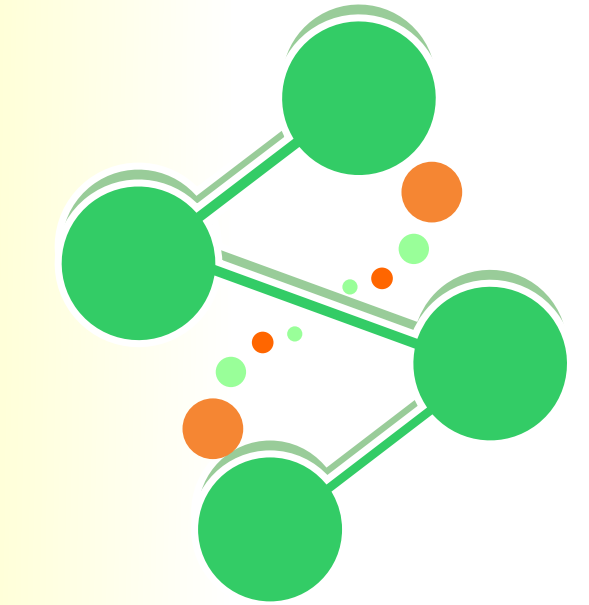

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2019

UNIVERSIDADE FEDERAL DE SANTA CATARINA

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APRESENTAÇÃO

O I Simpósio de Integração e Internacionalização das Pós-Graduações do CCA/UFSC (I SInPós) foi uma iniciativa dos Programas de Pós-Graduação do Centro de Ciências Agrárias/UFSC de se integrarem dentro do Subprojeto PRINT/CAPES "Produção sustentável de alimentos no âmbito das Ciências Agrárias", aproveitando o momento de celebrar também os 50 Anos da Pró-Reitoria de Pós-Graduação da UFSC, com um objetivo multidisciplinar e promovendo a internacionalização dos Programas.

Aproveitamos o momento para discutir a Ciência e as Pós-Graduações, e para celebrar o sucesso dos nossos alunos egressos. Nossa intenção foi integrar alunos, técnicos administrativos em educação e docentes, promovendo o conhecimento e estimulando as parcerias entre temas em comum, além de apresentar pesquisadores internacionais parceiros dentro de projetos internacionais (do Chile e do Canadá) e debater tecnologias sustentáveis e entraves na produção de alimentos.

Esperamos que esse seja apenas a primeira edição e que esse Simpósio crie frutos significativos para toda comunidade do Centro de Ciências Agrárias da UFSC. Em uma época de grande restrição orçamentária, conseguimos promover de uma maneira simples e efetiva nossas pesquisas e agradecemos a todos os envolvidos, desde a Comissão Organizadora até os participantes.

Leila Hayashi
Presidente do I SInPós

Ana Carolina Maisonnave Arisi
Vice-Presidente do I SInPós

PRESENTATION

The I Symposium on Integration and Internationalization of Graduate Studies from CCA/UFSC (I SInPós) was an initiative of the Graduate Programs of the Agrarian Sciences Center/UFSC to be integrated into the PRINT/CAPES Subproject "Sustainable Food Production in Agrarian Sciences", taking advantage of the moment to also celebrate the 50th Anniversary of the UFSC Prorectorate of Graduate Studies, with a multidisciplinary aim and promotion of the internationalization of the Programs.

In this opportunity, we took the time to discuss Science and Graduate Studies and to celebrate the success of our graduating students. Our intention was to integrate students, faculties, and professors, promoting knowledge and stimulating partnerships between common themes. Also, we would like to present the international partners from Chile and Canada and discuss barriers to food production and sustainable technologies.

We hope this is just the first edition, and that this Symposium will bring significant results to the entire community of the UFSC Agrarian Science Center. In a time of severe budget constraints, we were able to promote our research in a simple and effective manner, and we thank everyone involved, from the Organizing Committee to the participants.

Leila Hayashi
President of I SInPós

Ana Carolina Maisonnave Arisi
Vice-President of I SInPós

SUMÁRIO

BIOCHAR AND *Azospirillum brasilense*: EFFECT ON MAIZE LANDRACE GROWTH AND CHEMICAL ATTRIBUTES OF LOW NATURAL FERTILITY SOIL

Igor Polla Marcelino*, Arcangelo Loss, Edenilson Meyer, Marcio Antonio Nogueira Andrade, Shantau Camargo Gomes Stoffel

Maize is one of the most cultivated cereals in Brazil and worldwide. Its production requires high costs with fertilizers, mainly nitrogen and investments in technologies are necessary to decrease costs and keep productivity. Biochar is a carbon rich material and other nutrients, and is produced through the pyrolyzis of plant and/or animal biomass, which has been studied and suggested as an appropriate material for recovery and increase of soil fertility, crop productivity, reduced greenhouse gas emissions and improved waste management. Rhizobacteria *Azospirillum brasilense* has also been studied for its potential in favoring maize growth and reduce use nitrogen fertilizers without decreasing productivity. This study evaluated the performance of different kinds biochars use with and without *Azospirillum brasilense* inoculation on maize landrace growth and chemical attributes of low natural fertility soil. Experiment was carried out in a greenhouse in 8kg pots with sandy texture soil (18% clay) and low fertility (pH=5.2, Al=0.6 $cmol_c\ kg^{-1}$ and sum of bases=3.61 $cmol_c\ kg^{-1}$). Design was in randomized blocks in factorial scheme 7 x 2, with 4 replications. Treatments were: 1-poultry litter biochar (BC), 2-swine digestate biochar (BD), 3-swine digestate (DS), 4-BD+DS, 5-BC+DS, 6- Control without fertilization (Test), 7- Control with fertilization (NPK) and liming. Treatments 1, 2, 3, 4 and 5 were leveled by phosphorus, without complementation of other macronutrients. In treatment 7 there was pH correction and all nutrients necessary for the maize growth were added. In each of these 7 treatments there is still the inoculation factor, with and without inoculation. Soil pH was measured at 30 and 72 days after maized planting (DAP), maize stem diameter (SD) at 72 and 89 DAP, its length (SL) at 72 and 88 DAP, SPAD index and contents of chlorophyll "a", "b", carotenoids and total chlorophyll (TC) (these last 5 factors are linked to nutrients inputs and photosynthetic efficiency) at 58 DAP. Statistical analysis (Scott-knott, $p < 0.05$) did not indicate significant interaction between treatments and inoculation for pH, carotenoids and SD. For SPAD, chlorophyll a and b, TC and SL there was significant interaction between the factors. The results point to a better biochar and mixture performance than the control and liquid digestate-only treatment for most measurements, with some results equal to or even better than NPK treatment. This indicates that biochar has properties that improve soil fertility by releasing nutrients to the plant. The good performance of biochar mixtures with digestate compared to digestate alone indicates a possible synergy, such as making the digestate nutrients available to the plant more efficiently when combined with biochar. In general, both biochar and mixtures have potential to replace or decrease fertilizer use for maize production. The inoculation of *Azospirillum brasilense* influenced SL in the BC+DS treatment. Inoculated controls had superior results for TC, SL72 and SL88. In the DS treatment, inoculation had influence for TC and chlorophyll b. From the evaluations made, it can be inferred that the inoculation shows synergy, both in the controls and in the biochar treatments, showing improvements for maize growth.

Keywords: Swine digestate, biomass, poultry litter, plant growth promoting rhizobacteria, SPAD index

Support: CNPq

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DEHYDRATION OF DRAGON FRUIT (*Hylocereus polyrhizus*) PULP: AN ECONOMICAL APPROACH

Mariana Angonese*, Gabriel E. Motta, Carmen M. O. Müller

Dragon fruit (*Hylocereus polyrhizus*) belongs to the *Cactaceae* family and occupies a growing niche in the exotic fruit market. The fruits dehydration is an alternative to reduce the waste of non-standard products for fresh marketing. Freeze-drying (FD) is reported as a technology that allows the elaboration of higher quality and porosity products than those obtained through traditional convective drying (CD), although the latter is widely used due to its economic advantages. In this context, foam-mat drying (FM) is an alternative that provides a porous drying bed (which improves rehydration characteristics) and, simultaneously, presents similar energy costs to the CD. This study aims to effectively compare these three drying methods in terms of energy costs. Dragon fruits were donated by organic producers of municipality of Turvo, Santa Catarina State (28 ° 75'34" S,49 ° 40'45" W), sanitized in sodium hypochlorite solution 2.0-2.5 %, peeled and pulped manually, separating the seeds. FD was conducted in freeze-dryer (MicroModulyo 1.5 liter, Thermo Electron, USA), after freezing by submersion in liquid nitrogen. CD and FM were conducted in oven-drying (TE-394/2-MP, Tecnal, Brazil) at 40 °C with air circulation at 0.79 $m \cdot s^{-1}$. Foam formation was made by beating in a domestic mixer (Philips Walita Viva RI1364), with addition of egg white powder as a foaming agent (1.6 % w/w) and sodium alginate as foam stabilizer (1 % v/w of an aqueous solution at 2 % w/w). Process times were determined by periodic weighing until constant mass verification. The economical approach, based on energy consumption comparison of all methods, is shown in Table 1. It is important to emphasize that the capacity of the equipment used was not exhausted; thus, results are relative to the laboratory execution scale. These results indicate that in FM and CD products, the energy costs per mass of dry product were four times lower than in FD in the evaluated scale. Considering the porosity of the final product and, consequently, better solubilization of FM products, this technique of producing dehydrated products is a promising process.

Keywords: Foam-mat drying; Freeze-drying; Convective drying; Pitaya.

Support: CAPES, CNPq, UFSC.

Table 1: Economical approach comparing FM, CD and FD processes

PARAMETER	FM	CD	FD	PARAMETER	FM	CD	FD
Equipement power (W)	1500	1500	1520	Dry product (g)	4,63	9,95	36,34
Pre-traitment power (W)	400	-	1180[a]	Energy consumption (kWh)	1,63	3,38	53,32[c]
Process time (min)	60	135	1965	Energy cost (R$)	0,77	1,59	25,05
Pre-traitment time (min)	20	-	180[b]	Energy cost per unit of dry product (R$/g)	0,17	0,16	0,69

a: assuming use of an ultrafreezer; b: assuming refreezing (30 min) every 5 h; c: assuming energy cost of 0.46978 R$ · kWh^{-1}

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EFEITO DA ADIÇÃO DE ALGAS PARDAS NA DIETA DO CAMARÃO BRANCO DO PACÍFICO CULTIVADO EM SISTEMA DE BIOFLOCOS

Priscila Costa Rezende*, Norha Constanza Bolívar, Jaqueline da Rosa Coelho, Delano Dias Schleder, Felipe do Nascimento Vieira

Este estudo teve como objetivo avaliar o desempenho zootécnico, a microbiologia do intestino, a resistência ao choque térmico e ao vírus da Síndrome da Mancha Branca (WSSV), na fase de engorda de *Litopenaeus vannamei* alimentados com a combinação de duas algas pardas 1%S:2%U e 1%S:4%U *Undaria pinnatifida* (U) e *Sargassum filipendula* (S) cultivada em sistema de bioflocos. A biomassa seca das algas foi adicionada à dieta em substituição ao caulim, também foi utilizada uma dieta controle sem a adição de algas. O camarão foi cultivado por 5 semanas (3,8 ± 0,1 g a 10,9 ± 0,1 g) em tanques de 500 L na densidade de 300 camarões m^{-3}, preenchidos com água madura de um tanque matriz de bioflocos, sob aeração e temperatura constante (28,4 ± 0,2° C). Os animais foram alimentados quatro vezes ao dia durante o período experimental, de acordo com a tabela de Van Wyk (1999). Para o choque térmico, os camarões foram transferidos dos tanques com temperatura a 28,4 ± 0,2° C para aquários com temperatura a 12,5° C e mantidos por 1 h. Após esse período foram devolvidos aos tanques com temperatura a 28,4 ± 0,2° C, e mantidos por 48 horas para estimar a mortalidade cumulativa. Para resistência ao vírus WSSV, os camarões foram infectados por via oral e mantidos por 120 horas para estimar a mortalidade. O desempenho zootécnico não foi significativamente diferente entre os tratamentos. Foi possível observar uma redução de bactérias heterotróficas totais e *Vibrio* sp. nos camarões alimentados com as duas combinações de algas, mas essa diferença não foi significativa. Os camarões alimentados com 1%S:2%U apresentaram menor mortalidade cumulativa após choque térmico e desafio ao vírus WSSV (Figura 1). A concentração de 1%S:2%U apresentou melhores resultados para os camarões marinhos cultivados no sistema de bioflocos, aumentando a sobrevivência dos camarões após grande variação de temperatura e infecção com vírus WSSV. Ambos fatores ainda são entraves para o fortalecimento da cadeia produtiva de camarão marinho, principalmente na região sul do Brasil.

Palavras-chave: Aquicultura, aditivo alimentar, *Litopenaeus vannamei*, *Undaria pinnatifida, Sargassum filipendula*.
Apoio: CNPq, CAPES.

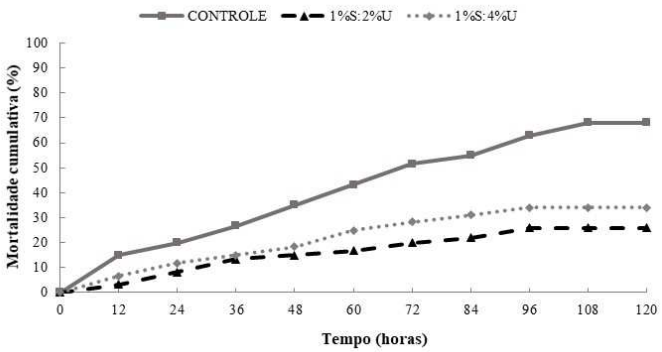

Figura 1. Mortalidade cumulativa de *Litopenaeus vannamei* alimentados com dietas contendo 1%:2% e 1%:4% (S:U) e uma dieta controle sem a adição de macroalgas, por 48 horas após infecção com vírus WSSV. Houve diferença significativa (p = 0,0001) na mortalidade entre 1%:2% e os outros tratamentos.

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POLISSACARÍDEOS DA BABOSA E ÓLEOS ESSENCIAIS COMO INDUTORES DE RESISTÊNCIA CONTRA MANCHA ANGULAR (*Xanthomonas fragarie*) EM MORANGUEIROS

Caroline Luiz*, Tarsis Aguiar, Juliane M. L. Blainski, Julia Behs, Denise Faccin, Robson M. Di Piero

A mancha bacteriana do morango (*Xanthomonas fragariae*) é uma doença capaz de reduzir significativamente a produção de morangos e pesquisas envolvendo métodos alternativos aos agrotóxicos para o controle da doença são necessárias. O presente estudo teve como objetivo avaliar a capacidade da babosa combinada ou não com óleo de *Melaleuca alternifolia* (tea tree) ou *Cymbopogon martinii* (palmarosa) de induzirem a resistência em morangueiros contra a mancha angular e de promoverem o acúmulo de lignina em resposta ao agente patogênico. Suspensão polissacarídica da babosa (AP), nanoemulsão de óleo de *tea tree* (T_{AP}) e emulsão de óleo de palmarosa (P_{AP}) foram pulverizadas sobre plantas de morango de duas cultivares, Albion (mais suscetível) e San Andreas (mais resistente). Após 4 dias dos tratamentos os morangueiros foram inoculados com o patógeno e 6 dias após foram analisadas as concentrações de ligninas nas folhas. Observou-se que a suspensão polissacarídica da babosa (AP) reduziu significativamente a doença provocada por *X. fragariae* em plantas da cultivar Albion e San Andreas. Contudo, a adição de óleo essencial de *tea tree* ou palmarosa ao preparado de polissacarídeo potencializou a capacidade de AP de atuar como indutor de resistência. Na cv. San Andreas, AP, T_{AP} e P_{AP}, em média, promoveram um decréscimo de 97% dos sintomas da doença. Plantas inoculadas da cv. San Andreas, previamente tratadas com AP e P_{AP}, apresentaram maior acúmulo de lignina. A não alteração na concentração de lignina nas plantas da cultivar Albion pode ser explicada pelo maior tempo necessário para esta cultivar responder ao ataque do agente causal da mancha angular. Acredita-se que os polissacarídeos de babosa, associados ou não às emulsões dos óleos essenciais possam ser uma alternativa eficiente para o controle da mancha angular, pois reduzem a severidade da doença, além de promoverem respostas de defesa das plantas como acúmulo de lignina nas folhas.

Palavras-chaves: Severidade; Acúmulo de lignina; Polissacarídeos de babosa; *Melaleuca alternifolia*; *Cymbopogon martinii.*

Apoio: CAPES PROEX.

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STIMULATION OF NITRIFICATION ON PACIFIC WHITE SHRIMP IN BIOFLOC SYSTEM

Gabriela S. Ferreira*, Daniele Santos, Frederike Schmachtl, Cláudia Machado, Ana Clara Chede, Vitor Fernandes, Thiago C. Santos, Felipe N. Vieira, Walter Q. Seiffert

In biofloc systems, the nitrogen compounds, especially ammonia and nitrite, have to be controlled by microbiology pathways, manly by heterotrophic and chemoautotrophic bacteria. The objective of this work was to assess different water preparation strategies (heterotrophic, chemoautotrophic and mature) on Biofloc system for Pacific white shrimp (*Litopenaeus vannamei*). A 35-day study was conducted with juvenile (3.46 g) shrimps stocked in twelve 300 L tanks at a stocking density of 350 shrimp m^{-3}. Before stocking the shrimps, the tanks were divided into three treatments, as follows: i) Heterotrophic treatment (H), with addition of molasses as a carbon source; ii) Chemoautotroph treatment (Q), with addition of ammonium and nitrite salts and iii) Mature treatment (M), that received a significant amount of water with mature biofloc from another system. During shrimp rearing, water quality variables, such as amount of sludge, input used in the systems, microbiological parameters of the culture water, centesimal analysis and performance parameters, were evaluated. The proximate analysis of the biofloc revealed a relatively high proportion of protein, being the heterotrophic system the one with the highest protein content ($p<0.05$). Essential fatty acids such as palmitic acid and myristic acid were identified in all biofloc types. The energy content of the three bioflocs was also examined, showing that the matured biofloc had the most energy ($p<0.05$). In mature and chemoautotrophic treatments, the nitrification process was efficient to keep toxic nitrogen compounds (ammonia and nitrite) in low levels without the addition of carbohydrates. In contrast, the heterotrophic system had peaks of ammonia and nitrite during the rearing, and the levels of these compounds were higher in this treatment. These results demonstrate the importance of nitrifying bacteria communities in biofloc systems before shrimp stocking and that the addition of carbon source is necessary only in emergency situations to control ammonia peaks.

Keywords: Protein, Ammonia, Nitrite, Water, *Litoppenaeus vannamei*.

Apoio: CNPq; CAPES.

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SURFACE AND SUBSURFACE APPLICATIONS OF PIG SLURRY ON CARBON, NITROGEN AND ORGANIC MATTER FRACTIONS IN SOILS UNDER NO-TILL SYSTEM

Cristiano Santos*, Arcângelo Loss, Cremildo A. L. Francisco, Marcus V. B. D. Silva, Gustavo Brunetto

Swine production is socioeconomically important in South Brazil, but it generates large amounts of slurry, which can be used as fertilizer for crops. However, the form of application of pig slurry (PS) to soils under no-till system (NTS) affects the fertilizer efficiency. The objective of this work was to evaluate the effect of injection and broadcast applications of PS on the soil carbon (C), nitrogen (N), and organic matter (OM) fractions. The experiment area had been fallowed until May 2010, when the soil was prepared with liming and a crop rotation in NTS was implemented— black oat (May to October, 2010), maize (November, 2010 to April, 2011), and wheat (June to November, 2011). The PS treatments were applied before plantings, using a rotation of summer (maize) and winter (oat or wheat) grasses up to December, 2015 (seven applications). The treatments were: injected (PS_I), and broadcast (PS_S) applications of PS, chemical fertilization (NPK), and a control without fertilization, using four replications. Soil samples were evaluated for total organic C (TOC), total N (TN) in bulk soil (BS; Ø<2.00 mm), macroaggregates (8.00>Ø≥0.25 mm), and microaggregates (Ø<0.25 mm); light OM (OM_L); and granulometric fractions of OM—particulate organic C (OC_P) and N (ON_P), and mineral-associated organic C (OC_M) and N (ON_M)—in the 0-5, 5-10, and 10-20 cm layers. Treatments with PS_I had higher TOC in the BS (0-5 and 5-10 cm), macroaggregates (5-10 and 10-20 cm) and microaggregates (0-5 cm); higher TN in macroaggregates (10-20 cm) and microaggregates (0-5 cm); and higher OM_L (0-10 cm), OC_P (0-5 cm), OC_M (5-10 e 10-20 cm), and ON_P (0-5 cm), when compared to PS_S. In addition, the treatments with PS_I had higher TOC, TN and OM than those with NPK, and the control. The use of PS_I improved the soil chemical attributes, by presenting higher C, N and OM fractions than the PS_S, resulting in lower losses by volatilization and C and N emissions to the atmosphere. Thus, PS_I is an agriculturally and environmentally more efficient alternative method of PS application than PS_S, which has been performed in most agricultural properties in South Brazil. Despite logistics, financial, and land slope problems for the proper application of PS, it is an alternative to chemical fertilizers to improve soil chemical attributes that assists on swine waste management, and supports the efforts for a more sustainable agriculture.

