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Poster Presentations

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Thermo-Biorrefineries: A promising concept for production of bio-electricity, 2nd generation ethanol and renewable chemicals in Portugal

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Bioelectricity production from woody wastes has been pointed out as a promising way to mitigate risks of fire incidence and propagation within forest plantations in Portugal along the most dry and hot periods of the year. Nevertheless, consistent price reductions resulting from the increasing availability of electricity, including cheaper sources such as solar energy has limited the economic feasibility of small and medium-scale thermo-electricity (only) units in Portugal. In this scenario, the adoption of a biorrefinery concept has emerged as an interesting alternative to improve and increase the economic envoltory of the biomass-to-electricity activity. Additionally to the bio-electricity itself as product, a biorefinery constituted by integrated plants and processes deliveries multiple products from lignocellulosic biomasses, thus making feasible the economic exploitation of a myriad of low-value agrondustrial wastes. In principle, different biomass components can be converted into sugars and other carbon-rich products, which in turn can be transformed into high-valued chemical products and high-volume biofuels, while generating bio-electricity and process heat for self-consumption and commercialization. In this scenario, the high-value products enhance profitability, the high-volume fuels contribute to support energy needs and the power production reduces costs while avoiding greenhouse gas emissions. Hence, the biorefinery concept envisages the maximization of the energy-value derived from the biomass feedstock at minimal impact to the environment. This paper describes the concept, technologies and economics related to the Thermo-Biorrefineries (TBR), which are integrated plants that produce bio-electricity, second-generation ethanol and chemicals using low-cost and abundant lignocellulosic biomasses such as eucalyptus wastes as feedstocks. The mentioned Thermo-Biorefinery (TBR) concept has been built on two different biomass-to-products platforms. Basically, the "sugar platform" is based on chemical and biochemical conversion processes, particularly the fermentation of C_5-sugars extracted from the hemicelluloses, while the "carbon platform" is based on the thermal conversion of the cellulignin fractions into bio-electricity and other valuable products.

Biography

Henrique Baudel has completed his PhD in Environmental Sciences from University of Concepción (Chile), Chemical Engineering from Federal University of Pernambuco (Brazil) and Postdoctoral studies from Lund University (Sweden). He works as P&D and Technology director of America Biomass Technologies, a premier chem and biotech company. His publications reach more than 50 works including papers in journals and proceedings, patents and specialised technical reports. He has been working as supervisor of research works at both academia and industry, as well as serving as reviewer and editorial board member of repute.

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Characterization of cubosomes, nanoparticles for drug delivery applications and its interaction with miltefosine, a model drug

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Nanomedicine is a growing research field nowadays. The use of nanoparticles is hoped to improve the bioavailability of drugs while decreasing undesired side effects. Therefore, nanoparticles offer both a protection for the active molecules and drugs as a carrying vehicle. Cubosomes are nanoparticles capable of storing both hydrophilic, hydrophobic and amphiphilic molecules within its structure. They have approximately 50% hydrophobic area, being able to carry more molecules than liposomes or micelles for instance. Particularly, cubosomes are quite easy to fabricate in which lipids (mainly monoglycerides (monoolein-GMO), glycolipids, urea amphiphiles, phytantriol (PHY), etc.) self-assembly in water medium. A model drug, miltefosine (MILT), was chosen as study case for the interaction with the nanoparticles, in concentrations ranging from 1% w/w to 15% w/w, added after queue cubosomal dispersion was formed. The aim was to obtain cubosomes in sizes smaller than 500nm, with controlled polydispersion. PHY-based cubosomes were reproducible from the chosen bottom-up approach protocol and studied in PBS and AcPhBo (pH 4.5) buffer. SAXS reveals nanoparticles with crystallographic structure Pn3m and lattice parameter 6.74(07)nm. DLS presents particles with mean diameter ~450nm and moderate polydispersion 0.161(10). TEM and cryo-EM reveals particles with internal structure and varied sizes, confirming DLS polydispersion. NTA measurements reveal particle concentration approximately 10^16 particles/mL. Up to 5% w/w the cubosomes incorporated MILT without loss of crystallographic structure, but at 10%, 15% and 20% w/w, the drug provoked phase change for Im3m symmetry. At the lower concentrations, MILT enlarged the lattice parameter of cubosomes and it was hypothesized that MILT inserted itself into the bilayer of the nanoparticles. GMO-based cubosomes were produced by a proposed bottom-up approach, in both PBS and AcPhBo (pH 4.5) buffer. Nanoparticles presented crystallographic structure Im3m and lattice parameter ~12.30(12) nm, differently from PHY-cubosomes. DLS revealed particle mean diameter ~300nm an low polydispersion 0.100(21). TEM presents particles with varied size. Up to 4% MILT incorporated into the cubosomes and enlarged the lattice parameter, also being hypothesized to be in the lipidic bilayer of the water channels. Experiments to encapsulate higher amounts of MILT are undergoing, as well as encapsulation efficiency for both GMO and PHY cubosomes.

Biography

Barbara Malheiros is a physicist by the University of Sao Paulo (Brazil), during her undergraduate, she had an exchange period at University of Groningen, working with thermal simulations for a slit system at the FAIR facility. After finishing her undergraduate, she followed a master in sciences through the Faculty of Pharmaceutical Sciences in a very interdisciplinary project, in which a nanoparticle was characterized by biophysical experiments. There, she gained some experience with both nanoparticle production and electron microscopy (conventional and cryo-EM). Some biophysical techniques were learned in the master, like small angle X-rays scattering (SAXS) and dynamic light scattering (DLS), along with electron microscopy. She also has some experience with programming in python for data analysis. Today, she is already enrolled for a PhD at University of Antwerp for working with polymorphism of organic molecules in order to better understand these structures and their potential medical applications.

