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Review

Ethnomedicine in South Africa: The role of weedy species

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Some weedy plant species have competitive advantage over other species found growing in the same habitat due to their efficient utilization of mineral resources, adaptability to the environment and comparative high fecundity. They are often caught in the web of conservation policy which causes the indiscriminate eradication of these species without consideration for other potential economic importance. This review elucidates the medicinal importance of weedy species found growing in South Africa. Twenty four plant families and 34 species were implicated in the treatment of twenty one diseases and sicknesses by the different natives of South Africa. The importance of this work on the future management of weedy species is briefly discussed.

Key words: Medicinal plant, native medicine, South Africa, weedy species.

INTRODUCTION

Southern Africa has one of the richest plant diversity in the world (Arnold and de Wet, 1993) and a high percentage of these species have been implicated in traditional medicine of the region for several centuries (Watt and Breyer-Brandwijk, 1962; Iwu, 1993; Hutchings et al., 1996; Eldeen et al., 2005). The use of herbal medicine is an integral part of the culture of the people and an estimated 80% of South Africans use herbal remedies for their physical and physiological health care at different stages of their life (Hutchings, 1989; Brandt and Muller, 1995). The high human and flora diversity of the country is probably responsible for the immense knowledge in native medicine. These species are mostly collected from the wild (Cunningham, 1988; Lange, 1997) and some are found in disturbed grass lands where weedy species are reported to be more predominant (Njoroge et al., 2004; Stepp, 2004).

Weeds are defined as plants found growing in unwanted agricultural lands, gardens, road sides and mainly disturbed areas where they do not depend on human intervention for their reproduction and survival (Ngugi et al., 1978; Stephen 1882; Casas et al., 1996).

They are considered as plant pests (Miller, 1999) due to their tendencies to reduce biodiversity and promote habitat loss for less competitive species within the same ecosystem (Heywood, 1995; Mungoro and Tezoo, 1999). Most successful of these plant species are those well adapted to their immediate natural environment with high fecundity (Richardson et al., 1992). Although weedy species could be a menace in most cultivated and natural vegetations, studies have shown the economic benefit of weeds in some crop fields (Espanol, 1976; Stephen, 1982; Altieri, 1994). These studies elucidate the role of weedy species in hosting natural enemies implicated in the control of crops' pests. Apart from the potential benefits of weeds to plant ecology, recent developments have revealed the importance of weedy species in traditional medicine (Njoroge et al., 2004; Stepp, 2004). In Kenya for instance, 75 plant species from 34 families are used to cure 59 ailments in traditional medicine of central Kenya (Njoroge et al., 2004). Also in the United States, 36 of the 101 plant species implicated in drug discovery are weedy species found mainly in disturbed habitats (Stepp, 2004). Today in South Africa, 197 plant species have been declared as weedy species with strong recommendations and strategies to eradicate or control their growth in cultivated lands and in the wild (Browmilow, 2001). Without a comprehensive study and documentation to appraise the importance of these spe-

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cies within plant ecology, valuable medicinal weedy species may be lost through improper management of perceived problem plants in South Africa.

This review attempts to document weedy species and their medicinal importance by providing information on published articles on medicinal plants of South Africa and relates the species used in these studies with the declared list of weeds and invader plant species established by Regulation 15 of the Conservation of Agricultural Resources Act 43 of 1983 (Browmilow, 2001). Till today, there is no other legal document or study available on any species added to this list.

TRADITIONAL MEDICINE IN SOUTH AFRICA

Earlier, the field of ethnomedicine was dominated by traditional knowledge and most native healers across ethnic and racial populations of the world are often reluctant to accurately share their experience with outsiders. This has led to a great gap in knowledge between modern medicine and traditional healing. The development of ethnomedicine within the last two decades with particular reference to South Africa is rapidly bridging this gap (Watt and Breyer-Brandwijk, 1962; Watt, 1967; Cunningham, 1988; Hutchings, 1989; Hutchings et al., 1996; Mander, 1998; Van Wyk et al., 1997; Van Wyk and Gericke, 2000; Afolayan and Meyer, 1997; Lewu et al., 2006). In South Africa, there are over 27 million users of indigenous medicines (Mander, 1998). The high patronage of this alternative form of medicine has been attributed to the high flora density and great cultural diversity of the people of South Africa (Van Wyk and Gericke, 2000). Due to the high diversity and endemism of plant species in the country, different natives of the South Africa have used different plant species to treat several diseases especially among the rural populations where western medicine is either not accessible or affordable (McGaw et al., 2005). The use of medicinal plants by the people of South Africa dates back to the early settlement when the native Hottentots used many plant species to treat different diseases which include the use of willow species for the treatment of rheumatic fever in the Cape of Good Hope (Stone, 1764; MacLagan, 1876). Also in 1897, Charles Stevens, an Englishman, was cured of tuberculosis by a Basuto tribal healer using a decoction prepared from the root of *Pelargonium sidoides* DC (Thompson, 2004). Today, about 200, 000 traditional healers practice herbal medicine in South Africa and a high percentage of the population use traditional medicine as their primary sources of health care (van Wyk et al., 1997; Kelmanson et al., 2000).

