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Perspective paper

Riding the wave: South Africa's contribution to ethnopharmacological research over the last 25 years

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Abstract

South Africa is a country with both rich floral biodiversity and cultural diversity. Traditional herbal medicines form an important part of the healthcare of most South Africans, and relies heavily on the use of indigenous plants. This article briefly describes the role South Africa has played in recent years, in contributing to the worldwide increase in research in the field of ethnopharmacology.

Keywords: Ethnobotany; Ethnopharmacology; Indigenous knowledge; South Africa; Traditional medicine

1. Introduction

Over the past 20 years, there has been a resurgence of worldwide scientific research in the field of ethnopharmacology. With the western world acknowledging the continued use of traditional medicines by the majority of third-world countries, and the need for novel drug development, much of the pharmaceutical research in recent years has focused on an ethnobotanical approach to drug discovery.

Southern Africa boasts an amazing floral diversity, with an estimated nearly 30,000 species of higher plants, many of which are endemic to the region (Goldblatt, 1978). Besides the great range of climatic zones and habitat types, South Africa also has great cultural diversity. For example, there are 11 official languages, 9 of which are indigenous. It is a complex country, and is often described as "a land of contrasts". Although an interesting merging of first- and third-worlds exists in all spheres of society, a dichotomy between the two still remains. This presents the possibility for many shortcomings, but also the unique opportunity to understand diverse points of view.

2. Traditional medicine in South Africa

In South Africa, as in most developing parts of the world, traditional herbal medicine still forms the backbone of rural healthcare. The government health services in South Africa provide only western medical care although the majority of the population consult traditional healers for some or all of their healthcare needs (McGaw et al., 2005). The use of traditional medicine is especially prevalent in regions where western medicines are inaccessible due to unavailability and their comparably high cost. It is, however, largely due to the cultural importance of traditional medicine that the demand for these herbal remedies remains so high (McGaw et al., 2005).

Due to the remarkable plant and cultural diversity in South Africa, a large number of plant species are used for medicinal purposes. For example, Zulu traditional healers use 1032 species, from 147 families (approximately 25% of the flora of KwaZulu-Natal) (Hutchings et al., 1996). In South Africa as a whole, it has been estimated that approximately 3000 plant species are used as medicines (van Wyk et al., 1997). Of these, as many as 500 species are traded in large quantities in informal medicinal plant markets, which contributes to a multi-million Rand "hidden economy" (Mander, 1998; Williams, 1996; McGaw et al., 2005).

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3. Ethnopharmacological research in South Africa

Ethnobotanical information forms the starting point for many ethnopharmacological studies (Buenz et al., 2004), and remains an important aspect of this field of research. In contrast to the two well developed systems of traditional medicine found in Indian Ayurvedic and Chinese traditional medicine, which have been extensively documented over centuries (Cragg and Newman, 2001), there is very little recorded documentation for most of African traditional medicine.

In southern Africa, references to the indigenous *Materia Medica* are found in early traveller's accounts and early ethnobotanical studies (van Wyk, 2002). One of the classic documentations of indigenous botanical medicines is that of Watt and Breyer-Brandwijk (1962), which was first published in 1932. This detailed and comprehensive publication on medicinal plants of southern and eastern Africa constitutes an extremely valuable reference work.

The fact that African traditional knowledge systems are largely oral, and not written, accentuates the fragility of this type of indigenous knowledge. As a result of urbanisation and strong cultural influences from other regions of the world, there is now an ever-increasing loss of traditional knowledge in southern Africa (van Wyk, 2002). Consequently, some effort has been made towards investigating and documenting the traditional medicinal practices of a number of southern African cultural groups in more recent years. To date, however, only the surface of these complex healthcare systems has been exposed. A recent review on ethnobotanical research in South Africa gives an overview of the surveys of various cultural groups in southern Africa (van Wyk, 2002). Two recently published books, on South African medicinal plants and the general traditional use of indigenous plants, (van Wyk et al., 1997; van Wyk and Gericke, 2000) have also brought South African ethnobotany to the general public and sparked renewed interest in the field.

