GENERAL NEWS

Microbes 'cheaper, fairer' for boosting yields than GM (SciDev.net, September 2013)

Adapting microbes that dramatically increase crop yields while reducing demand for fertilisers and pesticides through selective breeding or genetic engineering could be cheaper and more flexible than genetically modifying plants themselves. Such beneficial microbes could be produced locally for smallholder farmers to significantly improve food security and incomes in developing regions, according to a report published by the American Academy of Microbiology... Read more.

A malaria vaccine based on genetically modified parasites is worth developing further, according to the first study to test the new approach in humans. (SciDev.net, October 2013)

Six volunteers were exposed to the malaria parasite Plasmodium falciparum, rendered harmless by genetic modification, through the bite of Anopheles mosquitoes. All six developed antibodies against the parasite without getting infected, reports the proof of concept study, published in Vaccine... Read more.

Translating nature's library yields drug leads for AIDS, cancer, Alzheimer's disease (ScienceDaily, September 2013)

An ingredient in a medicinal tea brewed from tree bark by tribal healers on the South Pacific island of Samoa -- studied by scientists over the last 25 years -- is showing significant promise as a drug lead in the long-sought goal of eliminating the AIDS virus from its sanctuaries in the body and thus eradicating the disease, a scientist said... Read more.

UPCOMING BOOK PUBLICATION

Handbook of African Medicinal Plants, Second Edition
To be published: December 2013

Handbook of African Medicinal Plants provides a comprehensive review of over 1,000 species of plants employed in indigenous African medicine. It gives a concise description of the materia medica of an enormous and extensively varied continent, with well over 2,000 distinct tribes and several distinct florras.

A detailed pharmacognostical profile of the major herbs is presented, including the common name, synonyms, African names, habitat and distribution, medicinal uses, chemical constituents, and published pharmacologic activity. This extensive catalogue of plants is presented both in alphabetic order and according to family. References are cited from over 600 publications, and photographs and sketches illustrate many of the plants. The book also provides an introduction to African cosmology and beliefs as they relate to healing and the use of herbs.
PhD submission: Benjamin Kumwenda

Benjamin submitted his thesis in August this year, completing his PhD in Bioinformatics at the University of Pretoria. This is a fantastic achievement after a lot of hard work! We asked Benjamin to tell us more about his work.

My PhD project investigated thermophilic bacteria, particularly *Thermus* species which inhabit higher temperature environments such as hot springs, hot domestic water, compost manure, sewage sludge and the like. The PhD was registered at University of Pretoria under the supervision of Prof Oleg Reva of University of Pretoria Bioinformatics and Computational Biology Unit and Prof Derek Lithauer from University of Free State. Dr Özlem Tastan Bishop from Rhodes University Bioinformatics made substantial contribution to this study. She guided me through the protein modelling and thermostability analysis. This study was funded by the SABINA fellowship grant and partly by South African National Research Foundation grant 71261. I registered for my PhD in April 2010 and submitted my thesis on 19 August 2013, with one publication in Evolutionary Bioinformatics journal. A second manuscript is ready and expected to be submitted for publication before the end of 2013.

The interest to study *Thermus* bacteria was triggered by the complete genome sequencing of *Thermus scotoductus* SA-01 in South Africa at Witwatersrand, from 3.2 km deep in an old gold mine. In addition, *Thermus* species biochemically reduce heavy metals for lowering pollution and removing toxicity from food sources. They switch to anaerobic growth under certain conditions which is useful for efficient bio-fuel production.

High rates of natural transformation, which is one of the major mechanisms for horizontal gene transfer, are reported from previous studies in *Thermus* species as a survival technique. Natural transformations trigger rearrangement of functionally related genes on the chromosome which has implications on the coherence of the metabolic network. This study investigated the extent to which genome rearrangements occurred and their implication on the metabolic network. In addition, it examined possible factors that enhance protein thermostability in *Thermus* species which were analysed at both sequence and protein structure level.

Results showed no significant difference in distribution of functionally related genes between mesophilic and thermophilic bacteria. However, metabolic networks for thermophilic bacteria were found to be poorly clustered as compared to mesophiles. Dominant amino acid substitutions and their properties were deduced and implicated in enhancing thermostability.

SABINA NEWS

Congratulations to Dr John Becker (Pol-SABINA and the ACGT) and his wife, Nelmarie, on the birth of their first child!
Their son, William John, was born on 28 September 2013. We wish joy and happiness for the proud new parents at this special time!
Antioxidant and phenolic acid profiles of tissue cultured and acclimatized *Merwilla plumbea* plantlets in relation to the applied cytokinins


*Merwilla plumbea* (Lindl.) Speta is an important medicinal plant widely used in traditional medicine. The effect of five cytokinins [benzyladenine (BA), 2-isopentenyladenine (2iP), meta-topolin (mT), meta-topolin riboside (mTR), and meta-methoxy-9-tetrahydropryan-2-yl-topolin (MemTTHP)] were evaluated on the level of phenolic acids and antioxidant activity of *M. plumbea* during the tissue culture and acclimatization stages. Two cytokinins (mT and mTR) significantly improved the antioxidant activity of tissue culture plantlets while the control plantlets were better after acclimatization. Using UPLC–MS/MS, the levels of hydroxybenzoic and hydroxycinnamic acid derivatives (phenolic acids) varied significantly during tissue culture and acclimatization, depending on the cytokinin and plant part analyzed. Vanillic acid detected in underground parts of tissue culture plants supplemented with BA was the most abundant phenolic acid detected. The current findings indicate that the phytochemicals together with the bioactivity during *in vitro* propagation of *M. plumbea* is influenced by the cytokinin type used and the stage of plant material collection.