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Genetic characterization of *Rubus glaucus* Benth progenitors through SNPS and SSR

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Rosacea family comprise nearly 90 genera, with Rubus genus among them with 750 species (Longhi et al., 2014). This genus also includes a plant commonly known as *mora de Castilla* or *mora de los Andes* (Rubus glaucus). Genetic variability of the genus is well documented and has been widely studied considering phenotypic, morphologic, chromosomic and molecular features, highlighting important aspects such number of chromosomes, polyploidy and hybridization (Alice and Campbell, 1999). *Rubus glaucus Benth* (*mora de Castilla*) is an agricultural product with one of the biggest potential within Colombian-Andean Region. In the country, along 2014 it was achieved a total production of 150 thousand tons/year and in 2015, the plant's area accounted 66.770 hectares with average yielding of 11 tons per hectare per year (ENA, 2015). In this sense, the agricultural-food chain of *mora de Castilla* in Colombia is constituted by associated producers, with the intention of increasing performances through the behavior evaluation of promising plant material against high impact-phytopathogenic agents. Accordingly, this work pretends to strengthen the species characterization process of *mora de Castilla* through last generation molecular markers SSR and SNPs tending to identify tolerance-related genes in *Rubus glaucus* cultivars against anthracnose caused by *Colletotrichum gloesporioides* through transcriptome analysis (RNAseq) in susceptible species. Hence, 15 SRR markers showed positive amplification with a bi-allelic behavior for 14 of them, giving place to 29 loci and 58 alleles. Moreover, from 78 SPNs markers, only 36 yielded positive amplification. Obtained sequences showed high homology with species belonging Rosaceae family, as a result, genetic diversity based on SNPs data consisting in 8837 loci with 1082 effective alleles and an average polymorphism of 12.49% Revealed that genetic libraries constructed with SNPs and SSR markers showed high discrimination power for commercial cultivars of *Rubus glaucus*.

Biography

Ana Maria Lopez Gutierrez possesses wide experience into the fields of plant biology and plant genetics. Her work has concentrated in the investigation of plant diversity using SSR, SNPs and AFLP markers but also tending to the identification of resistance genes in susceptible and tolerant species against bacterial and fungal infections affecting crops with commercial/food interests.

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Morphologic and genetic characterization of *Botrytis cinerea* Pers. isolates responsible for gray mold in *Rubus glaucus* Benth in Colombia

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Botrytis cinerea Pers. is considered the most common and severe specie within *Botrytis genus*, a taxon which comprises 301 accepted names (Ferrada et al. 2016; IMA 2016). This fungus induces gray mold or fruit rot in some *Rubus* species, in almost all berries crops, but also causes the considerable economic loss in nearly 200 agriculturally important crops (Suresh *et al*. 2010; Zhou *et al*. 2014). *Botrytis cinerea* is considered as a complex system of species instead of a single variable one in which have been identified two sympatric groups based onto multiple-gene genealogies (Fournier *et al*. 2005). All these factors have created a great intrapopulation genetic variation affecting phenotypical features, such as adaptability, mycelial growth and pathogenicity. As a result, many studies tried to assess and characterize the genetic diversity of local *B. cinerea* species isolated from different cultivars. Thus, this paper pretends to explore and evaluate the diversity of *B. cinerea* isolates across Colombian cultivars using morphological and molecular approaches over 50 collected isolates, assessing mycelial growth (vertical and horizontal elongation), sclerotial distribution, color and SSR genetic diversity. Results showed the high correlation among both types of growth with statistical differences over the population average for seven strains. Similarly, the vertical and horizontal size of sclerotium were recorded, finding significant differences inside the studied group. In addition, genetic characterization driven data resulted in the construction of a phylogenic tree showing a mid-tendency of clustering depending on the geographical regions of the collection. Finally, fungal isolates of *B. cinerea* collected in different Colombian Rubus glaucus Benth cultivars of showed significant differences regarding mycelial growth and genotypic clustering pattern regarding its origin area. This general behaviour could support further pathogenicity studies in order to understand explore differential severity among them.

Biography

Liliana Isaza Valencia possesses wide experience into the field of plant tissue culture and in vitro culture of strategic plant species with economic and agricultural importance, including species of Heliconia and Rubus genus. In addition, she had performed research related to the characterization of genetic diversity of the mentioned plant species.

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Commercial opportunities behind genetic and climatic characterization with management culture approaches of *Heliconia* species in central-occident region of Colombia

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Heliconia genus has a growing commercial importance in the international flowers trade, which has increased the planted areas in countries in Central and South America, bringing a broader offer and demand of the product (Quirós, 2012).). In addition, the Colombian flower-producer sector has an important effect in terms of job creation (SUPERSOCIEDADES, 2016). The importance of *Heliconia* species in the cut flower trade is rising due to its phenotypic features (morphologic changes and color variations in flowers and inflorescences) which creates the necessity to explore the identification of different cultivars over this genera (Sheela et al. 2006). Within this paper 47 cultivars compromising four species and one interspecific hybrid of *Heliconia* species with great commercial potential were subjected to genetic characterization together with a climatologic description of the collection places. The first, based in the systematical collection of data derived from 7 weather stations controlled by Cenicafé and IDEAM located in the area of study and the latter, through the amplification of SSR obtained from the previous development of a genomic library for *Heliconia stricta* cv. Iris red. From 18 initial tested primers, there were identified 13 informative SSR from which the most polymorphic were HES69, HES 63, HES 57, HES 67 and HES 55 with a discrimination power and polymorphic information content (PIC) ranging among 0.620 and 0.970 in every studied specie. To conclude, from the genomic SSR library developed for *H. stricta* cv. Iris Red, 13 loci SSR are required in order to distinguish single Heliconia species. In addition, climatic evaluation demonstrated that the central-west region of Colombia possess the optimum conditions oriented to the production of Heliconia species with commercial purposes.