The changes in the socio-political climate in South Africa, over the last 10 years, have resulted in increased awareness and funding related to this kind of research. The new government and restructured National Research Foundation (NRF) are promoting greater interest in research of the country's natural resources. In particular, funds have been allocated to promote research in Indigenous Knowledge Systems. As a result, research in ethnobotany and ethnopharmacology has increased. This is evidenced by an increased contribution of research on South African medicinal plants over the last 10 years—a trend that is clearly reflected in publications in the *Journal of Ethnopharmacology*. Fig. 1 reflects the results of an electronic search of publications in this journal, using the keywords "Africa" and "African". As such, it gives a representative indication of studies conducted on African medicinal plants over the last 25 years, although not entirely comprehensive. Between the years 1980 and 1989 contributions from South Africa were less than 10%, and only 20% in the period between 1990 and 1994. However, this increased

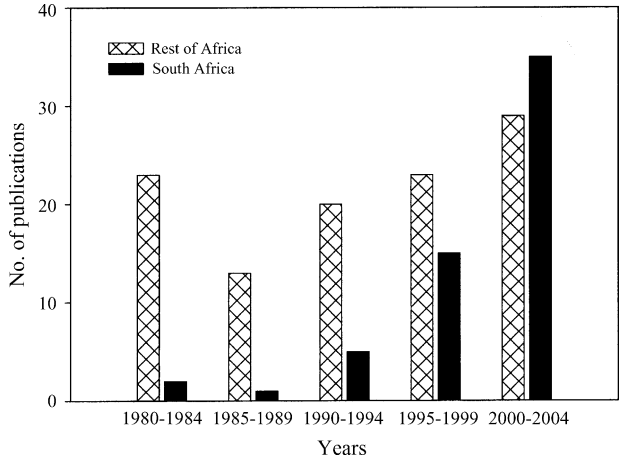

Fig. 1. Representation of the contributions from South Africa and the rest of Africa to publications in the *Journal of Ethnopharmacology* over the last 25 years. (*Note:* This is not a comprehensive analysis, but serves to give a general trend.)

to 39% between 1995 and 1999, and there has been an even greater contribution in the last 5 years to 55%.

A major emphasis of ethnopharmacological research in South Africa has been establishing the scientific rationale for traditional medicine and validating their use. This is largely due to the current trend which is moving towards the integration of traditional herbal medicine with primary healthcare. In South Africa, the prescription and use of traditional medicine is currently not regulated. As a result, there is always the danger of misadministration, especially of toxic plants. Furthermore, the potential genotoxic effects that follow prolonged use of some of the more popular remedies are also cause for concern (Fennell et al., 2004b).

The review by Fennell et al. (2004b) gives an overview of many recent ethnopharmacological studies on South African plants. Many plants from the region have been screened for antibacterial, antifungal, anthelmintic, antiamoebic, antischistosomal, antimalarial, anti-inflammatory and antioxidant activity, as well as psychotropic and neurotropic activity using appropriate in vitro tests. Table 1 gives a breakdown of some of the types of studies which have been conducted on African and South African plants in the last 10 years, and published in the *Journal of Ethnopharmacology*. It was compiled using a general electronic search, as described above, and although it is not a comprehensive list, it does give an indication of how the emphasis of certain types of studies has shifted during this period. Antimicrobial screening has formed the basis of much of the research, and is still an important area of research, considering the development of multidrug resistant bacteria. More recently, investigations relating to anti-inflammatory activity have received increasing attention, with the development of bioassays for cyclooxygenase and lipoxygenase enzymes. In Africa, malaria is still a major problem, and research in this area has many important implications. Furthermore, ethnopharmacological research could play an important role in the worldwide HIV-AIDS pandemic,

Table 1
Contributions of South Africa and the rest of Africa to studies published in the *Journal of Ethnopharmacology* over the last 10 years, giving a breakdown of the type of investigation

Type of study	1995–1999		2000–2004	
	South Africa	Rest of Africa	South Africa	Rest of Africa
General	1	3	2	3
Anti-inflammatory/analgesic	3	0	5	4
Antimicrobial	5	4	13	5
Antiplasmodial/antimalarial	1	2	3	5
Antioxidant	0	0	4	2
Antiviral/antifungal	1	1	2	2
Cancer	0	0	1	0
Central nervous system	1	3	2	2
Conservation	0	0	2	0
Molluscicidal/schizontocidal	3	1	2	0
Safety and toxicity	0	0	2	1
Wound healing	2	0	1	1
Other	5	3	3	9

Note: This is not a comprehensive list, but serves to give a general trend.

and associated opportunistic infections, such as tuberculosis and oral thrush. An example of such is study a that of Motsei et al. (2003) which investigated the use of South African medicinal plants to treat *Candida albicans* infections.

