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Plants used for stress-related ailments in traditional Zulu, Xhosa and Sotho medicine. Part 1: Plants used for headaches

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Abstract

The usage and indications of possible therapeutic and harmful effects of 96 plants reported to be used for headaches in traditional Zulu, Xhosa and Sotho medicine are reviewed. Although few pharmacological studies have been undertaken on the plants used, related usage by other ethnic groups and known properties in related plants indicate significant possible analgesic, decongestant, anti-inflammatory, antispasmodic or sedative properties. Observations made by healers indicate an acute awareness of some of the potentially toxic compounds likely to be found in the plants. Most of the medicines are snuffed or inhaled. Both the routes of administration and the plants used merit further investigation.

Keywords: Headache; Ethnobotany; Inhalants; Potential therapeutic value; Xhosa; Zulu; Sotho

1. Introduction

This paper is part of a tripartite study undertaken on plants used by the Zulu, Xhosa and Sotho for symptoms known to be frequently associated with psychological stress. The success of traditional African healers in treating stress-related ailments is often acknowledged (Swift and Asuni, 1975; Holdstock, 1979; Edwards et al., 1982; Gumede, 1990). This success is more often attributed to the counselling skills of the healers and to the use of herbal remedies as placebos, rather than to the bioactivity of the plants involved. Little research appears to have been undertaken in this field in southern Africa since the work of Watt (1967). It is clear, however, that many of the plants used by the Zulu, Xhosa and Sotho for stress-related ailments are from biologically active groups of plants (Hutchings 1989a). They are thus likely to act as more than placebos. The purpose of this paper is to review plants used to treat headaches in the traditional medical practices of the Zulu, Xhosa and Sotho, to point out any possible harmful effects, to stimulate research to validate the traditional claim, and to provide leads for the discovery of new drugs that

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may be used to treat pain, inflammation, congestion or the spasmodic or anxiety states associated with headaches.

The term headache, as used here, refers to pain felt in the skull, whatever the cause. Headaches are recognised in both modern Western biomedicine and in traditional African medicine to be caused by psychological, as well as physical, factors. Psychological factors appear in both views to be considered a predominant cause. Weiss (1988) observes that most modern medical writers acknowledge that as many as half of all headaches respond well to placebos. Swift and Asuni (1975) cite the results of a survey undertaken in Nigeria, which indicated that tension headaches accounted for the majority of headaches suffered by the patients in the sample. They define a tension headache as a dull constant pain either in the occipetal area, involving the neck muscles, or in the frontal area or on the top of the head, and they include headaches and also a feeling of heaviness in the head in their list of somatic symptoms of depression. In this study, possible analgesic, decongestant, antispasmodic or anti-inflammatory activity is considered helpful in the treatment of the physical aspects of headaches, and possible sedative activity is considered helpful for headaches associated with psychological stress.

2. Area of study

The people referred to in this study are members of the indigenous Zulu-, Xhosa- and Sotho-speaking tribal groups from adjacent parts of South Africa currently known as KwaZulu/Natal, Transkei, Ciskei and the Eastern Cape and from Lesotho (Fig. 1). Various tribal distinctions and customs do occur within and between these three groups and add to the cultural richness of the people as a whole. These differences need not concern us here, however, as there is a marked similarity in customs of medicinal plant usage. The flora is rich and diverse, reflecting the diversity in climate and altitude. The Eastern Cape, Ciskei and Transkei are temperate, transitional winter–summer rainfall areas, Lesotho and KwaZulu/Natal are summer rainfall areas, parts of KwaZulu/Natal are subtropical, while Lesotho is cold enough for frost and heavy snow to form in the winter. The altitudes vary from sea-level along the Natal, Transkei and the Eastern Cape coasts to 3480 m in the mountainous areas of landlocked Lesotho (Jacot Guillarmod, 1971).

3. Disease concepts — medical anthropology of the study group

In traditional Zulu and Xhosa medicine, headaches are perceived to be caused by both supernatural and natural agents, and psychological factors are also recognised (Hutchings, 1989a). One group of healers interviewed by one of us (A.H.) at Lusikisiki in Transkei observed that 'Headaches are caused in the mind'. Edwards et al. (1982) and Gumede (1990) list headaches as one of the symptoms of the conversion disorders experienced by Zulu patients in culture-bound syndromes. These disorders include ailments known as 'u(ma)fufunyane' and 'ukuthwasa' by both the Zulu and the Xhosa. The term 'u(ma)fufunyane' refers to a disturbed or hysterical state of mind in patients who believe that they are the victims of sorcery or witchcraft (Broster, 1982; Hutchings, 1989b). 'Ukuthwasa' refers to a disturbed state of mind commonly experienced by diviners during their vocational calling (Doke and Vilakazi, 1972; O'Connell, 1982). The healers interviewed at Lusikisiki referred to the state as one of 'mental illness'. Headaches are also symptomatic of a group of ailments known in Zulu as 'umkhuhlane', which includes colds, influenza, catarrh and various fevers (Bryant, 1966). These ailments are believed to be caused by natural agents.

Perceptions of aetiology in Sotho traditional medicine are assumed by the present authors to be similar to those of traditional Zulu and Xhosa medicine. This assumption is based on marked similarities in the usage of related plants and in the methods of treatment as indicated by Jacot-Guillarmod (1971).

Traditional Zulu, Xhosa and Sotho treatment of headaches commonly takes place through the nasal passages (Hutchings 1989a,b). This accords with a widely held belief that ailments should be treated at the site of discomfort. Snuffs for

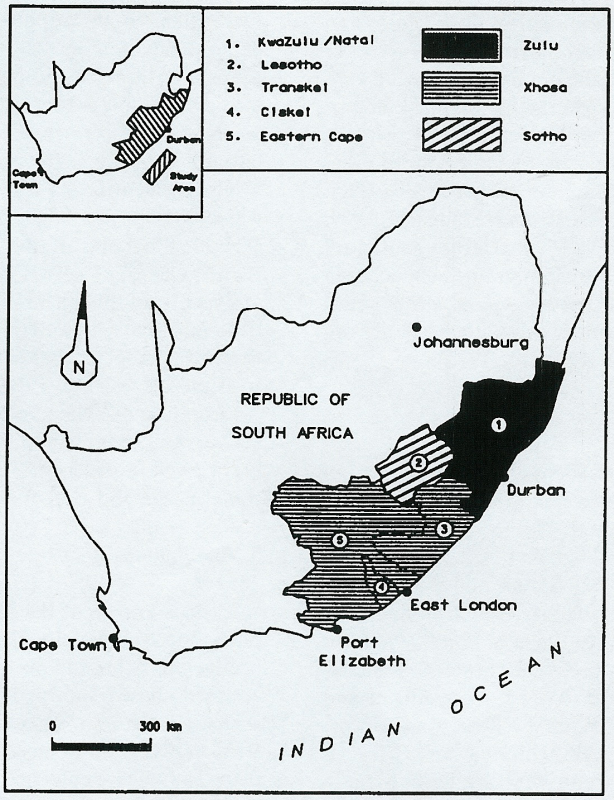

Fig. 1. Map showing distribution of the Zulu, Xhosa and Sotho speaking tribal groups within the study area. After Zietsman and van der Merwe (1986).

headaches are taken to induce sneezing, which, while serving to clear the nasal passages, may also be perceived as part of the process of healing and considered to show the egress of evil spirits. There are interesting parallels in other folk medicinal practices, including those from which modern Western medicine grew. Sneezing was observed by the missionary Callaway in 1868 to be regarded in Zulu tradition as a sign of the imminent restoration of health, through the blessings of the ancestral spirits (Callaway, 1970). The customary response of a patient who had sneezed was to say 'Ngi sa pilile. Idhlozi li nami: li fikile kum' which Callaway translates as "I am now blessed. The 'Idlhozi' [ancestral spirit] is with me, it has come to me". Brewer (1963) relates the still common Western custom of saying 'Bless you' to a sneezer to belief in the presence of evil spirits and omens; he also refers to similar customs practised in India, in ancient and modern Persia, in ancient Greek and Rome and among some North American tribes. Another interesting reference to snuff is picked up by Brewer (1963) in his gloss of the phrase 'up to snuff' as 'wide awake, not easily taken in or imposed upon'. The group of healers interviewed at Lusikisiki in Transkei passed a snuff around before a meeting with hospital staff, observing that it was taken 'to clear the mind'.

Other forms of traditional Zulu, Xhosa and Sotho treatment include the rubbing of powder into scarifications and the binding of the head with plant material (Hutchings, 1989a). Similar customs are observed in traditional medical treatment of headaches in other cultures, including those practiced in Botswana, Zimbabwe and Australia (Gelfand et al., 1985; Hedberg and Staugard, 1989; Lassak and McCartney, 1990). Herbal snuffs are also sometimes used to treat migraine headaches in traditional British folk medicine, and cloths soaked in hot-water infusions of aromatic herbs are applied to aching heads (Howard, 1987).

4. Methodology

Initially, a literature survey was undertaken on plants used for headaches and related ailments by the Zulu, Xhosa and Sotho (Smith, 1895; Gerstner, 1938a,b, 1939a,b,c, 1941a,b,; Watt and Breyer-Brandwijk, 1962; Batten and Bokelmann, 1966; Bryant, 1966; Jacot Guillarmod, 1971; Broster, 1982; Hutchings 1989a,b; Pujol, 1990). Interviews with various practicing healers were conducted by one of us (A.H.) to confirm and supplement data on Zulu and Xhosa usage. Informants included Mr. J. Mhlongo and Mr. H. Cwele, both Zulu traditional healers, Mr. F. Nkunjane, a practising homeopath and herbalist from Transkei, and two groups of healers interviewed at meetings held at St Elizabeths Hospital in Lusikisiki in Transkei in 1986 and in the Valley Trust at Botha's Hill in Natal in 1987. Well-known plants were referred to by their Zulu or Xhosa names at meetings. Interviews with Mr. Mhlongo took place partly in the medicinal plant garden at the University of Zululand. Reference was made to cultivated specimens or, when these were not available, to pictures of the plants when confirmation of usage was required. Voucher specimens of plants not previously published as used for headaches by the Zulu have been deposited in the University of Zululand Herbarium (ZUL). They were identified by one of the authors (A.H.) or by Mr. T. Edwards, curator of the University of Natal Herbarium in Pietermaritzburg.

