



Bioactivity of *Hibbertia scandens* – an Australian Aboriginal Traditional Medicinal Plant

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Authors' contributions

This work was carried out in collaboration between both authors. Author RMA wrote the original draft of the manuscript. Author HAA reviewed and edited the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

The First Australian Community is one of the ancient civilizations which has been dependent upon the available surrounding natural resources for their clothing, nutrition and healing of disease. Unfortunately, some of their traditional medicines and / or their practical applications are lost because of poor written documentation. Plants form parts of ancient remedies used by Aboriginal peoples to heal several ailments due to their therapeutic activities. One of these medicinal plants is *Hibbertia scandens* (Snake Vine), which has been used by Aboriginal Communities as a traditional medicine to treat sores and rashes due to antibacterial and antiseptic properties of this plant.

Keywords: *Traditional medicine; plant medicine; Australian aboriginal traditional medicine; Hibbertia scandens.*

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1. INTRODUCTION

1.1 Traditional Medicines

Since ancient times, humans have depended upon Nature for their basic requirements, nutrition, shelter, clothing, transportation, flavours, fragrances and medicines. Ancient medicinal systems existed in many parts of the world, of which the Ayurvedic, Traditional Chinese and Egyptian are possibly the most well-known traditional medicinal systems.

Traditional medicine, which is often called alternative or complementary medicine in developed countries, refers to health practices, approaches and knowledge built upon the theories, beliefs and experiences of ancient communities. This type of medicine can be divided into medication therapies, which include the use of plants, animal or other organisms, and non-medication therapies, such as acupuncture, manual and spiritual therapy [1-3].

Traditional medicine is widely spread throughout developing countries, where more than 80% of the total population depends upon natural products because of their accessibility and affordability. These non-conventional medicines are also used in developed countries as a result of a number of factors, including the movement of people (and their practices) and increased awareness of the adverse effects of existing drugs. Unfortunately, despite the increase in demand for these medicines, there is often poor clinical evidence to support their therapeutic efficiency and safety [1-3].

1.2 Plant Medicines

There are many existing drugs and supplements which are based upon natural products derived from sources including animals, plants, bacteria, fungi, and marine organisms. Vitamins A and D from cod liver oil, paclitaxel (Taxol) (8) from *Taxus brevifolia* and doxorubicin from *Streptomyces peucetius*, are examples of medications derived from different natural resources [4-6]. Plants form the basis of complex traditional medicinal systems that have existed for thousands of years and which continue to provide the inspiration for new remedies. In general natural products and their derivatives constitute more than 50% of all the drugs in clinical use in the World, with plants accounting for no less than 25% of this total [7,8].

Plants produce two classes of substances, primary metabolites, necessary for their own function, and secondary metabolites, used for defence and characterization purposes. Since ancient times, humans have benefited from the use of these secondary phytochemicals, using them as pigments, flavourings, fragrances and medicines. Secondary metabolites can be classified into three major groups, phenolics, terpenoids and alkaloids [9,10]. Phytochemicals are used traditionally due to their activity against many diseases, and include anti-inflammatory, anti-tumour and anti-bacterial agents.

1.2.1 A brief history of the use of plants as medicines

There are many ancient manuscripts which document the dependence of ancient cultures on plants to cure illnesses. For example, Sumerians documented plant-based medicine systems on mud slabs since 5000 years ago, which included 12 preparation methods from 250 plant species, such as henbane and poppy. A Chinese herbology volume 'Pen T'Sao', written by Emperor Shen Nung ca. 2500 B.C., lists about 365 recipes derived from plant materials such as ginseng and cinnamon bark. The Vedas, the Hindu scriptures, refer to the use of many spices, some of which are still used until this day, such as like clove, nutmeg, and pepper. There were also over 1000 medicinal plants described in ancient Arabic manuscripts such as Canon Medicinæ 'al-Qanun fi al-Tibb' by Ibn Sina (980-1037 A.D.) and Liber Magnæ Collectionis Simplicium Alimentorum et Medicamentorum by Ibn al-Baitar (1197-1248 A.D.) and the knowledge in these texts spread through Europe during the Middle Ages [8,11,12].

1.2.2 Australian aboriginal peoples and their medicines

The Australian Aboriginal civilization is one of the most ancient civilizations and has been threatened with disappearance and extinction due to many reasons, including the displacement of people from their traditional locations, the passing of elders who held and practised the traditional knowledge, and deficiencies in ethnomedicinal natural products due to deforestation. The medical knowledge which has existed for over 40,000 years is in danger of disappearing because of deficiencies in documentation [13] as its preservation was previously limited to oral transfer from generation to another, along with very few written recordings by early settlers [14,15].

Due to their geographic isolation, First Nation (Aboriginal) community used the unique and distinct normal flora available in their environment for many purposes, including nutrition and therapies. Unfortunately, there has been relatively little interest in this bush medicine, which was derived from diverse botanical sources.