Keywords: Macroaggregate; Light Organic Matter; Injected Application; Granulometric Fractions

Support: Fundação Agrisus (PA 2494/18).

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BIOESTIMULATION OF PLANTS BY MOLECULES OF ALGAL ORIGIN: COOPERATION PROJECT BETWEEN BRAZIL AND FRANCE

Marlon C. de Borba*, Aline C. Velho, Mateus B. de Freitas, Maryline Magnin-Robert, Beatrice Randoux, Patrice Halama, Philippe Reignault, Ali Siah, Marciel J. Stadnik

Bioestimalg is a cooperation project among the Brazilian institution Federal University of Santa Catarina (UFSC), the French Université du Littoral Côte d´Opale (ULCO) and Institut Supérieur d´Agriculture (ISA), funded by CAPES/COFECUB (2017-2020). The objective of this abstract is to summarize the main events of the project and results related to the effect of sulfated heteropolysaccharide extracted from the green seaweed *Ulva* spp., ulvan, to control the wheat diseases *Blumeria graminis* f. sp. *tritici* (*Bgt*) and *Zymoseptoria tritici* (*Zt*), causal agents of Powdery mildew and Septoria tritici blotch, respectively. Six work missions were carried out in the period of 2017-2018; three in France with Brazilian researchers and three in Brazil with French doctors. Two symposiums were organized by the Brazilian team, *i.e.*, I and II Latin-American Symposium on Bioestimulants in Agriculture (SLABA). In the first edition of SLABA, in 2017, around 200 peoples participated with 109 published abstracts. The second edition of SLABA was performed in 2018 together with recognized IX Brazilian Meeting of Plant Resistance Induction to Pathogens, with more than 500 peoples and 197 published abstracts. Participants' profile was 55% professional, 24% undergraduate and 21% graduate. The state of Paraná (20%), Santa Catarina (19%), São Paulo (19%), Rio Grande do Sul (15%) and Minas Gerais (10%) contributed to 83% of total participants. In addition, four study missions were carried out in this period; a sandwich doctorate and a postdoctoral were held at ISA and ULCO to study the defense mechanisms induced by ulvan in wheat against *Bgt* and *Zt*. To evaluate conidial germination *in vitro* assays, *Bgt* and *Zt* were spread on water-agar or potato dextrose agar medium amended or not with ulvan at 1 and 10 mg mL^{-1}. Ulvan enhanced conidial germination and stimulated the formation of multiple germ tubes of *Bgt* but did not affect those of *Zt*. To evaluate the effect on disease severity, wheat plants were treated with ulvan two days before fungal inoculation. Powdery mildew and Septoria tritici blotch severity were evaluated at 10 and 21 days after inoculation, respectively, and ulvan was able to protect wheat plants against both diseases by about 40%. Further analyses are ongoing in order to characterize the biochemical composition of the polysaccharide as well as defense reactions potentially induced by ulvan in wheat.

Keywords: Bioestimalg project; Ulvan; *Triticum aestivum*; Powdery mildew; Septoria tritici blotch.

Support: CAPES/COFECUB, CNPq.

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FEEDING FREQUENCY EFFECTS ON NUTRITIONAL PHYSIOLOGY OF JUVENILE SURUVI CATFISH (*Steindachneridion scriptum*)

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Suruvi (*Steindachneridion scriptum*), a catfish native from southern Brazil, has a great potential for use in Brazilian fish farming. Despite presenting favourable characteristics, studies on the intensive breeding of suruvi are scarce. This study aimed to determine the effects of feeding frequency on growth metrics and digestive enzyme activity for juvenile suruvi. The trial was conducted over 60 days with different feeding frequencies: once, twice, or three times per day until satiation (all in triplicate), during the dark period of the day. The juvenile suruvi (initial weight: 60.19 ± 10.67 g) were kept in 1m³ circular tanks (94 fish tanks^{-1}) with recirculating aquaculture system (25.5 ± 0.6°C; 12 L: 12 D). The fish were fed with a commercial carnivorous fish diet, comprised with 42% crude protein, 11% lipids, 20% carbohydrates, and 4,380 kcal kg^{-1} of crude energy in 6 mm pellets. Biometrics were performed at the beginning of the experiment and at each 30 days. The following variables were calculated from biometric data and feed intake quantification: survival (%), total weight gain (g), daily weight gain (g day^{-1}), coefficient of variation (%), specific growth rate (% day^{-1}), feed conversion. The gastrointestinal tract of the animals was extracted from each treatment (n=2), weighed and homogenized in 1:6 ice-cold distilled water for all samples. The homogenized samples were centrifuged at 28,230 *g* for 15 min and the supernatants were used to determine enzymatic activities at 25ºC. The concentration of soluble proteins in the enzymatic crude extract as determined by the Bradford method. Total alkaline protease activity was quantified by azocasein hydrolysis. Acid protease was assessed by hemoglobin hydrolysis. Amylase activity was determined by hydrolysis of soluble starch and lipase by hydrolysis of p-nitrophenylmiristate. Specific enzymatic activities (U mg^{-1} protein) were expressed as mean ± standard deviation. The growth variables and digestive enzyme activity were subjected to an analysis of variance and, when necessary, the means were compared using a Tukey's test. The homoscedasticity requirements of variance and normality were evaluated by Levene and Shapiro-Wilk tests, respectively. At the end of feeding, no significant differences were observed in the growth variables, alkaline protease and lipase activity ($P > 0.05$) between treatments. However, there were significant differences in amylase ($P < 0.05$). The proteolytic activity profile represents the digestive physiology of the juvenile suruvi, which, although carnivorous, presented the capacity to digest the starch in the supplied feed. This may present a favourable characteristic that improves the breeding success of suruvi, since fishes would be better able to digest carbohydrates in the diet. Moreover, our findings demonstrated that suruvi juveniles can be sustainably fed only once a day.

Keywords: proximate chemical composition; nutrient utilization; digestive enzymes; feed conversion

Support: CAPES.

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GERMINAÇÃO DE *Bipolaris maydis* SOBRE A SUPERFÍCIE FOLIAR DE CULTIVARES DE MILHO RELACIONADA À DIMINUIÇÃO DA SEVERIDADE DE HELMINTOSPORIOSE

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O milho é uma espécie de grande importância na agricultura mundial. O cultivo está presente em quase todas as propriedades rurais do país, sendo que a produção tem destaque na alimentação humana e animal. As plantas são acometidas por diversas doenças, entre elas a helmintosporiose. Um dos agentes causais desta doença é o *Bipolaris maydis*, um fungo presente em quase todas as regiões produtoras. Neste trabalho, objetivou-se avaliar a germinação de conídios de *B. maydis* sobre a superfície foliar de cultivares de milho e se a germinação dos conídios estava relacionada com a severidade da doença. Para tanto, testaram-se quatro cultivares de milho (SCS156 Colorado, P1630H, AG3700 e 30K75Y) inoculadas com o patógeno (10^2 conídios.ml^{-1}) através de aspersão, em casa de vegetação, no estádio V4, com 5 repetições por cultivar. Aos 10 dias após a inoculação, a severidade da doença foi avaliada com base em escala diagramática. Observou-se que as cultivares SCS156 Colorado e P1630H apresentaram as maiores médias de severidade, 15,2 e 13,3%, respectivamente, seguidas por AG3700 com 7,3% e 30K75Y com 3,3%. Este padrão de doença foi observado nas cultivares quando testadas também com maiores pressões de inóculo (10^3 e 10^4 conídios.ml^{-1}). Posteriormente, em um novo experimento, foram utilizadas 5 secções foliares, retiradas de 5 diferentes plantas, para cada uma das 4 cultivares. As secções foliares com 10 cm de comprimento foram acondicionadas em caixas gerbox, com papel filtro umedecido no fundo, e inoculadas com o patógeno (10^4 conídios.ml^{-1}), através de gota. Foram pipetadas 10 gotas de 10µL de inóculo sobre cada secção. Após 24 h, foram recortados 3 fragmentos de 1 cm² de cada secção, cada fragmento contendo uma gota de inóculo. Após o clareamento, os fragmentos foram colocados em lâmina de microscópio, corados com 50 µL de solução de azul de anilina (0,05%) e cobertos com lamínula. Foi realizada observação dos fragmentos contendo os conídios em microscópio óptico e contabilizado a porcentagem de conídios germinados e que apresentaram formação de duplos apressórios. Observou-se em torno de 83% de germinação de conídios do fungo nas cultivares SCS156 Colorado, P1630H e 30K75Y, enquanto que sobre AG3700 a germinação do fungo foi de 71,4%. Houve a formação de duplos apressórios em 49, 52, 45 e 34% dos conídios presentes em SCS156 Colorado, P1630H, 30K75Y e AG3700, respectivamente. Com base nos resultados deste trabalho, é possível afirmar que *B. maydis* apresentou maior dificuldade de germinação de formação de apressórios duplos sobre a superfície foliar das cultivares AG3700 e 30K75Y, resultando em menores severidades da doença nas plantas destas cultivares.

Palavras-chaves: *Zea mays*; Fungo; Doença; Microscopia; Conídio.

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INFLUÊNCIA DO TRATAMENTO TÉRMICO NO TEOR DE COMPOSTOS FENÓLICOS TOTAIS E NA ATIVIDADE ANTIOXIDANTE DE POLPA DE UVAIA

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A uvaia (*Eugenia pyriformis* Cambess) é uma fruta nativa brasileira pertencente à família *Myrtaceae*, geralmente encontrada de São Paulo ao Rio Grande do Sul, que vêm sendo reconhecida pelo elevado teor de compostos bioativos. Entretanto, este fruto apresenta alta perecibilidade e por isso a transformação em polpa é uma alternativa para a sua comercialização. O objetivo deste trabalho foi avaliar a influência do tratamento térmico (85°C por 1 minuto) no teor de compostos fenólicos totais (CFT) e na atividade antioxidante da polpa de uvaia, em comparação à polpa controle (sem tratamento térmico). O teor de CFT foi determinado pelo método de Folin-Ciocalteu enquanto a atividade antioxidante foi avaliada através da capacidade em sequestrar o radical 2,2-difenil-1-picrilhidrazila (DPPH) e quanto ao potencial antioxidante redutor férrico (FRAP). As análises foram realizadas em triplicata e os dados foram tratados estatisticamente por Anova e teste de Tukey. Pôde-se observar um aumento ($p<0,05$) de 2,25 para 2,48 mg de equivalente de ácido gálico/g de amostra no teor de CFT na polpa de uvaia após o tratamento térmico. Para a atividade antioxidante, em ambos os ensaios, também foi observado um aumento ($p<0,05$) desta atividade após o tratamento térmico, sendo que pelo método de DPPH foram obtidos valores de 19,85 e 21,47 mmol Trolox/g e pelo método FRAP os valores foram de 4,07 e 4,98 mmol Trolox/g, para as amostras controle e tratadas termicamente, respectivamente. O aumento observado pode estar relacionado à clivagem de ligações covalentes de alguns compostos fenólicos e a liberação dessas moléculas no meio devido ao aquecimento dos frutos. No entanto, na literatura permanecem indefinidos os mecanismos destas transformações. Vale destacar que a estabilidade dos compostos bioativos de um alimento não é apenas dependente da temperatura e da intensidade do aquecimento, mas pode estar relacionada a outros parâmetros, como pH, presença de oxigênio e interações com outros fitoquímicos presentes na mesma matriz alimentar. Desta forma, conclui-se que o binômio tempo/temperatura utilizado neste trabalho resultou no aumento dos compostos fenólicos totais e na atividade antioxidante da polpa de uvaia, tornando-a atrativa para a indústria de alimentos.

Palavras-chaves: Compostos bioativos; *Eugenia pyriformis* Cambess; Frutos nativos.

Apoio: CNPq; FAPESC, CAPES.

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JUÇARA FRUITS (*Euterpe edulis* Martius) EXTRACTS EXERT NEUROPROTECTIVE EFFECTS AGAINST GLUTAMATE-INDUCED OXYTOSIS IN HT22 CELLS

Mayara Schulz*, Luciano V. Gonzaga, Viviane de Souza, Marcelo Farina, Luciano Vitali, Gustavo A. Micke, Ana C. O. Costa, Roseane Fett

Juçara palm (*Euterpe edulis* Martius) is native to the Atlantic Forest and found mainly in the southern and southeastern Brazilian states. Studies demonstrate that the fruits of this palm contain excellent nutritional and bioactive characteristics, with emphasis on phenolic compounds and antioxidant capacity. The consumption of foods rich in phenolic compounds has been associated with reduced risk of chronic diseases, including neurodegenerative. In this context, this study investigated the neuroprotective activity against glutamate-induced oxytosis in HT22 hippocampal cells and phenolic composition of juçara fruit extracts. The samples were harvested in Florianopolis, Santa Catarina, Brazil, in June of 2016, and the crude extract was carried out by cold maceration of the freeze-dried edible portion of the juçara fruits (70 g) with methanol (500 mL) for 10 days. Afterward, the dried crude extract was dissolved in methanol and subsequent partitions were performed with hexane, dichloromethane, ethyl acetate, and butanol. After centrifugation and vaporization of the organic solvents, the extracts were submitted to freeze-drying. For phenolic compounds determination using a liquid chromatography- electrospray ionization- tandem mass spectrometry (LC-ESI-MS/MS) system, the extracts were solubilized in methanol and diluted in methanol:water (70:30, v/v). For hexane and dichloromethane extracts, lipid portion was previously removed. Cells were treated with freeze dried extracts dissolved in dimethyl sulfoxide (final culture concentration, 0.1%) at concentrations of 1 and 10 μg mL^{-1} and, after 24 h, were exposed to glutamate (5 mmol L^{-1}). Neuronal cell viability was assessed by MTT (3-[4,5-dimethylthiozol-2-yl]-2,5-diphenyltetrazolium bromide) assay. The crude, ethyl acetate and butanol extracts showed no protective effects. However, the dichloromethane and hexane extracts (10 μg mL^{-1}) were able to protect the cells from death induced by glutamate, with cell viability of 93,94 ± 1,46% and 59,67 ± 0,43%, respectively. The dichloromethane extract showed the highest number of phenolic compounds detected by LC-ESI-MS/MS (24), followed by the hexane extract (22). Some compounds were found only in the hexane and dichloromethane extracts, such as cinnamic acid, ferulic acid, *p*-coumaric acid, apigenin, eriodictyol, naringenin, and vanillin. The 4-aminobenzoic, sinapaldehyde, and syringaldehyde were quantified only in the dichloromethane extract. The results suggest that juçara fruits contain compounds that are promising for the reduction of the risk of neurodegenerative diseases.

Keywords: Neuroprotection; Phenolic compounds; LC-ESI-MS/MS; Oxidative stress; Antioxidant.

Apoio: CNPq; CAPES.

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PROMISING INITIAL STEPS AIMING TO THE ESTABLISHMENT OF A SOMATIC EMBRYOGENESIS PROTOCOL FOR THE BAMBOO *Guadua chacoensis*

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Bamboos are promising plants with multiples purposes that present some constraints in its conventional propagation, including scarce and infrequent seed production, as well as poor viability. For *Guadua chacoensis*, a native species from the Atlantic forest biome, the seed production occurs approximately every 28 years, for example, being micropropagation a suitable alternative to large scale propagation and also conservation. Two different morphogenetic routes could be used for bamboo micropropagation: organogenesis and somatic embryogenesis. The first one is the most used but for the second one many questions still remain to be answered. Thus, the objective of this work was to evaluate the effects of the growth regulator Picloram as well as the use of explant from different conditions in callus induction, being this the initial step to establish an efficient protocol of somatic embryogenesis. I*n vitro* culms established *in vitro* were individualized and inoculated in MS medium modified and supplemented with 30 g L^{-1} of sucrose, 2 mL L^{-1} of morel vitamins, 2 g L^{-1} of phytagel and 13 µM of the cytokinin BAP (6-benzylaminopurine). The cultures were kept at 25°C for 45 days, under light and dark conditions. The culms were then used as explant for callus induction. They were cut longitudinally and inoculated in MS medium supplemented with 30 g L^{-1} of sucrose, 2 mL L^{-1} of morel vitamins, 2 g L^{-1} of phytagel, 1.5 g L^{-1} of activated charcoal, and 5 concentrations of Picloram (0, 100, 200, 300 e 400 µM). After inoculation, the cultures were kept at 23°C in the dark, and the evaluation of callus induction was carried after 30 and 60 days. The concentrations of 200, 300 and 400 µM presented higher percentages of callus induction, and the response of callus induction was statistically different from light and darkness culms, being the darkness the best ones. The use of Picloram at high doses in combination with explant originated from darkness conditions were efficient for callus induction of *Guadua chacoensis in vitro* culms. These results represent a promising initial step for the establishment of a protocol of somatic embryogenesis for the mass propagation of this native bamboo species.

Palavras-chaves: Tissues culture, Micropropagation, Callus induction.

Apoio: FAPESC and CNPq.

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MOISTURE CONTENT, WATER ACITIVITY AND pH IN STINGLESS BEE HONEY SAMPLES OF DIFFERENT RIPPENING STAGES

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There are about 500 species of stingless bees around the world; hence, honeys with different characteristics, depending on the bee species, botanical source, geographic region, and climate conditions. Water content, pH and water activity are some of the factors that most differ stingless bee from *Apis mellifera* honey. The high water content verified in some stingless bee honeys may be a strong indicator of the ripeness stage of these honeys. Nectar and pollen collected by stingless bees are stored in cerumen pots, which can also indicate the ripeness stage of stingless bee honeys. Thus, honey stored in open pots (OP) are considered unripe honey, while honey from closed pots (CP) are considered ripe honey, ready to be collected, and consequently, consumed. Therefore, the aim of this previous study was to evaluate water content, water activity and pH in four stingless bee honey samples from OP and CP of two stingless bee species – *Melipona quadrifasciata* (Mandaçaia) and *Melipona bicolor* (Guaraipo) – originating from the same meliponary, located in Santa Rosa de Lima, Santa Catarina, under the same botanical source. Moisture content, water activity and pH values were measured using an Abbe refractometer, a bench topwater activity meter, and a pHmeter, respectively. Data were subjected to analysis of variance and means were compared by Student's t-test (p-value <0.05). All the samples analysed presented high water content and water activity, and acidic character, when compared to *Apis mellifera* honey. The two stingless bee honey samples originating from OP presented moisture content values of 82.19 ± 0.31 % (Guaraipo) and 31.04 ± 0.24 % (Mandaçaia), while samples from CP presented values of 35.16 ± 0.25 % (Guaraipo) and 29.78 ± 0.24 % (Mandaçaia). The water activities measured in the stingless bee honey samples were 0.99 ± 0.0009 and 0.75 ± 0.0012 for honey samples originating from OP, and 0.81 ± 0.0009 and 0.77 ± 0.0011 for honey samples from CP of Guaraipo and Mandaçaia species, respectively. The pH value determined for both stingless bee honey samples was 3.19, except the stingless bee honey sample of Guaraipo species originating from CP, that presented a lower pH value (2.93 ± 0.086). The results confirmed the high water content and low pH values in stingless bee honeys, and also showed that different species of stingless bees produce different honeys. The results verified in OP showed a higher water content than in CP, especially in honey samples from Guaraipo species, that in combination with the high values of acidity and water activity could promote a possible metabolization of compounds present in honey during its ripening process. The parameters evaluated could serve as an orientation for observation of the activity of the hives and the ripening stages of the honeys produced.

