressorium. As it matures, the appressorium generates internal turgor pressure which drives a penetration peg through the plant cuticle. Once inside the plant cell, infectious hyphae proliferate from cell-to-cell. After 72 hours of infection the lesions become apparent. The formation of appressoria requires a range of external cues, including surface hardness and hydrophobicity, which act to trigger transduction cascades involving cAMP production by adenylate cyclase. Although significant progress has been made identifying components of central importance to the development of appressoria, its relationship to initial perception of the leaf surface by the fungus needs further exploration. By using gene functional analysis, we demonstrate that Δndk1 mutant strains are impaired for appressoria development on artificial hydrophobic surfaces, which is partially restored with the addition of exogenous cues such as ATP, cAMP, and, 1,16-hexadecanediol. Once on the rice host, Δndk1 can form functional appressoria without the addition of any inducer. However, cell-to-cell movement of mutant strains are still reduced inside the rice cell, thus reflecting a reduced pathogenicity. Taken together, these results show that a plant-fungal metabolic interplay occurs at the leaf surface, capable of triggering appressoria development. Besides hydrophobicity, cutin and lipid monomers, environmental ATP (eATP), might play a pivotal role in inducing appressoria formation on the plant surface. These results give important insights into the metabolic strategies employed by *M. oryzae* to successfully penetrate host cells.

ID 4

Abstract Title: Anaerobic digestion and algae cultivation as a platform for high-value chemicals production

Authors: Silva, Pedro Ivo Guimarães Braga da[1] ; Senger, Ryan S[1].
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Keywords: algae; anaerobic digestion; high-value chemicals.

Composting is not an economically viable process as it is more expensive than sending waste to a landfill. Instead, we propose using organic residues in a process designed to convert waste into high-value chemicals using anaerobic digestion and algae cultivation. Anaerobic digestion can be used to degrade the residues into a nutrient-rich waste water, which can then be used to grow algae or cyanobacteria capable of converting these nutrients into high-value chemicals. As a proof of concept, a 1 L mesophilic anaerobic digestion was performed using 10% v/v ground salmon heads as substrate, and 10% v/v soil from a pond at Virginia Tech, Blacksburg, VA as the inoculum. Volatile solids monitoring showed a fast 50% reduction in the total organic content in the reactor in 5 days. After 30 days, the water from the reactor was harvested to test if it would support algae growth. Sixteen algae strains isolated from several locations in the United States were inoculated on a 1:5 dilution of the waste water and incubated at 25˚C under a 12/12h light/dark cycle for 10 days. Three isolates showed moderate growth (OD600 0.3) and one strain, a *Scenedesmus sp*. isolated from Madison, IN, showed the highest growth (OD600 = 2.7) and was able to remove 85% of the ammonia content in the media. Finally, by inoculating the recovered sludge from the reactor in BG11 media, we were able to isolate three cyanobacteria strains capable of withstanding high ammonia concentrations, belonging to genera well known for producing secondary metabolites: two *Nostoc sp.* and one *Anabena sp*. These results demonstrate the potential of this system and further experiments will be made to determine which products could be generated using the isolated strains.

ID 5

Abstract Title: Infection dynamics of *Metarhizium anisopliae* on *Aedes aegypti* eggs, adults and non-nutritive substrates

Authors: Luz, Christian[1]; Arruda, Walquiria[2]; Sousa, Nathalia Almeida[1]; Humber, Richard[2].
[1]Federal University of Goias. [2] USDA-ARS Emerging Pests and Pathogens Research Unit
Keywords: Biological control, Mosquitoes, Entomopathogenic fungi

Aedes aegypti is a vector of serious viral diseases. The problems affecting the control of this vector are its wide distribution, the close association with human dwellings, an increasing insecticide-resistance, and the ability of their eggs to persist for long periods without contact with water. Entomopathogenic fungi are good candidates for an integrated control of mosquitoes. They infect insects through the cuticle, and their invasion is based on enzymatical degradation and mechanical pressure on the cuticle. *M. anisopliae* affects all stages of this mosquito including eggs, but its ovicidal activity is not yet understood. This study compared the development of *M. anisopliae* on *A. aegypti* adult cuticles and eggs chorions, and on nutrient-free control substrate. Eggs, adults and control substrates were treated with dry conidia. After specific incubation times (0 - 240h) samples were analyzed with optical (OM) and/or scanning electronic microscopy (SEM). Although the histological processing did not preserve the morphology of chorionic layers, conidia germinated and developed appressoria, and later external new conidial chains were found on the eggs, as were septate hyphae inside the eggs (OM). Fungal development on eggs did not differ from what SEM analysis revealed on the cuticle of adults, including apparently enzymatic cuticular modifications around the germ tubes and appressoria. During late infection stages (>120h), eggs appeared to be broken and shriveled and showed strong internal and external mycelial development. Eggs were mycotized, and long conidial chains were produced on their surface. On inert substrates, conidia germinated; germ tubes extended more than on eggs or adults, and clearly released enzymes around the thickened hyphal tips, and finally produced new conidia. The course of the development of *M. anisopliae* was similar on all tested host stages and the substrate and can be considered typical for nearly all fungal entomopathogens.

ID6

Abstract Title: Sea Level Rise and Impact Evaluation: A comparison between Cedar Key and Florianopolis

Author: Luiz Felipe Ungericht
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Keywords: Sea level rise, planning for coastal change, vulnerability assessment

Sea level rise (SLR) is a long-term threat to coastal areas. Albeit the effects of this change are known to occur worldwide, regional differences are expected, given social and cultural aspects, economic development, to relative SLR and geomorphology. This paper analyzes SLR vulnerability assessment and coastal planning issues in different scenarios, comparing experiences and outcomes in two cities: Cedar Key, FL and Florianopolis, Brazil. We used the comprehensive report "Planning for Coastal Change in Levy County: Cedar Key" (Frank, Jourdan, & Volk, 2014) as a case study to set the initial parameters. With a structured and focused comparison methodology, we confronted with recent studies and SLR related interventions in the City of Florianopolis. The literature review also discusses some specific data regarding urbanization and SLR in Brazil, addressing some risky situations and forms of adaptation in coastal cities on three axes of problems: increasing temperature, heavy rainfall, and rising sea levels. Throughout this study we looked at the same time two different coastal cities, in different socioeconomic context, by the frame of SLR, highlighting different approaches to vulnerability assessment. More specifically, through the literature review and by combining the case studies analyzed, it was possible to identify areas where Brazil needs to improve when addressing SLR. In conclusion, two significant differences on the assessment process that Brazilian Cities need to improve in order to achieve a comprehensive vulnerability understanding: SLR data and monitoring, and community participation. Support: Grant 13570-13-7 from CAPES/Brazil. Works Cited: Frank, K., Jourdan, D., & Volk, M. (2014). Planning for Coastal Change in Levy County. Gainesville, FL.