Other informants included Mr. W. Menne, a horticulturalist, specialising in the cultivation of the indigenous plants of Natal/Kwazulu, and Dr. E. Bigalke, an anthropologist and former curator of the East London Museum, who allowed us to use data from an unpublished list of Xhosa medicinal plants collected by him in Transkei. The list is in repository in the Albany Museum Herbarium in Grahamstown, where the plants were originally identified. Further data on Xhosa usage was obtained from labels on herbarium specimens examined by one of the authors (A.H.) in the Bantu Cancer Registry collection held at the University of Fort Hare Herbarium (UFH) and from information on herbarium labels on some of the medicinal plants held at the National Botanical Institute Herbarium (PRE) in Pretoria.

Literature on related plant usage and on known activity and chemistry of related species was widely reviewed in order to establish indications of rational usage and potential toxicity.

5. Assumptions

Little is known of the bioactivity of most of the plant species used by the study group to treat headaches. A broad approach has, therefore, been adopted, based on the observations of authors such as Labadie (1989), Johns et al. (1990) and Russo (1992), who consider consistent usage of a plant to indicate evidence of a possible biological basis for efficacy. Related usage or the presence of potentially useful or harmful compounds, or observed effects and properties within the genus were also considered to be an indication of the possible therapeutic or harmful effects of a species. These assumptions were based on the observations of authors such as Gibbs (1974a) and Trease and Evans (1983) that related chemical compounds, and hence active principles, are often characteristic of or found in various members of the same taxa. This is most notable at generic levels, as in the case of cardiac glycosides found in various *Digitalis* species, tropane alkaloids such as hyoscine and hyosycamine in *Datura* species or steroidal saponins such as dioscin in *Dioscorea* species.

Species were selected for inclusion in Table 1 if they were known to have been used as a headache, neuralgia or cold remedy by the Zulu, Xhosa or Sotho.

Criteria used for deducing possible therapeutic

or harmful effects included:

1. Known usage within the genus for apparent analgesic, antispasmodic, decongestant or sedative purposes by any ethnic groups.
2. Known biological activity indicating potentially analgesic, anti-inflammatory, antispasmodic, decongestant, or sedative properties within the genus.
3. Known chemical compounds with relevant potential therapeutic or toxic properties within the genus.
4. Known morbid or mortal poisoning effects in humans or animals or known usage as an arrow, fish or insect poison within the genus.

In adopting these criteria, the following assumptions on potentially therapeutic activity were made:

1. Possible analgesic activity was assumed to be helpful in relieving the pain of headaches. Plant species were assumed to have possible analgesic activity if they came from genera with species also known to be used to treat other pain-producing ailments. This assumption is based on observations made by authors such as Grundy (1990) and Henry (1991) that the sensation of pain is a cardinal warning symptom of damage to tissue and arises from the synthesis of prostaglandins. These act on nerve endings to pass a message through a series of nerve cells to the brain, where it is interpreted as pain. Analgesia in modern biomedicine is commonly achieved by means of blocking the release of prostaglandins, with some possible CNS involvement as in the case of aspirin-like drugs or, as in the case of morphine-like drugs, by interaction with opioid receptors in blocking the transmission of pain signals within the brain. Ailments considered here to be pain-producing include those referred to in the literature consulted as abdominal pain, chest pain, dysmenorrhea, stomachache, toothache and snakebite. Remedies used by the Zulu to treat snakebite are, as Mr. Mhlongo reported, used for both analgesic and antidotal purposes.

2. Possible decongestant activity was assumed to be helpful in the treatment of headaches associated with colds, blocked sinuses and allergies. Decongestants are commonly used for the latter two purposes in modern biomedicine (Grundy, 1990; Henry, 1991). Congestion of the nasal passages and sinuses is caused by the enlargement of the blood vessels in response to infection or irritation (Henry, 1991). This leads to an increase in the amount of fluid passing into the mucous membrane, which then swells and produces more mucus. Decongestants work by a sympathomimetic action, whereby stimulation of the nerve-endings causes the walls of the blood vessels to constrict, thus reducing swelling of the membrane and mucus production. Species were considered to have possible decongestant properties if any species in the genus were known to be aromatic, or were known to be used for colds or as expectorants, or to have produced irritation of the mucosa. Weiss (1988) and Lassak and McCarthy (1990) ascribe the medicinal properties of several aromatic species to cineole-rich leaf oils, whose property is also to reduce the swelling of mucous membranes and, thus, loosen phlegm and facilitate breathing. Irritant substances may cause clearing of the airways by induction of the sneezing reflex or by a sympathomimetic action similar to those induced by nasal decongestant sprays used in modern biomedicine. The present authors acknowledge that irritant substances may also cause or exacerbate congestion. Repeated usage or high dosage of some of the nasal decongestant sprays used in modern biomedicine, are also known to produce a 'rebound' vasodilation (Grundy, 1990).

3. Possible antispasmodic activity was assumed to be helpful in relaxing smooth muscles and blood vessels which contract in tension headaches. Antispasmodics are used in modern biomedicine to reduce spasm of the smooth muscles, airways and blood vessels (Henry, 1991). Species from genera containing species known to be used to treat asthma, or reported in the literature consulted simply to be used as antispasmodics, were considered to have possible antispasmodic activity. Drugs used in modern biomedicine as bronchodilators in the treatment of asthma and related spasmodic ailments are thought to interfere with the nerve signals passed to the muscles through the autonomic nervous system (Henry, 1991). They may also relax muscles by a direct effect on the

muscle fibres by an as-yet unknown mechanism, as in the case of xanthine, or relax the muscles surrounding the airways by promoting the release of the neurotransmitter, noradrenaline, as in the case of ephedrine. Species from genera with species known to contain rutin or apigenin were also considered to have possible antispasmodic activity as this is a known property of these flavonoids (Weiss, 1988).

4. Possible anti-inflammatory activity was assumed to be helpful in relieving the pain of headaches. Aspirin-like substances used as anti-inflammatory agents are known to relieve pain and also to reduce inflammation by local inhibition of prostaglandin synthesis (Grundy, 1990). Species from genera with species known to contain quercetin, kaempferol or rutin were considered to have possible anti-inflammatory activity as this is a known property of these flavonoids (Farnsworth and Cordell, 1976).

5. Possible sedative activity was assumed to be helpful in relieving anxiety states associated with tension headaches. Sedatives are used in modern biomedicine to relieve such anxiety states (Silverstone and Turner, 1988). Their function is, broadly speaking, to relieve nervousness and tension, relax muscles, and encourage sleep. Their action is primarily through a dampening of the central nervous system, as in the case of the benzodiazepines and barbituates. Species from genera with species known to produce narcotic effects were considered to have possible sedative activity as this is a known effect of morphine-like narcotic drugs (Henry, 1991).

6. Plants used for the treatment of headaches by the Zulu, Xhosa and Sotho

Results of the literature and fieldwork survey are shown in Table 1. Plants are arranged alphabetically by family in the order of pteridophytes, gymnosperms and angiosperms (dicots and monocots).

All botanical names listed in the table have been updated in accord with Arnold and de Wet (1993) and all synonyms used in the references cited in Table 1 are included. Some nomenclature problems were encountered as the authors of the literature consulted do not always cite the authors of botanical names. These have been added for consistency, following careful verification of the name.

Zulu, Xhosa and Sotho names have been taken from the references consulted and are included only for that ethnic group which has been reported to use the plant to treat headaches. Some spellings of these names have been corrected by our informants.

7. Data analysis

7.1. Floristic composition

Ninety-six species from 73 genera and 34 families are recorded as used by the Zulu, Xhosa and Sotho to treat headaches. These comprise ten pteridophytes, one gymnosperm, 76 dicotyledons and six monocotyledons.

7.2. Parts of plants used

Aerial parts (excluding woody parts) are most commonly used. They are reported to be used in 59 species, of which the leaves are specifically used in 40 species. Underground parts are used in 33 species, while woody parts are used in 10 species. Plant parts used were not specified for 10 species. In 11 species, two or more parts are used, suggesting that active principles may be found in more than one part in these species.

