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Commentary

Phytochemical investigations of species of semi-arid Australian plants: A neglected area of research.[1*]

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BACKGROUND

Approximately 80% of mainland Australia is considered to be arid or semi-arid.[1] Most of the desert flora remains unexplored. There is a wealth of anecdote from first nation Australians, with a number of books detailing Aboriginal use of plants[2-7] and papers, dealing with either single plant species or groups of species reported as being used by Australian Aboriginal people, scattered throughout the literature.[8-15] These provide a good deal of information that can be a stepping stone to investigate the medicinal potential of a large number of desert floral species.

My own interests lie particularly with desert species of the Families Goodeniaceae, Gyrostemonaceae, Myoporaceae, Myrtaceae and Rutaceae. These are certainly not the limiting species that require investigation. The Australian flora is amongst the most biodiverse of the planet and yet there seems to be little support for research efforts into this amazingly varied panoply of life forms!

To give just a sample of what has been done, I have included a short précis of work reported on the families listed above.

Goodeniaceae

Within this family, my special focus is on the genera *Scaevola* and *Goodenia* with a view to identifying cancer and diabetes treatments.

A review by Ghisalberti[16] highlights how little of the phytochemistry and ethnopharmacology of this almost endemic Australian plant family has been investigated. Amongst the secondary metabolites discovered in *Scaevola spinescens*,[17, 18] the pyranocoumarins, iridoid glycosides, sesquiterpenoids and triterpenoids appear to exhibit a variety of biological activities that might be exploited in the development of medicinal agents. The occurrence of alkaloids within this family appears minimal with only limited investigations confirming their presence in non-Australian species[19, 20] although these might be artefacts of extraction. Even less is known about alkaloid content in the Australian species, with a couple of *Goodenia* and *Scaevola* species showing their presence in field tests but nothing further is known.[21, 22]

The pentacyclic triterpenoids isolated from various species of Goodeniaceae include ursolic acid (oleanene)[23], myricadiol and taraxerol (taraxerenes),[24] betulin and betulinic acid (lupenes).[25] These compounds and their many derivatives are variously described as being anti-tumorigenic[26] or antidiabetic.[27]

Also noted is the anti-tumour activity of the α-bisabolol derivative isolated from *Scaevola spinescens* and named scaevolal in deference to its relative abundance in the lipophilic plant extracts.[17]

Gyrostemonaceae

This small family includes the species *Codonocarpus cotinifolius* (Desert Poplar, Mustard Tree etc), which is reputed to have been combined with *Scaevola spinescens* in the treatment of cancer. Very little has been published on this plant family. Only 4 papers are listed in Scopus with two specifically dealing with the isolation of alkaloids from *Codonocarpus australis*[28, 29] with nothing appearing since.

Myoporaceae

In this family, the genus *Eremophila* has been quite extensively investigated in terms of its phytochemistry.[12] What is not known is the range of biological activities associated with the 'Emu Bush'. The *Eremophila* are well-recognised as Aboriginal medicines and at least one research group has published results of cardio-active compounds isolated from *Eremophila alternifolia*.[13, 30]

Myrtaceae

Species of Myrtaceae are very numerous and have been studied sporadically for many years. A large number of this family have been (and are still) used by Aboriginal folk in the Outback as sources of both food and medicine.[3, 6, 7]

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The family includes eucalypts, paperbarks and bottlebrushes, fringe myrtles and tea-trees. An extensive phytochemical literature is available but little exploration of their medicinal value has been executed… except perhaps for *Melaleuca alternifolia*.[31-33]

Rutaceae

A situation similar to that of Myrtaceae obtains for this large family! There is extensive scope for investigations here.

SOME DIRECTIONS FOR RESEARCH

Taking the cue that it is often bioavailability/toxicological issues that hinder the advance of plant extracts from the lab to the pharmacy, it seems appropriate to study some structure-activity relationships (SARs) of the variety of constituents found in the Goodeniaceae and other families.

Since the author has an interest in Aboriginal medicines (polypharmacy) and orthodox pharmaceuticals (monopharmacy), it seems pertinent to investigate both the phytochemistry and pharmacology of the Goodeniaceae (and other families) more thoroughly, with a view to developing appropriate formulations – oral dose forms for internal cancers and topical applications, especially in the case of skin cancers.

Methods to use and potential outcomes

Classical procedures for the *extraction and isolation* of constituents, together with their structure elucidation in the case of novel compounds are appropriate. Semi-automated chromatographic procedures, HPLC, GC/MS and LC/MS/MS are generally available for the required tasks.

Biological activities can be investigated by a number means including cell cultures animal studies and flow cytometry. These activity studies would involve you and your colleagues in multidisciplinary studies. As such, significant collaborative efforts would occur.

SARs would involve comparative studies of the natural products as well as a suite of prepared derivatives of the natural species. Thus enter the synthetic organic chemist. Lead compounds, including mixtures, would be examined for their suitability as topical formulations …. And who knows what might result?

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