Biography

Liliana Isaza Valencia possess wide experience into the field of plant tissue culture and *in vitro* culture of strategic plant species with economic and agricultural importance, including species of Heliconia and Rubus genus. In addition, she had performed research related to characterization of genetic diversity of the mentioned plant species.

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Development of oil-in-water multilayer emulsion as an effective encapsulation systems of astaxanthin

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Interfacial deposition of biopolymer layers on oil droplets may be a suitable strategy for increasing the emulsion stability and protection of functional ingredients. The aim of this study was to design oil-in-water multilayer emulsions stabilized by ionic biopolymers as encapsulation systems of astaxanthin. The emulsions were produced by sequential adsorption of biopolymers with opposite charges at pH 3.0: Lupin protein isolate (LPI), ι-carrageenan and chitosan. The primary emulsion (PE) obtained by homogenization pressures from 100 to 500 Bar and cycles from 1 to 5 was investigated. Then, the secondary (SE) and tertiary (TE) emulsions were homogenized at 5.000rpm for 2min. The physical stability of emulsions under different environmental stresses (pH: 3 to 7, temperature: 25 to 85°C and NaCl concentration: 25 to 300mM) was evaluated. The results showed that PE has stabilized with 0.50% w/w of LPI at 300 bar and 5 cycles. It was stable to a phase separation after 24h of storage at 25°C. Then, the saturation concentration of ι-carrageenan and chitosan were 0.11 and 0.09% w/w on the droplets of SE and TE, respectively. The PE was unstable to droplet aggregation at pH values between 4 and 5. The SE was stable at all pH range and TE was unstable at pH between 6 and 7. The emulsions were stable from 25 to 65°C and at all the NaCl concentration evaluated. Therefore, SE and TE presented greater physical stability than PE providing a stable system of astaxanthin encapsulation for food applications.

Biography

Eduardo Morales Antonio is Food Engineer and Master in Engineering Sciences with specialization in Biotechnology. Currently, he is the student in the Doctoral Program in Engineering Sciences with Specialization in Bioprocesses at Universidad of La Frontera, Temuco, Chile. His research is focused on "Multilayer emulsion as an effective encapsulation system of astaxanthin to develop a powdered beverage"..

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Effect of the degree of cross-linking in nanosponges on the efficiency of piperine encapsulation

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Nanosponges (NSs) is a novel method of encapsulation, formed by the bonding of microscopic particles that form cavities of nanometric diameter (less than 1µm) capable of encapsulating a great variety of compounds of food interest. These cavities can incorporate lipophilic and hydrophilic compounds.The objective of this work was to evaluate the effect of the cross-linking degree in NSs. NSs were formed with beta-cyclodextrin (β-CD) and diphenyl carbonate (DPC) through the microwave-assisted method. ß-CD: DPC molar ratios of 1:2, 1:6 and 1:10 were tested and NSs were characterized through FTIR, the degree of substitution (DS) and specific surface (SBET) analysis. The appearance of characteristic peaks of ß-CD at 1155cm-1 belonging to the glycosidic bonds was observed. In addition, a peak was identified at 1750cm-1 which is an indicator of the carbonyl group (C=O), which also demonstrate the esterification between DPC and the hydroxyl groups of the ß-CD. The results showed NS 1:2 DS=0.345, NS 1:6 DS=0.629 and NS 1:10 DS=0.878 and NS 1:2 SS=0.77, NS 1:6 SS=1.22 and NS 1:10 SS=2.00m2/g. Therefore, the higher the molar ratio, the higher the DS and the higher the specific surfaces of NSs. In addition, the pore size range was from 23 to 63 Å classified as mesopores. It confirms the crosslinking process between the ß-CDs, obtaining NS synthesis. Therefore, increasing the number of substituents increases the probability of generating greater cross-linking and specific area to facilitate the inclusion of lipophilic compounds.

Biography

Juan Pablo Guineo Alvarado is a Food Engineer from the University of La Frontera, Temuco, Chile. Currently, he is a student of the Master's Program in Engineering Sciences with specialization in Biotechnology. His thesis is entitled “Effect of the degree of cross-linking in nanosponges on the encapsulation efficiency and release of piperine”, supported by Fondecyt project N°1160558. “Nanoencapsulation of polyunsaturated fatty acids and pungency alkaloids using nanosponges as carrier model to deliver lipophilic compounds of high biological value”. This research was supported by funding from Conicyt through Fondecyt project.

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Study of the conditions of encapsulation of piperine in microwave-assisted nanosponges

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Nanosponges (NS) is a class of colloidal structures based on hyper-crosslinked polymers that are made up of microscopic particles with nanometric cavities in which a large variety of substances can be encapsulated. These cavities can incorporate lipophilic and hydrophilic compounds. The objective of this work was to evaluate the effect of NS with different degree of crosslinking, the type of solvent (SOLV) used in the loading process and the load ratio PIP-NS (w/w) on the encapsulation efficiency of piperine (PIP) in the microwave-assisted cyclodextrin-based nanosponges. The NS was formed with β-cyclodextrin (β-CD) and diphenyl carbonate (DPC) through the microwave-assisted method. NS of molar ratios 1:2, 1:6 and 1:10 (β-CD-DPC) were used to perform loads of PIP-NS (2:1, 1:1 and 1:2) (w/w). The solvents used in the fillers were dichloromethane, acetone and ethanol. Characteristic peaks were identified for PIP and displacement of peaks attributable to inclusion as methylenedioxy phenyl at 928cm-1. ANOVA was performed to determine if there were statistically significant differences for each of the variables on the encapsulation efficiency response. NS and PIP-NS are significant ($p \leq 0.05$), on the other hand, SOLV was not significant ($p \geq 0.05$) on the response. For the NS variable, the molar ratio that presented the best responses were 1:6=77.12a and 1:10=78.74a followed by 1:2=71.55b. For the PIP-NS variable, the load ratio that presented the best response was 1:2=84.08a, followed by 2:1=77.28b and finally 1:1=66.05c.