7.3. Routes of administration

Preparations from 78 species (80%) are administered as inhalants in one form or another. Of these, preparations from 37 species are inhaled as smoke, while preparations from 28 species are taken as snuff. Eight species are reported to be crushed and sniffed, and powder or small pieces from six species is directly inserted into the nostrils. Steam from preparations from four species is inhaled. Preparations from five species are administered as inhalants in more than one form. In addition, preparations from ten species are taken by mouth, while six species are externally applied as poultices or washes. Powders from two species are rubbed into scarifications cut on the forehead and preparations from one species are sometimes administered as an enema. More than

Table 1
Plants used for headaches in traditional Zulu, Xhosa and Sotho medicine

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
PTERYDOPHYTES			
ADIANTACEAE			
Adiantum aethiopicum L. maoru-metsu, pata-lwana (S)	lf	Smoked for head and chest colds (S) [84]. Used for chest complaints in Australia [52]. *A. caudatum* Forrsk. is used in India for pneumonia [4].	*Flavonol 3-glycosides (and maybe 3-deoxyanthocyanins) appear to be the predominant internal flavonoids in the genus [56]. *Spasmolytic activity has been observed in *A. caudatum* L. [21] ?antispasmodic (reported activity*) ?decongestant (>1 sp. used for colds)
Adiantum capillus-veneris L. lepata-maoa, pata-leona (S)	lf	Dried and burned, smoke inhaled for head and chest colds (S) [45]. Used for bronchial complaints in Europe and elsewhere [86].	Rutin, isoquertin, astragalin, kaempferol, hydroxycinnamic acid sulphate esters, adiantone and other terpenoids [86]. *spasmolytic activity has been observed in *A. caudatum* L. [21]. ?anti-inflammatory (flavonoids) ?antispasmodic (known activity*) ?decongestant (wide usage for colds)
Cheilanthes eckloniana (Kunze) Mett. (syn. *Notholeana eckloniana* Kunze) lehorometso, mathomeng (S)	lf	Smoked for head and chest colds (S) [84].	*Lipophilic flavonoid aglycones occur externally in the genus [56]. ?decongestant (>1 sp. used for colds)
Cheilanthes involuta (Swartze) Schelpe et N.C. Anthony (syn. *Pellaea involuta* Swartz) Bak). lehorometso, lepata maoa, mamoaneng, moarobetso,' mokubetso, mosokelo (S)	lf	Burned and smoke inhaled for head and chest colds (S) [84].	See above. ?decongestant (>1 sp. used for colds)
Pellaea calomelanus (Swartz) Link syn. *P. hastata* sensu Sim lehorometso, lepata-maoa, pata-leona, phatsoa-kammoho (S).	lf	Smoked for head colds and asthma (X) [77,84].	?anti-spasmodic (asthma usage)
ASPLENIACEAE			
Asplenium monanthes L. lehorometso (S)	lf	Smoked for head and chest colds (S) [84].	**Flavones and dihydroflavones constitute a significant portion of the total internal or external flavonoids known in the family (56). ?decongestant (>1 sp. used for colds)

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
Asplenium trichomanes L. lehorometso (S)	lf	Smoked for head and chest colds (S) [84].	**See above. ?decongestant (>1 sp. used for colds)
SCHIZACEAE			
Mohria caffrorum (L.) Desv. lehorometso (S).	lf	Smoked for the relief of head and chest colds (S) [84].	Aromatic — often smells of balsam. Flavonoids kaempferol, quercetin, procyanidin and prodelphinidin have been isolated [56]. ?anti-inflammatory (flavonoids) ?decongestant (aromatic compounds)
LYCOPODIACEAE			
Lycopodium clavatum L. boriba-bo-bohola, moriri-oa-lilomo, moriri-mafica (S)	wp	Dried and smoked with *Selaginella caffrorum* (S) [45]. Has been used as a medicated snuff and also as a sedative in urinary and gastric disorders [79,86]. *L. cernuum* L. is used as an anti-asthmatic in Indonesia [54].	Annontine alkaloids, mainly lycopo-lycopodine, polyphenolic acids, incl. di-hydrocaffeic, flavonoids incl. apigenin and triterpenes [86]. Lycopodine produces contractions and peristalsis in small rodents and the alkaloids can be toxic. Decongestant and soothing effects are reported [18]. Pain from bladder inflammations may be relieved but large doses are toxic to the CNS [26]. ?analgesic (>1 pain relief usage) ?antispasmodic (asthma usage*) ?decongestant (reported effects) ?toxic (known activity)
SELAGINELLACEAE			
Selaginella caffrorum (Milde) Hieron. boriba, moriri-oa-matlapa, phate-balimo (S)	wp	Dried and smoked with *Lycopodium clavatum* (S) [45]. Smoke from whole plants of *S. dregei* is used for toothache in Zimbabwe [27].	*The biflavones amentoflavone and hinokineflavone and their methyl ethers are thought to be widespread in the genus [56]. ?analgesic (>1 pain relief usage)
GYMNOSPERMS			
STANGERIACEAE			
Stangeria eriopus (Kunze) Baill. imfingo (Z); imifingwane (X)	rt rt	Burned and ash snuffed (Z) (W. Menne, pers. comm.). An ingredient in a mixture given for an illness which commenced with a headache (X) [12].	The incidental occurrence of C-glycoflavones is reported [60]

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
ANGIOSPERMS (DICOTS)			
ANACARDIACEAE			
Schinus molle L. pepper tree (X)	lf	Infusion inhaled or drunk for colds and influenza (X) [44]; BCR 193 (UFH). Fruit has been used in Spain for pain in the extremities [84].	Aromatic. Preliminary screening tests indicated analgesic, antidepressant, anti-inflammatory and antiarrythmiac activity [44]. The fruit is poisonous and produces gastric irritation, headaches and lassitude [84] ?analgesic (>1 pain relief usage; indicated activity) ?antidepressant (indicated activity) ?anti-inflammatory (indicated activity) ?toxic (reported poisoning)
APIACEAE			
Alepidia amatymbica Eckl. et Zeyh. leso(o)ko (S), iqwili (X), i(li)khathazo (Z)	rt	Eaten raw or cooked for colds, influenza and sore throats (Z) [32]; (X) [44]; (S) [45]. Also administered as snuff or burned and inhaled (Z) [84]. Roots are used for abdominal pains (X) [84] and for headaches and abdominal pains in Zimbabwe [27].	Aromatic, resinous and tastes of turpentine. Antihypertensive, antimicrobial and diuretic effects have been indicated in preliminary screening tests on animals [44]. ?analgesic (>1 pain relief usage) ?decongestant (aromatic compounds) ?hypotensive (test indications)
Heteromorpha trifoliata (Wendl. et Bartl.) Eckl. et Zeyh. (syn. *H. arborescens* (Spreng.) Cham. et Schlechtd.) 'mkatlala mongkhoane, monkhoane-*o*-monyenyane, mookhoane, phela (S)	—	Smoke inhaled from burning plant (S) [45] Root infusions taken for The headaches in Zimbabwe, plants used for asthma and chest pain [27]. Seeds and roots used for general pain and headaches in Venda and shortness of breath in Botswana [40].	Aromatic; bovine death is reported from experimental feeding [84]. The coumarin aesculetin and the flavonoids kaempferol and quercetin have been isolated from the leaf [40]. Two antifungal compounds, falcarin-diol and sarisan have been isolated from the leaves [82]. ?analgesic (>1 pain relief usage) ?anti-inflammatory (flavonoids) ?antispasmodic (used for asthma) ?decongestant (aromatic compounds) ?toxic (animal death)

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
APOCYNACEAE			
Acokanthera oppositifolia (Lam.) Codd (syn. *A. venenata* G.Don.) nthunguyembe, ubuhlungu, (X) ubuhlungubenyoka, uhlunguyembe (Z)	lf rt —	Dried and snuffed (X) [12]. Powdered and mixed with gall bladder of wild pig — one pinch of powder taken for pain of any sort, incl. snakebite (Z) (J. Mhlongo, pers comm.) Taken as snuff (Z) [64].	Cardiac glycosides incl. ouabain, acokantherin and acovenoside A [49]. Has been used as an arrow poison [84]. Animal and human deaths are reported [48,49]. Drying of plant parts is reputed not to destroy the toxicity and the poison can be absorbed through the skin [84]. Inhalation of sawdust can be fatal. Acovenoside is thought to have accumulative effects [49]. ?analgesic (>1 pain relief usage) ?decongestant (irritant effects) ?toxic (suspected human deaths)
ASCLEPIADACEAE			
Asclepias fruticosa L. umsingalwesalukazi (Z), lebegana, moethimolo, molimola (S)	st ap	Taken for head colds and also as snuff (S) [45]. Leaves have been used as snuff for tuberculosis in South Africa [84]. Roots of *A. tuberosa* L. are used for pleurisy pain and as an antispasmodic in Europe [86].	Taking snuff from leaf produces sneezing [84]. Has been used as an arrow or ordeal poison. Significant amounts of cardiacin glycosides are known to occur in the plant and deaths in stock and experimental animals are reported [49,68]. Human death suspected following ingestion of medicine made from whole plants (A. McVann, pers comm.) *Flavonoids, incl. quercetin and rutin are known in *A. curassavica* L. and *A. tuberosa* L. [50,86]. ?analgesic (>1 sp. used for pain) ?anti-inflammatory (flavonoids*) ?antispasmodic (reported usage) ?decongestant (reported effects) ?toxic (suspected human deaths)
Asclepias physocarpa L. umsingalwesalukazi (Z)	lf	Dried, powdered and snuffed (Z) (J. Mhlongo, pers. comm.) Hutchings 3003 (ZUL).	The plant has been found lethal to sheep, with ingestion of large amounts producing death within hours [68]. *See above. ?analgesic (>1 sp. used for pain) ?anti-inflammatory (flavonoids*) ?antispasmodic (reported usage) ?decongestant (reported effects*) ?toxic (cardiac glycosides*)

