

DAY 1

Scientific Tracks & Abstracts



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Sessions

Aquaculture Methods | Aquaponics | Aquaculture Nutrition | Aquatic Diseases & Immunity | Marine Conservation & Management | Urban Farming | Fish Pathology & Physiology

Session Chair

Ernesto A. Chavez

Marine Sciences Research Centre, Mexico

Session Co-Chair

Joaquim Gutierrez

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Session Introduction

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Title: Red microalgae as functional foods: An integrated study

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Title: Urban agriculture as a tool for creating socioeconomic development and healthy communities- The Israeli Experience

Ronit Golovaty, Hydronit Urban Farming, Israel

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Gergely Csakberenyi-Nagy, University of Debrecen, Hungary

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Title: Aquaculture Planning: For the development of a responsible and sustainable aquaculture in Morocco

Mustafa Amzough, National Aquaculture Development Agency, Morocco

THE WORLD FISHERIES DO THEY HAVE ANY FUTURE?

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The future of the fisheries is burdened by political trends, ruling economic and social factors. The development of fisheries is in the midst of the need to feed a growing human population and the consequences of the depletion of exploited stocks, motivated by economic interests and constrained by their finite biomass. Economic factors, social factors and the dynamics of fisheries face each other, multiple interacting problems, but they all have their own dynamics and complicate the possibility of finding isolated and independent solutions. Aquaculture seems to offer a light of hope for mankind by helping to solve the problem of producing food from the sea. However, this is not a permanent solution. There are certain trends in fishery development which in practice, may contribute to a future that can help fisheries to become truly sustainable, such as reduction of discharges, gradual reduction of large vessels, improvement of management measures, increased involvement participation of the, eco-labeling of fishery products, reduction of illegal fishing, relative price stability and certification of many fisheries, among others. All these factors open a window of hope that allows us to expect that the sustainability of fishing can become a reality, rather than a utopia. It is remarkable to realize that the maximum yield of the world oceans approaches very close to 100 M mt and the biomass of all the exploited stocks is near to 200 M mt. Current yield and stock biomass are nearly 40% below their maxima. Assessment of the main world fisheries suggest that nearly 45 M mt, could be obtained additionally by increasing mesh opening.

Biography

Ernesto A Chavez, Ph D (1978) is a Professor of the Marine Sciences Research Centre in La Paz, Mexico. His interests include Bio-Economic Assessment of Fisheries, Impact of Climate on Fisheries, Coral Reef Ecology. He is Teacher of the courses Fisheries Management and Coral Reef Ecology at his research Centre. He has been Adviser of 25 MSc thesis, BSc, 16 at the MSc Program and 5 at PhD level. He has led 17 research projects and has collaborated on another 16. He has published more than 150 scientific papers, including the Co-edition of a book on the coral reefs of the south Gulf of Mexico (2007), translated into Spanish (2010).

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RED MICROALGAE AS FUNCTIONAL FOODS: AN INTEGRATED STUDY

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Global demand for macroalgal and microalgal foods is growing, and algae are increasingly being consumed for functional benefits beyond the traditional considerations of nutrition. Among the principal algal sources are red microalgae, which produce unique biochemicals including novel sulfated polysaccharides (SP) (including dietary fibers), unsaturated fatty acids (EPA, DHA, AA), natural pigments (phycobilproteins, zeaxanthin), and a variety of other special chemicals (e.g., floridoside) and minerals. Of particular interest are the red microalgae *Porphyridium* sp., whose cells are encapsulated within a SP and extracellular portions are dissolved in the growth medium. Those SP have unique rheological characteristics and have been shown to act as a platform for metal incorporation, taking advantage of their ion-exchange capabilities and their negative charge. The current study motivated by the ongoing search for novel, bioactive ingredients that are capable of enhancing and extending the functionality of emulsions investigated the use of SP from red microalgae as potential stabilizers in food emulsions and the combination of emulsifying and antibacterial activities of a Zn-PS complex.

Optimization & Characterization of Oil Emulsions: The properties of emulsions were characterized based on physical stability, electrokinetic charge and overall appearance. In addition, the study examined emulsion responsiveness to sonication and to major environmental stressors (2<pH< 8 and salinity 0-300 mM NaCl).