Keywords: *Melipona quadrifasciata*. *Melipona bicolor.* Abelhas nativas. Meliponicultura.

Support: Universidade Federal de Santa Catarina; CAPES.

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AGGREGATES AND BULK SOIL ACIDITY PARAMETERS IN SOIL FERTILIZED WITH ORGANIC AND MINERAL FERTILIZERS

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Swine production stands out in southern Brazil, with emphasis on the state of Santa Catarina (SC). In SC, the municipality of Braço do Norte, located in the south region of the state, has one of the highest concentrations of pigs per area of the country, with a herd of 314,810 pigs, which generates a density of 1.485 animals per km^2 and 10.85 animals per inhabitant. As these animals are produced in an intensive confinement system, a large amount of waste is generated daily. In the search for a suitable destination to the large volume of manure produced by the swine activity, specialists have recommended the use of swine manure as fertilizer in agricultural areas. Swine manure contains macro and micronutrients necessary for plant development and may serve as an alternative for the partial or total replacement of mineral fertilizers. The aim of this work was to evaluate the effect of fertilization with organic and mineral fertilizers, associated with the use of cover crop residues in No-Tillage System (NTS), on acidity parameters in soil aggregates and bulk soil. The experiment was carried out in a rural property with a history of swine manure application, located in Braço do Norte, SC, and implemented in 2013, with the following treatments: Control, without fertilization; Mineral fertilizer (MF); Swine organic compound + MF (SOC+MF); Pig slurry + MF (PS+MF); Pig slurry to supply 100 and 30 kg ha^{-1} of N rates for maize and oat cultivation, respectively. In May 2016 undisturbed and deformed soil samples were collected to obtain soil aggregates and bulk soil. The following acidity parameters were evaluated: pH_{H2O} and SMP index, exchangeable Ca^{+2}, Mg^{+2} and Al^{+3} contents, and available K^{+} contents. Then, the values of H+Al, $CEC_{pH7.0}$, Effective CEC, Base saturation and Al saturation were calculated. The results show that the continuous application of swine manure for three years improves soil chemical conditions for all evaluated parameters, and this improvement was observed in the treatments where swine manure was applied, being more evident in the soil aggregates compared to bulk soil. In the soil aggregates, the treatment with SOC+MF presented the highest pH_{H2O} and lowest exchangeable Al values, which resulted in a higher $CEC_{pH7.0}$ and Base saturation value and lower AL saturation value.

Keywords: Animal waste; Soil aggregation; No-tillage System.

Support: CAPES, CNPq, FAPESC, UFSC; NEPEA-SC.

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AGRONOMIC PERFORMANCE OF VARIETY AROMERA IN SOUTHERN BRAZIL

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The control of grapevine fungal diseases in southern Brazil is done with fungicides. One of the most efficient strategies for reducing the number of sprays is the use of resistant varieties. These varieties are called PIWI (from German Pilzwiderstandsfähige) they combine disease resistance and high oenological quality. Among the PIWI white varieties, Aromera it's an important variety with pleasant flavor, like rose and citrus fruits, fine Muscat aromas with juicy acidity, very aromatic wine if well-ripened. The objective of this work was to evalute the agronomic performance of the variety Aromera in southern Brazil. The experiment was carried out in a commercial winery located in São Joaquim (28°13" S and 50°04" W, altitude 1,100 m), in the 2018 and 2019 vintages. The Aromera variety was implanted in 2015, grafted on 1103P and spacing of 3.0 x 1.2m. The plants were trained in VSP and pruned in double spur cordon. The time of occurrence of the main phenological stages was evaluated, at harvest were determined yield (kg plant^{-1} and T ha^{-1}), soluble solids (°Brix), total acidity (meq L^{-1}) and pH. Budbreak occurred on average on September 19th, full bloom on November 18th, véraison occurred on average on January 15th and maturity/harvest on February 26th. The average yield was 4,22 kg plant $^{-1}$ and 11,7 T ha^{-1}. At the time of harvest the values obtained were 23.3 ° Brix, 109.46 meq L^{-1}and pH 3.01. The results show that the variety Aromera presented good adaptation to the terroir of southern Brazil, the maturation indices obtained were adequate for the elaboration of quality white wines. In addition, the variety stood out for its particular aroma, indicating a potential for sparkling wine production.

Keywords: PIWI, resistant varieties, downy mildew.

Support: CNPq; CAPES, EPAGRI.

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ALLELOPATHIC ACTIVITY OF EXTRACTS OF *Psidium cattleianum* SABINE LEAVES

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The *Psidium cattleianum* Sabine (Myrtaceae) species, commonly known as Cattley guava, is being considered a plant with latent perspectives for the pharmaceutical and food industry due to its potential application as herbal, functional food, among others. Plants usually produce numerous secondary metabolites, and some of them have allelopathic activity, specially phenolic ad terpenoid ones also produced by *P. cattleianum*. Allelopathic substances may provide a competitive advantage for hosting plants through the inhibition of the growth of competitor plants. Given that, this work aims to determine the allelopathic activity of aqueous extracts of P. cattleianum Sabine leaves, collected in summer and winter, and obtained with the use of low-frequency ultrasound (WU) or enzymes by cellulase complex (WE). To evaluate the allelopathic effect of the extracts, we performed germination inhibition and growth biotests, using lettuce (*Lactuca sativa* cv. Grands rapids), as a bioindicator plant. When comparing WU and WE extracts, for the same season, it can be verified that the results did not show significant differences, which demonstrates that the extraction manner did not affect the content of compounds responsible for germination. Thus, the influence of germination happened due to the season when the leaves were collected, with a 25% to 60% variation in germination inhibition, when compared to the control experiment (100%). Furthermore, regardless of the season when the leaves were collected, they presented stable germination speed and average time. Regarding the growth inhibition percentage, the results have showed that extracts have exerted inhibition in plant growth of 50%, demonstrating the allelopathic effect of *Psidium cattleianum* Sabine leaves. It can be observed that the allelopathic influence on lettuce plantlet growth happened in the abnormality specially in the radicular system, in which roots presented necrosis, damages and even lack of roots. Thus, extracts from all tested samples and extractions showed considerable allelopathic activity, which suggests that leaf extracts can be tested as bioherbicides. The results highlight the significance of this plant, native in the South of Brazil.

Keywords: *Psidium cattleianum* Sabine; Leaves; Secundary metabolites; Allelopathy activity.

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ANTIOXIDANT CAPACITY OF BREAD ENRICHED WITH YERBA MATE LEAVES IN WHOLE WHEAT FLOUR

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The demand for natural antioxidants is a market trend and yerba mate (*Ilex paraguariensis)* becomes an alternative for the elaboration of new products, as it presents high bioacitivity. Bakery products are a good vehicle for incorporation of natural antioxidants. However, several stages of bread processing may interfere in final product quality and might alter the bioactivity of compounds with functional properties. In this context, the aim of this study was to evaluate the incorporation of yerba mate leaves in whole wheat flour in two particle sizes, as well its effect on the antioxidant capacity of flours and breads after baking. The experimental design was entirely randomized consisted of three treatments, two obtained by incorporation of 1.5 g of yerba mate/100 g of whole wheat flour with two particle sizes, named at medium yerba mate (MYM ≤ 425 µm) and coarse yerba mate (CYM ≤ 600 µm), as well as the control sample named whole wheat flour (WWF). The bread making the small-scale instrumental test was used. The total phenolic content was determined using the Folin-Ciocalteau colorimetric method and the antioxidant activity was determined by the ABTS radical scavenging assay (Azino-bis(3-Ethylbenzothiazoline-6-Sulfonic Acid). Both assays were performed on bread and flour samples, and the results were analyzed by analysis of variance (ANOVA) and the means were compared by Tukey's test ($p<0.05$). The phenolic compounds content of breads showed a significant effect ($p<0.05$) for samples elaborated with yerba mate leaves in both particle sizes (MYM and CYM) in relation to the control sample (WWF). The same was evidenced in ABTS assay for two breads made with addition of yerba mate (MYM and CYM) ($p<0.05$). In relation to the flours, the sample elaborated with MYM presented the highest content of phenolic compounds. Furthermore, authors suggest that during baking some compounds may be generated from the *Maillard* reaction. These compounds may have antioxidant activity, which may justify the results found for breads in this study. However, the particle size ≤ 600 µm (CYM) was more stable during brad baking, in relation to the content phenolics. Therewith, in this study it was possible to develop a bakery product with appropriate functional characteristics, presenting high antioxidant capacity even after baking. Additionally, yerba mate has proven to be an alternative for enhancing the products functionally, as well as used in regional products widely consumed by society.

Keywords: *Ilex paraguariensis*, bakery products, wholemeal, phytochemicals.

Apoio: CAPES, Inovamate, Biotrigo Genética e UPF.

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APLICAÇÃO FOLIAR DE POLISSACARÍDEO DO SHIITAKE, EXTRATO DE PRÓPOLIS E ACIBENZOLAR -S-METIL PARA CONTROLE DA MANCHA ANGULAR DO MORANGUEIRO

Bruna Rodrigues, Mycheli P. da Cruz*, Robson M. Di Piero

O morangueiro é bastante vulnerável a uma série de patógenos. Dentre as principais doenças que acometem a cultura, pode-se destacar a mancha angular provocada pela bactéria *Xanthomonas fragariae*. Esta doença é responsável por uma redução significativa na produção do morango e vem afetando a cultura em todo o mundo. Além disto, a demanda mundial por alimentos isentos de agrotóxicos tem impulsionado a pesquisa para a busca de métodos alternativos ao controle de patógenos em plantas. Desta forma, o objetivo deste trabalho foi avaliar o efeito de compostos alternativos na proteção de morangueiro contra a mancha angular de *Xanthomonas fragariae*. Foram testados o polissacarídeo extraído de biomassa fúngica do cogumelo shiitake (PSHII) (3 mg/mL), o extrato hidroalcoólico de própolis verde coletado na cidade de Wenceslau-Braz-PR (PWB) - a 5 mg/mL (base de matéria seca) e o indutor comercial Acibenzolar-S-metil (ASM, 25 ppm). O experimento foi realizado em casa de vegetação, onde plantas de morangueiro da cultivar Albion foram pulverizadas com os compostos (8 mL) até o ponto de escorrimento. Aos 3 e 6 dias após a aplicação dos compostos, as plantas foram inoculadas com suspensão de *X. fragariae* de 10^8 UFC/mL; para a testemunha foram utilizados água destilada e etanol a 0,01%. A avaliação da severidade da doença foi realizada aos 15, 22 e 29 dias após a inoculação do patógeno, com o auxílio do software *Quant.* Os resultados demostraram que o indutor ASM promoveu um maior nível de redução da severidade da doença ao longo do tempo, em torno de 60 e 80%, quando aplicado 3 e 6 dias antes da inoculação. No entanto, o polissacarídeo de shiitake (PSHII) foi mais eficiente quando aplicado aos 6 dias antes da inoculação do patógeno. O extrato PWB também promoveu uma proteção significativa das plantas ao longo do tempo, em comparação com plantas pulverizadas com água destilada ou etanol. Com os resultados alcançados, foi possível demostrar o grande potencial destes compostos alternativos para controle da mancha angular do morangueiro cultivado em casa de vegetação.

Palavras-chaves: *Xanthomonas fragariae*; Mancha angular; Própolis; Shiitake; Morangueiro.

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EFFECT OF DIFFERENT COVER CROPS ON CARBON AND NITROGEN DERIVED FROM WATER LIGHT ORGANIC MATTER IN A ONION CULTIVATION

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Agricultural production systems that integrate different crop species, decreased external inputs, nutrient cycling, cover maintenance and soil conservation, as well as increased productivity, have been chosen for the conservation of agroecosystems. In the no-tillage system (NTS), conservationist practices are prioritized, with less soil plowing and the presence of cover crops, which among their functions, increase the soil organic matter (SOM) content. One of the fractions of SOM is the water light organic matter (LOM), which is understood as the fraction of organic matter derived from the superficial mulch of the soil and the roots that were least altered by microorganisms. Knowing that LOM accumulation increases microbiota activity reflecting on nutrient release to plants, the objective of this study was to quantify the carbon and nitrogen contents of the LOM mass in a nine years experiment with combinations of cover crops species from different botanical families, using crop rotation and crop succession in onion NTS. The experiment was implemented in April 2007, in Ituporanga, SC, at EPAGRI experimental station. Undeformed and deformed soil samples were collected in the 0-5, 5-10 and 10-20 cm layers of the treatments: T1-NTS- maize and onion succession, T2-NTS- commercial crop rotation and biennial onion, T3-NTS- maize and biennial onion, T4-NTS- maize-mucuna and biennial onion, T5-NTS- cover grasses and annual onion, T6-NTS- cover legumes and annual onion, T7- Conventional tillage system (CTS) / onion), T8-NTS- cover and annual onion intercropping. The LOM was separated according to the methodology of Anderson & Ingran (1988), and subsequently, the carbon (C) and nitrogen (N) contents, contained in the LOM mass, were determined. Some treatments stood out compared to others for the evaluated variables, T2 added large amount of C rich material on the surface, due to the use of oilseed radish in combination with the rye. In depth the LOM, C of LOM and N of LOM were higher in T8, this is a result of the combination of plants from different botanical families and the presence of different root systems, which release exudates rich in carbon compounds. T4, due to the presence of legumes only as cover crops, generated a higher amount of nitrogen-rich plant residues in the most superficial layers evaluated. The absence of cover crops in T7 leads to lower plant inputs on the soil and, in addition to the soil plowing in this treatment, there is an increase in the rate of decomposition of plant residues, as well as losses of C and N. The NTS favors the accumulation of LOM compared to CTS, in addition the mixture of cover crops from different families results in greater carbon and nitrogen accumulation in both the superficial (0-5 cm) and deep (10-20 cm) layers.

Keywords: Onion no-till system; soil management; cover crops; *Allium cepa* L.

Support: CAPES.

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EFFECT OF FERTILIZATION AND CONSORTIATION OF WINTER SPECIES ON PASTURE PRODUCTION IN VOISIN'S ROTATIONAL GRAZING SYSTEM

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From a productive point of view, the native fields of southern Brazil have low carrying capacity due to the low natural fertility of the soils and the high seasonality in forage production. In these fields, breeding and management practices are important because they increase their production and ensure their conservation. Moreover, for grazing cattle achieving efficiency is a challenge because, besides the process of grazing and forage production in quantity and quality it is also necessary to take into account the social-economic-environmental needs. Thus, the objective of this work was to evaluate the production of pastures cultivated in winter, in Voisin's rotational grazing system (VRG), using different fertilizers and consortiation of species. The study was conducted between July and August of 2019 at the Voisin's Rational Grazing area at UFSC- Experimental Farm of Ressacada, Florianópolis, Brazil. Fertilizers were Soluble Fertilizer (Triple Super Phosphate, Potassium Chloride and Urea), poultry litter or a control in combination with grasses: Ryegrass (*Lolium multiflorum Lam.),* Black Oat (*Vicia sativa L.)* and legumes (White Clover (*Trifolium repens L.)* and Red Clover (*Trifolium pratense L.)* in consortium or only grasses species which resulted in 6 treatments that were distributed and replicated in 6 blocks, totalizing 36 paddocks. A forage mass was estimated with the pasture weight using the square method of 0.25 m² measured when the optimum grazing level was reached. Green mass(GM)/ha was calculated, and a composite sample per paddock was taken and oven dried at 65 ° C for 72h for dry matter(DM) determination and estimated DM/ha. There was a significant effect of fertilization on the production of GM/ha ($p < 0.0001$) and DM/ha ($p < 0.05$). The grasses and legumes consortium or only grasses species were not different for the evaluated variables. The GM/ha production was highest using soluble fertilizer (6100 kg) when compared with poultry litter (4606 kg) or with the control treatment (3652 kg). In addition, the DM/ha production from soluble fertilizer treatment were different than the control (1609kg ha vs 1295kg), but the poultry litter (1408kg) did not differ from both soluble or control treatment. Inclusion of white clover and red clover with the grasses was not efficient to increase GM or DM production. The results suggest that the use of fertilizer, at the recommended dosages according to soil analysis, is important because it provides increased forage production and this ensures good food supply, being soluble fertilizer more efficient than poultry litter. Intercropping legume species with grasses does not alter mass production, but nutritional quality assessments are recommended due to legume superiority in this respect.

Key words: Poultry litter, Phosphorus, Urea, Oats and Ryegrass

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ESSENTIAL OIL VOLATILIZATION AGAINST GREY MOLD (*Botrytis cinerea*) ON STRAWBERRY FRUITS

Eduardo Gainete Ramos*, Caroline Luiz, Robson Marcelo di Piero

Strawberry is highly susceptible to rot-causing pathogens on the postharvest. Essential oils have been studied as alternative control to the use of fungicides. These oils are plant extracts that contain compounds already known as antimicrobial, especially in their volatile phase. Thus, the present work tested the efficacy of tea tree (*Melaleuca alternifolia*), clove (*Syzygium aromaticum*) and palmarosa (*Cymbopogon martini*) essential oils, by volatilization, on the incidence and severity of grey mold (*Botrytis cinerea*) on strawberry postharvest. For that, two experiments were performed with strawberry fruits inoculated or not with *B. cinerea*. The oils were applied at 375 and 750 ppm in polyphenephthalate plastic (PET) trays (2.5 L), containing 10 fruits each and 4 replicates. The incidence (% rotten fruits) and the rotten severity (levels from 0 to 5) were evaluated at seven days after inoculation. The tea tree essential oil reduced the incidence up to 80% when compared to non-inoculated fruits being more effective than other treatments. This essential oil also reduced significantly the severity, with levels lower than 2, while other treatments received 5. Therefore, the tea tree essential oil shows potential as alternative control to postharvest decay.

Keywords: Postharvest, alternative control, tea tree, decay

Support: CAPES.

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EXTRAÇÃO DE COMPOSTOS BIOATIVOS COM AÇÃO ANTIOXIDANTE UTILIZANDO LÍQUIDO IÔNICO [BMIM][Cl] COMO CO-SOLVENTE

Bruno L. Ferreira*, Laércio G. Maciel, Jane M. Block, Daniel Granato, Itaciara L. Nunes

Os compostos fenólicos fazem parte das substâncias naturais mais estudadas atualmente. Esses compostos têm por principal ação no metabolismo humano a sua atividade antioxidante, já descrita em literatura, atuando principalmente na prevenção de doenças degenerativas como câncer, doenças cardiovasculares, disfunções neurológicas, entre outras. Entretanto, alguns desses compostos são de natureza apolar, necessitando de solventes orgânicos para sua extração, assim como metanol, hexano, éter, diclorometano, etc., os quais são potencialmente tóxicos e atualmente seu uso não é incentivado. Diante disso, solventes alternativos têm sido estudados, assim como os líquidos iônicos (LI), que são substâncias compostas por íons, que apresentam boa estabilidade química e são seguros ao ambiente e a saúde. Dessa forma o trabalho teve por objetivo avaliar a utilização de um LI como co-solvente em mistura trifásica para obtenção de um extrato com potencial antioxidante utilizando planejamento *simplex centroid*. Para a obtenção dos extratos, foi utilizado como amostra o resíduo seco do processamento da goiaba vermelha (*Psidium guajava*) composto de: semente, casca e sobra de polpa. Para as extrações foram utilizados etanol, água e LI especificadamente o cloreto de 1-butil-3-metil imidazólio ([BMIM][Cl]). As extrações foram conduzidas em ultrassom por 30 minutos a temperatura ambiente. A modelagem estatística foi realizada conforme um planejamento *simplex centroid* (com 3 variáveis: água, etanol e LI) com 7 pontos. O controle consistiu em uma extração com metanol nas mesmas condições experimentais. As respostas analisadas foram: compostos fenólicos totais (método do Azul de Prússia), e atividade antioxidante (métodos de DPPH e FRAP). Com relação aos fenólicos totais, a melhor extração com LI foi a de 50% do solvente [BMIM][Cl], resultado inferior a extração somente com água, etanol ou a combinação desses dois solventes, indicando que o LI como co-solvente não é efetivo nas condições experimentais testadas. Contudo a extração de compostos fenólicos com ação antioxidante foi efetiva, verificando-se que as respostas dos extratos contendo LI (50 e 33%) foram superiores ao solvente metanol em ambos os mecanismos de captura de radical (DPPH) e redução de ferro (FRAP). Além do mais, o uso de LI apresenta interações significativas e positivas com os outros solventes para a extração de compostos fenólicos com ação antioxidante verificados na análise estatística. É possível concluir que o LI é um solvente promissor para a obtenção de extratos antioxidantes livres de solventes orgânicos. O uso de LI em substituição total aos tradicionais solventes orgânicos está sendo estudado em nosso grupo de pesquisa, e os resultados preliminares são promissores. Ainda, os extratos antioxidantes têm potencial para incorporação em alimentos objetivando diminuir a degradação via oxidação lipídica.