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
Pachycarpus concolor E. Mey. ishongwe (X,Z)	tu	Ground and snuffed (X) [44]. Tubers of *P. lineolatus* N.E. Br. are used for abdominal pain in Zimbabwe [27].	*Cardiac glycosides reported in genus [84,35]. ?analgesic (>1 sp. used for pain) ?toxic (cardiac glycosides)
Pachycarpus vexillaris E. Mey. leshokhoa (S)	tu	Taken as snuff (S) [45].	See above. ?analgesic (>1 sp. used for pain)?toxic (cardiac glycosides*)
Xysmalobium undulatum (L.) Ait. f. ishongwe (X) Hutchings 2294 (KEI)	tu	Ground and snuffed (X) [44]. Roots are used for uterine pain in Zimbabwe [27]. Used for headaches and abdominal pains in Botswana [84].	Cardiac glycosides in tuber [84]. Weak CNS depressant, antidepressant and antiarrythmia action indicated in extracts [44]. ?analgesic (>1 pain relief usage). ?antidepressant (test indications) ?toxic (cardiac glycosides)
ASTERACEAE			
Artemisia afra Jacq. ex Willd.	lf	Inserted in nostrils (Z) (J. Mhlongo, pers. comm.), Hutchings 3008 (ZUL).	Aromatic. Thujone and umbelliferone derivatives, coumarins and acetylenes have been isolated [10]. Narcotic analgesic and antihistamine effects have been indicated in preliminary tests [44]. Toxic effects have been observed in experimental animals [84]. Thujone is found in many spp. and is toxic with hallucinogenic and addictive properties [5]. It is the toxic principle in *A. absinthium* L. and the liquor in absinthe. *A. annua* L. has proven antimalarial properties. *Anti-inflammatory properties have been indicated in *A. drancunculoides* L. and *A. vulgaris* L. [7]. ?analgesic (>1 pain relief usage; >1 sp. used for pain; ?antispasmodic (reported usage*) ?anti-inflammatory (reported action*) ?decongestant (aromatic compounds) >1 sp. used for colds) ?narcotic (tests) ?toxic (thujone)
lengana (S)			
umhlonyana (X,Z)	lf	Also inserted for head colds and influenza or steam inhaled (X) [44] (S) (45). Widely used for colds in Africa, also for toothache and earache [84]. *A. absinthium* L. has been used for many ailments in Europe, incl. colds, pain in childbirth and as an antispasmodic [86].	
Aster bakeranus Burtt Davy ex C.A. Sm. (syn. *A. hispidus* (Thunb.) Bak; (syn. *Diplopappus asper Less.*)	rt —	Ground and snuffed, induces sneezing (X) (E. Bigalke, pers. comm.). Potion used (S) [45]. Mixed with	Reported to have been implicated in fatal human poisoning but not found in victim's stomach; emesis

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
phoa (S), noxgxekana (X), u(lu)dulutshana (Z)	rt	water and sniffed (Z) (J. Mhlongo, pers. comm). Pounded and used to clean nostrils (Z) [43]. Also used for snakebite (Z) [84].	and depressant effects noted in animals, but no striking toxic effects from roots and tubers [48]. Reported to be very toxic [84]. *Extracts from seven of eight species tested produced anti-inflammatory activity in rats [7]. ?analgesic (>1 pain relief usage) ?anti-inflammatory (known activity*) ?toxic (repute)
Cineraria lyrata DC. khotolia, moholu-oa-pela (S)	—	Burned and smoke inhaled for colds (S) [84]. Leaves of *C. aspera* Thunb. are smoked for asthma (S) [84].	*C. aspera* Thunb. is reputed to be as intoxicating as *Cannabis sativa* L. [84]. ?antispasmodic (asthma usage*) ?narcotic (repute)
Conyza scabrida DC. (syn. *C. ivifolia* (L.) Less.) isavu (X)	lf	Ground and snuffed (X) BCR 454 (UFH). Leaf infusions taken for coughs and colds, charred root powder rubbed into cuts made on the chest for pleuritic pain (Z) [84]. Decoctions are used for convulsions in children by various ethnic groups in South Africa [84]. Flowers of *C. spartioides* O. Hoffm. are taken as a snuff for colds by the Bemba and related tribes [84].	The plant is aromatic and reported to have diaphoretic action [84]. Diterpenes, hautriwaic acid and 12 clerodane derivatives have been isolated [41]. ?analgesic (>1 pain relief usage) ?anti-inflammatory (usage) ?decongestant (aromatic compounds; >1sp. used as snuff)
Cotula anthemoides L. umhlonyana (X)	lf	Inserted into nose (X) [84].	No chemical compounds, biological activity or related usage known to authors.
Euryops evansii Schltr. sehlakoana (S)	st	Burned and smoked (S) [84]. A *Euryops* sp. is used in the Cape as a snuff for headaches and taken for asthma and influenza [84].	*Many spp. observed aromatic by one of us (A.H.). ?antispasmodic (asthma usage*) ?decongestant (aromatic compounds*)
Felicia muricata (Thunb.) Nees subsp. *muricata* (syn. *Aster muricatus* Thunb.) koelehane, 'ma'mileng, mohot soane, mokhoto, mosola-tsela (S)	—	Crushed and inhaled (S) (84). Leaves of *F. erigeroides* DC. are used for severe abdominal pain (Z) [13].	*Polyacetylenic compounds germacrene-D and neophytadiene have been isolated from *F. erigeroides* [9]. ?analgesic (>1 sp. used for pain)
Gerbera viridifolia (DC.) Sch. Bip. moarubetso, ripa-lithata	—	Burned and smoked (S) [84]. Roots of *G. piloselloides* (L.) Cass. are used for earache (S; Z) [84]. *G. ambigua* (Cass.) Sch. Bip. is used for abdominal and heart pain in Zimbabwe [27].	*Extracts from *G. lanuginosa* Benth. have shown antispasmodic activity [21]. ?analgesic (>1 pain relief usage >1 sp. used for pain) ?antispasmodic (known activity*)
Helichrysum caespititium (DC.) Harv. boriba, botsikinyane,	wp	Crushed, burned and inhaled (S:45). Roots of *H. globosum* Sch. Bip. are	Caespitin, a phloroglucinal deriv. with antimicrobial activity has

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
lelula-phooka, mafole, moriri-oa-lefatse (/naha/phooko/ setsohali /thota), phate-ea-naha (/thota), selelusa-phooko (S)		used for menstrual pain in East Africa [51]. *H. stoechas* DC. was used as an expectorant in Britain [86].	been isolated from the plant [20]. See also below. ?analgesic (>1 sp. used for pain) ?anti-inflammatory (flavonoids*) ?decongestant (>1 sp. used for colds)
Helichrysum dregeanum Sond. et Harv. toane-ea-thaba (S)	lf	Smoked to cure colds in the head (S) [45].	*See above and below. ?analgesic (>1 sp. used for pain) ?anti-inflammatory (flavonoids*) ?decongestant (>1sp. used for colds)
Helichrysum nudifolium (L.) Less. impepho (Z)	wp/lf	Burned and smoke inhaled (Z) (J. Mhlongo, pers. comm.) Hutchings 3004 (ZUL).	Aromatic. *See above.?analgesic (>1 pain relief usage) ?anti-inflammatory (flavonoids*) ?decongestant (aromatic compounds; >1 sp. used for colds)
Helichrysum odoratissimum (L.) Sweet imphepho (X,Z)	wp/lf	Smoke inhaled (Z) (J. Mhlongo, pers. comm.) (X) (C. Lamla, pers. comm.). *H. odoratissimum* (L.) Less. is used for dysmenorrhoea in Rwanda and abdominal pain and colds in other parts of Africa [81].	Aromatic. Phloroglucinols have been isolated [47]. Helichrysetin and two flavonoids, have been isolated from flowers of *H. odoratissimum* (L.) Less. [81]. The flavonoids 3.O-methylquercetin showed antimicrobial activity. ?analgesic (>1 pain relief usage; >1 sp. used for pain) ?anti-inflammatory (flavonoids*) ?decongestant (aromatic compounds; >1 sp. used for colds)
Mikania capensis DC. ililhoza, ihlozi elimhlope, umdlozo (Z)	lf	Smelled and used as poultice for headaches (Z) [22,28]. Used for head colds (Z) [29]. Used for painful rectums in children (Z) (J. Mhlongo, pers. comm.). A *Mikania* sp. is used for snake and scorpion bites in other parts of Africa [84].	*Extracts from aerial parts of *M. cordata* have CNS depressant properties and anti-inflammatory, analgesic and neuropharmacological effects on animals [8,62]. Reductions in agressive behaviour in mice were observed. ?analgesic (>1 pain relief usage: >1 sp. used for pain) ?sedative (known effects*)
Mikania natalensis DC. umdlozo (Z)	lf	Probably used as above for headaches (Z) [28]. Usage confirmed by J. Mhlongo.	*See above. ?analgesic (>1 pain relief usage: >1 sp. used for pain) ?sedative (known effects*).
Nolletia ciliaris (DC.)' Steetz moloka, sekikitiela (S)	lf	Smoked (S) [45].	No chemical compounds, biological activity or related usage known to authors.

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
Senecio retrorsus DC. (syn. *S barbellatus* DC.) idwarhane (X)	rt	Powdered and taken as snuff (X) [72]. Roots of *S. petitianus* A. Rich. and *S. syringifolius* O. Hoffm. are used for head colds in East Africa [51]. *S. vulgaris* L. was used for bilious pain and *S. jacobaea* L. was used for myalgia in Britain [86].	Alkaloids retrosine, isatidine and sceratine present, human poisoning from medicinal ingestion reported [72]. ?analgesic (>1 sp. used for pain) ?toxic (suspected human deaths; alkaloids)
Senecio rhyncholaenus DC. mahoanengi, mahhoanyana (S)	lf, wp	Smoked or burned and smoke inhaled (S) [45]. Root decoctions drunk for colic pains (also other spp.) (S) [45].	Hepatotoxic pyrollizidine alkaloids are known in many spp. [82]. ?analgesic (>1 sp. used for pain) ?toxic (suspected human deaths*); alkaloids*)
Senecio speciosus Willd. ibohlohlolo, igwayi (Z)	l	Dried, ground and snuffed (Z) [43]. Leaf decoctions are taken for chest pain (Z) [84].	*See above. ?analgesic (>1 pain relief usage; >1 sp. used for pain) ?toxic (poisoning reports*; alkaloids)
Tarchonanthus camphoratus L. mofahlana (S)	br	Crushed, burned and inhaled (S) [45]. Used in the Cape asthma and toothache (84). Used in Botswana for asthma [40].	Aromatic. Narcotic effects reported from smoking and chewing leaves [64]. ?analgesic (>1 pain relief usage) ?antispasmodic (asthma usage) ?decongestant (aromatic compounds) ?narcotic (reported effects) ?toxic (narcotic properties)
CAESALPINACEAE			
Albizia adianthifolia (Schumach.) W.F. Wight umgadankawu (Z)	sb	Powdered and snuffed (Z) (pers. comm. M. Cele) (X) [67]. Roots of two spp. are used for headaches in East Africa [51]. Roots of *A. atunesiana* Harms are used for various forms of pain in Zimbabwe [27].	Large amounts of histamine have been found in the bark of the roots, stem and branches [57]. Root extracts produce uterine contractions in several experimental animals and also have hypotensive effects [19]. *A highly toxic, abortifacient glycoside, albitocin, is known in *Albizia* spp. [61]. Sawdust of some spp. is very irritant to the nasal passages and some spp. have been used as fish poisons. Human death from medicine made from *A. anthelmintica* (A. Rich.) is suspected [51]. ?analgesic (>1 sp. used for pain) ?decongestant (irritant properties*) ?hypotensive (known effects) ?toxic (reported poisoning*)