Pulmonary effects and disposition of luteolin and *Artemisia afra* extracts in isolated perfused lungs


*Artemisia afra* (Asteraceae) is a traditional medicinal plant frequently used in steam inhalation form to treat respiratory conditions. The aim of the study was to quantify luteolin content in *Artemisia afra* dried crude and aqueous extract and evaluate the pulmonary effects of *Artemisia afra* steam inhalation, nebulized *Artemisia afra* extract and luteolin in isolated perfused lungs (IPL). Further we aimed to evaluate the pulmonary disposition of intravenously administered luteolin. HPLC was used to quantify luteolin in *Artemisia afra* extracts. A modified version of the IPL was used to determine the effects of *Artemisia afra* steam inhalation, nebulized luteolin, and nebulized aqueous leaf extract on lung function, as well as the pulmonary disposition of IV luteolin. *Artemisia afra* extract contained significantly higher luteolin levels than the crude dried leaves. Inhaled *Artemisia afra* steam, and nebulized luteolin, and *Artemisia afra* extract and IV luteolin produced significant dose-dependent improvements in lung function, with nebulized *Artemisia afra* producing the greatest improvements. Nebulisation with *Artemisia afra* extract yielded higher quantities of luteolin than luteolin nebulisation. Results verify the traditional use of inhalation of *Artemisia afra* steam, although nebulized luteolin and aqueous extract are better alternatives. Luteolin significantly contributes to the bronchodilatory effects of *Artemisia afra*.

In *vitro* and *in vivo* antimarial activity and cytotoxicity of extracts and fractions from the leaves, root-bark and stem-bark of *Triclisia gilletii*


This study aimed to the *in vitro* antiplasmodial activity and cytotoxicity, and the *in vivo* activity of extracts and fractions from the leaves, root-bark and stem-bark of *Triclisia gilletii* (De Wild) Staner (Menispermaceae), used in traditional medicine against malaria. The aqueous and 80% methanol (MeOH) extracts, and a series of fractions and subfractions from the leaves, stem and root-bark of *Triclisia gilletii* were tested *in vitro* for their antiplasmodial activity against a chloroquine-sensitive strain of *Plasmodium falciparum*, against the chloroquine and pyrimethamine-resistant K1 strain of *Plasmodium falciparum*, for cytotoxicity against MRC-5 cells, and *in vivo* in mice infected with *Plasmodium berghei berghei*. Many samples from the three plant parts exhibited pronounced activity against the Congolese chloroquine-sensitive strain of *Plasmodium falciparum* with some IC_{50} values <0.02 μg/ml, and against the K1 strain, with some IC_{50} <0.25; the selectivity was higher against the Congolese strain. At oral doses of 200 and 400 mg/kg body weight in infected mice, the aqueous, 80% MeOH and total alkaloid extracts from the three plant parts produced more than 65% and 75% chemosuppression, respectively. The antiplasmodial activity of these three plant parts of *Triclisia gilletii* can at least in part be attributed to bisbenzylisoquinoline alkaloids, and supports its use for the treatment of uncomplicated malaria in traditional medicine.

Antioxidant and antimicrobial activities of white, green and black tea extracts


In the present study, the antioxidant and antimicrobial activities of three tea (*Camellia sinensis*) types (white tea- WT, green tea- GT, black tea- BT) were compared and the relationships between total phenolic, tannin and flavonoid contents were determined. Regardless of the assays used, the highest total phenolic content (313.3±1.41 μg GAE/mg extract), total flavonoid (16.98±0.27 μg QE/mg extract) and total tannin content (266.79±2.59 μg TAE/mg extract) were determined in green tea extract, which also demonstrated the highest antioxidant capacity. Black tea extract showed the lowest phenolic content and antioxidant capacity. The EC_{50} value of DPPH scavenging activity was in the order of: ascorbic acid > GT > BHA > WT > BT > BHT. While the tea extracts exhibited antibacterial activity against *Staphylococcus aureus*, no inhibitory effects were observed against *Escherichia coli* and *Salmonella enteritidis*. All extracts exhibited antifungal activity against two aflatoxigenic moulds *Aspergillus parasiticus* NRRL 2999 and NRRL 465. The antibacterial activity of tea extracts decreased in the following order: GT > WT > BT DPPH scavenging activity strongly correlated with total phenolic content, reducing power, antimicrobial activity against *S. aureus*, *A. parasiticus* NRRL 2999, *A. parasiticus* NRRL 465 (P<0.05). These data suggest that green tea extract is more effective than white and black tea extracts as a potential source of natural antioxidants.
The role and place of medicinal plants in the strategies for disease prevention