Palavras-chaves: Compostos Bioativos; Química verde; Solventes emergentes.

Apoio: FAPESC, CAPES.

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FRAÇÕES POLISSACARÍDICAS DE BABOSA (*Aloe barbadensis*) CONTROLAM MANCHAS FOLIARES CAUSADAS POR *Xanthomonas euvesicatoria* EM PLANTAS DE PIMENTÃO

David F. Posso*, João A. V. Fonseca, Robson M. Di Piero

O pimentão (*Capsicum annum*) é uma das hortaliças mais cultivadas no Brasil, estabelecida em aproximadamente 13 mil hectares e com uma produção anual de 290 mil toneladas. Dentre os problemas fitossanitários que acometem esta cultura se encontram as manchas foliares causada pela bactéria *Xanthomonas euvesicatoria* que afeta a cultura em qualquer fase de seu desenvolvimento comprometendo a produção. O controle desta bacteriose é baseado na implementação de cultivares resistentes e sobretudo com uso de agroquímicos, estes últimos caracterizando-se por intensificar a pressão de seleção de bactérias resistentes, acarretando assim problemas técnicos, econômicos, ecológicos e à saúde humana. Uma alternativa para controlar esta bacteriose na cultura de pimentão é mediante o uso de produtos de baixo impacto ambiental e que apresentam efeito antimicrobiano e/ou potencial de induzir mecanismos de defesa latentes nas plantas como são as frações polissacarídicas extraídas da babosa (*Aloe barbadensis*). Mediante isto, o objetivo desta pesquisa foi avaliar em plantas de pimentão o efeito de diferentes concentrações destas frações para controlar esta doença. Plantas de pimentão cv. Amarelo-SF-112 com 5 folhas verdadeiras foram pulverizadas com 3 ou 5 mg. mL^{-1} de frações polissacarídicas (10 ml por vaso). Como controle negativo as plantas foram tratadas com água destilada e como controle positivo as plantas foram tratadas com o indutor comercial Bion® a 50 ppm. Após 3 dias dos tratamentos as plantas foram inoculadas com uma suspensão de *X. euvesicatoria* (1 x 10^8 UFC/mL) e mantidas em câmara úmida por 48 horas. As avaliações da severidade da doença iniciaram 7 dias após a inoculação (*DAI*) e a cada 7 dias avaliando-se 4 folhas por vaso, para um total de 3 avaliações. Bion a 50 ppm e babosa a 3 mg/mL reduziram significativamente a severidade da doença em todos os tempos avaliados (Figura 1). Aos 21 dias, a redução média foi em torno de 50%, indicando que esses produtos apresentam potencial para serem utilizados no manejo da bacteriose (Figura 1).

Palavras-chaves: Manchas foliares, Controle alternativo, Babosa

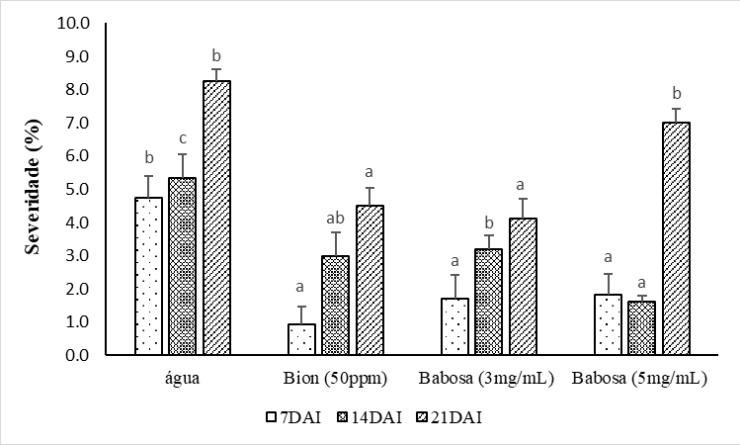

Figura 1. Efeito de Bion e babosa em diferentes concentrações sobre a severidade de *X. euvesicatoria* em plantas de pimentão Amarelo SF 112. DAI = Dias Após de Inoculação. Médias seguida pelas mesmas letras não diferem significativamente a 5% pelo teste Tukey.

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HOMEOPATHIC PREPARATIONS OF PROPOLIS ON SPORE GERMINATION OF *Colletotrichum* spp.

Antonia Gomes de Queiroz*, Angela Costa, Cíntia Armond, Robson Marcelo Di Piero

Colletotrichum spp is a major disease-causing pathogen in fruits and vegetables before and after harvest. Anthracnose in peppers is caused by *Colletotrichum* spp. It is one of the major fungal diseases that occurs in this culture. This fungus can cause seedling fall, stem necrosis and leaf spot, but its severity is recognized by postharvest damage to the fruit, being mainly controlled by the use of fungicides and refrigeration. Given the high level of chemical residues left on plants and the environment, the search for new disease management practices, such as homeopathy, is increasing. The homeopathic preparation of propolis is obtained from crude propolis, a resinous substance with antimicrobial properties. This work aimed to evaluate the homeopathic preparation of propolis at 12CH and 30CH (centesimal hanemanian dilutions) in the conidial germination of *Colletotrichum* spp. The tests were performed at the Phytopathology Laboratory of the Center for Agricultural Sciences of the Federal University of Santa Catarina (UFSC). Homeopathic preparations were made at the Homeopathy Laboratory of the Federal University of Recôncavo da Bahia (UFRB), following a methodology applied in the Brazilian Homeopathic Pharmacopoeia (BRASIL, 1997). The crude propolis extract was subjected to dilution and suction (stirring).The homeopathic method used to make homeopathic medicines was the Hahnemannian Method, as dilutions are made in the ratio 1: 100, that is, centesimal scale dynamizations, represented by the acronym CH. In this stage, 30 mL containers were used, where 99 parts of the inert input (70% alcohol) and one part of the drug were added in the previous dynamization. Thus, 0.2 mL (6 drops) of propolis were used in 19.8 mL (1/100 dilution) of 70% alcohol and 100 times suction in the mechanical dynamizer (Denise 50-Autic Model), obtaining a dynamic CH 1. And so on until you reach the desired dynamizations. To obtain the spore suspension, five discs (5 mm in diameter) containing *Colletotrichum* spp. were removed from a BDA plate after 20 days of incubation, the discs were transferred to a becker containing 10 mL of sterile distilled water. After it was shaken to release conidia and filtered, the suspension was adjusted to $1x10^5$ spores / mL with the aid of the Neubauer hemacytometer. An aliquot of 20µL of the spore suspension ($1X10^5$ conidia / ml) and 20µL of extracts was included in each slide. After 20 hours of incubation at 25°C, germination percentage was determined. All dynamizations were able to reduce pathogen germination significantly. After three trials, propolis at 12CH and 30 CH reduced spore germination, in average, by 46.7 and 49.5%, respectively. The results showed the potential of the propolis homeopathic preparation in the control of Colletotrichum spp. showing that the antimicrobial properties were found even after extracts were dynamized.

Keywords: Alternative control, hydroalcoholic extracts, homeopathic preparations, dynamization.

Support: CAPES.

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IDENTIDADE FUNCIONAL DE CULTIVOS CONTRIBUI PARA PRODUÇÃO DE BIOMASSA EM SISTEMAS AGROFLORESTAIS

Marinice Teleginski*, Fernando Joner, Diego dos Santos, Renata Rodrigues Lucas, Álvaro L. Monteiro, Ilyas Siddique

Uma forma de avaliar os efeitos da biodiversidade no funcionamento dos ecossistemas é através da diversidade funcional e identidade funcional, ou seja, quantificando os valores, amplitude dos valores e média ponderada de atributos funcionais de espécies que compõe determinado ecossistema. Neste trabalho usamos essa abordagem para avaliar o efeito de espécies cultivadas na produção de biomassa total em Sistemas Agroflorestais (SAFs) jovens. Um experimento foi implantado em 2016 em Florianópolis na Fazenda experimental da Ressacada utilizando três tratamentos que constituíram diferentes composições funcionais de plantas cultivadas: (1) Alto, apenas espécies com alto N-foliar; (2) Baixo, apenas espécies com baixo N-foliar e; (3) Médio, consórcio de espécies com alto e baixo N-foliar. A produção de biomassa total foi coletada em quadros de 0,5x0,5m. A diversidade funcional e identidade funcional foram determinadas usando, respectivamente, a entropia quadrática de Rao e *Community-Weighted Mean* (CWM). Para tanto, foram utilizadas as seguintes características relacionadas com ciclos biogeoquímicos e capacidade competitiva das plantas cultivadas: altura máxima (H), área foliar (LA), área foliar específica (SLA), conteúdo da matéria seca das folhas (LDMC), densidade específica do caule (SD), pH das folhas (pH). Foram avaliadas a biomassa total de 15 espécies cultivadas. Utilizamos modelos lineares de efeitos mistos, considerando blocos como efeito aleatório, para avaliar a biomassa total em cada uma das 18 parcelas experimentais, entre o período de maio de 2017 a janeiro de 2019. Os tratamentos tiveram efeito sobre a produtividade. Quando comparados com o tratamento médio o tratamento baixo produziu menos biomassa ($p = 0.01$), enquanto o tratamento alto ($p = 0.08$) não diferiu. A identidade funcional é um preditor importante e contribui para a produtividade de agroecossistemas. A identidade funcional de SLA está relacionada com produção de biomassa acima do solo. Comunidades dominadas por plantas com alto SLA ($p = 0.01$) e cota topográfica elevada ($p = 0.02$) produziram mais biomassa total. Isso demonstra que as folhas maiores e menos espessas e solo melhor drenado foram responsáveis pela maior produtividade. Adicionalmente aos resultados encontrados, a avaliação a longo prazo tanto da identidade como da diversidade funcional em múltiplas contribuições materiais em agroecossistemas é importante para desenhar ótimas composições de SAFs multifuncionais.

Palavras-chaves: Agroecologia; Agrofloresta; Serviços ecossistêmicos.

Apoio: CNPq, CAPES.

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INDUTORES DE RESISTÊNCIA NO MANEJO DA MANCHA DE BIPOLARIS (*Bipolaris maydis*) NO MILHO.

João A.V. Fonseca*, David F. Posso, Robson M. Di Piero

O milho (*Zea mays*) é o terceiro grão mais produzido no mundo, apresentando uma produção de 1.1 mil toneladas na safra de 2019, desse montante 9% se atribui à produção no Brasil. Dentre os diversos fatores que podem acarretar na diminuição da produtividade do milho encontra-se a mancha causada por *Bipolaris maydis*, um dos fungos relacionados ao complexo de manchas foliares tratadas como helmintosporiose, comum nas principais regiões produtoras do país, podendo promover perdas de até 70% em condições de alta severidade. As principais medidas de controle para essa doença envolvem o uso de cultivares resistentes e a aplicação de fungicidas. Buscando medidas alternativas de controle com baixo impacto ambiental, o presente trabalho teve por objetivo estudar o uso de frações de polissacarídeos extraídos de shiitake ou babosa como potenciais indutores de resistência no patossistema da mancha de bipolaris (*B. maydis*) em milho. Para isso foram realizados ensaios com plantas de milho cultivar P1630H, mantidas sob condições de casa de vegetação em vasos de 2 litros contendo terra e turfa (3:1). As plantas, no estádio V4, foram pulverizadas com as suspensões de duas frações de polissacarídeo de shiitake (1,0 e 3,0 mg mL^{-1}) e uma de babosa (3,0 mg mL^{-1}) e a testemunha somente com água destilada. Após 5 dias as plantas foram inoculadas com *B. maydis* (suspensão a 10^3 esporos mL^{-1}) e colocadas em câmara úmida por 24 horas. As plantas tiveram sua severidade avaliada no décimo dia após a inoculação (DAI) com o auxílio da escala diagramática estabelecida por Fernandes et al. 2011. A fração polissacarídica proveniente da babosa (PB) não afetou significativamente a doença, ao passo que as frações polissacarídicas de skiitake (PS1 e PS2) nas diferentes doses promoveram redução da severidade em torno de 50% sem diferenças significativas entre as mesmas. Dessa forma pode-se concluir que as frações polissacarídicas de shiitake apresentam potencial controle para o patossistema da mancha de bipolares, fazendo se necessários mais estudos para compreensão de seu modo de ação assim como se há ativação das defesas da planta.

Palavras-chaves: helmintosporiose, controle alternativo, elicitores, polissacarídeos.

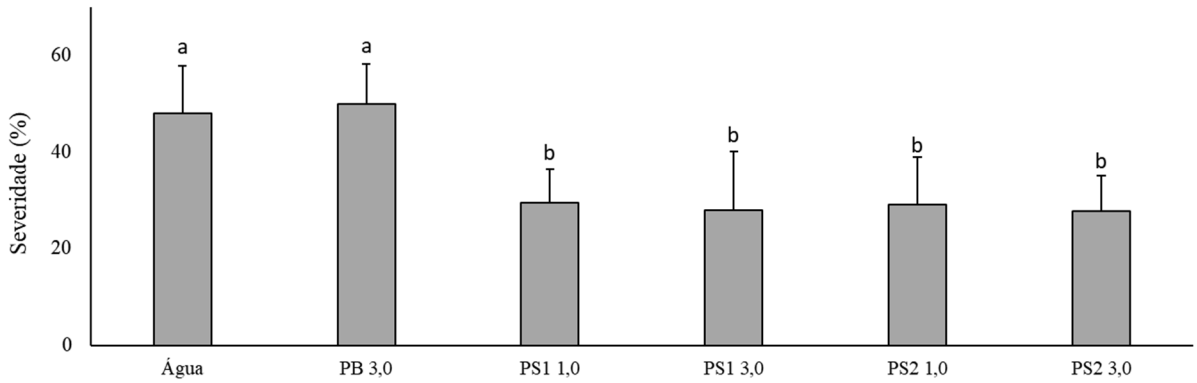

Figura 1. Severidade da mancha *B. maydis* em plantas de milho pulverizadas com água destilada (controle) ou com as frações polissacarídicas de babosa (PB) ou com as de shiitake (PS1 e PS2), a 1 e 3 mg mL^{-1}. Médias seguidas pela mesma letra não diferem entre si (Tukey P<0,05).

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INTERACTION OF PLANT GROWTH PROMOTING BACTERIA *Azospirillum brasilense* AND *Herbaspirillum seropedicae* CO-INOCULATED IN MAIZE PLANTS (*Zea mays* L.)

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Maize is a worldwide traditional crop of great importance for food security. The nutrition offered by the soil is directly related to maize productive potential, being common the indiscriminate and exacerbated use of chemical fertilizers in agriculture, which causes negative effects on the environment and the biodiversity present in the soil, disturbing the whole ecosystem. An alternative to minimize the use of synthetic fertilizers without affecting productivity is the use of Plant Growth Promoting Bacteria (PGPB), among them *Azospirillum brasilense* and *Herbaspirillum seropedicae*. PGPB provide benefits to plants stimulating phytohormones release, phosphate solubilization, siderophores production, as well as helping to control biotic and abiotic stresses. The combination of different beneficial microorganisms can produce a synergistic effect, surpassing the productive results when associated to the plants alone. The objective of this study was to analyze the effect on plant growth under low nutrition soil conditions of the interaction of PGPB *A. brasilense* FP2 and *H. seropedicae* SmR1 co-inoculated on maize. The bifactorial experiment was conducted in a greenhouse under a completely randomized design with four biological replications, with four inoculation treatments and three harvest times. The soil was collected in secondary forest, characterized as Red-Yellow Argisol without soil nutritional correction or sterilization. The treatments were divided into Treatment 1 - Control, without bacterial inoculation; Treatment 2 - Root inoculation with the *A. brasilense* FP2; Treatment 3 - Inoculation of shoot with *H. seropedicae* SmR1 in physiological stage of V2 corn plant (vegetative, second leaf); Treatment 4 - Co-inoculation of *A. brasilense* FP2 in roots and *H. seropedicae* SmR1 in the shoot. The treatments were collected at 7, 14, 21 and 28 days after inoculation (D.A.I). The evaluated variables were stem diameter, shoot and root length and bacteria enumeration by plate counting. The results presented are preliminary, however, the co-inoculation presented higher root length and stem diameter at 28 D.A.I. Treatment 2 presented high values of leaf length compared to control. The bacteria enumeration was higher in root for all inoculated plants compared to control at 21 D.A.I. Low bacteria count was observed in all leaf samples. The co-inoculation of *A. brasilense* FP2 and *H. seropedicae* SmR1 is a promising technology, further research is needed to clarify the synergic effect of co-inoculation with *A. brasilense* FP2 and *H. seropedicae* SmR1.

Keywords: Synergistic effect; Leaf inoculation; Diazotrophic bacteria.

Support: PPGRGV and CNPq.

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PHENOLIC COMPOUNDS AND ANTIOXIDANT ACTIVITY OF GLUTEN-FREE COOKIES ENRICHED WITH FEIJOA FLOUR

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The Feijoa (*Acca sellowiana*) fruit is native from the southern region of Brazil, named for its similarity to the common guava (*Psidium guajava*). Its peel is commonly despised of consumption because it has acid, astringent and bitter flavor, becoming a residue. On the other hand, it has high levels of vitamin C, vitamin E, catechins and polyphenols, having therapeutic activity because of its high antioxidant capacity and bioactive compounds. Considering the importance of bakery products in the food industry, the aim of study was to formulate gluten-free cookies enriched with feijoa flour in differents concentrations (0%, 10% e 15%), being characterized in relation to the content of total phenolic compounds and antioxidant activity (DPPH and FRAP). The content of total phenolic compounds showed significant difference ($p<0.05$) among the different formulations, showing an increase with the addition of feijoa peel flour, as well as its antioxidant activity determined by the FRAP assay. As for the DPPH assay, the cookies made with feijoa peel flour did not differ from each other ($p> 0.05$), differing only when compared with the control sample (without addiction). Was shown a positive relation between the phenolic compounds and the antioxidant activity of the cookies, since as the total phenolic compounds content increased as well as it's antioxidant capacity. In addition to the antioxidant activity derived from the bioactive compounds present in the feijoa flour, the synergy between the ingredients used in the formulation may have contributed to the increase in the antioxidant capacity of the cookie, mainly by the use of brown rice flour, which according to the literature has bioactive substances, such as phenolic compounds, attributing this property to the final product. Thus, the elaboration of gluten-free cookies with the addition of feijoa flour was viable and satisfactory, proving to be an alternative for the use of bioactive and sustainable agro-industrial residues in gluten-free bakery products.

Keywords: *Acca sellowiana*, celiac disease, waste, antioxidants.

Support: CAPES, CNPq, UFSC.