Biography

Jeyson Alan Hermosilla Gajardo is a biotechnologist from the University of La Frontera, Temuco, Chile. He has worked on several projects at the University in the micro and nanoencapsulation area, currently working on the Fondecyt project N°1160558 "Nanoencapsulation of polyunsaturated fatty acids and pungency alkaloids using nanosponges as carrier model to deliver lipophilic compounds of high biological value".

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Study of nanosponge based on cyclodextrin and carbonate as a nanoencapsulation system of lipophilic compound

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Nanosponges (NSs) are able to capture, transport and selectively release a huge variety of substances, they can be used to mask the unpleasant flavor. The objective of this work was to evaluate nanosponges based on cyclodextrin and carbonate as piperine (PIP) nanoencapsulation system. The NS was formed with a molar ratio of polymer (β-cyclodextrin) and crosslinker (diphenyl carbonate) of 1:2, 1:6 and 1:10 by the solvent method, but only molar ratios 1:6 and 1:10. The NS 1:6 and 1:10 were loaded with piperine in different encapsulation media (ethanol and acetone) and determine its loading efficiency. Both for the NSs and the inclusion complex (PIP:NS) were characterized with FTIR, hyperspectral FTIR images and Degree of Substitution. The appearance of characteristic peaks of ß-CD at 1155cm^{-1} belonging to the glycosidic bonds was observed. In addition, a peak was identified at 1750cm^{-1} which is an indicator of the carbonyl group (C=O), which also demonstrate the esterification between DPC and the hydroxyl groups of the ß-CD. The results showed NS 1:6 DS=2.613 and NS 1:10 DS=3.429. Both NSs 1:6 and 1:10 obtained a high load capacity with the different means of encapsulation. Therefore the formation of cyclodextrin-based NSs by solvent method was demonstrated. Moreover, the capacity of cyclodextrin-based NSs to encapsulate PIP was confirmed. The NSs are an effective encapsulation system of PIP and they protect the bioactive properties of the PIP. Therefore the formation of cyclodextrin-based NSs by solvent method was demonstrated. Moreover, the capacity of cyclodextrin-based NSs to encapsulate PIP was confirmed showing that PIP is distributed in a dispersed way, not forming large clusters or concentrating in a single zone. The NSs are an effective encapsulation system of PIP and they protect the bioactive properties of the PIP. Supported by funding from Conicyt through Fondecyt project 1090516.

Biography

Sofía Belen Gonzalez Lezana is a Food Engineer from the Universidad of La Frontera, Temuco, Chile. Currently, she is a working in Fondecyt project N°1160558. "Nanoencapsulation of polyunsaturated fatty acids and pungency alkaloids using nanosponges as carrier model to deliver lipophilic compounds of high biological value". This research was supported by funding from Conicyt through Fondecyt project.

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Synthesis structural characterization and antioxidant activity of alkyltrimethylammonium thiotungstate

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An emerging area of research in the field of oxidative stress is the use of inorganic drugs, possessing redox properties, which act as effective free radical scavengers, a starting point for the development of new therapies to combat oxidative damage. In this way, it was found in the literature that some ammonium thiosalts, as tetrathiomolybdate (TMA), have anticancer, anti-angiogenic, antioxidant, anti-inflammatory and have been tried as copper-chelator drugs, including preclinical, animal and human studies. Although the biological activity of TMA suggests that related inorganic species such as thiotungstate salts might show analogous behavior, to the author's knowledge, the biological activity of tungstate thiosalts has not been evaluated. In this work, ammonium thiotungstate (TTA) were synthesized, characterized and their antioxidant activity was evaluated. In addition, an alkyl chain was incorporated into TTA and the influence of carbon on biological activity was evaluated. TTA was prepared by direct sulfidation in an aqueous ammonia solution of ammonium metatungstate. The alkyltrimethylammonium thiotungstate $(R\text{-}(CH_3)_3N)_2WS_4$ (R=octyl, dodecyl or hexadecyl) were prepared by means of a simple reaction of ATT with alkyltrimethylammonium halogens in aqueous solution. The synthesized thiotungstates were characterized using Fourier transform infrared (FTIR) and ultraviolet (UV) spectroscopic techniques for determining their chemical structures. Thiotungstate salts antioxidant activity was evaluated using DPPH and ABTS assays. The preliminary results suggest that the influence of carbon derived from the hydrocarbon chain on the properties of the resulting biomaterials improved their antioxidant activity.

Biography

J Horta Marron has earned his Bachelor's degree in Industrial Chemistry from the Autonomous University of Baja California and is currently working on research. He has worked as a quality control technician in several Mexican industries such as petrochemical, alimentary and water waste. He has also collaborated with various Mexican researchers on projects involving nanotechnology and environmental sciences. Recently, he participated in the Congress of the Faculty of Chemical Engineering located in the Autonomous University of Yucatán where he presented a ceramic material created from sewage sludge.

