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Review

Medicinal plant harvesting, sustainability and cultivation in South Africa

A.S. van Wyk[a,*], G. Prinsloo[b]

[a] Department of Environmental Sciences, University of South Africa, Florida campus, Florida 1710, South Africa
[b] Department of Agriculture and Animal Health, University of South Africa, Florida campus, Florida 1710, South Africa

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ABSTRACT

Concerns regarding the conservation of medicinal plant species are receiving much attention due to overharvesting and exploitation. Medicinal plant harvesting is a global concern as plants are the source of the majority of medicines, either traditional or western, in the world. Millions of U.S. dollars of plant material are being exported annually from developing countries to developed countries. The challenge in developing countries is that, apart from the exports, the majority of people in those countries still use medicinal plant material for their basic healthcare needs. Biodiversity loss is therefore a significant challenge. This review focuses on South Africa as a developing country in which traditional medicines are highly valued, but also engages in exports of medicinal plant material to developed countries. Medicinal plant harvesting, with reference to suppliers of medicinal plant material, customary knowledge and the drivers of increased harvesting rates in South Africa is discussed. General aspects of sustainability and the causes of unsustainable medicinal plant harvesting, as well as cultivation to increase medicinal plant populations referring to its advantages and disadvantages and the challenges regarding cultivation of medicinal plant species for the medicinal plant trade market are reviewed. The shift from a cultural method of survival to a competitive trade business, South Africa's legislation regulating the management of natural environments, legislation compliance and the regulation of African traditional medicine are also reviewed.

1. Introduction

Plants were once the primary source of medicines in the world. Since then, plants continue to provide humans with new remedies as 50% of all drugs in clinical use in the world are derived from natural products, of which higher plants contribute 25% of the total (Van Wyk et al., 2013). Medicinal plants play an integral role in basic healthcare in many developing countries, including South Africa (Fullas, 2007). In developing countries approximately 80% of people use traditional medicines because of its affordability and cultural acceptability (Maroyi, 2013).

South Africa is home to more than 30,000 species of higher plants of which at least 3000 species could possibly be used medicinally (Van Wyk and Gericke, 2007). Authors differ in the number of species that are most actively and commonly used and traded. Mander (1998) reported 700 species commonly used and traded, and Van Wyk et al. (2013) reported only 350 species, which could be an indication of reduced availability between 1998 and 2013, although detail on the species are not available. No statistics are available after 2013 which could serve as an indication of the neglect of monitoring and recording of use and exploitation of medicinal plant species. The majority of plant material used as traditional medicines is South African indigenous plants harvested from wild resources occurring in grasslands, savannah, forests and thickets. Harvesting includes the collection of either whole plants or plant parts such as roots, bark, flowers, leaves, stems, bulbs and tubers, to treat ailments or to perform rituals (Mander et al., 2007).

The shift from subsistence use to commercial trade in medicinal plants has led to an increase in the frequency of medicinal plants harvested from wild habitats (Van Wyk et al., 2013). All plants, when overharvested are vulnerable to extinction, although medicinal tree species are most vulnerable to harvesting as they are slow-growing, slow-reproducing and many have specific habitat requirements which limit their distribution (Cunningham, 1997). Trees dying as a result of harvesting are therefore not readily replaced. For centuries the sustainable use of medicinal plants was facilitated by several indirect control methods and some intentional management practices. Some of these practices became unused as urbanization and a change in traditional healing practices were experienced.

There are a number of initiatives in South Africa attempting to develop propagation and sustainable production methodologies for continuous sustainable use of medicinal plant material. Funding and coordinated efforts at both provincial and national level, and

* Corresponding author at: 21 Myrtle Rigg Avenue, Bonnievale 6730, South Africa.
E-mail address: 45519560@mylife.unisa.ac.za (A.S. van Wyk).

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competition for limited resources for housing, sanitation, primary education, basic health care and crime prevention, however, restrict the progress and implementation of effective and sustainable conservation strategies for overexploited medicinal species (Crouch and Smith, 2011). Without financial, resource and human capital support from government, municipalities and the private sector, the valued indigenous knowledge and biodiversity of South Africa will continue to be underutilized and exploited.

2. Methodology

Electronic searches of Science Direct and Google Scholar were undertaken to select literature relevant to South Africa and the search was started with search terms “South Africa” and “medicinal plant harvesting” combined with “traditional health practitioners”, “indigenous knowledge” and “trade” for publications dealing with traditional and commercial medicinal plant harvesting and trade. Additional electronic Science Direct and Google Scholar searches using the terms: “medicinal plant harvesting” in combination with “methods”, “commercial harvesters”, “girdling”, “harvesting impacts”, “biodiversity” and “status of bark” were undertaken to search for publications focusing on biodiversity and conservation relating to the different methods of harvesting used by traditional health practitioners and commercial harvesters, the effects of harvesting on biodiversity and the reasons for increased harvesting rates at a global scale. Google searches using the term “South African environmental legislation” were undertaken to search for access to existing South African environmental legislation regarding traditional health practitioners, traditional medicines, forest management, environmental and biodiversity management, protected areas and bioprospecting. Further Science Direct and Google Scholar searches using the terms “medicinal plant harvesting” combined with “sustainability”, “plant parts” and “quantities harvested” was undertaken for publications in which the sustainability or non-sustainability of medicinal plant harvesting and the principles of a sustainable society are highlighted. Using the term: “cultivation” in combination with “medicinal plants” in Science Direct and Google searches, journals were sought which included information regarding medicinal plant cultivation and the challenges regarding medicinal plant cultivation. Books, dissertations and theses were also consulted on the topics of “medicinal plants”, “indigenous knowledge” “environmental management” and “conservation biology”.