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Rhizophagus intraradices MYCORRHIZAL INOCULANT ON GROWTH AND NUTRITION OF AGRICULTURAL IMPORTANT CROPS

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The use of inoculants is a common practice in Brazilian agriculture. However, the emergence of commercial arbuscular mycorrhizal inoculants in the market requires studies to assure their proper efficiency. Thus, the objective of this work was to evaluate the growth and nutritional status of nine plants of agricultural/forestry importance: soybeand (*Glycine max*), beans (*Phaseolus vulgaris*), cotton (*Gossypium hirsutum*), maize (*Zea mays*), wheat (*Triticum aestivum*), sunflower (*Helianthus annuus*), sugarcane (*Saccharum officinarum*), pinus (*Pinus taeda*) and eucalyptus (*Eucalyptus dunnii*) using a commercial mycorrhizal inoculant based on the fungal mycorrhizal species *Rhizophagus intraradices* on non-sterilized soil. For this, evaluations were carried out in three harvests along plant growth. The experiments were conducted in a greenhouse in a completely randomized 2 x 2 factorial design (with and without inoculant application) and two P concentrations (50 and 100 % of the recommendation) with four replicates. The evaluations were: mycorrhizal colonization, shoot dry matter (MSPA), root dry matter (MSR) and total dry matter (MST) yield, content and accumulation of P. The experiments demonstrated that the inoculant increased the percentage of mycorrhizal colonization of the plants, mainly for cotton, corn and soybean. The inoculation provided increases of 130 % for MST in cotton, 59 % in sugarcane, and 18 and 43 % in MSR of sunflower and corn, respectively. Meanwhile, the soy, bean, wheat, eucalyptus and pinus plants were not so responsive to inoculation. The accumulation of P in inoculated plants was significantly higher in cotton, sugarcane, sunflower, corn and wheat, with increases varying from 45 to 170 %. Comparing the effects of inoculation with the treatments of phosphate fertilization used in agricultural crops, cotton, sugar cane, corn and sunflower are the most responsive crops and have the potential to be tested for agronomic efficiency in the field.

Keywords: arbuscular mycorrhizae, agricultural inoculants, Rootella BR, agricultural yield

Support: CNPq, CAPES.

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VINE PERFORMANCE OF CALARDIS BLANC VARIETY GROWN IN TWO ALTITUDES OF SANTA CATARINA STATE, BRAZIL

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The European Union recently established premium goals to reduce pesticides, particularly copper, in viticulture. One of the strategies is to shift from a treatment-oriented approach to a disease prevention approach by the development of fungus-resistant varieties (PIWI, from German: *Pilzwiderstandsfähige*). Fungus-resistant grapes result from interspecific crossbreeding between the Mediterranean species and North American and Asian Vitis spp. that carries high resistance to fungal diseases, including powdery and downy mildew. Resistance to major diseases such as powdery mildew significantly reduces the need for pesticides and thus represents a major advantage in organic farming, especially in humid areas. The aim of this work is to evaluate how the different altitudes and climatic characteristics of Água Doce (AD) (1329m) and Videira (VID) (744m), cities of Santa Catarina State, Brazil, can influence the physiology and phenology of Calardis Blanc variety, a white PIWI, for fine wine production. In 2018/2019 vintage were performed analyzes such as climatic, phenological, fertility index (FI), gas exchange (liquid photosynthesis (A), transpiration (E), stomatal conductance (g_s), intracellular carbon concentration (Ci)), technological maturity (pH, acidity (Ac) and total soluble solids (TSS)) in both cities during the same phenological stage, which are *véraison* (grape skin color change) and vintage. There was a statistically significant difference during *véraison* for A, Ci, E and during vintage for g_s, Ci, E, FI, pH, Ac and TSS. The following results were observed during *véraison*: (A) in AD (12,17 µmol $CO_2.m^{-2}.s^{-1}$) and VID (16.68 µmol $CO_2.m^{-2}.s^{-1}$); (Ci) in AD (333 µmol$CO_2.m^{-2}$) and VID (317 µmol$CO_2.m^{-2}$) and (E) in AD (5,08 mol$H_2O.m^{-2}.s^{-1}$) and VID (6,59 mol$H_2O.m^{-2}.s^{-1}$). The following results were observed during vintage: (g_s) in AD (0,35 mol$H_2O.m^{-2}.s^{-1}$) and VID (0,48 mol$H_2O.m^{-2}.s^{-1}$); (Ci) in AD (332 µmol$CO_2.m^{-2}$) and VID (310 µmol$CO_2.m^{-2}$); (E) in AD (6,23 mol$H_2O.m^{-2}.s^{-1}$) and VID (7,81 mol$H_2O.m^{-2}.s^{-1}$); (FI) in AD (1,7) and VID (1,8); (pH) in AD (3,44) and VID (3,25); (TSS) in AD (19,10°Brix) and VID (14,23°Brix); (Ac) in AD (76,66 mEq.L^{-1}) and VID (107,9 mEq.L^{-1}). Vintage in AD occur in early March 2019 and in VID the vintage had to be made anticipated to late January due to high rainfall (150mm above historical climatological average). The cycle duration was 126 days in VID and 154 days in AD. The results indicate that both municipalities present conditions for favorable variety development and production of quality grapes, however, although the gas exchange and fertility was higher in Videira, the grapes only managed to reach technological maturity in Água Doce. This fact can be explained due to atypical rainfall during January/2019 in Videira (over 300mm), leading to the attack of *Botrytis cinerea* and the consequent anticipated vintage.

Keywords: PIWI; Gas Exchange; Altitude.

Support: CCA/UFSC, PPGRGV, Neuvin, CNPq, Epagri, Fondazione Edmund Mach, Julius Kühn Institut.

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AT SUBOPTIMAL LOW TEMPERATURE, DIETARY SUPPLEMENTATION OF *Aurantiochytrium* sp. MEAL IN NILE TILAPIA DIETS PROMOTED HIGHEST GROWTH THAN COD LIVER OIL

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Many of the nutritional requirements of Nile tilapia are known; however, further understanding is necessary about the dietary requirement of fatty acid at suboptimal low temperatures. The beneficial effects of dietary polyunsaturated fatty acids (PUFA) to membrane function in ectothermic animals such as fish is well documented. The aim of this project was to improves productive performance of Nile tilapia at low temperature. We evaluated the dietary supplementation of two different sources of docosahexaenoic-acid (DHA, 22:6 n-3) to Nile tilapia juveniles (8.47 ± 0.19 g) kept at a water temperature of 22° C. Such temperature simulates winter conditions in Southern Brazil, where the highest production of tilapia occurs in that country. Supplementation of *Aurantiochytrium* sp. meal (AM) or cod liver oil (CLO) were evaluated on growth, cholesterol, glycogen and lipid contents in the hepatopancreas, as well as the fatty acid profiles of whole body, muscle, and hepatopancreas. AM is composed of a heterotrophic microorganism rich in DHA (16 g 100 g^{-1} dry weight) and it is produced by Alltech Inc. (Nicholasville, KY, USA). Three practical diets were tested, which contained: 1) 1.0 g AM 100 g^{-1} dry diet, 2) 2.0 g CLO 100 g^{-1}, and 3) a control diet without n-3 fatty acids, with swine lard as the sole lipid source. Both DHA-rich diets contained similar DHA contents (~0.20 g 100 g^{-1}). Fish were fed the experimental diets twice a day to apparent satiation during 87 days. The study followed a completely randomized design, with five replicates per dietary treatment and the level of significance adopted was 5%. Fish fed the diet supplemented with AM presented 5.3% and 16.2% highest weight gain than those fed the CLO and the control diets, respectively. However, fish fed the CLO diet showed the highest DHA in the whole body, muscle, and hepatopancreas but presented the lowest lipid and cholesterol contents in the hepatopancreas. A digestibility trial was also performed at 22 °C to evaluate the utilization of AM nutrients by Nile tilapia weighing 16.01 ± 0.68 g. DHA presented high digestibility (96.05%) for Nile tilapia, even at a suboptimal temperature, but the digestibility of protein, lipid, and saturated fatty acids, decreased. The supplementation of 1.0 g AM 100 g^{-1} dry diet improves productive performance and the supplementation of CLO improves the concentration of n-3 PUFA in the body, muscle, and hepatopancreas. Thus, either CLO or AM are potential additives in winter diets for Nile tilapia. Additionally, lipid sources with different dietary fatty acid profiles, such as the ones tested here, interfere on lipid metabolism and their inclusion should be made with caution, especially at cold temperatures.

Keywords: Aquaculture, polyunsaturated fatty acids, DHA, winter diet

Suport: CAPES, Alltech Brasil.

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AVALIAÇÃO DE MINERAIS E ÁCIDOS ORGÂNICOS EM CERVEJAS POR ELETROFORESE CAPILAR DE ZONA

Fábio Z. Ugalde*, Ana Carolina de O. Costa

A cerveja é constituída essencialmente por água, cereais, lúpulo e fermento. A composição de cada ingrediente e as interações ocorridas durante o processo de produção possui um grande impacto no produto final, refletindo na diversidade de estilos de cervejas disponíveis atualmente. São vários os fatores que influenciam na qualidade e composição da cerveja, e conhecer esses fatores permite interferir ou corrigir eventuais dificuldades relacionadas ao processo de produção ou às matérias primas utilizadas. Visto que os minerais e os ácidos orgânicos alifáticos participam de reações com enzimas, leveduras, assim como auxiliam na redução do pH e contribuem para os sabores, aromas e outras características do produto final, se torna importante conhecer sua composição. Nesse contexto, surge a necessidade de conhecer a respeito dessa matriz por meio de métodos analíticos capazes de avaliar simultaneamente mais de uma classe de compostos e a técnica de eletroforese capilar se propõe a esta finalidade, aliando outras vantagens, quando comparadas a outras técnicas de separação, tais como alta resolução, baixo custo operacional e mínima geração de resíduos. O presente estudo teve como objetivo desenvolver um método rápido, com um simples preparo de amostra, para determinação simultânea de minerais (cloreto, nitrato, sulfato, fosfato, cálcio, sódio, potássio e magnésio) e ácidos orgânicos (oxálico, pirúvico, lático, succínico e acético) utilizando eletroforese capilar. Com auxílio do *software PeakMaster*®, que permite realizar simulações de separações com os eletroferogramas resultantes, demonstrando características dos componentes do eletrólito de corrida, como constante de dissociação (pKa) e mobilidade da espécie ionizada, além de parâmetros do sistema, tais como pH, força iônica, condutividade e capacidade tamponante, foi possível prever que a partir de um eletrólito composto por 40 mmol L^{-1} de imidazol, com adição de ácido fórmico até pH 4,5 e 7% de metanol, permitiu-se alcançar a separação. O ácido 3,5 dinitrobenzóico foi utilizado com padrão interno. O capilar utilizado foi de 60 cm de comprimento total e 75 µm de diâmetro interno com injeção pelas duas extremidades do capilar. A tensão aplicada foi de 15 kV com polaridade positiva para a injeção e o comprimento de onda ajustado para 215 nm com referência a 450 nm, no modo de detecção indireta. O preparo das amostras consistiu em descarbonatação em banho ultrassom por 15 minutos, centrifugação por 3 minutos e diluição com padrão interno. Foram avaliadas três amostras de cerveja adquiridas no comércio local , sendo que o método proposto foi capaz de identificar todos os analitos em menos de 9 minutos, obtendo uma separação com ótima resolução, além de utilizar um preparo de amostra rápido, de fácil execução, baixo custo e baixa geração de resíduos, contribuindo para a química verde. O método proposto foi eficiente na identificação de minerais e ácidos orgânicos em diferentes amostras e atingiu o objetivo do estudo, além da realização de um rápido preparo de amostra, auxiliando no desenvolvimento de métodos rápidos. O *software PeakMaster*® demonstrou ser uma ótima ferramenta no desenvolvimento do método, reduzindo o número de experimentos e quantidade de reagentes.

Palavras-chaves: Identificação, bebidas, método, eletrólito, otimização.

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COPPER AND ZINC TRANSFER POTENTIAL TO WATER ACCORDING TO VARIATIONS IN CLAY AND SOIL ORGANIC MATTER CONTENTS: PARAMETER INDICATIVE OF ENVIRONMENTAL POLLUTION

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Natural processes, such as soil water erosion or anthropic action, through soil management practices, can modify the relationship between clay content and soil organic matter. Thus, it is expected changes in the maximum adsorption capacity (MAC) of elements such as heavy metals, including copper (Cu) and zinc (Zn), which can be deposited in soils through the addition of inputs; and, consequently, their concentrations in water, which determines the contamination of water resources. The study aimed to evaluate the participation of clay and soil organic matter in Cu and Zn MAC and their concentrations in water. Samples of the Bw horizon of Oxisol 70% clay + 1.8% SOM (700 g kg^{-1} clay and 18 g kg^{-1} SOM) and A horizon of a Incepsol 17% clay + 9.5% SOM (170 g kg^{-1} clay and 95 g kg^{-1} SOM) were collected, dried, prepared and mixed to obtain mixtures of 17% clay + 9.5% SOM; 30% clay + 7.6% SOM; 50% clay + 4.7% SOM and 70% clay + 1.8% SOM. These mixtures were were kept at 70% of the maximum water holding capacity (MWHC) to stabilize the physicochemical properties and subsequently incubated again for another 30 days with limestone to raise the pH in water to 6.0. In the soil mixtures Cu and Zn adsorption curves were performed and MAC-Cu/Zn determined by the Langmuir model. Based on MAC-Cu/Zn values, soil mixtures were added with seven doses of Cu and Zn and incubated again for 20 days. After incubation, the Cu and Zn contents available by Mehlich-1 and in water were defined. Cu transport limits ranged from 118 to 187 mg kg^{-1} (by Mehlich-1). On the other hand, Zn transport limits ranged from 61 to 116 mg kg^{-1} (by Mehlich-1). Soil mixtures with higher soil organic matter content showed higher maximum Cu and Zn adsorption capacity, decreasing the concentration of both metals in water, which reduces the potential for environmental contamination. Mixtures of higher clay soils made less Zn available to the water, which may decrease environmental contamination or even toxicity to plants.

Keywords: Heavy metals; Environmental contamination; Mehlich-1; Desorption.

Support: CAPES; CNPq; UFSC; NEPEA-SC.

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DETERMINAÇÃO COLORIMETRICA DE ÓLEOS DE CAFÉ PELO SISTEMA CIE (*Commission Internationale de Eclairage*)

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As mudanças que ocorrem nos grãos de café durante a torrefação são de natureza física e química, como por exemplo, as reações de Maillard, caramelização e degradação de Strecker que influenciam diretamente na cor, sabor e aroma da bebida. A alteração da cor dos grãos de café durante o processo de torra advém da produção de melanoidinas. A cor da superfície de materiais pode ser mensurada, dentre outros métodos, utilizando o sistema CIE (*Commision Internationale de Eclairage*) L*a*b*, padrão internacional para determinações de cor. Esse sistema emprega as coordenadas espaciais no plano cartesiano como: a coordenada L* ou luminosidade; a coordenada a* eixo verde-vermelho; e a coordenada b* eixo azul-amarelo. Outra forma de mensurar a cor pode ser por meio de coordenadas cilíndricas que compõem o sistema CIE L*c*h°. Dessa maneira, a coordenada L* corresponde à luminosidade, a coordenada c* ao croma que fornece a intensidade ou saturação da cor e a coordenada h° que corresponde à tonalidade do material analisado. Objetivou-se, com este trabalho, determinar a cor em óleos de café para posterior aplicação em matriz alimentar. Duas amostras comerciais de óleos de café sendo uma de grãos crus e a outra de grãos torrados foram cedidas pela Cooperativa Regional de Cafeicultores em Guaxupé – COOXUPÉ, localizada no estado de Minas Gerais. O processo de obtenção deu-se a partir de grãos crus e torrados do *Coffea arabica* L., por prensagem a frio, e posterior filtração via cartão filtrante. O delineamento experimental foi composto por cinco tratamento que variam de 25% a 100% dos referidos óleos. A análise de cor foi realizada através do Espectrofotômetro (Kônica Minolta, Japão) modelo CM-5 no sistema CIELab operando com fonte iluminate D65 e ângulo de observação de 10 ºC. O parâmetros obtidos foram luminosidade (*L**), índice de vermelho (*a**), índice de amarelo (*b**) e, a partir deles, os índices de saturação (*C**) e ângulo de tonalidade (*h**; em graus) foram calculados utilizando as fórmulas): *C** = [(a*2 + b*2) 1/2] e *h** = tan-1 (b*/a*). Ressalta-se que as leituras foram realizadas quatro vezes e calculou-se os desvios padrão. Observou-se que para os tratamentos com maior proporção do óleo de café verde (T2 = 100%V e T5 = 75%V e 25%T), maiores foram os valores médios para os parâmetros: luminosidade (*L**) = 16,8 e 10,0; índice de vermelho (*a**) = 2,9 e 2,2; índice de amarelo (*b**) = 13,2 e 5,6; índice de saturação (*C**) = 13,4 e 6,1 e ângulo de tonalidade (*h**) = 77,1 e 72,0, respectivamente. Conclui-se que houve linearidade de todos os valores dos parâmetros analisados, aumentando dos tratamentos com maior porcentagem do óleo de café torrado para os com maior porcentagem de óleo de café verde.

Palavras-chaves: Cor; Grãos crus; Grãos torrados; Fluido.

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DETERMINAÇÃO DA ATIVIDADE DE ÁGUA EM ÓLEOS DE CAFÉ

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A água presente nos alimentos pode apresentar-se na forma de molécula livre ou ligada ao substrato. A atividade de água (a_w) é um dos fatores intrínsecos dos alimentos e é uma medida qualitativa que possibilita avaliar a disponibilidade de água livre. Nesse sentido, a água livre não se encontra comprometida com as moléculas constituintes do produto estando disponível para fenômenos físicos, químicos e biológicos sendo o principal responsável pela deterioração dos alimentos. Determinar a a_w é importante para prever o desenvolvimento dos micro-organismos, avaliar as reações químicas, vida de prateleira, estabilidade física, analisar a transferência de umidade, predizer a curva e isoterma e projetar embalagens. Assim, a a_w pode ser utilizada como parâmetro de controle de qualidade, demonstrando a disponibilidade real da água no alimento para participação de reações de deterioração oxidativa, enzimática e microbiológica, sendo que estes fatores podem afetar diretamente a qualidade sensorial e microbiológica do alimento em questão. Vale ressaltar que o comportamento microbiano frente à a_w é variável, sendo as bactérias mais exigentes em relação aos fungos e leveduras. Neste contexto, objetivou-se com este estudo determinar a atividade de água em óleos de café arábica para avaliar a qualidade dos mesmos. Duas amostras comerciais de óleos de café sendo uma de grãos crus e a outra de grãos torrados foram cedidas pela Cooperativa Regional de Cafeicultores em Guaxupé – COOXUPÉ, localizada no estado de Minas Gerais. O processo de obtenção deu-se a partir de grãos crus e torrados do *Coffea arabica* L., por prensagem a frio, e posterior filtração via cartão filtrante. O delineamento experimental foi composto por cinco tratamento que variam de 25% a 100% dos referidos óleos. Foi utilizado um higrômetro digital Aqualab modelo 3TE (Decagon, Pullman, USA) a 25 °C para a avaliação do referido parâmetro e a análise foi conduzida em três repetições. Alimentos com atividade de água menor que 0,60 são microbiologicamente estáveis e a reação de hidrólise é favorecida em a_w acima de 0,7. O menor valor de atividade de água encontrado nos óleos de café estudados foi 0,49 com desvio padrão de 0,004 e o maior 0,57 com desvio padrão de 0,01. Para alimentos com atividade de água próxima de 0,60, existe um pequeno ou nenhum crescimento microbiano. Os óleos de café avaliados possuem segurança para serem incorporados em formulações de alimentos.

Palavras-chaves: Alimentos; Estabilidade; Segurança

Apoio: FAPEMIG; CNPq; CAPES.