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Encapsulation of carotenoid in nanofibers by emulsion electrospinning: Termal and oxidative stability

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The canola oil, rich in polyunsaturated fatty acid has been used in emulsions/nanoemulsions as the carrier for lipophilic compounds encapsulation due to its therapeutic potential and anti-inflammatory effect. Specifically, astaxanthin is a carotenoid of commercial interest due to its potential health benefits. However, the therapeutic benefits of this carotenoid is limited due to its low bioavailability, chemical, thermal and shelf stability. In this work, Bovine Serum Albumin (BSA) was studied as a model protein for the nanofiber production with astaxanthin enriched canola oil by emulsion electrospinning. Significant independent variables: BSA emulsion, Poly Ethylene Oxide (PEO) concentration and solution pH, were selected for the nanofiber optimization based on methodology surface response. Nanofibers were characterized by scanning electron microscopy, thermogravimetric analysis and peroxide value for 7 days at 50°C. Nanofibers without bead defects were produced with 10% w/w BSA emulsion, 5% w/w PEO and pH 3. Astaxanthin loading efficiency of 97.43% was obtained under optimal conditions. Moreover, the encapsulated oil was randomly distributed as droplets inside the fibers. Melting temperature (Tm) of PEO was approximately 400°C and the Tm of loaded BSA emulsion-PEO nanofibers was 440°C. The shift to higher temperatures means that better thermal stability of astaxanthin was found in loaded nanofiber. Finally, BSA protein through the nanoemulsion and nanofiber protect canola oil from oxidative stability. Therefore, emulsion electrospinning results offer an alternative for the development of an astaxanthin encapsulation system with enhanced thermal and oxidative stability compared with electrospinning where the oil is added into the nanofiber without being emulsified.

Biography

Camila Medina is a PhD student in the Doctoral program in Sciences of Natural Resources, at University of La Frontera, Temuco, Chile. She is a Food Engineer and has a Master's Degree of Engineering Sciences with Specialization in Biotechnology. She has focused her research on the micro/nano encapsulations of bioactive compounds for food and pharmacological applications. She is currently working on "The behavior of the release of a lipophilic drug from protein by O/W-emulsion electrospinning".

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Augmentation of the immune response of Atlantic salmon through the oral delivery of alginate encapsulated salmon rickettsial septicaemia antigens

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Salmon rickettsial septicaemia (SRS) is the infectious disease that produces the highest losses in the Chilean salmon industry. Disease outbreaks continue to emerge despite the use of vaccines and antibiotics.Therefore, as a new strategy for the control of SRS outbreaks, in this study we evaluated the effect of Alginate-Encapsulated SRS Antigens (AESA) incorporated in the feed as an oral vaccine to induce the immune response of Atlantic salmon. 960 healthy Atlantic salmon (40g) were distributed into three groups (Injectable vaccine, oral vaccine high dose, oral vaccine low dose) with four tanks being assigned to each group. The feed intake was assessed during the entire trial. To evaluate the effect of the experimental feed on the fish immune system, blood samples were taken at four sampling points (0 degree days post vaccination (DD), 300DD, 600DD and 800DD). The *P. salmonis* specific IgM levels in blood plasma were measured by ELISA. During the vaccination period, the feed intake rates were 100% for all groups indicating that the addition of AESA did not affect the palatability of the fish feed. The oral vaccine effectively enhanced the immune response of fish. There was a significant increase in the IgM levels at 800DD for both experimental groups. Furthermore, there were no significant differences when comparing the IgM levels of the experimental groups with those of the injectable vaccine. These findings suggest that AESA incorporated in the feed can be an effective alternative to enhance the immune response in Atlantic salmon.

Biography

Daniela Sotomayor Gerding is a fourth year student in the Doctoral Program in Sciences of Natural Resources, at University of La Frontera, Temuco, Chile. She has a Master's degree in Engineering Sciences and has a professional degree in Civil Engineering in Biotechnology. She has focused her research on the development of new oral delivery systems for bioactive compounds through microencapsulation techniques and she is currently working in collaboration with the company Cargill Aqua Nutrition in the development of a new oral delivery system for immunostimulants against Piscicricketsia salmonis infections in Atlantic salmon.

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Production of poly-3-hydroxybutyrate microfibers and gelatin nanofibers as scaffolding material using electrospinning process

Claudia Sanhueza, Jeyson Hermosilla and **Francisca Acevedo**
University of La Frontera, Chile

The poly-3-hydroxybutyrate (PHB) is a biodegradable and biocompatible polymer produced by microorganisms. It is suitable for biomedical applications; however, the biodegradation rate of PHB is low. On the other side, gelatin (GE) is an hydrolyzed of collagen highly used in tissue engineering due to its biocompatibility. Electrospinning is an electrodynamic technique that allows to produce scaffolds from different polymers, increasing the polymers biodegradation rate and improving their mechanical properties. The objective proposed in this study was to produce and to combine PHB-microfibers and gelatin-nanofibers by electrospinning, controlling some process variables. For obtaining PHB-microfibers and gelatin-nanofibers, electrospinning conditions such as polymer concentration, voltage and flow rate, weretested at three different levels. Diameter and morphology of the micro and nanofibers were analysed by scanning electron microscopy and their thermogravimetric properties and FTIR spectrum were investigated the process variables evaluated showed to have a significant effect over fiber diameter. Continuous and smooth PHB-microfibers were obtained at 8%w/v, 25kV and 0.5mL*h-1 with a diameter of 1.252±0.174 μm and a morphology index of 0.950. On the other hand, ultrafine GE-nanofiber were obtained at 30%w/v, 25kV and 0.5mL*h-1 with a diameter of 0.222±0.047 μm and a morphology index of 1.000. The FT-IR and TGA-DSC spectrum of GE-nanofibers showed the formation of secondary structures by the electrospinning process, for PHB was possible to observe a decrease on PHB crystallinity. It was possible to obtain good quality PHB-microfibers and GE-nanofibers under similar process conditions reaching a high morphology index. The combination of PHB-microfibers and GE-nanofibers was successfully done.

Biography

Claudia Sanhueza is Biochemist from the University of La Frontera. Now a days, she is a PhD student from the doctoral program in Sciences of Natural Resources. Her doctoral thesis is entitled "Development of a skin scaffold of PHB from B. xenovorans LB 400 and gelatin for dermal tissue regeneration". This study was partially supported by Direction of Investigation, University of La Frontera, Conicyt Scholarship N° 21160515 and Proyecto Anillo Conicyt N° ACT1721288.