Medicinal plants have been used in healthcare since time immemorial. Studies have been carried out globally to verify their efficacy and some of the findings have led to the production of plant-based medicines. The global market value of medicinal plant products exceeds $100 billion per annum. This paper discusses the role, contributions and usefulness of medicinal plants in tackling the diseases of public health concern, with particular emphasis on the current strategic approaches to disease prevention. A comparison is drawn between the ‘whole population’ and ‘high-risk’ strategies. The usefulness of the common-factor approach as a method of engaging other health promoters in propagating the ideals of medicinal plants is highlighted. The place of medicinal plants in preventing common diseases is further examined under the five core principles of the Primary Health Care (PHC) approach. Medicinal plants play vital roles in disease prevention and their promotion and use fit into all existing prevention strategies. However, conscious efforts need to be made to properly identify, recognize and position medicinal plants in the design and implementation of these strategies. These approaches present interesting and emerging perspectives in the field of medicinal plants. Recommendations are proposed for strategising the future role and place for medicinal plants in disease prevention.

Phyto-synergy in some Hypoxis species and pharmacological properties of a Hypoxis-based phytopharmaceutical formula


Hypoxis species are used extensively in traditional medicine in Southern Africa for several ailments including tuberculosis, chest infections, and nervous and urinary disorders. Several other claims have been made for extracts emanating from Hypoxis species and have led to the production of several commercial products used as immunostimulants mostly for people living with HIV/AIDS and cancer. This study was aimed at investigating the biological activity of four Hypoxis species and a commercial herbal product, ‘African potato extract’ (APE). Antibacterial, antifungal, cyclooxygenase (COX) and acetylcholinesterase (AChE) inhibitory activities of H. acuminata, H. colchicifolia, H. hemerocallidea and H. rigidula and Hypoxis-based herbal preparation, APE, were tested. The phytoconstituent of the mixture were also profiled using TLC methods. Several combinations of the Hypoxis species were prepared and their synergism, additive, autonomic and antagonism effects investigated. The results confirmed H. colchicifolia and H. hemerocallidea as the phytoconstituents of APE. The extracts showed a broad spectrum of activities against the bacterial and fungal strains used. The results provide some evidence of phyto-synergy in some extracts of H. hemerocallidea and H. colchicifolia except for a few extracts which act as additive, autonomous and antagonistic when used to inhibit some bacterial and fungal strains. Even though the results give an indication of a positive interaction between some extracts of H. hemerocallidea and H. colchicifolia, the study was carried out on 1:1 v/v combinations only. It is therefore important to carry out isobologram studies, which considers more than one ratio of the combinations.

Effect of four medicinal plants on Amyloid-β induced neurotoxicity in SHSY5Y cells


Amyloid-beta peptide (A beta) is implicated in the pathogenesis of Alzheimer’s disease (AD), a neurodegenerative disorder. This study was designed to determine the effect of four medicinal plants used to treat neurodegenerative diseases on A beta-induced cell death. Cytotoxicity of the ethanol extracts of the plants was determined against SH-SY5Y (human neuroblastoma) cells which were untreated, as well as toxicologically induced with A beta, using the MTT and neutral red uptake assays. Cell viability was reduced to 16% when exposed to 20 µM A beta(25-35) for 72 h. The methanol extract of the roots of Ziziphus mucronata Willd., Lannea schweinfurthii (Engl.) Engl. and Terminalia sericea Burch. ex DC., were the least toxic to the SH-SY5Y cells at the highest concentration tested (100 µg/ml). All four plants tested were observed to reduce the effects of A beta-induced neuronal cell death, indicating that they may contain compounds which may be relevant in the prevention of AD progression.

The value and use of social media as communication tool in the plant sciences

Osterrieder A, Plant Methods 9:26, 2013

Social media now complements many parts of our lives. Facebook, Twitter, YouTube and many other social networking sites allow users to share and interact with online content and to connect with like-minded people. Its strengths – rapid dissemination and amplification of content and the ability to lead informal conversations – make it a powerful tool to use in a professional context. This commentary explains the overall concept of social media and offers suggestions on usage and possible types of scientific content. It advises researchers on the potential benefits and how to take a strategic approach towards building a social media presence. It also presents examples of effective social media use within the plant science community. Common reasons for scientists to not engage with social media include the fear of appearing unprofessional, posting something wrong or being misunderstood, or a lack of confidence in their computer skills. With the rapid changes in academic publishing, dissemination and science communication, as well as the rise of ‘altmetrics’ to track online engagement with scientific content, digital literacy will become an essential skill in a scientist’s toolkit.