

on the environment remain worrisome. In recent times, agricultural practices involving organic and environmentally-friendly compounds are gaining acceptance. In line with this, we evaluated the effect of different concentrations of vermicompost leachate (VCL, a form of liquid organic fertilizer) on greenhouse grown tomatoes and bananas. In terms of the potential of VCL to replace essential elements (N, P and K) during the growth of tomato seedlings, the use of VCL proved beneficial with either a complete nutrient solution or in the absence of P and K. The current findings suggest that VCL could serve as a potential substitute in cases of P and K deficiency. The role of VCL on the root system and stimulation of more off-shoots in bananas was tested. In VCL-treated banana plantlets, the number of off-shoots was significantly higher than the control. In addition, VCL significantly enhanced the root system of the banana plantlets. The positive effect on rooting is beneficial for acclimatization and establishment of tissue-cultured banana plantlets in nurseries and subsequent transfer to the field. The current findings support the potential use of VCL as an easy and affordable alternative to both small scale and commercial farmers for increasing crop production.

doi:[10.1016/j.sajb.2013.02.042](https://doi.org/10.1016/j.sajb.2013.02.042)

Concerns over regulatory practices in the traditional medicine industry - does storage affect the biological activity and chemical composition of medicinal plants?

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Despite the popularity of the traditional method of healthcare in Africa, the continent remains behind in terms of regulation, safety and quality control of its medicinal plant industry. Therefore, there is heightened interest in aspects that affect the industry, with storage practices and consequent effects on plant efficacy being important concerns. After plant materials are collected, several biochemical variations can occur within the material resulting in bioactivity changes. The main objective of the study was to assess the overall effect of storage on the efficacy of three South African medicinal plants. The pharmacological and phytochemical properties of freshly harvested and short-term stored (± 3 years) *Ocimum basilicum*, *Senna petersiana* and *Hypoxis hemerocallidea* were assessed. Fresh samples of most plant extracts indicated greater anti-bacterial (*Staphylococcus aureus* and *Escherichia coli*) and anti-fungal (*Candida albicans*) activity in comparison to the stored samples. The anti-oxidant assay for DPPH radical scavenging activity showed variable results, with increased activity in both stored and fresh samples for the different plants. Phytochemical analysis pointed towards noticeable differences between fresh and stored samples of the various plant extracts with fresh samples showing higher chemical concentrations in most plant parts. In general, the current findings indicate that the degree of changes in pharmacological and phytochemical activity due to storage were species-specific, with fresh samples being favoured in terms of efficacy.

doi:[10.1016/j.sajb.2013.02.043](https://doi.org/10.1016/j.sajb.2013.02.043)

Evaluation of South African plants for cosmetic interest

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There is an increasing concern with the impact of synthetic cosmetics on humans and the environment. The long-term effects of low dose exposure to an ever growing number of synthetic chemicals are not understood at present. Small molecules derived directly or indirectly from natural sources have a highly successful track record as pharmaceuticals, and their economic importance is big. The aim of this project is therefore to discover and develop plant derived small molecules with potential as new and/or improved cosmetic agents. Eleven South Africa plant species used traditionally for cosmetic properties were evaluated for their cosmetic potential. Hyaluronic acid (HA) and antioxidants are important ingredients in skin conditioners and have been reported to be involved, in skin growth, wound healing, inflammation and preserves tissue hydration. The hyaluronidase assay was used to assess the cosmetic potential of these plants whilst the ABTS assay was used to assess the antioxidant activities of these plants. Four samples showed good results in the HA assay with percentage inhibition of more than 50% suggesting they can be good cosmetic candidates. In the antioxidant assay, 10 samples showed good antioxidant activity with an IC₅₀ range of 1.99 to 9.45 $\mu\text{g/mL}$ with two of these having a Trolox equivalence of above 0.4. An attempt to isolate the active compounds is still underway. These results show that South African plants have an important role to play in the development of cosmetics.

doi:[10.1016/j.sajb.2013.02.044](https://doi.org/10.1016/j.sajb.2013.02.044)

Application of metabolomics in cultivation of medicinal plants

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A small number of South African medicinal plants have entered the commercial market with another few that either show potential or will enter the commercial market soon. Although some species are already commercially available, the plant material is often still wild harvested, with an increasing threat of becoming threatened and extinct in the wild. Cultivation of plants shows potential to contribute significantly to job creation and community upliftment, but is however not exploited and has not reached its full potential. Cultivation is not generally practised for medicinal species and therefore many questions remain regarding cultivation and quality assessment of produced material. It has been demonstrated in previous studies that factors such as irrigation and nutrient status affect the chemical profile and composition of plants. Since there is very little understanding of the mechanisms and activity of herbal formulations to combat disease, quality assessment is often reduced to quantifying one or a few compounds. Herbal formulations are however very complex and only a selected few compounds very seldom will be satisfactory to determine the changes in the chemical profile and composition of cultivated material. Metabolomics is a relatively new technique used to take a snap-shot of the plant revealing all the metabolites in the plant at a specific time. Since it is a holistic approach, it attempts to determine quality of produced material by not only focusing on a selected few compounds, but

targets the whole metabolome. The paper will discuss the possibilities and challenges of using this technique in quality assessment of cultivated South African medicinal plants.