3. Results

A total of 366 journal articles, theses, dissertations and books dated between 1970 and 2016 were accessed and consulted on topics pertaining to medicinal plant harvesting, South African legislation, legislation compliance, indigenous knowledge, traditional health practitioners and commercial harvesters, the national and international trade of medicinal plants, biological conservation, environmental management, protected species, sustainability, and cultivation. The literature published between 1970 and 1978 were eliminated. Some of the literature sources between 1978 and 2000 were also considered, even though not recent publications, especially where no new information or statistical data was available. Literature on harvesting and cultivation of medicinal plants in countries other than South Africa were also eliminated for this review. The majority of research on medicinal plant harvesting, sustainability, cultivation and trade in South Africa were conducted, written and published between 1987 and 2016. Literature published after 2016 is extremely limited, which emphasizes the need for updated research and continued monitoring and recording of current trends. Only peer-reviewed publications downloaded from Google scholar and Science Direct were included in the study. South African legislative documents published in the ‘Government Gazette’ were accessed from Google. The department of Forestry and Fisheries (DAFF) mainly publishes statistics on the exports of medicinal plant material. Data that deal with the imports of medicinal material from neighboring countries are generally not available. Of the 366 references, 60 were thus selected and used as references.

4. Discussion

4.1. Indigenous knowledge and medicinal plant harvesting

Individual tribes and ethnic communities in different parts of the world preserved different versions of Indigenous or Traditional Knowledge (Bruchac, 2014). In South Africa, the harvesting of medicinal plant material used to be an activity restricted to traditional health practitioners, (Van Andel and Havinga, 2008). Traditional health practitioners are people with no formal medical training, but the communities within which they live recognize them as being competent in dealing with their healthcare needs by using plant, animal and mineral substances (Agbor and Naidoo, 2011).

Indigenous knowledge (IK), such as the knowledge gained by traditional health practitioners over many generations, which includes knowledge on medicinal plants, their uses and methods of application, is the main asset of the poor in the struggle for survival, to produce food and medicines, to provide for shelter and to achieve control of their own lives (Senanayake, 2015). It is the grassroots of decision-making in their communities, and therefore IK regarding natural resources, ecological zones, aquaculture, agriculture, game-management and forestry is more sophisticated than what was previously believed (Senanayake, 2015). Indigenous Knowledge about the identity and the use of medicinal plants has been circulating chiefly among practitioners of traditional medicine or the benefactors of such practices. Localized knowledge and experiences gained through generations, such as the types, distribution, ecology, methods of management and methods of extracting the useful medicinal plants properties are disappearing annually due to lack of written documents, the death of seniors, migration of people due to drought and social problems, urbanization, the influence of modern medicines and the influx of different cultures (Hamilton, 2004; Regassa, 2013).

Traditional health practitioners have stringent traditional values, which include taboos, superstitions, norms and cultural beliefs regarding the harvesting of medicinal plants, and therefore they contributed towards the conservation of medicinal plant species (Williams et al., 2000; Kambizi and Afolayan, 2006). Examples of customary practices that prevented plants from being overexploited included: 1) they only collected plant material after it has been ordained by their ancestors and after performing certain rituals, 2) where the root of a plant is collected for use as medicine, cultural tradition forbids the collection of more than two roots of the same plant at one time, 3) *Trichilia emetica* (Natal mahogany) is, for instance, conserved for their fruit although they are also used in traditional medicine, 4) harvesting of plants such as *Siphonochilus aethiopicus* (African ginger) and *Alepidea amatymbica* (larger tinsel flower) are restricted to winter collection to ensure seed set and multiplication during summer periods, 5) bark that is used for treating kidney diseases are sometimes only harvested from the eastern and western sides of the tree, traditionally resembling the kidneys thereby preventing ring-barking, and 6) plants were collected with a pointed wooden digging stick or small axe which tended to limit the quantity of bark or roots gathered (Kambizi and Afolayan, 2006; Van Wyk et al., 2013). These indirect control measures were often practiced unconsciously (Williams et al., 2000; Kambizi and Afolayan, 2006), while others were purposefully incorporated to conserve the knowledge and plant material ensuring sustainable harvesting. Several of these practices became unused as the harvesting of material, previously exclusively practiced by traditional health practitioners, is now performed by commercial harvesters. These abolished practices resulted in species such as *Siphonochilus aethiopicus* and *Ocotea bullata* (Black stinkwood) facing serious threats of extinction in South Africa. The shift from subsistence use to commercial trade in medicinal plants