Antibacterial activities of a Zn-PS complex: Dairy emulsions and oil-in water emulsions were stable in low concentrations of a Zn-PS complex (<0.2% and <500 ppm Zn). This complex was also shown to have higher effect on inhibition of bacterial growth when compared with the algal polysaccharide alone. Overall, the data support the potential of using functional sulfated polysaccharides from red microalgae to stabilize emulsions and inhibit contamination in food applications. This information is believed to be of importance for possible utilization of red microalgal polysaccharides as novel emulsifiers in the rational design of food emulsions and potentially in other food applications. These encouraging results indicate that we should pursue the development of red microalgae as novel functional foods.

Biography

Irit Dvir has completed her PhD at the Ben-Gurion University of the Negev, Israel in 1999. She is an expert in the study of algae and its uses in the food industry and as a dietary supplement. Currently she is a Senior Lecturer and Head of the Chemistry and Life Sciences program at Sapir Academic College, Israel. She is a member of the Council of Young Israeli Entrepreneurs and is always looking for original and innovative research projects. She has published papers in reputed international journals. Much of her work is interdisciplinary and extends beyond red microalgae to include nutrition and food manufacturing, development of novel functional foods that can positively impact health and prevent or treat metabolic diseases such as diabetes and obesity.

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URBAN AGRICULTURE AS A TOOL FOR CREATING SOCIOECONOMIC DEVELOPMENT AND HEALTHY COMMUNITIES, THE ISRAELI EXPERIENCE

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The phenomenon of urban agriculture is expanding as a reverberation of population and urban growth. In Israel 91% of the population lives in cities, and only 2% are working in agriculture. The unfavourable conditions for agriculture in Israel, especially scarcity of water and competition over arable land, brought to decrease in agricultural areas, and subsequently to production of food far away from its consumers. The various new methods and technologies that exist today (hydroponics, aquaponics, aeroponics), allow urban farming to be integrated in an easy, accessible and efficient way in the city, and can provide urbanities with a series of benefits that foster new communities. Various projects of urban farming were executed in Israel, among them: educational programs in schools, horti therapy in geriatric and rehabilitation centres and social and economic empowerment projects in refugees' neighbourhoods. All these successful examples show how urban farming has the potential to influence and benefit economy, environment, society and health in the city.

Biography

Ronit Golovaty is an Agronomist and Natural Resources Management Specialist, with a BSc and MSc from the Hebrew University in Plant Protection, and MSc from Oxford University in Natural Resources Management. She was for 7 years the Director of the Agrotechnology and Environmental Technologies sectors in the Israeli Export and International Institute, promoting joint ventures and cooperation (PPP) between Israeli agrotechnology companies, governments, international organizations and NGOs, and was sent to overseas long term missions as a Project Manager in Ethiopia and Brazil. She has experience of more than 25 years in development and adaptation of innovative agrotechnologies, for increasing the productivity of the agricultural sector, and today is an international Consultant in agricultural extension and urban farming.

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INCREASING THE EFFICIENCY OF AQUAPONICS CROP PRODUCTION BY APPLYING QUAIL DUNG

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To make aquaponics systems ever more widespread, raising crop yields is an indispensable task. In the present study it is examined, how much the intrinsic integration of the quail dung into the aquaponics system modifies the development of plants, thereby increasing the efficiency of the flower and yield formation. In the study jalapeno chili, arugula and artichokes were coated. The plants in buckets were grown in three different ways. In the first parcel plants were grown in potting soil and irrigated with groundwater. In the second parcel plants were grown in potting soil and irrigated with fish tank effluent. In the third parcel to the potting soil quail dung was mixed in 2:1 ratio, the plants were irrigated with groundwater. Potting soil, groundwater and fish tank effluent were analyzed. Macro (Na, Al, Ca, Fe, K, Mg) and micro elements (Ba, Cd, Cr, Cu, Li, Mn, Ni, Pb, Sr, Zn), as well as the elements of the plant nutrient (NO_3^- , NO_2^- , NH_4^+ , $(\text{PO}_4)^{3-}$) were measured. The results of the soil measurements in the vegetation period show that the mixture of quail dung resulted higher concentration of Ba, Zn, Cr and Al, Fe, K, Mg, Mn than the other two cultivation forms. The samples with a mixture of quail dung contained nearly 50% less Na than the fish tank effluent irrigated samples. P, Sr Cu concentrations did not show significant differences in the three cultivation forms. Samples without fish tank effluent irrigation or quail dung mixing contained significantly less amounts of trace elements except NO_3^- and P. The Ni, Cd and Pb did not exceed the toxic level in any of the cultivation forms. Based on the results, it can be stated that the quail dung contributes greatly to the trace supply, so it can be successfully integrated into the aquaponics systems.