WEEDY SPECIES AND TRADITIONAL MEDICINE OF SOUTH AFRICA

South Africa is home to about 30,000 plant species and

over 3,000 of these are used in traditional medicine in the country (van Wyk et al., 1997). The high species and cultural diversity of the country has generated enormous cross cultural native knowledge among the people which further increased the belief and patronage of traditional medicine in South Africa (McGaw et al., 2005). For instance, the Sotho, Xhosa and Zulu traditional healers use 1,032 species from 147 plant families (Hutchings et al., 1996). Over 500 of these species are currently traded in the informal medicinal plant market of KwaZulu-Natal (Mander, 1998; Williams, 1996; McGaw et al., 2005). Most of these medicinally important species are collected in the wild (Cunningham, 1988; Lange, 1997) and their population status is not always important to medicinal plant collectors until conservationists notice a drop in their population demography (Nault and Gagnon, 1993; Olmsted and Alvarez-Buylla, 1995; Pfab and Scholes, 2004; Lewu et al., 2007). Several workers have reported many native and imported plants as weeds or invasive species due to their competitiveness in the wild (Richardson et al., 1992; Browmilow, 2001). Other researchers have also acknowledged the importance of weedy species in the medicine of other parts of the world (Stepp and Moerman, 2001; Njoroge et al., 2004; Stepp, 2004). Apart from the work of Ellof et al. (2007) on the screening of few weedy species on some fungi strains, our literature search did not provide any other information on the weedy species implicated in the medicine of South Africa. Yet, some of the so called weedy species in South Africa are medicinally important. For instant, Pharmacological and phytochemical studies performed on *Bidens pilosa*, a single weedy species, have shown anti-microbial, anti-helminthic, anti-malaria, protozoocide and anti-ulcerogenic properties (Geissberger and Sequin, 1991; Oliveira et al., 2004). *Datura stramonium*, an aggressive weedy species found growing in several plant habitats of South Africa has been documented by several workers to be used for the treatment of boils, swellings of the skin and pneumonia (Watt and Breyer-Brandwijk 1962; Smith, 1966; Gelfand et al., 1985; Hutchings 1996; Van Wyk et al., 1997). *Mentha longifolia* is a stubborn weedy species in maize fields and abandoned farmlands. Fresh leaf of the herb made into tea is widely used to treat many cold related diseases (Watt and Breyer-Brandwijk 1962; Smith, 1966; Gelfand et al., 1985; Hutchings 1996; Van Wyk et al., 1997). The same therapy was reported for the treatment of internal organs like kidney and liver by the people of Western Cape (Thring and Weitz, 2006). Grierson and Afolayan, (1999) also reported the use of *Opuntia ficus-indica* Mill. for the treatment of wounds by the people of Eastern Cape Province of South Africa. *Agave americana* is a common weedy species found in all the provinces of South Africa (Browmilow, 2001). Prepared leaf sample of the herb is a strong remedy for such killer diseases like high blood pressure and cardiac disease (Duncan et al., 1999). The above are just a few discovery of the potential of weedy species in native and orthodox medicine. More indebt

Table 1. List of weedy species used in traditional medicine and implicated in South Africans pharmacopeias.