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
Erythrophleum lasianthum Corb. syn. *E. guineense* var. *swaziense* Burtt Davy umkhangu (Z)	sb	Powdered and snuffed (Z) (Notes on H.B. Nicholson 3033 (PRE) confirmed by J. Mhlongo) Bark of *E. guineense* G. Don is used as a sternutatory in West Africa [61]. *E. africanum* (Benth.) Harms is used in Zimbabwe for stomach pains [27].	Cardioactive alkaloids (b, s), mainly erythrophleine, which has local anaesthetic action but is also convulsant [61]. Erythrophleine may be useful in spasmodic asthma. The bark has been used in arrow and ordeal poisons and human death from respiratory arrest reported [84]. ?analgesic (>1 sp. used for pain; known activity) ?antispasmodic (alkaloid effects) ?toxic (human poisoning)
CANNELACEAE			
Warburgia salutaris (Bertol. f.) Chiov. (syn. *W. ugandensis* Sprague) isibaha (Z)	sb	Used for headaches, chest congestion, influenza and malaria (Z) [67]. Widely used in Africa for coughs and colds, also in Tanzania for toothache [84].	The inner bark, root bark and leaves taste pungent and the bark is aromatic [84]. D-mannitol has been isolated from the bark and drimenol and eremophilone sesquiterpenes from the heartwood [33–35]. Drimenin has insect antifeedant properties [83]. ?analgesic (>1 pain relief usage) ?decongestant (usage; aromatic properties) ?toxic (antifeedant properties)
CAPPARACEAE			
Capparis tomentosa Lam. iqwaningi, umabusane (Z)	rt	Burned, powder rubbed into scarifications (Z) [84]. Roots are used for headaches in Venda [40] and for asthma and chest pain in East Africa [51]. *C. fascilularis* DC. is used for headaches in East Africa [51]. Fruit of *C. cartiaginea* Decne is used for headaches in Egypt [36]. *C. decidua* (Forsk.) Edgw. is used in India for fever and rheumatism [61].	Roots reported to have caused illness and death in humans after medicinal use [84]. Toxic stachydrine alkaloids are known in fruit, also in fruit of *C. fascicularis* DC [78] and also in root bark of *C. decidua* (Forsk.) Edgw. [61]. *Cappaprenol-13 has been isolated from *C. spinosa* and has anti-inflammatory properties [1]. **C. badduca* L. has anticonvulsive activity (17) ?analgesic (>1 pain relief usage; >1 sp. used for pain) ?anti-inflammatory (known activity*) ?antispasmodic (asthma usage; known activity*) ?toxic (suspected human deaths)

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups*/	Plant part used[b] (where known).	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
CRASSULACEAE			
Crassula lanceolata (Eckl. et Zeyh.) Endl. ex Walp. (syn. *C. transvaalensis* (Kuntze) Schum.) moriri-oa-letlapa (S)	wp	Dried, crushed and smoked (S) [45]. A *Crassula* sp. is used in a snuff taken for ringing in the head (X) BCR 978 (UFH). *C. vaginata* Eckl. et Zeyh. is used for earache (X) BCR 416 (UFH).	*Some spp. are reported toxic to stock [59]. ?analgesic (>1 sp. used for pain) ?toxic (poisoning reports)
EBENACEAE			
Euclea undulata Thunb. mokoerekoere, molwerekwere, mohlakola (S)	sb	Powdered and applied to head on a strip of bark from *Dombeya rotundifolia* (Hochst.) Planch. (S) [84]. Roots are used in South Africa for toothache and other pains [84]. Roots of *E. natalensis* A. DC. are used for headaches and toothache by the Tonga [84]. Roots of *E. divinorum* Hiern are used for headaches in Zimbabwe [27] and for abdominal and chest pain in East Africa [51].	Diospyrin and 7-methyljuglone has been isolated from roots of *E. undulata* var. *myrtina* [80]. Root-bark infusions have purgative effects **E. coriaceae* A. DC. roots are suspected of causing human deaths [84]. Roots, rootbark and fruit of **E. crispa* (Thunb.) Guerke (syn. *E. lanceolata* E. Mey. ex A. DC.) is [84]. reputed by users to be toxic [84]. ?analgesic (>1 sp. used for pain: >1 pain relief usage) ?toxic (suspected poisoning*)
EUPHORBIACEAE			
Andrachne ovalis (Sond.) Muell. Arg. mbezo (X); umbeza, umembezi, umbosa (Z)	rt	Burned and sniffed (X) (E. Bigalke, pers. comm.); (Z) [31].	Strong smelling, induces sneezing and is used to kill flies [31]. ?decongestant (reported effects) ?toxic (insecticidal usage)
Clutia pulchella L. ugadi (X)	rt	Ingredients in cure (X) (E. Bigalke, pers. comm.). Stems, leaves and roots are used for griping pains children (Z) [84]. *Roots of three spp. are headaches and colds in East Africa [51].	Roots emit a pungent odour when burned [77]. Bark suspected of causing human deaths [84]. ?analgesic (>1 pain relief usage; >1 sp. used for pain). ?toxic (suspected human deaths)
Phyllanthus meyerianus Muell. Arg. ilethi (Z)	rb	Decoction drunk — substitute for *Myrica serrata* (Z) [31]. *P. stuhlmanni* Pax is used in East Africa for asthma and *P. urinaria* L. is used in Australia for headaches and in Asia for toothache and as a spasmolytic [84] *P. niruri* L. is used for intenstinal spasms in ghana [61].	*Antifungal, antiviral and antibacterial properties have been reported in *P. niruri* extracts [61]. *Extracts from *P. niruri* and *P. maderaspatensis* L. produce antispasmodic activity [21]. **P. engleri* Pax and *P. reticulatus* Poir roots, root bark and fruit are reported to have been used as human poisons [84]. Stock deaths are also reported [78]. Toxic glycoside are known in the bark

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups*/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
			roots and leaves of *P. engleri* and symptoms of poisoning include a slower heartbeat, followed by convulsions. ?analgesic (>1sp. used for pain) ?antispasmodic (known activity*; asthma usage*) ?toxic (suspected human deaths*)
Spirostachys africana Sond. umthomboti (Z)	wo	Slightly burned and inserted in nostrils (Z) (63). Latex is used for stomach pain in Zimbabwe [27].	Highly irritant latex, known to be toxic [84]. Sawdust irritates the eyes and skin and the smoke causes headaches. A human death following medicinal ingestion of four drops of latex is reported [27]. Other human poisoning is suspected, and use as fish poison is also reported. ?analgesic (>1 pain relief usage) ?decongestant (irritant effects) ?toxic (suspected human deaths; known effects)
Synadenium cupulare (Boiss.) L.C. Wheeler umbulele, umdlebe, umzilanyone (Z)	lf	Broken and inhaled for headaches from influenza and catarrh (Z) [13]. Dried and chewed for asthma (S) [84]	Highly irritant latex, producing pain, severe inflammation and even loss of the eye, swelling of the mouth and blistering and sores on the skin [84]. *S. grantii* Hook. f. is suspected of causing death in cattle and has caused death in experimental animals [84]. Leaves are suspected of causing convulsions in a child. ?analgesic (> 1 sp. used for pain; >1 pain relief usage) ?decongestant (irritant effects) ?toxic (human poisoning reports).
	wo	Burned and smoke inhaled (Z) (J. Mhlongo, pers. comm.). Latex used for toothache (S) [84]. Roots and leaves of *S. grantii* Hook. f. are used for earache and for backache in East Africa and Tanzania [51].	
FABACEAE			
Indigofera fasti. giata E. Mey. leta-la-phofu, phehloane (S)	rt	Burned and smoked (S) [45]. Various spp. are used for neuralgia and as sedatives. Roots of *I. sessilifolia* DC. are used for toothache (X) (77). *Some spp. are used for chest pain in Zimbabwe [27]. Other spp. are used as antispasmodics and analgesics in Mexico [39]. Stems and leaves of *I. tinctoria* L. are used for asthma in Tanzania [84]. Roots of *I. swaziensis* Bolus are used for general pain in East Africa and two spp. are	*Two spp. are reported to have caused human deaths in South Africa and some spp. to have poisoned stock animals [84]. *Spasmolytic activity has been noted in two Indian spp. [21]. *Rutin and apigenin are known in *I. hartwegi* Rydb. [39]. *I. suffruticosa* Miller has CNS depressant properties [88]. *Aerial parts of *I. swaziensis* Gillet are cytotoxic [16].