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e-Poster

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Bioremediation of polluted water using unicellular algae native from Argentina

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Physicochemical and microflora characterization of water samples from Cildañez stream at Ciudad Autónoma de Buenos Aires shows that these waters are mainly polluted by cloacal microorganisms, metals and compounds that raise the COD and BOD. In the present work, the remediation of these waters by bioprocesses in agitated tank bioreactors was simulated using cultures of a native strain of *Chlorella vulgaris* immobilized in alginate beads. The bioremediation processes were carried out in bioreactors with a marine impeller in autotrophic conditions for 7 days allowed the decrease of the microbial population particularly *Escherichia coli* and total coliforms reduction (over 95%) and several physical-chemical parameters and heavy metals. The percentage of pollutants removed was: ammoniacal nitrogen (96%), nitrates (86%), nitrites (98%) and total phosphorus (53%) content. Moreover, significant results were observed with lead content reduction (95%). In addition, the evaluation and monitoring of contaminated water can be done following the mitotic index and germinative power of *Allium cepa* seeds (Datsch Silveira *et al.*, 2017). This economic test evaluates cytostatic effects, DNA instability and inhibition of cell division, caused by xenobiotics. The test was done before and after each bioprocess using distilled water as negative control. Germination and mitotic indexes showed that treated waters after bioprocess recovers the values similar to the negative control. The results obtained demonstrate the potential of this algae to be used in integrated processes that seek removal of xenobiotics.

Biography

Carlos Nadra is Currently working as the Researcher at APRA-CIFA at Argentina. Her research interests include Bioremediation, Cytostatic effects.

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Accepted Abstracts

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Tissue engineering and 3D bioprinting of humam tissues: From technology to challenges

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The treatment of damaged, disease or non-functional tissue and organs through tissue engineering is still a major challenge. Within this context, recent advances in the development of biomaterials for regenerative medicine and the combination of fabrication techniques, such as 3D Printing, have allowed the three-dimensional fabrication of biocompatible matrices with a great precision, which can be associated with cells and bioactive molecules. The association of cells could be improved in a 3D cell organization in a form of building blocks called spheroids, which can closely mimic the natural microenvironment of organs and tissues, consisting of an attractive approach for the development of tissue engineering and cell therapies. Then, with the tissue engineering techniques combined with the information technology and engineering aspects, homogeneous spheroids could be obtained. These spheroids could be placed in a 3D bioprinting, in which the tissues manufacturing aspects could be precisiously controlled. This technology permits the biofabrication in different shapes, with sophisticated geometry and when combined with bioactive agents could promote the functionalization of the tissues. The area which combines all those fields cited before is called biofabrication, which is growing, maturing and receiving the collaboration of scientists with various backgrounds, characterizing its multidisciplinary aspect. Nowadays, one of the main bottlenecks of biofabrication is to promote the synergy and integration of all those techniques, which is a huge challenge.

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Meta-analysis of RNA seq data to gain insight into crop responses to environmental stresses

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RNA-Seq analysis is a strong tool to gain insight into the molecular responses to biotic stresses in plants. Transcriptomic studies are usually conducted in a singular time, they do not provide any repetition across different seasons and frequently they are performed in field conditions where environmental variability is high and disturbing factors are frequently present. The identification of up- or down-regulated genes is often not enough to draw meaningful biological conclusions because it is hard to identify which gene plays a key role in specific signaling networks in host responses. This issue leads to high difficulties in deriving conclusive models for understanding disease symptomatology. For these reasons, more meta-analysis is needed in order to validate singular transcriptomic works with other similar studies performed with the same research purposes. Meta-analysis of transcriptomic data will identify commonalities and differences between differentially regulated gene lists and will allow screen which genes are key players in gene-gene and protein-protein interaction networks. These analyses will allow delivering important information on how a specific environmental factor affects plant molecular responses and how plants activate general stress responses to environmental stresses. An early "stress condition" in plants is similar to the "inflammatory response" occurring in animals in response to pathogen-associated factors. The objective of this work is to identify specific and common molecular features (genes, proteins, gene sets, pathways), linked to both abiotic and biotic stress resistances among key crops. The identification of common genes between different biotic stress will allow to gain insight into these general responses and help the diagnosis of an early "stress state" of the plants. These analyses will help in monitoring stressed plants to start early specific management procedures for each disease or disorder.

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Impact of mineral fertilizer on the yield of groundnut and soil available phosphorus in the Karaga district of Ghana

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Field experiments were carried out to ascertain the impact of mineral fertilizer application on the yield of groundnut and the soil available phosphorus at Nyong Guma, Pishegu and Cheshegu. Mineral nutrients applied were phosphorus(P), potassium(K), magnesium(Mg), sulphur(S), zinc(Zn) and boron(B). Triple superphosphate(TSP) fertilizer was used for P, potassium chloride(KCL) for K, zinc sulphate monohydrate(HOSZn) for Z, magnesium sulphate (MgSO4) for Mg and S and finally borax for B. The experiments were laid in a randomized complete block design(RCBD) with six treatments. Response parameters measured were shooting biomass at 50% flowering, grain yield, agronomic efficiency and value cost ratio. Buffer rows were created to avoid over-spill of inputs between plots and the non-leguminous crop was used as a reference crop in the case of estimation of biological nitrogen fixation. Soil pH was determined by using temp pH meter. Barkley and Black method were used to determine the organic carbon. Kjeldahl distillation method was used to determine total nitrogen. Bray 1 extraction method was used to determine phosphorus. Exchangeable cations were determined using ammonium acetate at pH of 7.0. All data were subjected to Analysis of Variance (ANOVA) and means were separated using GENSTAT statistical package 12th edition. Least significant difference (Lsd) at 5% probability level was used to compare the treatment means. Chinese variety of groundnut was used and planted at a spacing of 60cm between rows and 20cm between plants for spreading type or 50cm row and 15cm plant to plant for erect types. None of the mineral fertilizers applied significantly ($P<0.05$) increased in shoot biomass. The use of PK increased the biomass yield at 50% flowering by 62% over the control. The sole application of P yielded the highest agronomic efficiency. The use of PKMgS had the highest grain yield of 800kg/ha which was however not a significant ($P<0.05$) increase over control in all the study sites. All the mineral fertilizer application options were not cost effective.