Family	Botanical name	Part used	Traditional uses	Method of preparation	Therapeutic uses and references
Agavaceae	<i>Agave americana</i> L.	Leaf	Gastro-intestinal complaints, heart treatment and blood pressure regulator	Not indicated	Possesses angiotensin converting enzyme inhibitors (Duncan et al., 1999).
Apiaceae	<i>Foeniculum vulgare</i> Mill.	Leaf	Arthritis, fever, milk stimulant in pregnant women, diuretic for weight loss	An infusion made from the leaves is drunk, to treat arthritis and fever and to stimulate milk production, green fruit is chewed to reduce fat	Flatulence, cough, diuretic, digestive problems, diarrhea, stomachache and cramps (Watt and Breyer-Brandwijk, 1962; Van Wyk et al., 1997)
Asclepiadaceae	<i>Asclepias fruticosa</i> L.	Leaf and root	Diarrhoea and stomach pain in children	Infusion and decoctions of the leaf	Infusions for diarrhoea and stomach pain in children (Hulme, 1954; Watt and Breyer-Brandwijk, 1962) Decoctions for stomach ailments (Mabogo, 1990)
Asteraceae	<i>Bidens pilosa</i> L.	Leaf or root	Stomach pains	Infusion	Infusions as enemas for stomach complaints (Bryant, 1966)
Cactaceae	<i>Opuntia ficus-indica</i> Mill.	Leaf	Treatment of wound	Heated with blues soap and Epsom salts and applied as a poultice	Grierson and Afolayan, 1999.
Caesalpinaceae	<i>Senna didymobotrya</i>	Leaf		Not indicated	Senna spp. are used pharmaceutically in laxative preparations (Hutchings et al., 1996)
Commelinaceae	<i>Commelina africana</i> L.	Root	Infertility	Not indicated	Watt and Breyer-Brandwijk 1962
	<i>Commelina benghalensis</i> L.	Not specified	Infertility	Not indicated	(Van Wyk and Gericke, 2000)
Cyperaceae	<i>Cyperus esculentus</i> L.	Root	Amenorrhoea infertility	Not indicated	Bryant 1966
Dennstaedtiaceae	<i>Pteridium aquilinum</i> (L.) Khum	Root	Irregular menstruation and abortifacient	Not indicated	Watt and Breyer-Brandwijk 1962
Euphorbiaceae	<i>Ricinus communis</i> L.	Leaf	Inflammation and rheumatism	Leaves are bound to affected area	Stomach ache, wounds, sores, boils (Watt and Breyer-Brandwijk, 1962; Hutchings 1989; Hutchings et al., 1996; Van Wyk et al., 1997); epilepsy (Watt (1967); headache (Watt and Breyer-Brandwijk, 1962)
			Stomach ache	Infusion	Infusions administered orally or as enemas for stomach ache (Gerstner, 1939)
		Root and leaf	Treat wound	Poultice applied to wound and sores	Grierson and Afolayan, 1999.

Table 1. Contd.

Family	Botanical name	Part used	Traditional uses	Method of preparation	Therapeutic uses and references
Moench	<i>Schkuhria pinnata</i>	Whole plant	Abortifacient and contraceptive	Not indicated	Abortifacient and contraceptive (Van Wyk and Gericke, 2000)
Myrtaceae	<i>Psidium guajava</i> L.	Leaf	Boils	Decoction	Gelfand et al., (1985)
Pedaliaceae	<i>Ceratotheca triloba</i>	Leaf	Diarrhoea and stomach pain	Infusion	Infusions administered for diarrhoea and gastro-intestinal cramps (Watt and Breyer-Brandwijk, 1962; Roberts, 1990)
	<i>Ceratotheca triloba</i> (Bernh.) Hook. f.	Leaf	Abortifacient and Dysmenorrhoea	Not indicated	Watt and Breyer-Brandwijk 1962; Pooley 1998; Van Wyk and Gericke, 2000
Table 1 (continue)					
Family	Botanical name	Part used	Traditional uses	Method of preparation	Therapeutic uses and references
Phytolaccaceae	<i>Phytolacca dodecandra</i> L. Hér.	Root	Infertility		Hutchings et al. 1996
Poaceae	<i>Cenchrus ciliaris</i> L.	Runners	Dysmenorrhoea	Not indicated	Pujol 1990
	<i>Eragrostis plama</i> Nees.	Root	Menorrhagia	Not indicated	Bryant 1966
Polygonaceae	<i>Rumex lanceolatus</i> Thumb	Rhizome	Infertility	Not indicated	Watt and Breyer-Brandwijk 1962
Solanaceae	<i>Solanum mauritianum</i> Scop.	Root	Menorrhagia	Not indicated	Hutchings et al., (1996)
		Leaf	infertility and menorrhagia	Not indicated	Mabogo (1990)
		Leaf	Dysentery and diarrhoea	Infusion	Watt and Breyer-Brandwijk, 1962
	<i>Datura stramonium</i> L.	Leaf	Used to treat sores boils swellings on skin and also used to treat pneumonia.	Place leaf on sore or affected area to draw out the poison	The species has many uses in medicine including pain (Watt and Breyer-Brandwijk, 1962), rheumatism, gout, boils, abscesses and wounds by using a poultice (Smith, 1966; Hutchings 1996; Van Wyk et al., 1997). Fruit has been reported to be used for toothache, tonsillitis, and sore throat (Wyk et al., 1997). Also used to treat asthma, bronchitis and the leaves are smoked to treat headaches (Smith, 1966; Van Wyk et al., 1997). Poultice applied to boils, abscesses and septic swellings of the skin; powder also applied to wounds and decoction taken for pneumonia (Watt and Breyer-Brandwijk, 1962; Gelfand et al., 1985)
Urticaceae	<i>Urtica urens</i> L.		Infertility	Unspecified	Bryant 1966