doi:[10.1016/j.sajb.2013.02.045](https://doi.org/10.1016/j.sajb.2013.02.045)

Taxonomy and conservation of *Marasmodes* (Asteraceae, Anthemideae): A highly threatened and often overlooked genus endemic to the Cape Floristic Region

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Marasmodes DC. is a genus of rather inconspicuous woody shrubs with sclerophyllous ericoid leaves and sessile discoid flower heads. The species flower during the dry autumn months and are rather indistinguishable from the surrounding vegetation when not in flower. As a result they have been largely overlooked and poorly collected. Prior to 2009 only four species were recognised. In the last three years these have been teased apart, with nine species newly described, so the genus now comprises 11 species. However, a thorough taxonomic revision of the genus is required to assess the status of the four original species in relation to the slew of newly described taxa, as well as to provide a comprehensive taxonomic key to identify them. They are all highly localised and largely found in agricultural landscapes where there is significant development pressure. Consequently they are also all considered to be highly threatened and two are possibly already extinct. It is for these reasons that CREW (Custodians of Rare and Endangered Wildflowers) dedicate a day each year, *Marasmodes* Day, focused on locating species of this genus. Through this program and targeted fieldwork as part of the revision almost all of the species have been located and studied *in situ*, another three new species discovered, and *M. beyersiana* S.Ortiz revealed to be a synonym of *M. polycephala* DC. A taxonomic revision of the genus, in which we now recognise 15 species, along with a reassessment of their conservation statuses is presented.

doi:[10.1016/j.sajb.2013.02.046](https://doi.org/10.1016/j.sajb.2013.02.046)

The Bews Virtual Herbarium (NU): Introduction to a useful resource via BRAHMS-online

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In keeping with international trends towards digitisation of biological collections, the staff of the Bews Herbarium (NU) on the Pietermaritzburg campus of University of KwaZulu-Natal, migrated its existing database from PRECIS to BRAHMS in 2011. BRAHMS (Botanical Research and Herbarium Management System) was designed by Denis Filer of University of Oxford to be a free, flexible and powerful tool for use by botanical researchers and herbarium workers. It allows the herbarium database to be published to a

searchable web site, which provides a useful service to users of botanical information. About 30 000 botanical records in the BRAHMS database of Bews Herbarium are currently available through the BRAHMS portal at the following link: <http://herbaria.plants.ox.ac.uk/bol/nu>. About one fifth of the estimated 150 000 records in Bews Herbarium is accessible through BRAHMS, and continued efforts are made to increase this percentage. A large proportion of records were converted from PRECIS to the new BRAHMS format, but new digitisation efforts are adding new and old records in the BRAHMS format. Specimens and specimen labels are photographed for data capture, which means that both photographs and data are available for consultation by researchers. Data is easily exported in Excel format and localities are available in Google Map/Earth format. The basic features, lay-out and functionality of the web site will be demonstrated to show how its use can benefit research.

doi:[10.1016/j.sajb.2013.02.047](https://doi.org/10.1016/j.sajb.2013.02.047)

The development of an accurate DNA-based identification tool for traded and protected tree species in Southern Africa

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A prerequisite for efficient control and seizure of illegally harvested forest products is a rapid and accurate method of identification. However, most producing nations still rely on slow and in some cases intense limited morphological identification practices. The current and rapid development of DNA barcoding techniques is acknowledged to bring about accuracy and efficiency in species identification. The main objective of this project is to generate a DNA barcode library for traded and protected trees, and test the efficacy of DNA barcode in discriminating timber species. Furthermore, the project also successfully explores the recent progress in DNA isolation from unconventional materials. Our current library represents a database of 109 species representing 10 genera for which the standard barcoding regions *matK* and *rbclA* are generated. This database can serve as a backbone to a better control mechanism based on DNA techniques for species identification and also advances the ability of relevant authorities to rapidly identify species of timber at entry and exit points between countries with simple but fast and accurate DNA techniques.

doi:[10.1016/j.sajb.2013.02.048](https://doi.org/10.1016/j.sajb.2013.02.048)

A geobotanical investigation of the Koedoesfontein Complex in the Vredefort Dome

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The Vredefort Dome hosts several unique dioritic to ultramafic intrusive bodies, which were emplaced into the core and collar of the dome. Differences in the mineralogy of these intrusions can produce various weathering products and abrupt transitions in soil characteristics. This ultimately affects the floristic and physiognomic characteristics of the associated vegetation. There is insufficient knowledge of the geological factors that determine species occurrences and abundance on various geological formations. The primary aim of this study was to broaden our knowledge by investigating one of the ultramafic complexes in the dome, namely the Koedoesfontein