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DETERMINAÇÃO DE ÁCIDOS ORGÂNICOS ALIFÁTICOS EM MEL DE MANUKA COMO INDICADORES DE QUALIDADE PÓS-COLHEITA

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O mel é composto majoritariamente de frutose e glicose (até 80%), seguido da água (até 20%) e outros componentes, incluindo os ácidos orgânicos. Os padrões de identidade e qualidade regulamentados não definem teores máximos ou mínimos de ácidos orgânicos alifáticos (AOA) individuais em méis. Porém, sabe-se que muitos desses compostos podem ser formados devido a processos de fermentação, reidratação do 5-hidroximetilfurfural, conversão de açúcares, dentre outros. Nesse contexto, pode-se destacar o ácido glucônico, principal AOA encontrado em méis. Esse ácido é formado pela conversão da glicose por meio da ação da enzima glicose oxidase (presente na glândula hipofaringeana das abelhas) e/ou pela ação da bactéria *Gluconobacter* spp. (presente no intestino da abelha). Ainda, o ácido acético também pode ser destacado, uma vez que este é considerado um dos principais AOA relacionados ao processo de fermentação em méis. Sendo um dos méis mais apreciados do mundo e de valor comercial destacado, o mel de manuka (*Leptospermum scoparium*) é um mel floral de cor escura, produzido na Nova Zelândia, mas mundialmente conhecido devido as suas excelentes propriedades antioxidantes e antibacterianas. No entanto, apesar de se conhecer muito sobre o seu potencial biológico, até o momento, não há relatos na literatura científica quanto a sua composição de AOA. Portanto, este trabalho teve como objetivo avaliar 13 AOA em mel de manuka comercial adquirido no ano de 2018. A determinação dos AOA foi realizada em sistema de eletroforese capilar modelo 7100 (Agilent Technologies, Alemanha). Dos 13 AOA investigados, 8 foram determinados no mel de manuka, sendo estes o ácido glucônico (423,60 ± 10,80 mg 100 g^{-1}), ácido cítrico (22,27 ± 0,57 mg 100 g^{-1}), ácido lático (20,83 ± 0,85 mg 100 g^{-1}), ácido fórmico (15,45 ± 0,44 mg 100 g^{-1}), ácido acético (13,35 ± 0,33 mg 100 g^{-1}), ácido glicólico (11,98 ± 0,35 mg 100 g^{-1}), ácido málico (8,26 ± 0,22 mg 100 g^{-1}) e ácido succínico (< 3,54 mg 100 g^{-1}). Conforme esperado, o ácido glucônico foi o principal AOA quantificado no mel de manuka. O teor encontrado foi similar aos teores reportados para méis florais e de melato especialmente europeus (cerca de 10 a 600 mg 100 g^{-1}), mas foram inferiores aos encontrados em méis florais e de melato brasileiros (4478 a 8712 mg 100 g^{-1}). Ainda, apesar de ter sido quantificado no mel de manuka, o baixo teor de ácido acético sugere que este mel não apresenta indícios de fermentação, especialmente considerando que teores superiores (13,7 a 135 mg 100 g^{-1}) foram reportados para méis florais e de melato brasileiros considerados frescos. Portanto, esse estudo preliminar relatou pela primeira vez os AOA presentes no mel de manuka, indicando adequada manipulação pós-colheita deste mel.

Palavras-chave: Ácido acético; Eletroforese capilar; Mel floral.

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EFFECTS OF GENETICALLY MODIFIED SOYBEAN AND SUBLETHAL DOSES OF ROUNDUP® ON THE FLUCTUATION OF INFECTION INTENSITY BY *Nosema* spp. ON ADULT WORKER BEES (*A. mellifera* L.)

Mayara M. Cardozo*, Márcia R. Faita, Dylan T. T. Amândio, Adriana Chaves, Afonso I. Orth, Rubens O. Nodari

Pollination is one of the most important ecosystem services for humans and the decrease in the pollinator population can compromise the stability of agricultural and natural ecosystems. Two of the factors responsible of the bee decreases are pesticides and parasites, besides the interaction between these factors. The aim of this study was to evaluate the effects of artificial diets on the fluctuation of infection intensity by *Nosema* spp. on adult worker bees (*A. mellifera* L.). The bioassay was established in the Experimental Apiary of the Bee City, Federal University of Santa Catarina, from April to August, 2016 (until the death of all hives from at least one treatment) with twenty hives submitted to five artificial diets: sugar syrup (CON-control), sugar syrup plus soybean flour from organic (ORS), conventional (COS) and GM varieties (TRS), as well as sugar syrup plus Roundup® (ROU). To quantify the average infection level, sixty bee abdomens were separated and ground up in 60 mL of water (1 ml per bee). A drop of the suspension was placed on a haemacytometer and the spores were counted microscopically at 400x magnification. The infection intensity was classified according to the average number of spores (million) per bee: null (<0.01), very low (0.01-1.00), low (1.00-5.00), regular (5.00-10.00), semi-severe (10.00-20.00), severe (>20.00). In April, before treatment, all the hives presented a very low infection intensity by *Nosema* sp., increasing in May to July. In August, the TRS treatment presented a low intensity of infection, the CON and ROU treatments presented a regular infection intensity and the ORS and COS treatments presented a semi-severe infection intensity. Despite that, the COS, TRS, and ROU treatments presented a sharp drop in the infection intensity in August, when compared to July, that is explained by the worsening quality of these hives (mainly classified by the number of combs covered by adult worker bees). In this sense, it is presumed that most of the bees present in the combs were young and did not have time to become infected with *Nosema* spp, as newly emerged bees (less than eight days old) are not susceptible to *Nosema* spp. The results presented that artificial diets containing pesticide residues, cry1aC protein or Roundup® decreased the hive quality, and consequently decreased the number of adult bees older than eight days, which leaded to a decrease in the infection intensity by *Nosema* spp. However, contaminated bees presented a higher spore load than other treatments.

Keywords: Herbicides, Nosemosis, Transgenics, Intacta RR2 PRO®

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EFFECTS OF ROUNDUP® ON BEES (*Apis mellifera* L.) WITH *Nosema* spp. INFECTION

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Decreasing pollinator populations can compromise the stability of natural and agricultural ecosystems. One cause of the bee populations reduction is their exposure to pesticides, which decreases also the resistance of these insects to parasites. In this context, the aim of this study was to evaluate the survival of adult workers of *A. mellifera* infected or not with *Nosema* spp. and exposed to a diet containing Roundup® under laboratory conditions. The bioassay followed the methodology proposed by OECD-213 and EPPO for *A. mellifera* toxicity tests. It consisted of four treatments, where the bees received a diet consisting of: only of sugar syrup solution (50%); sugar syrup solution (50%) and Roundup®; sugar syrup solution (50%) and spores of *Nosema* spp.; sugar syrup solution (50%), Roundup® and *Nosema* spp. spores. After treatments, newly emerged bees (0-6 h) in the winter period were kept in B.O.D. (28 ± 2 ºC and relative humidity 60%) and monitored for 120 h. During that period, the number of dead bees was counted every 24 h. At the end of the experiment, the bees were evaluated for the presence or absence of *Nosema* spp. spores. The survival rate of these insects was calculated for each treatment. Data were subjected to analysis of variance and Tukey test at 5% significance level. The treatment in which bees received food containing Roundup® + *Nosema* spp. showed a statistically significant difference compared to the others, indicating that this interaction has a synergistic effect on bee mortality and suggests a decrease in microsporidian resistance of the bees. The results of the present work confirmed the infection caused by *Nosema* spp. on all bees that died during the bioassay and on all those that remained alive at the end of 120 h of evaluation period. This is an important result because it associates mortality with the pathogenic effect of *Nosema* spp., which is enhanced by the exposure to glyphosate-based herbicide. This study has advanced scientific knowledge on the effects of Roundup® on the health of *A. mellifera.* In particular, our results showed that the most widely used herbicide in Brazil significantly increases the mortality rate of *Nosema* spp. compared to the individual effects of each stressor.

Keywords: Nosemosis; Herbicides; Mortality; Bees.

Support: CNPq; CAPES.

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ESTUDO DE EFEITO DE MATRIZ E RECUPERAÇÃO DE ÁCIDO OKADÁICO E ANÁLOGOS EM MEXILHÃO POR LC-ESI-MS/MS

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As técnicas cromatográficas acopladas à espectrometria de massas comumente apresentam elevada sensibilidade. Porém, em se tratando de matrizes complexas, esta qualidade pode ser afetada, principalmente por uma menor eficiência durante a ionização. Esses fatores culminam em resultados de recuperação não satisfatórios, e consequentemente dificuldades na quantificação dos analitos de interesse, levando a uma perda considerável da detectabilidade. A correta quantificação de toxinas, como o ácido okadáico (AO), em mexilhões é de suma importância para a segurança alimentar dos consumidores, que pode apresentar inflamações gastrointestinais, no caso da ingestão de mexilhões contendo AO. Nesse contexto, é relevante dispensar especial atenção às etapas de purificação e extração das amostras, juntamente com o estudo do efeito de matriz e recuperação (exatidão), parâmetros importantes de desempenho do método. Existem diversas formas de avaliar tais parâmetros, porém o uso de materiais de referência certificados (MRC) é o fortemente recomendado para tais estudos, pois apresentam características semelhantes às amostras que serão analisadas. Este trabalho foi desenvolvido com o objetivo de determinar o efeito de matriz e a recuperação do ácido okadáico (AO) e seus análogos, dinofisiotoxina-1 (DTX1) e dinofisiotoxina-2 (DTX2), no método proposto por Molognoni et al. (2019). Os padrões de AO (16.000 ng mL^{-1}), DTX-1 (6.400 ng mL^{-1}) e DTX-2 (2.010 ng mL^{-1}) foram adquiridos da National Research Council Canada (Ottawa, Canada). A matriz certificada contendo ácido okadáico (2,4 mg kg^{-1}), dinofisiotoxina-1 (1,1 mg kg^{-1}) e dinofisiotoxina-2 (2,2 mg kg^{-1}) (CRM-DSP-Mus-c lote 201304) foi adquirida do mesmo fornecedor. Para avaliação do efeito de matriz, foram analisadas três curvas de calibração distintas: uma curva preparada diluindo os padrões de AO, DTX1 e DTX2 em metanol (curva em solvente), uma segunda curva preparada fortificando um extrato de matriz branca, previamente extraído para este estudo, nas mesmas concentrações da curva anterior (curva matrizada), e por fim, a mesma amostra branca, foi fortificada com os padrões, na concentração equivalente ao ponto central das curvas preparadas, e então seguiu-se o procedimento de extração de acordo com o método avaliado (recuperação). A recuperação foi avaliada usando também os dados das três curvas, como proposto por Hoff et al. (2015). Outra forma de determinar a recuperação do método é a comparação dos resultados com o MRC. A matriz de referência certificada foi extraída em triplicata e analisada de acordo com Molognoni et al. (2019) e os resultados foram expressos em mg de toxina por kg de amostra. Para o AO, DTX1 e DTX2, o efeito de matriz foi de 9,21%, 24,04% e 23,86%, e a recuperação foi de 82,72%, 62,84% e 75,36%, respectivamente. O método avaliado, quantificou na matriz de referência certificada para AO, DTX1 e DTX2, nas concentrações de 2,00 ± 0,17 mg kg^{-1}, 1,08 ± 0,06 mg kg^{-1} e 2,34 ± 0,11 mg kg^{-1}, respectivamente. Os resultados alcançados para os parâmetros de exatidão em relação à matriz certificada foram satisfatórios e possibilitaram o conhecimento a respeito do comportamento do método frente a mesma, viabilizando a tomada de decisão e possíveis correções na expressão dos resultados, com maior confiabilidade e segurança.

Palavras-chave: Ácido okadáico; Dinofisiotoxina; Material certificado; Efeito de Matriz; Recuperação.

Apoio: CAPES, LFDA/RS.

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ATIVIDADE ANTI-INFLAMATÓRIA DE MEL DE ABELHA JATAÍ (*Tetragonisca angustula*)

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As abelhas da espécie Jataí (*Tetragonisca angustula)* pertencem à subfamília *Meliponina*e, a qual tem como principal característica morfológica a ausência ou a atrofia do ferrão. Essa espécie de abelha é uma das mais comuns e abundantes dentre o grupo de abelhas sem ferrão. Sãoencontradas naturalmente na América, entre o sul do Brasil e o norte do México e caracterizam-se por ser uma abelha de pequeno porte. Além disso, a abelha Jataí é conhecida por produzir mel com característica sensorial, física e química particular, que reflete o efeito terapêutico reconhecido na medicina popular, sendo tal benefício atribuído principalmente aos compostos bioativos presentes nos méis, como ácidos fenólicos, flavonóides, ácidos orgânicos e minerais. No entanto, comprovações científicas quanto aos benificios do mel produzido por abelha Jataí para a saúde humana ainda são restritas. Assim, o presente estudo objetivou investigar a citotoxicidade e os níveis de óxido nítrico (NOx) em macrófagos RAW264.7 estimulados por lipopolissacarídeos e tratados com diferentes concentrações (1, 3, 10, 30, 100 e 300 µg mL^{-1}) de mel de abelha Jataí coletado no municipio de São Miguel do Oeste, Santa Catarina, Brasil. Os resultados encontrados revelaram que o mel de abelha Jataí avaliado não se mostrou citotóxico nas concentrações testadas (1-100 µM) e ainda reduziu significativamente os níveis de NOx nas concentrações de 10, 30 e 100 µg mL^{-1}, observando uma inibição de 32, 35 e 31% respectivamente, onde 30 µg mL^{-1} mostrou-se mais efetiva. A dexametasona a 7 µM, que foi o fármaco usado como anti-inflamatório padrão, reduziu os níveis de NOx liberado dos macrófagos RAW 264.7 em 57,8%. Os resultados confirmam que o mel de abelha Jataí possui atividade anti-inflamatória e impulsionam as investigações desse tipo de mel para novas descobertas.

Palavras-chaves: Abelhas sem ferrão, Mel, Células.

Apoio: CNPq; CAPES, AMESG.

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ATIVIDADE MICROBIOLÓGICA DO SOLO COM PRÁTICAS DE MANEJO AGROECOLÓGICO E CONVENCIONAL NA PRODUÇÃO CEBOLA

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Sistemas de cultivo com o uso de diferentes espécies de plantas de cobertura, como é o caso do sistema de plantio direto agroecológico de hortaliças (SPDH), influenciam na qualidade do solo. Um importante indicador da qualidade do solo é a atividade enzimática, pois as enzimas exercem um importante papel na funcionalidade dos processos nos solos. Por isso, a avaliação da atividade enzimática no solo permite detectar as alterações ocasionadas pelas formas de manejo ou influências antrópicas a curto prazo. Sendo assim, este estudo avaliou a atividade dos microrganismos presentes no solo em diferentes sistemas de manejo cultivado com cebola por meio da atividade enzimática total da enzima Hidrólise do Diacetato da Fluoresceína (DFA). O experimento foi implantado na Estação Experimental da Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina (EPAGRI), em Ituporanga, Santa Catarina (SC), Brasil. O delineamento experimental foi de blocos ao acaso com 8 repetições. Os tratamentos avaliados foram: testemunha (vegetação espontânea), SPC (Sistema de Preparo Convencional) sem o uso de plantas de cobertura, Centeio (CE), Nabo-forrageiro (NF), e consórcio de Nabo-forrageiro+Centeio (CE+NF), as plantas de cobertura permaneceram durante o inverno e, após, foram acamadas e realizado o plantio das mudas cebola. Foram realizadas 6 coletas de solo para avaliação, 3 durante o ciclo das plantas de cobertura e 3 durante o cultivo da cebola. A atividade microbiana do solo foi estimada pelo método da enzima DFA, na profundidade de 0-10 cm, as amostras foram acondicionadas sob refrigeração até a análise. Foi pesado 1,0 g de solo em triplicatas. As amostras de solo foram acondicionadas em tubos tipo Falcon com capacidade de 50 mL, incubadas a 37 °C em agitação durante duas horas com 12,5 mL de solução de Diacetato de Fluoresceína e 32,5 mL de solução tampão de fosfato de sódio. Após 2h de incubação foi adicionado 5 mL de acetona concentrada para realizar a paralização da atividade. Na sequência a amostra foi centrifugada a 4000 rpm durante 5 minutos. O sobrenadante foi filtrado e a absorbância do extrato foi medida a 490 nm. Com base nos resultados obtidos, foi possível constatar que a matéria seca das plantas de cobertura de inverno, influenciou positivamente na atividade microbiana avaliada pela atividade da enzima DFA, nos tratamentos NF e no seu consórcio entre NF + CE. No tratamento com revolvimento excessivo do solo por arações e gradagens o SPC e a testemunha, que por não terem o uso de plantas de cobertura, apresentaram os menores valores de atividade enzimática no solo. Assim, o aumento da compreensão dos fatores que controlam atividade dos microrganismos do solo é importante para definir estratégias de manejo para a melhoria da estruturação do solo e, consequente, aumento de produtividade e diminuição de impactos ambientais em sistemas de produção agroecológica.

Palavras-Chave: Plantas de Cobertura. Qualidade do Solo. Enzima Hidrólise do Diacetato da Fluoresceína.

Apoio: CAPES, CNPq, UFSC, Laboratório de Análise de Solos e Tecidos Vegetais (CCA/UFSC), NEPEA/SC.

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AVALIAÇÃO DE COMPOSTOS FENÓLICOS APÓS O ARMAZENAMENTO DO MEL DE *Melipona mondury* TRATADO TERMICAMENTE

Francieli Braghini*, Fabíola C. Biluca, Adriane C. dos Santos, Luciano V. Gonzaga, Luciano Vitali, Gustavo A. Micke, Ana C. O. Costa, Roseane Fett

A abelha nativa *Melipona mondury* pertence à subfamília *Meliponinae*, as quais têm o ferrão atrofiado ou ausência do mesmo, e por isso são reconhecidas como abelhas-sem-ferrão. O mel produzido por estas abelhas possui características físico-químicas, sensoriais e bioativas distintas do mel produzido pelas abelhas *Apis mellifera*. As principais diferenças concentram-se na elevada umidade e acidez e baixo teor de açúcares, 5-hidroximetilfurfural e atividade diastásica. Também apresentam sabor ácido e menos doce, e elevada capacidade antioxidante. Este mel é ainda reconhecido por suas propriedades terapêuticas (anti-inflamatória, anticâncer, antidiabética, entre outras), que derivam, especialmente, dos compostos bioativos transferidos do néctar das flores para o mel. Por outro lado, devido as suas características físico-químicas distintas, este produto é pouco estável durante o armazenamento. Deste modo, o tratamento térmico tem sido sugerido como alternativa a manutenção das suas características no pós-colheita. Neste sentido, é importante avaliar os possíveis efeitos dos processos térmicos aplicados na manutenção dos compostos fenólicos presentes, assim como sua estabilidade ao armazenamento e garantia do potencial bioativo dos méis. O objetivo deste estudo foi avaliar os compostos fenólicos, através de LC-MS/MS, em mel de *Melipona mondury* fresco (tempo 0) e após o armazenamento a temperatura elevada (40 ± 0,2 °C) por 90 dias, tanto nas amostras submetidas ao tratamento térmico (90 °C/10 min) quanto naquelas sem tratamento (controle). As médias obtidas foram submetidas à análise de variância (ANOVA) e posteriormente ao teste Tukey (p<0,05). Os resultados apontaram que de 47 compostos fenólicos testados, 12 compostos foram encontrados no mel de *M. mondury* fresco, sendo em maior concentração o ácido gálico (113 ± 2,3 µg 100 g^{-1}), aromadendrina (71,7 ± 2,0 µg 100 g^{-1}) e ácido *p*-cumárico (65,2 ± 0,3 µg 100 g^{-1}). Após o período de armazenamento, tanto as amostras submetidas ao tratamento térmico, quanto aquelas sem tratamento tiveram os teores reduzidos de sete compostos (ácidos *p*-cumárico, ferúlico e gálico e aromadendrina, naringenina, apigenina e eriotictiol), comparado à amostra de mel fresco. Além disso, cinco novos compostos fenólicos foram encontrados em ambas as amostras armazenadas (*p*-hidroximetilbenzóico, protocatecuico, ácido salicílico, hispidulina, kaempferol e vanilina), e outros dois compostos (quercetina e isoquercetina) que estavam presentes na amostra de mel fresco, foram somente encontrados na amostra que foi tratada termicamente após o armazenamento. Desta forma, verifica-se que, apesar de ao final do armazenamento, os méis tratados termicamente terem os conteúdos de alguns compostos reduzidos e o surgimento de novos compostos, os méis sem tratamento térmico também apresentaram resultados similares. Conclui-se assim que o tratamento térmico foi capaz de manter os conteúdos de compostos fenólicos e que as alterações ocorridas possivelmente se devem ao tempo e temperatura de estocagem. Porém, maiores estudos são necessários para garantir que o potencial bioativo dos méis de abelhas-sem-ferrão sejam mantidos após o armazenamento, em conjunto com o prolongamento da sua vida útil.

Palavras-chaves: Abelhas-sem-ferrão; Aquecimento; Vida de prateleira; Compostos bioativos.

Apoio: CNPq; CAPES; UFSC; AMESG.