Table 2. Weedy species implicated in antiplasmodial activity^a.

Family	Species	Plant part used in the study
Amaranthaceae	<i>Achyranthes aspera</i> L.	Whole plant
Apiaceae	<i>Centella asiatica</i> (L.) Urb.	Leaves
Asphodelaceae	<i>Ageratum conyzoides</i> L.	Whole plant
Asteraceae	<i>Bidens pilosa</i> L.	Leaves
	<i>Conyza albida</i> Spreng.	Whole plant
	<i>Spilanthes mauritiana</i> (Pers.) DC.	Stem
	<i>Tridax procumbens</i> L.	Whole plant
Euphorbiaceae	<i>Euphorbia heterophylla</i> L.	Whole plant
	<i>Ricinus communis</i> L. var. <i>communis</i>	Leaves
Fabaceae	<i>Senna didymobotrya</i> (Fresen.)	Leaves
Plantaginaceae	<i>Plantago major</i> L.	Roots
Poaceae	<i>Setaria megaphylla</i> (Stapf)	Whole plant
Polygonaceae	<i>Rumex crispus</i> (L.)	Leaves
Sapindaceae	<i>Cardiospermum halicacabum</i> (L.)	Whole plant
Verbenaceae	<i>Lantana camara</i> (L.)	Leaves/twigs

^aBased on Clarkson et al. (2004).

studies may reveal an amazing proportion of weedy species that are medicinally important as was discovered in Kenya (Njoroge et al., 2004). Biologists, plant conservationists and policy makers need to orchestrate an appropriate programme to protect the country's wealth of medicine hidden in these weedy species.

DISEASES AND WEEDY SPECIES IMPLICATED IN SOUTH AFRICAN'S PHARMACOPOEIAS

Natural products are increasingly becoming an important source of pharmaceuticals across the world (Abelson, 1990). These studies stem from early discovery of the healing effects of several plant species by indigenous people over centuries (Hutchings et al., 1996). Due to high diversity and endemism of plant species in South Africa, many native and imported species classified as weeds have found relevance in South African's traditional medicine. According to Ellof et al. (2007) report, some weedy species including *Cestrum laevigatum*, *Nicotiana glauca*, *Solanum mauritianum*, *Lantana camara*, *D. stramonium*, *Ricinus communis* and *Campuloclinium macrocephalum* were found to inhibit the growth of several fungi strains with the most active extracts at MIC level of 0.08 mg/ml. Gynaecological problem is a growing phenomenon among women of South Africa. In a survey conducted by Steenkamp (2002), about 10% of the 156 plant species used for the treatment of different gynaecological complaints including, infertility and menstrual disorder are weedy species. Hutchings et al., 1996 also reported the use of *Senna didymobotrya* (Fresn.) as the primary ingredient for the production of laxatives in the pharmaceutical industry. Infused leaves of *R. communis* L. is administered orally for the treatment of stomach

ache (Gerstner, 1939). Although not directly linked with invasive species, many remarkable books and articles have been published on medicinal plants of South Africa (Watt and Breyer-Brandwijk, 1962; Robert, 1990; Hutchings et al., 1996; Van Wyk et al., 1997). Some of these medicinal species have been declared as weedy species and there is a need to formulate an appropriate policy to control their population within the environment. Tables 1 and 2 are lists of weedy species implicated in South African's traditional medicine and pharmacopoeias. According to our literature search, twenty four plant families and 34 species have been found to be medicinally important in South Africa. These species are used to treat twenty one diseases and sicknesses by the natives of South Africa. There is a need to conduct proper study on the control of the population of these species within plant population in order to make them available for medicinal uses and possible development into drugs.

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