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
		used for headaches [51]. An *Indigofera* sp. is used to induce sleep in and calm down mental patients in Botswana [40]. *I. flavicans* Bak is used for trance induction by the !Kung Bushmen in the Kalahari [88].	*Roots of various spp. have been used as fish poisons [39,84]. ?analgesic (>1sp. used for pain). ?anti-inflammatory (flavonoids*) ?antispasmodic (used for asthma*; known activity*) ?narcotic (trance induction*) ?sedative (usage) ?toxic (suspected human deaths*)
Indigofera tristoides N.E. Br. mmusa-pelo (S)	—	Used for neuralgia (S) [84].	*See above. ?analgesic (>1sp. used for pain; reported properties*) ?anti-inflammatory (flavonoids*) ?antispasmodic (used for asthma* known activity) ?sedative (usage*) ?narcotic (trance induction*) ?toxic (suspected human deaths*)
Otholobium polystictum (Benth. ex Harv.) C.H. Stirton (Syn. *Psoralea poly-sticta* Benth. ex Harv.)	rt	Smoked for a cold in the head (S) [84]. *A *Ploralea* sp. is smoked as an asthma remedy in the Kalahari [84].	*Psoralen from *P. coryfolia* L. has photosensitising and phototoxic effects in animals and humans [58] ?antispasmodic (used for asthma*) ?toxic (phytoalexin**)
Rhynchosia caribaea (Jacq.) DC. monya-a-mali, morarana-oa-liphephepa, thara (S)	rt	Powdered and snuffed (S) [45]. *Roots of two spp. are used for abdominal pain in Zimbabwe [27]. Roots of *R. holoserica* Schinz are used for stomach pain in Botswana [40].	*Seeds of *R. pyramidalis* (Lam.) Urb and *R. longeracemosa* Mart. et Gal. are reported to have narcotic effects [2]. *Anti-inflammatory activity has been observed from extracts from aerial parts of *R. phaseoloides* DC. and *R. pyramabilis* (Lam.) Urb. (7). ?analgesic (>1 sp. used for pain) ?anti-inflammatory (known activity*) ?narcotic (known effects*)
Rhynchosia harveyi Eckl. et Zeyh. uvuma (X)	rt	Snuffed for headaches (X) BCR 217 (UFH). ?analgesic	See above. (>1 sp. used for pain) ? anti-inflammatory (known activity*)?narcotic (known effects*)
Rhynchosia sp. u(lu)khamile, ikhalimele (Z)	lf/st	Used for headaches, migraine and menstrual pain (Z) [13,67]. Also used for sore eyes.	See above. ?analgesic (>1 sp. used for pain) ?anti-inflammatory (activity*) ?narcotic (reported effects*)

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
Tephrosia capensis (Jacq.) Pers. isikwali, isidamvubu (Z)	rt	Dried and powdered and snuffed (Z) Mogg, 3822 (PRE). Roots of *T. radicans* Bak. are used for headaches in Zimbabwe [27]. Roots of *T. vogellii* Hook. f. are used for toothache in Central Africa [84]. *T. purpurea* (L.) Pers. is used for headaches in East Africa and this and two other spp. are used for abdominal pain [51]. Leaves of two spp. are inhaled for head colds.	Used as an arrow poison [84] *Rotenone occurs in some spp. and causes nausea, vomiting, muscle tremors, tachypnea in large doses (chronic poisoning may effect liver and kidneys and inhalation is more harmful than ingestion. Some spp. are suspected of having caused human deaths and many spp. have been used as fish or arrow poisons [84]. ?analgesic (>1 sp. used for pain) ?decongestant (head cold usage*) ?toxic (arrow poison usage; suspected human deaths*)
FLACOURTIACEAE			
Gerrardina foliosa Oliv. i(li)lethi (Z)	sb	Smelled for headache, used as a substitute for *Myrica serrata* Lam. (Z) [31].	No chemical compounds, biological activity or related usage known to authors.
LAMIACEAE			
Acrotome inflata Benth. isigagisa (X)	—	Ground and mixed with other, unspecified ingredients; also used for stomachache (X) (E. Bigalke, pers. comm.).	Aromatic. ?analgesic (>1 pain relief usage) ?decongestant (aromatic compounds)
Leonotis leonorus (L.) R. Br. imunyane (Z)	lf	Pounded, cold water infusion inhaled (Z) [13]. Crushed and inserted in nose (Z) (J. Mhlongo, pers. comm.). Rootbark is used for snakebite. This and other spp. are widely used in South Africa for headaches and asthma [84]. *L. nepetifolia* (L.) Ait. f. is used for stomachache in East Africa and a *Leonotis* sp. is used for stomach pain in Botswana [40].	Aromatic. Reported to have narcotic properties but these have not been confirmed [84]. ?analgesic (>1 sp. used for pain; >1 pain relief usage) ?decongestant (aromatic compounds) ?narcotic (reported properties) ?toxic (narcotic properties)
Leonotis ocymifolia (Burm. f.) Iwarsson var. *raineriana* (Visiani) Iwarsson (syn. *L. dysophylla* Benth.) munca, muncgwane (X).	—	Used with another medicine for headaches (X) (E. Bigalke, pers. comm.).	Aromatic. *See above. ?analgesic (>1 sp. used for pain) ?decongestant (aromatic compounds) ?narcotic (reported properties*) ?toxic (narcotic properties)
Mentha longifolia (L.) L. (syn. *M. sylvestris* L.) koena, koena-ya-thaba (S) inixina (X)	lf	Crushed, inserted in nose, head then bound, also used for coughs and colds (S;X;Z) [84]. Decoctions drunk	Aromatic. Epoxypulegone is the major volatile oil component [86]. *Spasmolytic properties are

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
		for asthma (X) BCR 1232 (UFH). Leaves of *M. australis* R. Br. are sniffed for headaches in Australia [52]. *M. x piperata* L. is inhaled for head colds in Europe [26].	known in other spp. **M. spicata* L. is reported to have analgesic properties [42]. ?analgesic (>1 pain relief usage) ?antispasmodic (asthma usage; known activity*) ?decongestant (aromatic compounds)
Rabdosiella calycina (Benth.) Codd (syn. *Plectranthus calycinus* Benth.) ikambi (X)	—	Powder inserted into nose (X) (E. Bigalke, pers. comm.)	Aromatic. ?decongestant (aromatic compounds)
Tetradenia riparia (Hochst.) Codd (syn. *Iboza riparia* (Hochst.) N.E. Br.) iboza (Z)	lf	Crushed and inhaled (Z) (J. Mhlongo, pers. comm.) Hutchings 3009 (ZUL). Decoctions are taken as expectorants for chronic coughs (Z) [13]. Used for headaches and various aches and fevers in Rwanda [38].	Aromatic. Compounds isolated include a diterpenediol with antimicrobial, antispasmodic and anti-trichomonas activity [1,81,38]. ?analgesic (> pain relief usage) ?antispasmodic (known activity) ?decongestant (aromatic compounds)
LAURACEAE			
Ocotea bullata (Burch.) Baill. umnukani (Z, X)	sb	Ground and snuffed or smoke inhaled (Z) [84]. Usage confirmed by J. Mhlongo.	Odorous when freshly cut; *Aporphine alkaloids and neolignans are known in other spp. [33,35]. ?decongestant (aromatic compounds)
MALVACEAE			
Hibiscus malacospermus (Turcz.) E. mey. ex Harv. bohojana, lebutsela, sekutle, seputle (S)	—	Used to cure headaches, no further details reported (S) [45]. Roots of *H. rhodanthus* Gurke are used for earache in Zimbabwe [27]. Roots and stems of *H. abelmoschus* L. are used for headaches in Guinea [84]. Two *Hibiscus* spp. are used for chest and abdominal pain in Botswana [40].	*The bioflavonoid gossipin from *H. vitifolius* L. has anti-inflammatory activity [61]. **Gossypol from *Gossypium* spp. has anti-influenza viral action [61]. ?analgesic (>1 sp. used for pain). ?anti-inflammatory (known activity*)
MELIACEAE			
Ekebergia capensis Sparrm. (syn. *E. meyeri* Presl ex DC.) mmamba (S)	rt	Decoctions taken orally (S). [84]. Roots of **E. benguelensis* Welw. ex DC. for abdominal and pains and dysmenorrhea in Zimbabwe [27].	Bark is reputed to be poisonous [84]. ?analgesic (>1 pain relief usage) ?toxic (repute)
MELIANTHACEAE			
Bersama lucens (Hochst.) Szyszyl. isindiyandiya, undiyaza (Z)	sb/rt	Ground and snuffed, (Z) [67]. Also used as an emetic for nervous com-	Leaves and roots are suspected of causing a human death [84].

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
		plaints (confirmed by H. Cwele). Stembark is used for dysmennorhoea [13]. Root infusions of *B. abyssinica* Fresen. are taken for headaches and general body pain in Zimbabwe [27].	?analgesic (> 1 sp. used for pain; > 1 pain relief usage) ?toxic (human poisoning reports)
MYRICACEAE			
Myrica serrata Lam. (syn. *M. conifera* auct. non Burm. f.) ilethi (Z)	rb	Decoction drunk (Z) [31]. Plant also used for dysmenorrhea (S) [45] *M. cerifera* L. is used for colds and other ailments in Europe [86]. *M. salicifolia* Hochst. ex *A. Rich* is used for headaches and this and two other spp. for abdominal pain in East Africa [51].	Aromatic, oil found in leaves, stems and roots; chewing the leaf produces intense throat irritation and headache [84]. *Spasmolytic activity has been observed and confirmed in *M. nagi* Thunb. [21]. *Carcinogenic activity has been reported from tannins and phenol from the bark of *M. cerifera* and myricitrin is bactericidal and spermatocidal [86]. ?analgesic (> 1 pain relief usage; > sp. used for pain) ?decongestant (aromatic compounds*) ?antispasmodic (known activity*) ?toxic (known irritant effects; reported activity*)
OLEACEAE			
Olea europea L. subsp. *africana* (syn. *O. africana* Mill.) motholaoari (S), umquma (Z)	rt, sb lf lf	Decoctions from scraped roots and grated bark are used, no further details are given (S; X; Z) [70]. Used for headaches, no further details given (S) [84].	*O. europea* is used in Europe in drugs for hypertension, the active principle is oleuropein [85]. The drug shows spasmolytic activity and has irritant effects on gastric mucosa. Cytotoxic activity is noted in leaves and bark of *O. lancea* Lam. [16]. ?antispasmodic (known activity) ?hypotensive (known activity) ?toxic (known activity*)
PLUMBAGINACEAE			
Plumbago auriculata Lam. (syn. *P. capensis* Thunb.) umatshintshine (Z, X); umabophe, umthiwa-amadoda (X)	rt lf	Powdered and snuffed (Z) [31]; (X) [84]. Crushed and sniffed (Z) (J. Mhlongo, pers. comm.). Hutchings 3002 (ZUL). Roots of *P. zeylanica* L. are widely used for shortness of breath and chest pain in Zimbabwe and Botswana [27,40]. *P. zeylanica* is used for trance induction by the !Kung Bushmen in the Kalahari [88].	Plumbagin from roots has in vitro antimicrobial activity [80]. It is a CNS stimulant and produces convulsions in frogs, rabbits and mice, and foetal death in rats [84]. A human death is suspected after external application of bark. **P. zeylanica* L. is reported to be known as a dangerous abortifacient and the genus is known to contain