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COMMERCIAL AND NEW SWEET POTATO (*Ipomoea batatas* (L.) Lam) CULTIVARS FROM SANTA CATARINA STATE: BIOMETRIC COMPARISON AND CULTIVAR RECOMMENDATION

Cláudio E. Cartabiano-Leite*, Daniel P. Alves, Gerson H. Wamser, Alicia de Francisco

Sustainable agriculture works to overcome traditional agricultural problems based on a healthy environment, social and economic equity, and financial profitability as the primary goals associated with cultivar production practices that take care of the environment. Sweet potato (*Ipomoea batatas* (L.) LAM) is a nutritional root-tuber widely cultivated and considered as the sixth most relevant food crop worldwide. It can be grown on many types of soil with no need for a large amount of water or fertilizers during the growing season. From this perspective, this study evaluated the biometric characteristics of six new sweet potato cultivars patented and registred in the National Register of Cultivars from the Ministry of Livestock, Agriculture and Supply (RNC/MAPA) by the Agricultural Research and Rural Extension Company of Santa Catarina, Ituporanga Experimental Station (Epagri-EEITU). These were compared to commercial varieties from Florianópolis/Santa Catarina. Seventy sweet potato roots of the six different cultivars were obtained from Epagri-EEITU and twenty commercial sweet potato roots were purchased from different regions (southern, eastern, central, and northern areas) of Florianópolis which constitute the control group sample named Floripa. Thus, ninety roots were evaluated in this work. The main biometric variables were weight, length, width, and pulp color. Quantitative results were statistically analyzed by Statistica® 7.0 and Excel® 2016. Results are shown in Table 1. The deep yellowish/orange and purple colors of SCS370 Luiza and SCS372 Marina cultivars suggest the presence of phytochemical compounds such as carotenoids, anthocyanins, and phenolic compounds. Since the biometric results (Table 1) show similar characteristics to the control group it is then proposed that these new sweet potatoes cultivars could be cultivated and commercialized as an alternative to the commercial varieties in order to valorize a national crop developed by Epagri-EEITU breeders work team.

Keywords: Sweet potato; Sustainable agriculture; Epagri; Crop.

Support: CNPq.

Table 1 – Biometric comparison between commercial and Epagri-EEITU new sweet potatoes cultivars

Sample	Weight ($\tilde{x}$±IQR)¢	Length ($\bar{x}$±SD)	Width ($\bar{x}$±SD)	Pulp color
Floripa	349.52±247.16^{A}	22.17±5.61^{a}	4.46±1.13^{bc}	White/Yellowish
SCS367 Favorita	83.30±22.01^{B**}	12.43±3.27^{d*}	2.98±0.71^{d*}	Yellow
SCS368 Ituporanga	307.90±224.39^{A}	16.30±2.39^{bc*}	5.32±1.23^{a*}	Yellow
SCS369 Águas Negras	302.81±182.88^{A}	18.70±4.89^{bc*}	4.93±1.31^{ab}	White/Cream
SCS370 Luiza	246.49±86.91^{A}	16.20±3.43^{c*}	4.98±1.07^{ab}	Purple
SCS371 Katiy	306.64±156.48^{A}	19.95±5.01^{abc}	4.09±0.68^{c}	White/Cream
SCS372 Marina	443.82±329.25^{A**}	20.50±4.63^{ab}	5.64±1.48^{a*}	Yellowish/Orange

Capital letters, lowercase letters, asterisks and double asterisks in the same column show significant differences (95% of certainty) by Kruskal Wallis, Tukey-Kramer, Dunnett, and T-tests respectively, considering Floripa as the control group. ¢ Median and Interquartile Range or Average and Standard Deviation.

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DESICCATION EFFECTS ON GERMINATION AND INITIAL SEEDLING GROWTH OF *Eugenia brasiliensis*

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Eugenia brasiliensis Lam. (Myrtaceae) is a Brazilian native species with great potential in gastronomic, medicinal, and industrial segments, especially for its fleshy edible fruits and antirheumatic, antidiarrheic and antifebrile properties. *E. brasiliensis* produces desiccation sensitive seeds, also called recalcitrant seeds. Recalcitrant seeds represent around 50% of all tree species from tropical regions, being metabolically active and possessing high moisture contents when shedding from the mother plant. This trait has conservation implications since seeds cannot be stored in usual conditions (low water content [WC] and sub-zero temperatures). For this reason, our study evaluated desiccation tolerance of *E. brasiliensis* seeds, aiming to comprehend seed physiology behavior and improve conservation and restoration strategies. Seeds were collected from a plant population in Florianópolis-SC. We evaluated the initial water content (WC) through the oven method (105 ºC for 24 h). To analyze seed desiccation tolerance, we conducted a desiccation curve and selected 7 WC points to verify germination percentage and initial seedling growth. Germination analysis was performed using four replicates of 25 seeds, stored in germination chambers at 25 ºC/12 h photoperiod, and was assessed for 85 days. In the end, root and shoot length of five seedlings of each replicate were measured (when available) using a caliper. Initial WC was 49.7%. Seeds took 35, 50, 65, 117, 145 and 195 h to reach 30, 25, 20, 15, 10 and 5% WC, respectively. Germination remained unchanged until 25% WC, with percentages ranging from 70 to 80%. When it reached 20% WC, the germination decreased to 50%, while in 15% WC the germination decreased more than 3 times. Only 3% of seeds germinated at 10% WC and at 5% seeds were unable to germinate. The seedling length was close to 10 cm. Roots and shoots had nearly the same size, and total seedling size was preserved until 25% WC. Even in seeds desiccated to 15 and 10%, seedlings produced root and shoot. In restoration and crop contexts, information about desiccation tolerance is a crucial step for success, since it ensures the maintenance of seed viability and high germination percentages when reintroduced to the environment. Consequently, WC is an important factor influencing seed viability and vigor of recalcitrant seeds. Therefore, in order to maintain initial development characteristics of *E. brasiliensis* seeds, these should not be desiccated to WCs below 20%.

Keywords: Native species; Recalcitrant; Seed dehydration; Conservation.

Support: CAPES, FAPESC.

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DIVERSIDADE FUNCIONAL DE CULTIVOS PROMOVE MULTIFUNCIONALIDADE NO PRIMEIRO ANO DA SUCESSÃO AGROFLORESTAL

Diego dos Santos*, Fernando Joner, Marinice Teleginski, Renata Rodrigues Lucas, Álvaro L. Monteiro, Ilyas Siddique.

Apesar do conhecimento acumulado sobre os benefícios em aumentar a agrobiodiversidade, ainda carecemos de diretrizes práticas para diversificar sistemas de cultivo que considerem não só produtividade mas também as funções reguladoras dos agroecossistemas. Para avaliar os efeitos da diversidade das culturas nas principais funções do agroecossistema, a equipe do Laboratório de Ecologia Aplicada (LEAp) adotou uma abordagem baseada em atributos funcionais, estabelecendo parcelas experimentais permanentes de sistemas agroflorestais sucessionais (SAFs). Trata-se de um sistema de cultivo agroecológico de alta diversidade, que mistura árvores com culturas anuais e perenes, e consegue acelerar os processos de sucessão florestal. O objetivo do trabalho é avaliar se a diversidade de atributos funcionais (diversidade funcional, DF) das culturas impulsiona múltiplas funções do agroecossistema. O experimento, estabelecido em 2016 na Fazenda da Ressacada em Florianópolis – SC, representa um gradiente de diversidade de características biogeoquímicas das espécies cultivadas, mantendo a riqueza constante em três tratamentos. Quantificamos atributos das espécies cultivadas e espontâneas (altura máxima da planta, área foliar, área foliar específica) e realizamos duas coletas de dados respeitando os ciclos das culturas anuais. Utilizamos a Modelagem de Equações Estruturais para testar um modelo causal hipotético para explicar como a diversidade funcional das culturas afeta: (1) diversidade funcional da comunidade de plantas espontâneas, (2) supressão de plantas espontâneas, (3) proteção do solo, (4) índice de área foliar, ou seja, área foliar total acima de um m² de chão e (5) produção das culturas durante o primeiro ano de implantação dos SAFs. Utilizamos o pacote PiecewiseSEM no software estatístico R que permite a inclusão de relações causais não consideradas no modelo hipotético inicial e posterior exclusão de relações não significativas. Como resultado o modelo global utilizado teve uma estatística de ajuste C de Fisher = 14,98 com valor p = 0,663 (p deve ser maior que 0,05 para o modelo não ser rejeitado). Nossos resultados apoiam a hipótese de que a alta diversidade funcional conduz vários processos do agroecossistema e contribui significativamente para a prestação de serviços ecossistêmicos. Encontramos que, com maior DF nos SAFs, mais nichos foram ocupados por plantas cultivadas, aumentando assim a interceptação fotossintética total da luz no agroecossistema (coeficiente de regressão = 4,89; p<0,001). Essa maior interceptação de luz aumentou a produção da biomassa aérea e grãos das culturas (coef. regressão = 1,06; p<0,001). Ainda, SAFs com alta DF tiveram maiores áreas de solo protegidas por plantas cultivadas (coef. regressão = 0,93; p=0,002) e redução da cobertura por plantas espontâneas (coef. regressão = -0,57; p=0,03). Essa maior DF também reduziu a DF da comunidade de espontâneas (coef. regressão = -0,50; p=0,003). Concluímos que quanto mais heterogênea a estrutura e projeção de área foliar dos cultivos, mais resistente à invasão por plantas espontâneas e maior produtividade já no primeiro ano de sucessão agroflorestal.

Palavras-chaves: Agroecologia; Atributo funcional; Serviços ecossistêmicos.

Apoio: CNPq, CAPES, Bill Shipley.

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EXOGENOUS POLYAMINES AND WATER DEFICIT DURING GERMINATION OF *Campomanesia xanthocarpa* (Mart.) O. BERG SEEDS

Daniela Goeten*, Rosa A. Elias, Pedro H. M. Vieria, Rinaldo Oriano, Maycon Moraes and Neusa Steiner

In front of the climate change scenario, understand how seeds respond when exposed to a drought condition and the search by methods that induces tolerance to water deficit can be a decisive factor in seedlings establishment and survival. Polyamines (PAs) can improve water deficit tolerance in plants; however, there is little information about the mechanism of action of PAs. *Campomanesia xanthocarpa* (Mart.) O. Berg. *C. xanthocarpa* is a tree commonly found in the Brazilian Atlantic Forest with desiccation sensitivity seeds and nutraceutical properties as well as potential for food production. This work aims to evaluate the effects of exogenous polyamines on the induction of tolerance to water deficit during the germination of *C. xanthocarpa* seeds. Seven osmotic potentials of of polyethylene glycol (PEG) 6000 solutions (control = 0, -0.2, -0.4, -0.6, -0.8, -1.0, -1.2 MPa) and five concentrations of putrescine (Put), spermine (Spm) and spermidine (Spd) (control= 0, 50, 100, 200, 400 µM) were evaluated. Germination was negatively affected under water deficit of -0.6 MPa (60% of germinated seeds), and totally inhibited when submitted to -0.8 MPa. Seeds treated with Spm and submitted to seven different osmotic potentials presented higher tolerance to water deficit (40% of seeds germinated at -1.0 MPa PEG). Thus, it was observed that seeds with exogenous Spm 200 µM germinated at -1.2 MPa (30% of germinated seeds), followed by treatment with Spd 200 µM (10% of germinated seeds at -1.2MPa). Our results suggest that Spm and Spd are key factors for regulating *C. xanthocarpa* seed germination under water deficit. In addition, this work may provide useful insights for further studies for adaptation of seedling to a drought-prone environment.

Keywords: Ácido abscísico; *Ex situ* conservation; Myrtaceae.

Support: CNPq; CAPES.

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GERMINATION BEHAVIOR AND INITIAL SEEDLING GROWTH DURING *Eugenia pyriformis* SEED DESICCATION

Guilherme A. G. Rodrigues, Amanda P. dos Santos*, Oscar L. Loaiza, Bruno Ganzo, Neusa Steiner.

Eugenia pyriformis Cambess. is a Brazilian native species widely used in agroforestry systems and appreciated by its fleshy edible fruits, holding great potential in gastronomic and medicinal industries. However, as most of Myrtaceae species *E. pyriformis* produces desiccation sensitive seeds, so-called recalcitrant seeds. Recalcitrant seeds do not undergo maturation drying, being dispersed with high water contents and remaining metabolically active throughout development and sensitive to low temperatures, which is also a drawback for *ex-situ* conservation strategies usually applied. There is considerable tolerance variation between species and population of species, particularly with respect to the amount of water loss that can be tolerated and rate at which drying can occur. In order to study *E. pyriformis* seed physiology behavior, this work analyzed desiccation tolerance by evaluating seed germination and initial seedling growth. Seeds were collected from different plant populations in Urupema-SC. We evaluated the initial water content (WC) through the oven method (105ºC for 24h). To analyze seed desiccation tolerance, we conducted a desiccation curve and selected 7 WC points to verify germination percentage and initial seedling growth (ISG). Germination analysis was performed using three replicates of 20 seeds, stored in germination chambers at 25ºC/12h photoperiod and was assessed during 85 days. At the end, root and shoot length of five seedlings of each replicate were measured (when available) using a caliper. Initial WC was 51,6%. Seeds took 35, 50, 60, 90, 120 and 150 hours to reach 30, 25, 20, 15, 10 and 5% WC, respectively. At initial and 30% WC, germination was around 85%, not differing statistically. At 25% WC, only half of seeds germinated. From 20% WC, germination drastically decreased, reaching 5, 3, 1 and 0%, respectively in the subsequent WC. For ISG, after 85 days seedlings presented 6-9 cm at initial and 30% WC, with 75% of the total size contemplated by the root. Below 25% WC, roots were less than half of the length of initial and 30% WC, and shoots were barely prominent. Oxidative stress is one of the main reasons to explain seed desiccation sensitivity, once it causes substantial damage in cell structure. Even mild dehydration might affect recalcitrant seed viability adversely decreasing seed vigor or even leading to seed death, as observed in WCs below 25% for *E. pyriformis*. Conservation and crop strategies must take into account the desiccation tolerance level of *E. pyriformis*; therefore, seeds should not be desiccated to WCs below 30%.

Keywords: Native species; Recalcitrant; Seed dehydration.

Support: CAPES, FAPESC.

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KNOWLEDGE AND ATTITUDES OF SMALLHOLDER DAIRY FARMERS REGARDING THE USE OF ANTIBIOTICS TO MANAGE MASTITIS

Raphaela E. Woodroffe*, Bianca Vandresen, Rita Albernaz-Gonçalves, Maria J. Hötzel

Understanding the knowledge and attitudes of dairy farmers regarding the use of antibiotics to manage cows' health is essential to support interventions aiming to achieve the goal of prudent use of antibiotics. This goal is a necessary step to reduce bacterial resistance to antibiotics, considered one of the major challenges for human and animal health in the coming decades. The aim of this study was to identify dairy farmers' milking practices, knowledge and attitudes regarding the use of antibiotics to support udder health. We interviewed 52 dairy farmers from the southeastern region of Santa Catarina, Brazil. All farms were pasture based, had herds of 33 ± 2,3 lactating cows and milk production of 13,5 ± 0,7 L/cow/day. All farmers reported that mastitis was the main disease in their dairy herds and considered antibiotics essential in its treatment and prevention - when drying off the cows. All dairy farmers considered antibiotics expensive and had concerns for milk lost due to the need to discard milk of cows treated with antibiotics. However, they also indicated that they had easy access to antibiotics, without veterinary indication. Farmers bought antibiotics in farming stores, or on farm from agricultural inputs sellers. Several mentioned that veterinary assistance was linked to the sale of inputs, but that these veterinarians did not talk about mastitis prevention. Farmers believed that the antibiotics used for mastitis did not work in some cases, which indicates possible development of resistance or misuse of medication (inadequate molecule, dose or duration of treatment). Indeed, misuse of antibiotics was identified in reports of use of larger doses than prescribed "to improve effectiveness"; use of antibiotics in the absence of diagnosis; choice of molecules without veterinary prescription or based on commercial advertisements. Farmers called veterinarians only when they perceived extreme necessity and based most mastitis treatments on their empirical experience. Most farmers claimed that if prescriptions of antibiotics were to become compulsory there would not be enough veterinarians to support all dairy farms demand. Farmer's opinion towards policies aiming at restricting the use of antibiotics was divergent. Some farmers were pessimistic, arguing that with such restrictions dairy production would become impossible; others stated that they already used the minimal antibiotic amount necessary, and therefore would not be affected; some were optimistic about the implementation of antibiotics restriction policies, because some dairies pay financial incentives for good quality of milk. Based on the interviews, it was clear that controlling the sale of antibiotics is needed to reduce overuse. Furthermore, veterinary assistance focusing on mastitis prevention - a central pillar for the reduction of antibiotic use in dairy farms - is lacking in the region. Results also suggest that farmers are more likely to adopt measures to achieve the goal of prudent use of antibiotics if policies are based on incentives rather than on restrictions.

Keywords: antibiotic resistance, dairy cows, qualitative research, sustainable dairy production

Support: CNPq.

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MORPHOPHYSIOLOGICAL AND STRUCTURAL CHARACTERIZATION OF DESICCATION TOLERANCE IN *Campomanesia littoralis* (D. Legrand) SEEDS

Rosa Angelica Elias*, Daniela Goeten, Pedro E.M.Viera, Rinaldo R.J. Oriano, Maicon Morais, Vanessa Miranda Neusa Steiner

Myrtaceae is one of the most diverse plant families in Atlantic Forest. However, about 87.5% of their species produce desiccation-sensitive seeds, which hampers the conservation of these species in the long-term. *Campomanesia littoralis* (D. Legrand) is an endemic fruit tree adapted to the environmental conditions of the coast of Santa Catarina, Brazil. The aim of this study was to characterize the behavior of desiccated *C. littoralis* seeds. Ripe fruits of *C. littoralis* were collected from mother plants located in Florianópolis, SC. The initial water content (WC) was calculated by the oven method (105ºC for 24h). The mature seeds were dried by 1.5; 13;18 and 24 hours using silica gel at 27° C. In the germination of fresh and desiccated seeds, the tetrazolium test as well as polyamines (PAs) and histological analysis were performed. *Campomanesia littoralis* seeds were dispersed with high WC (0.86 gH_2O/gdw) and after 24 hours reached 0.04 gH_2O/gdw. About 90% seed germination was observed for all WC (0.42, 0.16, 0.11, 0.04 gH_2O/gdw). This was confirmed by the 80% of seeds that reacted positively to the tetrazolium test. Histological analyses indicated a swollen hypocotyl and rudimentary cotyledons in the embryo of *C. littoralis*. Protein storage vacuoles were observed in hypocotyl cells by Coomassie Brilliant Blue (CBB) reaction and intracellular spaces with abundant lipid content in all embryos. Seed coat is an outer layer of tissue with many oil storage cavities. After 24 hours desiccation, were observed an increased in protein bodies of the hypocotyl cells. Spermidine (SPD) was the highest polyamine content observed, followed by spermine (SPM) and putrescine (PUT), respectively. This study indicates that the seeds of *C. littoralis* tolerate low WC similar to orthodox seed and differs from the physiological behavior of *Campomanesia* spp studied. However, future studies must be performed to study seed longevity and *ex situ* conservation.

Keywords: Orthodox, Polyamines, ex-situ conservation, Myrtaceae,

Support: CNPq; CAPES.