First Nation medicines were prepared for external use as ointments, poultices, and often employed steam or smoke; plant preparations were made by boiling or suspending plant materials in water, or by the burning or direct warming of plant materials without water. The majority of these medicines depend upon the direct application of fresh plant materials [13,15]. Most of these preparations have been used as remedies for skin diseases, wounds, burns, microbial infections, fever and rheumatic pains, but a small portion are for internal use, including the treatment of sore throats, pain and headaches, and systemic infections such as cold and influenza [16]. In the latter applications, these folk medicinal plants are prepared by freshly crushing the leaves and fruits or without processing, which explains the requirement for easy access to these plants [17].

First Nation medicinal plants have been used to treat illnesses such as colds, asthma, diabetes and diarrhea and these communities have also benefited from the antibacterial and antiseptic properties of these plants in the healing of cuts, burns, bites and stings. Some of these plants were also administrated as a general health tonic and / or have insect repellent effects [14,15,18].

Packer *et al.* discussed fifty-four medicinal plant preparations after interviewing nineteen people from the Yaegl Aboriginal Community in Northern New South Wales, Australia. These plant preparations are made mostly from leaves (56%) including *Alocasia brisbanensis*, *Canavalia rosea* and *Duboisia myoporoides* and fruits (31%) including *Eupomatia laurina*, *Opuntia* and *Phytolacca octandra* which are used to heal several illnesses. Plants used to treat cancer such as *Carica papaya* and *Sonchus oleraceus*, Diabetes like *Smilax australis* and *Smilax glyciphylla* and Arthritis such as *Centella asiatica*, *Ipomoea brasiliensi* and *Smilax glyciphylla* [17]. Many of Aboriginal medicinal plants used to treat skin illnesses that are common in this community [19,20]. This gives an indication of the possibilities associated with harnessing the antimicrobial potential of these plants. Most of these plants arising from these interviews with

the Yaegl Community are known in the medicinal plant systems of other communities, except *Hibbertia scandens* used to treat sores and rash and *Lophostemon suaveolens* used for wound healing because of their antiseptic effect [17,19].

1.2.2.1 *Hibbertia scandens*

Hibbertia scandens (Willd.) is a native Australian plant that was reported to be of medicinal value by the Yaegl Community, but which is not mentioned in any pharmacopeia of other ancient civilizations [13,18].

H. scandens belongs to the Dilleniaceae family, *Hibbertia* genus. The unique Australian plant genus *Hibbertia* comprises 150 species, numbers of which have featured in the medicinal, cultural and religious aspects of First Nation people's lives [21]. *H. scandens* has different common names, such as snake vine, yellow vine, Golden Guinea vine or climbing Guinea flower and is found natively in Australia in the area extending from South-East New South Wales to North-East Queensland. It is a climbing plant, characterized by a golden yellow flower with five sepals and five petals and about 6 cm elliptical leaves with an unpleasant odour (Fig. 1A). The fruits of *H. scandens* are capsular, containing two to five shiny brown seeds with gruff seed coverings (Fig. 1B) [22]. *H. scandens* is a wild plant that can tolerate different climates, including tropical and sub-tropical, which can grow in coastal areas due to its salt resistance; its flowers grow best in exposed to full sun zones but can also grow in partially shaded areas [23].

H. scandens leaves were used locally to treat skin-related ailments such as sores and rashes, suggesting that it has wound healing properties [13,14,17]. However, there have been very limited studies on the biological evaluation of *H. scandens*. An ethanol extract (70%) of *H. scandens* leaves displayed slight antibacterial activity against methicillin-sensitive *Staphylococcus aureus* (MSSA), as well as free radical scavenging potential and antioxidant properties [13]. Another study showed the antibacterial potential of both aqueous and ethanol extracts of *H. scandens* leaves against *Pseudomonas aeruginosa* and *Staphylococcus aureus* [24,25], while another report on the aqueous and 80% ethanolic extracts of the leaves indicated that they had no antibacterial activity against these microorganisms [14]. The phytochemical screening of the ethanol extract (70%) of *H. scandens* leaves using indicators demonstrated the existence of flavonoids, steroids, terpenoids and tannins [13].



Fig. 1. *H. scandens* (A) flower [23] and (B) fruit [26]

2. CONCLUSION

Natural products, derived from a variety of organisms including plants, marine species, and fungi, have been used for thousands of years not only as foodstuffs but also for other purposes such as medicinal uses. Medicinal plants form a major part of these traditional medicines because of their affordability and accessibility, and are traditionally applied freshly or after some processing. Although the use of these folk remedies (and their components) has spread globally, the majority of them still have not undergone clinical investigation and evaluation. The Australian Aboriginal Community is one of the oldest global civilizations and, unfortunately, much of their knowledge and expertise in this area has been lost. *Hibbertia scandens* is one of the plants which has only been utilized by this community to treat sores and rashes, but the part of the plant used and the preparation method of implementation are unknown. This review supports the traditional medicinal uses of this plant due to its antibacterial effect and suggests the isolation and identifying the components of different parts of this plant to determine the compounds responsible for its bioactivities.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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