Biography

Gergely Csakberenyi-Nagy, CEO of Renewable Energy Park Research Center in Debrecen, Hungary, and the Department Head of Renewable Energy Department at the University of Debrecen. His research topics are the Solar Energy, Heat Pump Systems, Algae Systems and Aquaponic Systems.

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DEVELOPMENT OF AUTOGENOUS VACCINE OF *STREPTOCOCCUS AGALACTIAE* FOR HYBRID TILAPIA FROM ISOLATION TO THE FIELD

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S*treptococcus agalactiae* is one of the major disease problems affecting farmed tilapia worldwide, usually for fish that are 300-600 g in average weight. This results in a significant economic loss for farmers. Affected tilapia commonly present with an irregular behavior associated with anorexia, exophthalmia, ascites and erratic swimming. It also causes septicemic disease, affecting organs such as the brain, kidney and gut, among others. The vaccination strategy is the most important measure for the control of streptococcosis in fish. Nevertheless, vaccine efficacy may vary due to the existence of different serotypes and the genetic profiles of circulating strains. Thus monitoring, by laboratory diagnosis, is essential to understand the prevalence of serotypes and genetic profiles existing in the country, which directly informs the relative importance of using local bacteria and development of autogenous vaccines. In this study, an autogenous vaccine for hybrid tilapia (*Oreochromis niloticus* x *O. aurea*) was developed against local species of *Streptococcus agalactiae*. The entire progress, from field sampling of the pathogenic bacteria until field application of the vaccine, is described. This includes the isolation and identification of the bacteria, the establishment of a seed lot system including preparation of master seed and working seed, the fermentation process, inactivation of the antigen and vaccine preparation. Six different emulsions were prepared in order to compare two different adjuvants at three different antigen titers. The laboratory quality control methods and residue of formalin are also presented. Safety and efficacy trials were carried out for all six emulsions. Based on the efficacy results; one of the preparations was selected as an autogenous vaccine for full-scale production. The product was tested for onset of immunity, duration of immunity and stability. Following the tests, it was used in a commercial farm of tilapia in Israel.

Biography

Yechiam Shapira has completed his MSc at the Hebrew University in Jerusalem, in fish health and fish genetics. He has published one article in Aquaculture magazine, and was involved in two others. He worked as the Fish Health Manager in different farms in Israel and in Mexico for the last 30 years. His experience includes fresh water species, marine species and ornamental fish, growing on land and in cages in the sea. He was the president of The Israeli Society of Aquaculture and Biotechnology for four years. In the last 4.5 years, he is a Senior Researcher in Phibro Aqua, a division of Phibro Animal Health Corporation.

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PRODUCTION OF MONOSEX POPULATION IN TAMBAQUI (*COLOSSOMA MACROPOMUM*)

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Tambaqui is the main native fish species for the Brazilian aquaculture. Studies of our group confirmed that under captivity the females are heavier than males at harvesting weight of 3 kg. As the system of sex determination of tambaqui remains unknown, we tested four different doses of 17 β -oestradiol administered for 6 weeks to produce monosex batches of tambaqui via the direct method. To evaluate the phenotypic sex, we analysed histologically 135 fish (average 22/treatment) and to assess whether the fish meat of treated tambaqui presented hormonal residues, an analytical method for the determination of 17 β -oestradiol residues in muscle was developed and validated using high performance liquid chromatography coupled to tandem mass spectrometry (LCMS/MS). The dose 120 mg kg⁻¹ E₂ of diet administered from 14 mm length was the most effective treatment for tambaqui feminization as no males were found in the group (85% females and 15% intersex). If one considers that the intersex fish will not show precocious maturation (as males do), this percentage would not compromise the superiority of the group in weight gain. Therefore, we consider that higher oestradiol doses are unnecessary for aquaculture purposes. Regarding the food security of the technique, at a quantification limit of 0.3 ng g⁻¹, the muscle of treated tambaqui did not show detectable E₂ residues. In conclusion, our results indicate that 120 mg kg⁻¹ E₂ of diet is sufficient to eliminate the males in tambaqui population, which would increase almost 20% the profitability of the activity. Moreover, the technique is safe for human consumption as no hormone residues are found in the meat of treated fish. These data will greatly contribute for the native fish farming in Brazil since it supports the development of new techniques for the tambaqui industry.

Biography

Almeida F L has completed her PhD in 2009 from Utrecht University (The Netherlands) and has developed her Postdoctoral studies from the Institute of Marine Research of Norway. She is now a permanent Researcher at the Brazilian Agricultural Research Corporation. She has published 18 papers in reputed journals and is currently leader of four research projects, which includes international partnership, besides the collaboration of different universities and research institutes of Brazil. She has also been cooperating as a Reviewer from reputed indexed scientific journals.

