

serve as biofertilizers in cropping systems. Studies of their grain yield and food quality are therefore crucial for human nutrition and health in Africa. The leaves and grain of cowpea, for example, are consumed in large quantities in Africa and elsewhere in the world. Protein levels in the edible leaves are high and range from 29 to 40%, while grain protein also ranges from 23 to 40% depending on the variety and its symbiotic functioning. In fact, the grain protein of farmer-selected cowpea varieties such as Soronko and Bengpla can be as high as 40%, a level comparable to that of soybean. Both leaves and grain also contain very high concentrations/amounts of macronutrients and trace elements, the latter needed for overcoming micronutrient deficiency in rural Africa. Evidence from field and glasshouse studies has shown that, as with leaf and grain protein, the accumulation of mineral nutrients by cowpea is symbiosis-dependent. In the field, cowpea varieties with high N<sub>2</sub>-fixing ability accumulated more nutrient elements than low fixers, while in nodulation assays, rhizobia with high N<sub>2</sub>-fixing efficiency generally elicited greater mineral accumulation in cowpea shoots when compared to strains with low symbiotic efficacy. These findings on the symbiosis-induced mineral accumulation in cowpea offer an additional explanation for the benefits of legume/cereal rotations beyond the known N contribution by the legume and further validate cowpea as an important food legume for nutritional security in Africa.

doi:10.1016/j.sajb.2015.03.005

#### Why has there been no success in finding new antibiotics from plants?

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There has been tens of thousands of publications on antimicrobial activity and plants in good journals and hundreds of thousands of publications on poor journals. The motivation is frequently that due to the increased resistance of microorganisms to current antibiotics there is an urgent need to find new antibiotics. With the multiplication of poor open access journals many publications in this area have hardly any value. In contrast to the use of plants for other indications where in the order of 25% of prescribed pharmaceuticals originated from plant leads and the majority of antibiotics originating from fungal leads there has been no commercial antibiotic developed from plants. Several actors may play a role including the methods used, the plants selected for investigation, low activity of isolated compounds in comparison to the activity of the crude extract and cellular toxicity of isolated compounds. Few compounds are ever tested on animals and factors such as a lack of bioavailability may also be involved. Because the same antimicrobial compounds are repeatedly isolated, it appears that plants use a limited number of compounds for protection against microorganisms, but enhances activity by synergism with other compounds present in extracts. There are two possible solutions to the problem. The first is to focus on developing herbal extracts with good activity. In the case of topical application safety may not be a major complication. Another alternative is to screen large number of plants using reproducible methods and then investigate species with high activity in depth. The phytomedicine has had success in this approach in isolating a novel compound with higher activity and better safety against *Candida albicans* than the commercially used fungicide amphotericin B.

doi:10.1016/j.sajb.2015.03.006

#### The role of pollinators in the floral diversification and life history of *Leucospermum* (Proteaceae)

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*Leucospermum*, commonly known as pincushions, are an endemic genus often associated with South Africa and, more specifically, the fynbos ecosystem and Cape Floral Kingdom. The staggering floral polymorphism within the genus suggests a wide variety of pollination modes. Despite this remarkable assortment of floral morphologies within *Leucospermum* only recently has any research been conducted to explain the role of pollinators in driving diversification. In this study we construct the first molecular phylogeny for the genus and, taking relatedness into account using a phylogenetic generalized least squares approach, determine how pollinators have driven floral divergence. Pollinators were assigned through direct observations and a suite of floral traits that are likely to reflect pollination mode were measured for each taxa. In addition, the ability to autonomously self-pollinate was determined for each taxon and used to test if autogamy is linked to specific classes of pollinators, specialized taxa or recently derived taxa. All fieldwork has been finalized and we are awaiting our phylogenetic analysis before any results can be determined.

doi:10.1016/j.sajb.2015.03.007

#### Natural products for skin infections

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Traditional medicine or natural products are often the first line in the therapeutic treatment for skin infections. This study explores some of the antimicrobial efficacies of natural products with special emphasis on their use to treat dermatological infections. Antimicrobial methods used include the minimum inhibitory concentration (MIC) assays and interaction studies where the calculation of fractional inhibitory concentrations (FIC) and isobolograms are given. Studies on some of the most widely used essential oils for dermatological conditions demonstrated noteworthy antimicrobial activity, particularly against *Propionibacterium acnes* (ATCC 11827), having MIC values as low as 0.5 mg/ml against *Cymbopogon citratus* (lemon grass), *Commiphora myrrha* (myrrha), *Pogostemon patchouli* (patchouli) and *Andropogon zizanioides* (vetiver). Of particular interest is the inhibitory effects (as low as 0.1 mg/ml) of commercial oils against *Santalum album* (sandalwood) and *A. zizanioides* against *Brevibacterium* spp., a group of bacteria responsible for foot odour. Synergistic interactions were noted between oils commonly used together. Naturally derived bee products (honey and propolis) are frequently used for wound healing and our studies show that some South African honey samples demonstrate activity (lowest activity 11% growth inhibition), equivalent to the gold standard Manuka honey, derived from Australia. South African propolis has shown excellent antimicrobial efficacy with activities of 6 µg/ml when tested against *Staphylococcus aureus*. This activity correlates with the high flavonoid content observed during chemical profiling studies. When examining the dermatological application of medicinal plants in the South African context, over 100 plant species were identified as being of importance. Some of these species will be highlighted where