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Application of quantitative post translational modification proteomics and interactomics in plant biology study

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Quantitative and functional post-translational modification (PTM) proteomics and interactomics have emerged as powerful omics approaches in studying cellular events in various model organisms. In this seminar, I intend to show several examples on how to apply in planta metabolic labeling and *in vitro* chemical labeling-based (4C) quantitative PTM proteomic and interactomic workflow (SILIA, SQUA-D and AQUIP) in investigation of cell signaling in the model plant *Arabidopsis* and its potential impact in the plant cell biology research in general. To elucidate the molecular mechanism underlying plant hormone ethylene signaling in *Arabidopsis* on a number of plant responses, several well-known *Arabidopsis* ethylene response loss-of-function mutants (ctr1-1, rcn1-1, ein2-5 and eil3eil1) were selected as target plant materials for both stable isotope metabolic labeling (SILIA) and *in vitro* dimethyl labeling (SQUA-D) for the PTM quantitation. The 4C quantitative proteomics and interactomics results clearly revealed that there exist multiple PTM-mediated signaling pathways in *Arabidopsis*. This quantitative PTM proteomics was able to identify rapidly phosphorylated proteins, such as TREPH1, MAP Kinase Kinases, CPKs, in response to 40 second of touch or 150 seconds of gravity stimulation in *Arabidopsis*. The following reverse genetic and transgenic plant approaches in combination with cell biology studies validated the biological functions of these key candidate phosphoproteins in these internal and external signals-mediated cellular events and dramatic plant responses. These successful research results suggest that our PTM proteomic approach can be quantitative, repeatable, accurate and versatile in addressing many important biological questions in life sciences.

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Organic phosphorus mineralization and phytase activity by fungi isolated from coffee plants rhizosphere

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The coffee industry has a big importance in the Colombian economy, in the coffee zone prevails soils with low disponibility of phosphorus (P), it is an essential nutrient for plant growth [1,6]; in order to correct this problem it is necessary to apply big quantities of chemical fertilizers, causing high production costs and environmental damage. The organic P is between 30 and 70% of the total P in agricultural soils [2], it has been reported that approximately the half of the microorganisms in soil associated to the plants' rhizosphere have the capacity of mineralizing organic phosphates[4,5]. The aim of this work was to isolate microorganisms associated with rhizosphere of coffee plants with the ability to mineralize organic P and to evaluate their phytase activity. Soil Rhizosphere samples were collected from coffee crops located in two towns in Antioquia, Colombia. For isolation of microorganisms, it was done serial dilutions until 10^{-6} and they were plated by duplicated on selective solid medium in order to detect phytase producers. After to select more promising fungi, they were evaluated by *in vitro* assays with medium supplemented with wheat bran and their enzymatic activity was measured according to Lee et al. (2005) with modifications. In total 13 microorganisms were found in the analyzed samples and 8 fungi were selected to later assays. One fungus (*Penicillium* sp.) showed the ability to mineralize organic P and five fungi presented phytase activity. Two of these fungi have been selected to carry out additional greenhouse trials, which are in course. This is the first study of organic P mineralizers present in coffee crops and it is very important due to the use of these microorganisms could be an alternative to enhance the plant nutrition and a solution to the overfertilization of P in coffee and other crops

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Brewer spent yeast susceptibility to protein hydrolysis: Effect of serial repitching and yeast strain

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Many different yeast strains and cultivars are available for beer production because each one may result in a different flavor profile. They are chosen considering brewing conditions and beer style. Brewer spent yeast (BSY) is the second most relevant sub-product generated from the brewing industry but it is usually discarded or used as inexpensive animal feed. However, this material is rich in proteins and may be a source of bioactive peptides, which can be obtained through proteolytic treatment. The aim of this study was to investigate the susceptibility to hydrolysis of two commonly used yeast strains for Lager Pilsen production (*Saccharomyces cerevisiae* and *Saccharomyces pastorianus*) using Alcalase™ 2.4L, Protamex™ (Novozymes, Denmark) and a commercial protease mixture for yeast cell hydrolysis, Brauzyn® 100L (Prozyn, Brazil). Three samples of brewer spent yeast from Lager Pilsen beer production were collected after 11 days of maturation: Repitched *Saccharomyces pastorianus* (RSP), non-repitched *Saccharomyces pastorianus* (NSP) and non-repitched *Saccharomyces cerevisiae* (NSC). Firstly, protease activity of the commercial proteases was determined for each studied condition using azocasein as substrate. Then, the effect of serial repitching (no repitching and 5 times repitching) and yeast strain on the degree of hydrolysis (DH*) with those three enzymes was studied, at the same hydrolysis conditions, using an automatic titrator. Protease activity results show that maximum Brauzyn® activity was achieved at low pH (5.6) and high temperature (74°C), but this enzyme showed 17 and 2 times less protease activity per mL when compared to Alcalase™ and Protamex™. In order to take into account the different protease activities of the enzymes, enzyme/substrate ratio (E:S) was determined in U g protein-1. When comparing non-repitched yeasts from different strains, NSC samples presented 18.5% higher DH* than NSP samples, when hydrolyzed using Brauzyn®. The effect of serial repitching of *Saccharomyces pastorianus* showed that non-repitched yeast samples were more easily hydrolyzed than the repitched ones. At the same hydrolysis conditions (pH, temperature and E:S) RSP samples took 3.5× more time to achieve the same DH* (3.2%) using Brauzyn®. Very low DH* was achieved using Brauzyn®, for a wide range of E:S, from 50 to 1500U g protein-1, which would indicate that this enzyme could not effectively break RSP yeast cells. Using Alcalase™, higher DH* could be obtained, but RSP had to be diluted 1.4 times and a higher E:S was needed to reach the same degree of hydrolysis of NSP yeast during 2h of hydrolysis. These results show that repitched cells seemed to be more difficult to break down. Indeed, although all fermentation yeasts are imposed to stressful conditions during beer production, the successive reuse of cells in repeated cycles of fermentation makes them more exhausted in terms of its cell components and their cell wall get thicker and more resistant to rupture treatments such as enzymatic hydrolysis. In conclusion, technologies and approaches proposed to add value and reuse BSY must contemplate yeasts differences in terms of its characteristics and susceptibility to break down so that they can be successfully transformed and processed.