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MELATONIN IN THE PROMOTION OF FISH REPRODUCTION

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Enhancement of reproductive ability that essentially includes expansion of breeding periodicity and acceleration of oocyte maturation in any economically important fish species is a fascinating area of modern aquaculture. The target is traditionally reached by effective manipulation of one or more endocrine and environmental factors, which collectively determine the rate of fecundity of the species. Accordingly, the pineal hormone melatonin (N-acetyl-5-methoxytryptamine), that transmits photoperiodic information of the environment to the neuro-endocrine regulatory axis of reproduction, has earned special attention. A number of carefully controlled experimental studies provided convincing evidence that exogenous administration of melatonin at a specific dose, for a particular duration, and at an appropriate reproductive season in a periodic breeder, like carp, stimulates the process of gonadal growth and oocyte maturation. Melatonin as a hormone seems to play a critical role in the regulation of seasonal reproduction by activating the cascade that stimulates hypothalamic neurons to produce gonadotropin-releasing hormone (GnRH), and/or by acting directly on the gonads. Thus a commercial product 'ovaprim' (a combination of GnRH and domperidone) is very popular for ready use in fish farming. Moreover, several new studies unequivocally demonstrated that melatonin, apart from playing the role of a hormone, may act as a potent antioxidant to reduce oxidative stress during maturation. A recent study by providing the first evidence that melatonin pretreatment in carp ameliorates ovaprim actions on the process of final oocyte-maturation and alleviates oxidative stress in pre-ovulatory follicles has opened up a possibility of further application of melatonin for induced spawning. This communication thus aims to bring together the current knowledge on the role of melatonin as a hormone as well as an antioxidant in the regulation of fish reproduction and shape the current working hypotheses supported by recent findings obtained in carp or based on knowledge gathered from other fish species.

Biography

Saumen Kumar Maitra has completed his PhD from Calcutta University (India) and Postdoctoral studies from Mainz University (Germany). He is the Professor and Former Head in the Department of Zoology, Visva-Bharati, a premier Central University in India. He has published more than 150 papers in reputed journals and has been serving as an Associate Editor of *Frontiers in Experimental Endocrinology*, and Editorial Board Member of several journals of international repute. He made a break-through research in off-season breeding of carp by manipulation of duration of light (photoperiods) and/or endogenous profiles of melatonin. By demonstrating melatonin receptors on the carp oocytes, and the role of intra-ovarian melatonin as a potent antioxidant, he provided the first evidence of extra-hypothalamic actions of melatonin on any fish ovary. Collectively, his research unequivocally proved the efficacy of melatonin treatment as an effective tool for achieving desired state of spawning in a commercially important fish.

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AQUACULTURE PLANNING: FOR THE DEVELOPMENT OF A RESPONSIBLE AND SUSTAINABLE AQUACULTURE IN MOROCCO

Mustafa Amzough

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The presentation will focus on the aquaculture planning in Morocco, which is a pillar and an essential lever for the development of a responsible and sustainable aquaculture. By adopting a relevant and well-structured approach, ANDA has initiated a genuine planning program that strives to reconcile economic and environmental imperatives while ensuring the balanced growth of the aquaculture sector. This program has covered up to now about 1700 km of the Moroccan coast. The conception of each aquaculture development plan follows four key steps carried out in chronological order: 1) Establishing background assessment of areas subject to planning, 2) Study of the Environmental Characteristics of the dedicated appropriate areas, 3) Establishing of aquaculture planning scheme and 4) Environmental impact assessment and Environmental and Social Management Plan.

Biography

Mustafa Amzough is currently Head of Investment, Promotion and Studies Department at the National Agency for the Development of Aquaculture. He was Chief Engineer, graduated from the Agronomic and Veterinary Institute Hassan II in Halieutics in 1999. He has worked in the Department of Maritime Fisheries, Regional and Central Services, from 2000 to 2011. He has gained 16 years of professional experience in the fish products industry and fisheries and fleet management. In 2011, he participated, for one year, in the prestigious program Hubert H Humphrey in the USA. During this year he received training at Davis University in California and Cornell University in New York. Also, and still as part of this program, he worked as a Consultant in the Aquaculture Office of the National Oceanic and Atmospheric Administration in Washington DC and in a hatchery and shellfish farm in the New York state. He joined the ANDA team after his appointment in 2012 as Head of Investor Support Service.

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