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
			substances with antispasmodic activity and to produce narcotic and paralytic effects [88]. ?analgesic (>1 sp. used for pain) ?antispasmodic (known activity*) ?narcotic (reported effects*) ?toxic (suspected human deaths)
POLYGONACEAE			
Rumex sagittatus Thunb. bolila-bo-boholo (S) umdende (Z)	rt	Powdered and snuffed (S) [45]. Used for toothache (Z) [28]. Roots are used for abdominal pain in infants in Zimbabwe [27]. Leaves and roots of *R. nepalensis* Spreng. are used for headaches and abdominal pain in Tanzania [84].	*Anthraquinones chrysophanein and the aglycone chrysophanol occur widely in the genus [79]. *Oxalic acid is known in a number of spp. and animal and human deaths have been suspected [84]. ?analgesic (>1 pain relief usage; >1 sp. used) ?toxic (suspected human deaths*)
RANUNCULACEAE			
Anemone caffra Eck. et Zeyh. umanzemnyama, uxhobakhulu uxhobokhulu (X) umanzemnyama, iyeza elimnyame (Z)	rt/lf	Ground and snuffed (X;Z) [77]. If this fails, smoke from burned roots is inhaled and ground leaf paste applied (X) [77]. Snuffed for dizziness (X) BCR 984 (UFH). Also put in hole for toothache (X) BCR 1236 (UFH). *A. hepatica* L. is used for neuralgia and *A. nemorosa* L. has been used for toothache in Europe [18].	*Triterpene saponins and ranunculin, hydrolizing to protoanemonin, are characteristic of the genus [73]. These compounds are acrid and strongly irritant to skin and mucous membranes. Protoanemonin has known vesicant, antibacterial and antifungal properties [58,55]. ?analgesic (> pain relief usage; >1 sp. used for pain) ?decongestant (irritant effects) ?toxic (vesicant properties)
Clematis brachiata Thumb. ityolo (X)	st	Bruised and sniffed to clear nostrils (X) [77]. Leaves and roots are used as snuff and for chest pain in other parts of Africa [84]. Roots and leaves of two spp. are used for headaches in East Africa [51]. *C. vitalba* L. is used for migraine in Europe [18]. Leaves of *C. glycinoides* DC. are sniffed for headaches in Australia [52].	*Belongs to the ranunculin-producing group with action as above. *Analgesic and rubifacient effects are reported from the application of ointment made from leaves of *C. vitalba* L. [18]. Sap is reported to possibly relieve migraine attacks but can damage the mucous membrane. Decongestant effects are reported from sniffing leaves of *C. glycinoides* DC. [53]. ?analgesic (>1 sp. used for pain; reported effects*) ?decongestant (reported effects*) ?toxic (reported effects*)

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups*/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
Knowltonia anemonoides H. Rasm. subsp. *anemonoides* (syn. *K. gracilis* (vent) DC.) uxapusa (Z)	lf	Burned and smoke inhaled (Z: 84). *K. transvaalensis* Szylszyl is used for headaches in the Transvaal province of South Africa [84].	*Belongs to the ranunculin producing group with action as above. *K. bracteata* Harv. ex Zahlbr. is suspected of causing human deaths [48]. ?analgesic (>1 sp. used for pain) ?decongestant (irritant effects) ?toxic (suspected human deaths*)
Ranunculus multifidus Forrsk. (syn. *R. pinnatus* Poir) (t)lapi (S), uxhaphozi (Z)	wp/lf lf	Burned and smoke inhaled (S) [45]. Bruised and sniffed (Z) (J. Mhlongo, pers. comm.). Applied to traumatic bumps on head and to stop pain from wounds (X) BCR 771 (UFH); BCR 88 (UFH).	*Belongs to the ranunculin-producing group with action as above. Reported toxic to sheep [51]. ?analgesic (>1 pain usage) ?decongestant (irritant effects) ?toxic (vesicant properties)
Ranunculus sp. isishoshoka (Z)	lf	Pounded with *Synadenium cupulare* in water and sniffed for influenza headaches and catarrh (Z) [13].	*Belongs to the ranunculin-producing group with action as above. ?decongestant (irritant effects) ?toxic (vesicant properties)
ROSACEAE			
Alchemilla woodii Kuntze molal-phoka, moro-thetso phokana (S)	wp	Roasted on hot ashes, smoke inhaled (S) [45].	*Traces of salicylic acid are found in *A. vulgaris* L. [23]. *A. vulgaris* is reported to have anti-inflammatory properties [42]. ?analgesic (salicylic acid) ?anti-inflammatory (known activity*)
Prunus persica (L.) Batsch pereski (S)	rt	Burned and smoke inhaled (S) [45]. Bark, leaves and oil from seeds are used as sedatives, diuretics and expectorants in Europe [86].	Cyanogenetic glycosides in leaves [86]. *Stem extracts from *P. spinosa* L. show antidepressive-like activity in mice [15]. ?decongestant (expectorant usage) ?sedative (reported usage; observed activity*) ?toxic (glycosides)
SAPINDACEAE			
Ptaeroxylon obliquum (Thunb.) Radlk. umtate (X)	wo	Powdered and snuffed (X) [84]	Aromatic. Wood dust is very irritant, and induces sneezing [64]. The wood oil is pungent and the wood is insect-repellant. ?decongestant (aromatic compounds; reported effects)
Cardiospermum halicacabum L. ikhambi leziduli, uzipho (Z)	lf	Rubbed and inhaled for catarrh (Z) [13].	Stigmasterol and quebrachitol in aerial parts [61]; leaves reported pungent but this was not con-

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
			firmed by one of the authors (A.H.). Ingestion of large quantities of seed may produce convulsions in children (84). ?decongestant (pungent compounds) ?toxic (repute)
Hippobromus pauciflorus (L. f.) Radlk. (syn. *H. alata* (L. f.) Eckl. et Zeyh.) ughume (Z)	rt	Pounded in water drawn up into nose for influenza headaches (Z) [13]. Usage confirmed by J. Mhlongo).	Tree resinous and aromatic; reputed poisonous [13]. ?decongestant (aromatic compounds) ?toxic (repute)
	sb	Taken as an emetic and analgesic (Z:84).	
SOLANACEAE			
Datura metel L. syn. D. fastuosa L. (li)loyi, iyoli, iyoye, iyoyi (Z)	lf	Smoked for relief of asthma and headaches (Z) [31]. Usage confirmed by J. Mhlongo. Flowers are used for asthma in East Africa [51] and as an analgesic and for asthma in China [3]. Smoked with tobacco for toothache in Indonesia [54].	Atropine alkaloids, atropine, hyoscyamine, hyoscine found in flowers, leaves and seeds [61]. These alkaloids can produce delirium and hallucinations. They are antispasmodic and are used in many asthma powders. Atropine has CNS stimulant properties and is a useful sedative and hypnotic. Datura poisoning is well known [27]. Symptoms include ataxia, confusion dilated pupils, tachycardia and exaggerated reflexes. The plant has been reported to be used homicidally in Africa and to poison fish in China [84]. ?analgesic (>1 pain relief usage; >sp. used for pain) ?antispasmodic (asthma usage) ?narcotic (known effects) ?sedative (known activity) ?toxic (suspected human deaths; known effects)
Datura stramonium L. ibhudabhuda, ingsqanganuanga ijoyi, umvumbangwe (X) iloyi, iyoli, iyoyi (Z)	lf	Smoked for relief of asthma and headaches (Z) [31]. Usage confirmed by J. Mhlongo; (X) BCR 822 (UFH). Used in Europe for burning powders and cigarettes for relieving asthma [85]. Leaves are used in India for headaches [46].	The plant has a distinctive smell. Atropine alkaloids, mainly hyoscyamine, hyoscine and atropine. Whole plant toxic, poisoning with symptoms of mental confusion reported [27]. Scopolamine from the plant is used for analgesia in China [65] ?analgesic (>1 pain relief usage; >sp. used for pain) ?antispasmodic (asthma

Table 1 (continued)