As mentioned above, the issue of the possible toxic, genotoxic and/or mutagenic effects of plants used in traditional medicine is extremely important, and is also highlighted in the review by Fennell et al. (2004b). There are a number of studies on plants used in human diets or in traditional medicine which have shown mutagenic effects in in vitro assays. Furthermore, in a study by Elgorashi et al. (2004) a herbicide known for its mutagenic, genotoxic and teratogenic effects was isolated from cultivated medicinal plants. This raises the important issue concerning good agricultural practices.

Successful research in ethnopharmacology encompasses various disciplines which need to be integrated. These include the testing of extracts and isolated compounds in pharmacological bioassays, and phytochemistry. In South Africa, there are a number of active research groups in the field of natural products chemistry (George et al., 2001). The contribution of South African medicinal chemistry to global phytochemistry has been recently reviewed (Mulholland and Drewes, 2004). This interesting editorial on the history of natural product chemistry in South Africa highlights the attempts of chemists since the early 1900s to investigate the chemistry of the southern African flora.

4. Future prospects

There are many complex issues surrounding the use of indigenous plants in traditional medicine in South Africa, including that of bioprospecting and intellectual property rights (George and van Staden, 2000). Of great importance is the concern regarding the conservation status of medicinal plant resources. As a result of over-harvesting, in order to meet the increased demand for medicinal plants, and the pressure of habitat destruction caused by agricultural, forestry, industrial and urban development, there are some valued indigenous plant species which are now near extinction (Williams et al., 2000). Consequently, there is a need for conservation strategies and the promotion of sustainable harvesting. One such approach involves developing medicinal plants as crops for small-scale farming (van Staden, 1999). Fennell et al. (2004a) reviews a number of studies related to the effect of cultivation and post-harvest storage practices on levels of biological activity in traditionally used medicinal plants in South Africa, areas of ethnopharmacology which have received scant attention until now (Stafford et al., 2005).

As mentioned earlier, there is an urgent need in South Africa for ongoing scientific documentation of indigenous knowledge. It is also important that this be used for the application and beneficiation of sustainable development in South African communities (van Wyk and Gericke, 2000). The use of medicinal plants in their crude form, without scientific evaluation of their efficacy and safety could be harmful. Therefore, there is also the need to continue scientific evaluation of these plants. Through scientific validation of effective remedies, coupled with training of healthcare practitioners, it may be possible to bring traditional medicine to a level of efficiency and safety where it can be regarded as an acceptable alternative to western healthcare systems. Currently, there are only a few South African medicinal plants that have contributed to herbal medicines used internationally. These include, for example, aloe (*Aloe ferox*), buchu (*Agathosma betulina*), devil's claw (*Harpagophytum procumbens*), cancer bush (*Sutherlandia frutescens*) and *Hoodia* (van Wyk, 2002).

5. Conclusion

The field of ethnopharmacology, and related disciplines, such as ethnobotany and natural products chemistry, is progressing steadily in South Africa. There is still a lack of research that would benefit the majority of the users of traditional medicine in South Africa, such as the traditional healers, gatherers and traders. Most of the research support is directed at seeking commercially useful compounds from medicinal plants.

The *Journal of Ethnopharmacology* has had a major impact, and provided a valuable platform, in the field of ethnopharmacology in southern Africa, especially in terms of validating claims made by traditional healers. South African researchers have certainly contributed to the global trend of increased awareness and interest in this field, and will continue to do so into the future. At present, South Africa is rich in biodiversity, but relative to most first-world countries it is poor in biotechnology. It is important that the latter be strengthened to make full use of the potential of all our resources.

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