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OCCURRENCE OF ARBUSCULAR MYCORRHIZAL FUNGI AND MYCORRHIZAL COLONIZATION IN LANDRACE, CONVENTIONAL, AND GENETICALLY MODIFIED MAIZE IN SOUTHERN BRAZIL

Marcelo B. Agudelo*, Rubens T.D. Duarte, Sidney L. Stürmer, Edenilson Meyer, Cláudio R.F.S. Soares, Paulo E. Lovato

Maize (*Zea mays* L.) is a mycotrophic plant with a large root system, high photosynthetic capacity, and high demand for phosphorus. The degree of dependence on symbiosis with arbuscular mycorrhizal fungi (AMF) and responsiveness to soil phosphorus availability vary widely among plant lineages. This study evaluated the occurrence of AMF species and mycorrhizal colonization in genetically modified maize, comparing with conventional maize hybrids and landrace maize lineages in the fields of western Santa Catarina, southern Brazil, or whether the physical-chemical attributes of the soil or the management associated with crop fertilization define these differences. Five soil samples at a depth of 20 cm and roots from five plants were collected in five areas for each maize lineage. A total of 23 morphotypes of AMF were recovered from 75 field soil samples and trap cultures, and 18 species were identified by morphological methods. They belong to the families Acaulosporaceae, Glomeraceae, Gigasporaceae, Diversisporaceae, and Archaeosporaceae. The genera *Glomus* and *Acaulospora* comprised 52% of all soil species. A total of 271,912 single-end sequences were obtained from roots of 15 samples, using Illumina MiSeq sequencing of the minor subunit (SSU) amplified with the primers AML1 and AML2. 81 OTUs were identified in 12 phylotypes, 79 % belonging to Glomus, with 216,931 sequences. Maize lineages and soil physical-chemical variables did not influence AMF communities. Differences in diversity and mycorrhizal colonization were not linked to the maize lineages, but to low values of soil phosphorus (P). Lower P availability was linked to higher rates of AMF colonization and the presence of arbuscules in maize roots. Soil apparent density, pH, and organic matter affected AMF community structure and size root mycorrhizal colonization in all maize lineages. Our results indicate that high P fertilization leads to low root infection by AMF, while lower P values stimulate the potential activity of native AMF in the soil.

Keywords: Mycorrhizas, Species richness, Soil, *Zea mays*.

Apoio: CNPq; CAPES.

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ONION (*Allium cepa* L.) PRODUCTION WITH AGROECOLOGICAL PRACTICES IN NO-TILLAGE SYSTEM FOR EIGHT YEARS

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Brazil is the eighth largest onion producer in the world, with 1.7 million tons per year. The main onion producing regions in Brazil adopt the conventional tillage system (SPC), characterized by soil tillage with plowing and harrowing before planting, which promotes soil physical and chemical degradation, as well as water and nutrient losses through erosion. Alternatively, the onion and other vegetable cultivation system in Santa Catarina has been conducted in an agroecological no-tillage system, following ecologically-based principles such as soil mobilization restricted to planting lines, the use of different cover crops, the split-apply of fertilizers and other management practices, instead of herbicides for the control of weeds. Studies on agroecological crops aiming at improving the compression of the transition path and substitution of the use of inputs and herbicides, as well as the decrease of mechanization, the improvement of chemical attributes and the increase of onion crop yield are still scarce. The objective of this work was to evaluate the onion yield after eight years cultivated in agroecological no-tillage system with cover crops. The experiment was conducted from 2009 to 2016, in Ituporanga, Santa Catarina, Brazil, and was installed in an area with a history of twenty years of onion cultivation in SPC (plowing and harrowing) until 1996. From that year on, the minimum tillage system was implemented with cover crop rotations. The treatments were: control with weeds (CT), black oats (BO), rye (RY), oilseed radish (RA), oilseed radish + rye (RA + RY) and oilseed radish + black oats (RA + BO). The experimental design was randomized blocks with eight replications. Each experimental unit was 5 x 5 m, totaling 25 m². In April, the species of winter cover crops were sown and applied the poultry compost in the area. In July the cover crops plants were rolled down and the onion seedlings were transplanted. In November the onion was harvested and the yield measured. After eight years of transition, without herbicide and fungicide application, residues of black oat, rye and oilseed radish, single and intercropped, contributed to the growth of onion bulbs, starting at 10 t $ha^{-1}$and reaching 24 t ha^{-1}. This is because with the decomposition of residues of cover crops, there is the release of nutrients contained in plant tissue, such as N, P, K, Ca and Mg, increasing their soil contents, as well as reducing soil losses, water and nutrients by runoff. The lowest yields were observed in the treatment with weeds, reaching 16 t ha^{-1} after eight years.

Keywords: Agroecology; Cover crops; Soil management.

Support: CAPES; CNPq.

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PERFIL MINERAL DO BAGAÇO OBTIDO DO PROCESSAMENTO DO SUCO DE PSEUDOFRUTO DE CAJU DO CERRADO (*Anacardium Othonianum* Rizz)

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O caju do cerrado (*Anacardium othoanianum* Rizz) é uma espécie nativa do bioma cerrado do Brasil, com grande potencial econômico, e que apresenta características sensoriais atrativas, como cores e sabores característicos do fruto, além de importante valor nutricional. O principal produto derivado do processamento do pedúnculo do caju é o suco, e durante o seu processamento é gerado um grande volume de resíduo sólido, denominado de bagaço de caju. Estudos com o bagaço de caju são recentes e este material ainda é pouco valorizado, devido à sua alta perecibilidade. Considerando o valor econômico do caju do cerrado e a exploração dos seus subprodutos como fontes alternativas de minerais, é importante identificar e quantificar os minerais a fim de buscar a valorização deste material através do seu aproveitamento como alimento funcional. Desta forma, o objetivo deste estudo foi caracterizar o perfil mineral do bagaço de caju do cerrado (*Anacardium othoanianum* Rizz), visando uma futura aplicação deste material no enriquecimento de alimentos. O caju do cerrado de coloração amarela foi coletado e processado para obtenção do suco de caju. O bagaço obtido durante o processamento do suco foi congelado em ultrafreezer -80 ºC, posteriormente liofilizado por 24 horas e triturado em moinho de facas com peneiras em malhas de 10 mesh. A composição elementar (Ca, Mg, Cu, Fe, Mn, K, S e Zn) foi determinada em espectrômetro de absorção atômica em chama (FAAS). Os elementos B e P foram determinados em espectrofotômetro Femto 600 com exatidão fotométrica. Os macroelementos K (4,50 ± 0,44 mg/g) e P (1,60 ± 0,10 mg/g) estão presentes em altas concentrações no bagaço de caju, já os macroelementos Ca (0,63 mg/g), Mg (0,40 mg/g) e S (0,27 mg/g) foram encontrados em menores teores. O Fe (146,67 ± 4,16 µg/g) e Mn (33,33 ± 2,89 µg/g) foram os microelementos presentes em maiores concentrações no bagaço de caju. A presença de ferro nos alimentos é extremamente importante, pois o Fe é essencial para o transporte e armazenamento do oxigênio, dentre outras funções metabólicas relacionadas à imunidade e atividade muscular. Já o manganês é importante para o desenvolvimento de tecidos conjuntivos. Os microelementos B (4,00 µg/g), Zn (12,00 ± 2,65 µg/g) e Cu (21,67 ± 1,53 µg/g) foram quantificados em baixas concentrações no bagaço de caju. Os resultados apresentados neste estudo são promissores para o aproveitamento deste subproduto no enriquecimento de alimentos como fonte alternativa de minerais, além de contribuir para a valorização de resíduos agroindustriais e redução de impactos ambientais.

Palavras-chave: Suco de caju; Bagaço; Minerais; Macroelementos e Microelementos

Apoio: CAPES, FAPESC.

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POLYAMINES AND PHYSIOLOGICAL CHARACTERIZATION OF *Eugenia uniflora* L. SEEDS DESSICATION

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Seed behavior during storage is important for the conservation of native species. Most tropical seeds are desiccation sensitive and this is a bottleneck for the *ex situ* conservation of biodiversity by traditional methods. Pitangueira (*Eugenia uniflora* L.) is a tropical species native to the Brazilian Atlantic Forest with ecological and socioeconomically importance, which presents desiccation sensitive seeds and little effort has been made to conserve them. This work had the objective of evaluating the desiccation tolerance of *E. uniflora* seeds through physiological aspects and biochemicals analysis, aiming to improve seed storage. Seeds of *E. uniflora* were collected in two natural populations in Florianópolis (27º 34' 01.9'' S and 48º 25'40.7'' W), Santa Catarina – Brazil. The initial water content was calculated and for evaluation of desiccation tolerance, seeds were dried in silica gel at 27ºC until they reach a water content (WC) of 40%, 30%, 25%, 20%, 15%, 10% and 5%. Germination speed index (GSI), tetrazolium and electric conductivity test were performed to determine the seed viability. In seeds with intact tegument, desiccation process took 1327 hours until reach 5% of WC, while in seeds with damaged tegument took 216 hours. *E. uniflora* seeds lose germination capacity between 40 and 30% WC, but the tetrazolium test demonstrated 5% of viability in seeds with 10% WC. GSI was different between 50 (1.72) and 40% (0.90) of WC and only in these treatments the germination was above 50%. The electric conductivity values did not present statistical differences between treatments. The endogenous content of Putrescine (PUT) also was not statistically different between treatments, but spermidine (SPD) content decreased together with reduction of seeds WC. However, spermine (SPM) content increased when seed's WC reduced. Our results suggest that Spd is a key factor for regulating *E. uniflora* seed germination. While Spm could be associated with desiccation tolerance. This work may provide useful insights for further studies about the polyamines' role in the Atlantic forest seeds desiccation and conservation.

Keywords: Atlantic Forest Conservation, Recalcitrant Seeds, Desiccation Tolerance, Myrtaceae

Support: CNPq, CAPES.

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STARCH EXTRACTION YIELD AND VISCOAMYLOGRAFIC PROFILE FROM UNCONVENTIONAL FOOD PLANTS

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Starches are often used in the food industry as thickeners, colloid stabilizers, gelling and volume agents, adhesives, moisture retainers, texturizers and fat substitutes. However, in their native form, they usually have some unwanted technological functional characteristics, such as high hygroscopicity, high tendency to retrograde, low shear strength and heat treatments, which makes its industrial application difficult. To overcome these limitations, chemical modification of starches is the most widely used technique. However, chemical modification poses food and environmental safety risks, which creates restrictions on their use in accordance with country-specific legislation. In this context, food industries and agricultural producers are interested in identifying and developing new sources of native starches with adequate yield, that exhibit rheological behavior similar to modified starches for commercial exploitation. Considering the great Brazilian biodiversity the present work aims to characterize starches extracted from tubers, tuberous roots, rhizomes, bulbs and/or rhizomes of 4 unconventional food plants. These are *Cyperus esculentus* (Ce), *Canna edulis* (Ca.e), *Dioscorea bulbifera* (Db) and *Hedicum coronarium* (Hc) collected from Florianópolis. Starch wet extraction yield was determined as well as their viscoamylographic profile performed in a by rapid viscosity analyzer (RVA). The evaluated parameters were paste temperature (° C), maximum viscosity (RVU), and final viscosity (RVU). The means obtained in the evaluated parameters were submitted to analysis of variance (ANOVA), Tukey and Dunnet test (α=0.05), for comparison with the control group (commercial cassava starch). The extraction yield (%) was: 22.95 ± 0.16^{a} (Ce), 11.03 ± 0.03^{c} (Ca.e), 17.08 ± 18^{b} (Db), 10.09 ± 0.15^{d} (Hc) compared to original sample weight. The percentages may be considered satisfactory for commercial exploitation, in accordance with the values reported for commercial cultivars such as cassava and yam (25 and 6.2%, respectively). The viscoamylogram revealed that the Ce and Ca.e samples showed the highest paste temperatures (°C): 81.60 ± 1.15^{a} and 80.80 ± 1.40^{a}, respectively, while the sample Db presented the lowest value (71.70 ± 0.45^{b} °C). For the maximum and final viscosities (RVU), the highest values were found in the Db sample 318.50 ± 5.50^{a} and 492.83 ± 0.5^{a}, while the Ce sample presented the lowest values 73.66 ± 0.40^{d} and 102.33 ± 0.69^{e}. All samples differed statistically from the control group by Dunnet test ($p \leq 0.05$), which presented paste temperature of 69.45 ± 0.17^{c} °C, maximum viscosity (RVU) of 256, 66 ± 20. 53^{b} and final viscosity (RVU) of 154.08 ± 8.93^{d}. The behavior of the evaluated starches in relation to the control suggests their use in applications where the characteristics of native cassava starch are undesirable, opening new opportunities in the market for these new starches.

Keywords: Unconventional food plants; New starches; Rheological behavior.

Support: CAPES; UFSC.

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SYMBIOTIC EFFICIENCY OF AUTOCHTHONOUS RHIZOBIA FROM RESTINGA AREAS IN TREE LEGUMINOUS SPECIES

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Restinga has been suffering increasingly mischaracterization of the environment and constant menaces by anthropogenic actions. A problem that is growing worldwide, also affects restinga, is biological invasion of allochthones species, such as genus *Pinus*. An alternative that can facilitate restinga recovery is revegetation by insertion of pioneer native leguminous species through symbiotic association with nitrogen fixing bacteria. This revegetation is necessary by the low fertility of the restinga soils. Association symbiotic between leguminous species and nitrogen fixing bacteria can facilitate plant growth, improves soil quality and protects against erosion. The objective of this study was evaluate the efficiency of autochthonous rhizobia isolates from restinga areas of Parque Estadual do Rio Vermelho (PAERV) in pioneer native leguminous species with potential use in revegetation programs. We made tests in greenhouse with *Mimosa bimucronata*, *Sophora tomentosa* and *Dalbergia ecastophyllum* species, in which we evaluated 12 rhizobia autochthonous of restinga areas from PAERV, and uninoculated control treatments containing high and low nitrogen supply. Seeds were seeded in tubes containing sterilized soil from restingas' PAERV. After 120 days (*M. bimucronata* and *S. tomentosa*) and 90 days (*D. ecastophyllum*) of plant growth, we evaluated: plant height, symbiotic compatibility, number of nodules, shoot dry matter, dry matter of nodules, effects of inoculation on nitrogen uptake in inoculated plants with rhizobia and symbiotic efficiency. There was symbiotic compatibility to *S. tomentosa* and *M. bimucronata* with all the inoculated treatments. In *D. ecastophyllum* only seven rhizobia isolates presented symbiotic compatibility. In *S. tomentosa* isolates UFSC-R139, UFSC-R141 e UFSC-R155 increase 371 % in N accumulation in relation to low N control, and especially UFSC-R155 showed symbiotic efficiency above 50 % in *S. tomentosa*. Isolates UFSC-R141 e UFSC-R158 were able to nodulate *M. bimucronata*, providing average increases of 261 % in N accumulation compared to treatment with low N, and they showed symbiotic efficiency above 40 %. In *D. ecastophyllum,* the isolates that most influenced biomass accumulation were UFSC-R129, UFSC-R141, UFSC-R149 and UFSC-R155. Through partial 16S RNAr DNA sequencing, we identified UFSC-R141, UFSC-R155 and UFSC-R158 as *Bulkhorderia* spp., *Bradyrhizobium* spp and *Paenibacillus* spp., respectively. In *D. ecastophyllum,* the isolates that influenced biomass accumulation the most were R129, R141, R149 and R155 with a symbiotic efficiency below 25 %. Some of the isolated of autochthonous rhizobia evaluated showed good nitrogen fixation capacity in the tested native leguminous and they can be applied in revegetation of degraded restinga areas. The rhizobia isolates used in this study should be tested on other leguminous species of economic interest.

Keywords: Revegetation; Nitrogen fixing bacteria; Dalbergia ecastophyllum; Mimosa bimucronata; Sophora tomentosa.

Support: CAPES, FAPESC.

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USE OF HOMEOPATHY AND PHYTOTHERAPY IN DAIRY CATTLE SANITARY MANAGEMENT IN TWO REGIONS OF SANTA CATARINA

Ana P. L. Marostega, Caroline Massignani*, Bruno N. Meira, Marcelo S. Pedroso, Daniele C. da Silva-Kazama

The organic foods searching by consumers promotes an important challenge to dairy production chain, in order to develop production techniques with no animal drugs, to promote animal welfare and to reach environment sustainability. Drugs utilization for cows' management results in milk discard. It is a one-way direction to respect grace periods in treated animals and then, to avoid milk contamination. Alternative therapies to replace or minimize allopathic drugs are homeopathy and phytotherapy, but they are not well widespread among dairy farms. So, this study aimed to verify the frequency of homeopathy and phytotherapy adoption in dairy production at family-based farms. An interview-based study was performed in Santa Catarina's North Plateau region (64 dairy farmers between 2012-2013) and Grande Florianópolis region (40 dairy farmers in 2014). The mainly questions applied were: Is homoeopathy or phytotherapy adopted for sanitary management of the farm? If so, what's the goal? In 2014, an interview adjustment was adopted and phytotherapy was not considered anymore because the research group observed a tiny utilization of phytotherapy by dairy farmers of North Plateau region. Data were presented as answers frequency. About half (51.6%) of dairy farmers from North Plateau region use homeopathy, and 4.7% use phytotherapy for herd's sanitary management. According to dairy farmers, these alternative therapies were mainly adopted to control mastitis (52.8%), mastitis/ectoparasites (2.8%), mastitis/others diseases (11.1%), ectoparasites (8.3%), and endoparasites (8.3%). It's interesting to highlight that 66.7% of dairy farmers adopted alternative therapies to control mastitis, a worrying sanitary problem of dairy production that causes losses in order to 12-15% yearly in Brazil. Additionally, the use of allopathic drugs may lead milk residues. In the group from Grande Florianópolis region, only 17.5% of dairy farmers use homeopathy as a therapy to the herd and all of them use for mastitis control. The large difference of homeopathy adoption between regions may be related to incentive and dissemination programs of the therapy among farmers, which are exclusively from family-based farms. It can be concluded that alternative therapies choices tend to be regional, adopted by more than a half of dairy farmers from Santa Catarina's North Plateau region. Homeopathy is more used than phytotherapy, and mastitis control is the main goal.

Keywords: Ectoparasites, Endoparasites, Mastitis, Organic Milk

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NUTRITIONAL COMPOSITION, BIOACTIVE COMPOUNDS AND ANTIOXIDANT ACTIVITY OF MUNGUBA (*Pachira aquatica*) SEEDS

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The munguba (*Pachira aquatica* Aublet) is a Brazilian native tree from the Malvaceae or Bombacaceae family. The so-called "mungubeira" is a large tree, often found in northern and northeastern Brazil. This species produces a large number of fruits that have edible seeds with organoleptic characteristics very appreciated by the Amazonian populations. However, munguba seed is not well known nor consumed in other regions of Brazil. The seeds can be consumed raw, baked, boiled or roasted and processed into milled flour. Despite the nutritional potential of munguba, there is a lack of information in the literature on its nutricional and technological potential. The present work aimed to determine the nutritional composition, the content of phenolics and tannins and antioxidant activity of munguba seed kernel. The moisture, ash, proteins, and total lipids in muguba seeds were determined according to the Association of Official Analytical Chemists - AOAC. Minerals (Ca, Mg, Na, K, Zn, Mn, Cu, Fe, and Co) were determined by flame atomic absorption spectrometry (F-AAS). The total phenolic content was determined by the Folin-Ciocalteau method (λ_{max} = 725 nm) and the condensed tannins content was quantified by the vanillin assay (λ_{max} = 500 nm). The antioxidant activity was determined by radical scavenging methods (2,2-diphenyl-1-picryl-hydrazil (DPPH); Ferric Reducing Antioxidant Power (FRAP); and Inhibition of Lipid Peroxidation (ILP). The results showed that munguba seed kernel is a rich source of lipids (59.47 mg 100 g^{-1}), as well as carbohydrates (23.44 g 100 g^{-1}), proteins (8.49 g 100 g^{-1}), and dietary fiber (4.01 g 100 g^{-1}). The high lipid and carbohydrates content contributes to the high energy value (663.68 kcal 100 g^{-1}). Munguba seeds also have a high content of K (15,640.02 mg kg^{-1}), Ca (2,668.9 mg kg^{-1}), Mg (2,249.05 mg kg^{-1}), Na (391.52 mg kg^{-1}), Zn (9.23 mg kg^{-1}), and Fe (12.82 mg kg^{-1}). The content of total phenolic compounds and condensed tannins were 239.34 mg of gallic acid equivalent 100 g^{-1} and 149.97 mg of catechin equivalent 100 g^{-1}, respectively. The antioxidant capacity was as confirmed by FRAP (6.74 mM Fe^{2+} 100 g^{-1}), DPPH (31.42 %) and ILP (21.45%) methods. The results showed that munguba seed kernel is rich in minerals and phytochemicals which indicate a high potential for different uses of this raw material as an ingredient in foods.

Keywords: Oilseed; Vegetable fat; Minerals; Phytochemicals.

Support: CAPES.

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