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Statistical analysis for the production of secondary metabolites and its chemical characterization from Streptomyces parvulus C5-5Y

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Introduction: The needs for an increase in novel drugs urged to discover and develop new antibiotics with biopotential. The natural products have been developed from medicinal plants and the recent research has mainly focused on the microbial sources for novel antibiotics with bioactivities and this is economical in the state. In this investigation, we have developed a new bioactive compound with maximum antioxidant and antimicrobial activities.

Methodology: In order to increase the metabolite production as well as the organism's growth we aimed to optimize the medium with economical parameters and sources rapidly. The investigation followed the one factor at a time, Plackett-Burman design and Box Behnken design to get the optimized medium for the enhanced metabolites production. Stat-Ease design expert software was used for this investigation. On purification, the secondary metabolite which was exhibiting maximum activity at a minimum concentration was taken for structural elucidation analysis through UV-VIS, FTIR, NMR and HRLC MS/MS analysis.

Results: The bioactive compound was elucidated from *Streptomyces parvulus*. The maximum growth and pigment production were evaluated with the standard formula and the production was higher in optimal pH, temperature, carbon and nitrogen sources. The carbon sources are found to increase the growth of the organism, especially in starch. The mass production was obtained in the optimized medium and the extracted pigments were subjected to HPLC analysis where the peak 4 was eluted and found to contain bioactivity through antimicrobial assessment. The compound AP_4 was structurally elucidated with raw data, finally, the AP_4 was 4-MHA (4-Methyl 3-Hydroxy anthranilic acid) pentapeptide lactone and it represents the half actinomycin structure with antioxidant properties. Further studies will be focused on two-dimensional NMR spectroscopy to confirm the structure and application of pigment as pharma product in *in vivo* studies.

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Effect of medicinal plant pesticide and microbial insecticides for the control of Dengue vector, *Aedes aegypti* (Insecta: Diptera: Culicidae)

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Mosquitoes can transmit more diseases than any other group of arthropods and affect millions of people throughout the world. Dengue is an acute viral infection with potentially fatal complications. Dengue fever is spread by the bite of infected *Aedes* mosquitoes. *Aedes aegypti* mosquito is the principal vector of the viruses responsible for urban yellow fever, dengue, dengue hemorrhagic fever, as well as Zika and Chikungunya in Brazil. To prevent the proliferation of mosquito-borne diseases and to improve the quality of the environment and public health, mosquito control is essential. Biopesticides provide an alternative to synthetic pesticides because of their generally low environmental pollution, low toxicity to humans and other advantages. Many herbal products have been used as natural insecticides before the discovery of synthetic organic insecticides and also some of the biological control agents have been evaluated against larval stages of mosquitoes, of which the most successful ones comprise bacteria such as *Bacillus megaterium*. The purpose of this investigation is to determine the larvicidal and pupicidal activity of *Justicia adhatoda* and microbial insecticide, *Bacillus megaterium* on dengue vector, Aedes aegypti. Lethal dose concentrations (LC50 and LC90) were calculated for different larval instars and pupal stages. Field trials were conducted at the breeding sites of the A. aegypti and the mortality was observed after 72 hours of treatment.

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Fermentation conditions for the production of flavonoids from *Streptomyces hygroscopicus* AVS7 by statistical approaches

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Introduction: Statistically optimized fermentation conditions for the maximized pigmented metabolites production from *S. hygroscopicus* AVS7 isolated from western ghats regions was estimated using basic economical carbon and nitrogen sources. Normally in Starch Casein Broth (SCN), the strain AVS7 produced about 2.92g/L of metabolites from the biomass. In order to increase metabolites production, the parameters were optimized using statistical experiments with Design expert software. Basic parameters pH, temperature, incubation period, carbon and nitrogen sources were optimized using one factor at a time experiment and the highest production profile remarked by pH, temperature and incubation period were kept as constant. The factors were evaluated for Plackett-Burman design and under this factorial design three significant factors potato pulp, sucrose and maltose influenced the highest pigmented metabolite production. These three factors were further investigated using Response Surface Methodology (RSM) Box Behnken design; the results were displayed as a contour and 3D surface plots. The analysis of variance implied the model to be significant with a p-value of 0.0011 and lack of fit was not significant. The production of metabolites in RSM was 4.91g/L which was 2 fold increases from the basic medium. Finally, the model was validated and the highest response area was targeted as an optimized medium for maximized metabolite production. The pigment production was 2.98g/L in normal medium and it was about 4.91g/L in the optimized medium. The pigment showed a two-fold increase through optimization. This optimized medium was taken for further studies. The crude metabolite extract was purified under chromatographic techniques using a gradient solvent system. About six fractions were eluted from the preparative HPLC system and antimicrobial assessment was carried out for all the fractions, in which fourth fraction F4 explicit highest antimicrobial profile. This fraction F4 was taken a spectral range which displayed a peak at 527nm and it was also determined for flavonoids presence. This study explores the biomolecule and its fermentation conditions to increase its production to explore the anticancer potentiality by animal models. This is the first report in the production of secondary metabolites from an actinomycete- *S. hygroscopicus* AVS7.

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