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			usage) ?narcotic (known effects) ?sedative (known activity) ?toxic (suspected human deaths; known effects)
Lycium cinereum Thunb. (sens. lat.) (syn. *L. kraussii* Dun.) moferefere, mosukusoane (S)	—	Unspecified parts of plant smoked (S) [45]. Roots are used in Botswana for kidney pain [40].	Serious poisoning is recorded but not detailed [84]. *Fruit and other aerial parts of *L. ferocissimum* Miers. have been suspected of causing poisoning, with narcotic effects, in humans and animals [84]. *Steroidal lactones (withanolides) are known in genus [24]. **A withanolide from *Withania coagulans* has anti-inflammatory activity [74]. ?analgesic (>1 pain relief) ?anti-inflammatory (known activity*) ?narcotic (reported effects) ?toxic (suspected human poisoning)
Solanum mauritianum Scop. syn. *S. auriculatum* Ait. umbangabanga (X)	lf	Dried, ground and snuffed (X) (E. Bigalke, pers. comm.). Roots of *S. delagoense* Dunal and *S. incanum* L. are used for headaches, general body pains and dysmennorhoea in Zimbabwe [27]. Roots of *S. cf. panduriforme* E. Mey. are used for headaches in Venda and for chest pain in Botswana (40). Seeds, fruit and leaves of *S. mammosum* L. are used for asthma in Guatamala [14]. Roots and fruit of *S. carolinense* L. are used as sedatives and anticonvulsants in Britain [86]. *Several spp. are used for toothache (X) BCR 585, 929 (UFH); (Z) [30].	The plant produces a distinctive, unpleasant smell when handled. Intense allergic responses involving the skin and eyes have been reported after handling [84]. Human fatalities from ingestion of fruit and cattle poisoning are reported. Solasodine has been isolated from leaves and fruit [71]. It has known anti-inflammatory activity. *Solanine, from other spp. has analgesic anticholinesterase and sedative action [61]. ?analgesic (>1sp. used for pain: known activity*) ?anti-inflammatory (known activitiy*) ?antispasmodic (asthma usage*) ?decongestant (reported effects) ?sedative (known activity*) ?toxic (reported effects)
THYMELAEACEAE			
Gnidia capitata L. f. (syn. *Lasiosiphon capitatus* (L. f.) Burtt Davy) setele, thopa (-e-nyenyane), thopana (S)	lf	Snuffed and also applied as a poultice for toothache (S) [84]. Smoke from roots is inhaled for asthma in Zimbabwe [27]. Leaves of *G. kraussiana* Meisn. used for	*Spasmolytic activity has been noted in extracts from *Lasiosiphon eriocephalus* Decne [21]. *A human death has been reported following ingestion of

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups*/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
		earache in Zimbabwe, for abdominal pain in East Africa and for toothache in Zaire [27]. Roots of *G. cuneata* Meisn. (syn. *Lasiophon meisneri* Endl.) are used for snake-bite and toothache (X) [77].	medicine from roots of *G. kraussiana* [27]. *Severe irritation to eyes, nose and skin have been reported in humans handling *G. burchelli* (Meisn.) Gilg. and *G. polycephala* (C.A. Mey.) Gilg. [49]. Other symptoms included dyspnoea, coughing, headache and nausea. Stock deaths are reported. Irritant, cocarcinogenic and anti-plastic principles have been isolated from roots of various spp. incl. *G. kraussiana* [25]. ?analgesic (>1 sp. used for pain, >1 pain relief usage) ?anti-spasmodic (known activity*) ?decongestant (irritant effects*) ?toxic (suspected human deaths*; known effects*)
Gnidia gymnostachya (C.A. Mey.) Gilg. thopana-nyana, thopanyana, tsika-mango-tsoana (S)	lf	Smoked (S) [45].	See above. ?analgesic (>.1 sp. used for pain, >1 pain relief usage) ?antispasmodic (asthma usage; known activity*) ?decongestant (irritant effects*) ?toxic (suspected human deaths*; known effects*)
Gnidia sp.	rt	Smoke inhaled, also smoked for coughs and general pains and applied to painful teeth (S) [84].	See above. ?analgesic (>.1 sp. used for pain, >1 pain relief usage) ?anti-spasmodic (known activity*) ?decongestant (irritant effects*) ?toxic (suspected human deaths*; known effects*)
VERBENACEAE			
Lippia javanica (Burm. f.) Spreng. (Syn. *L. asperifolia* Rich.) umsuzwane (Z)	lf, st	Milk or water infusions are drunk for colds (X) [84]. (Z) (W. Menne, pers. comm.). Leaves and roots are used for headaches, shortness of breath and chest and abdominal pains in Zimbabwe [27]. **Aloysia triphylla* (syn. *L. triphylla* L'Her. is used as a sedative, antispasmodic and anti-pyretic in Britain [86]. It is also used as a cure for madness in Malawi [87].	Aromatic. Icterogenins are known in this sp. and *L. rehmanni* H.H.W. Pierce and are suspected of causing photosensitization in animals [84]. *Iridoid glucosides are known in several spp. [69]. *Sedative and antineuralgic properties are reported in *Aloysia triphylla* [18]. The oil is reported to have antispasmodic action on guinea-pigs [86]. *A caffeic acid ester from leaves of *L. multiflora* Moldenke

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
			has hypotensive action in rats [66]. ?analgesic (>1 pain relief usage) ?antispasmodic (known activity*) ?decongestant (aromatic compounds) ?hypotensive (known activity?) ?sedative (known usage*) ?toxic (icterogenins)
ANGIOSPERMS (MONOCOTS)			
AMARYLLIDACEAE			
Boophane disticha (L. f.) Herb. incwadi (X)	bu	Decoctions administered by mouth or as enemas (X) [37]. Used as a narcotic (S) [84]; (X) (F. Nkunjane. pers. comm.).	Alkaloids, incl. buphanine, known to be cardioactive, haemanthine, known to be narcotic and distichine [84]. Human death after ingestion of medicine reported [36]. Symptoms in non-fatal poisoning include giddiness, impaired vision and stupor. ?narcotic (known effects/usage) ?toxic (suspected human deaths).
IRIDACEAE			
Gladiolus crassifolius Bak. syn. *G. dieterlenii* Phill. Khahla-e-nenyane (S)	—	Used as a remedy for both headaches and lumbago (S) [84]. Corm decoctions of *G. ecklonii* Lehm. are taken for rheumatic pains (S) [84]. Corms of *G. sericeo-villosus* Hook. f. are used for dysmenorrhea (Z) [13].	*See below. ?analgesic (>1sp. used for pain) ?toxic (known activity*)
G. dalenii Van Geel (syn. *G. psittacinus* Hook.) kxahla-e-kholo (S)	co	Burned, smoke inhaled for colds (S) [84].	Saponins, flavonoids and phenolic substances have been isolated [11]. Extracts have caused toxic effects in rats, especially when administered intraperitoneally. Haemolysis was observed, for which the saponins were thought to be responsible. ?analgesic (>1 sp. used for pain) ?toxic (reported effects)
LILIACEAE			
Bowiea volubilis Harv. ex Hook.	bu	Used for headaches, no details reported (X) [6].	Various cardiac glycosides have been found [84]. Human and animal deaths reported. Sap and dry bulb reported very irritant. ?decongestant (irritant properties), ?stimulant (glycosides) ?toxic (suspected human deaths)

Table 1 (continued)

Family/species/synonyms used in references/ethnic names/ ethnic groups[a]/	Plant part used[b] (where known)	Preparation/route of administration/related usage/ informant[c]/ specimen voucher[d]/ reference[e]	Indicated constituents/biological properties/physiological effects/ reference[e]/deduced possible therapeutic or toxic action
Eucomis autumnalis (Mill.) Chitt. (syn. *E. undulata* Ait.) umathunga (Z)	bu	Dried and snuffed for pain from old skull wounds (Z) (J. Mhlongo, pers. comm.) also reported by [13] for *Cyrtanthus obliquus* (L. f.) Ait. but this is probably a misidentification).	Homoisoflavones, inc. autumnalin, eucomin and punctatin, the spirocyclic nortriterpene eucosterol and choladienoic acid [75,76,89]. The plant is suspected of causing human poisoning and known to cause death in sheep [84]. A bulb decoction of *E. autumnalis* subsp. *clavata* is reputed to cause sleepiness [84]. ?narcotic (reputed effects) ?toxic (suspected poisoning)
Litanthus pusillus Harv. khoho-ea-lefika, khoho-ea-mafika (S)	wp	Mixed with some mosses, burned, powdered and rubbed into incisions on forehead (S) [45].	No chemical compounds, biological activity or related usage known to authors.

[a]Ethnic groups: S = Sotho, X = Xhosa, Z = Zulu.

[b]Plant parts used: ap = aerial parts, sb = stem bark, br = branch, bu = bulb, co = corm, fr = fruit, lf = leaf, rt = root, rb = root bark, sd = seed, st = stem, tu = tuber, wo = wood, wp = whole plant.

[c]Informants: Dr E. Bigalke — former curator East London Museum; Mr. M. Cele, traditional healer, Natal; Mrs. A. McVann — forensic scientist, South African Department of National Heath and Population Development; Mr. W. Menne — horticulturalist, Natal; Mr. J. Mhlongo — traditional healer, KwaZulu; Mr. F. Nkunjane — homeopath, herbalist, Transkei.

[d]Specimen voucher acronyms: BCR = Bantu Cancer Registry, PRE = National Botanic Institute Herbarium, Pretoria, UFH = University of Fort Hare Herbarium, ZUL = University of Zululand Herbarium.

[e]References: 1, Al-Said et al., 1982; 2, Allen and Allen, 1977; 3, An-Ming, 1986; 4, Anis and Igbal, 1986; 5, Arnold, 1989; 6, Batten and Bokelman, 1966; 7, Benoit et al., 1976; 8, Bhattacharya et al., 1987; 9, Bohlmann and Fritz, 1979; 10, Bohlmann and Zdero, 1972; 11, Botha, 1987; 12, Broster and Bourquin, 1982; 13, Bryant, 1966; 14, Caceres et al., 1991; 15, Castiella et al., 1990, 16, Chapuis et al., 1988; 17, Chauhan et al., 1988; 18, Chiej, 1984; 19, Da Silva et al., 1969; 20, Dekker et al., 1983; 21, Dhar et al., 1968; 22, Doke and Vilakazi, 1972; 23, Dorfler et al., 1989; 24, Evans, 1986; 25, Felhauer and Hecker, 1986; 26, Fluck, 1988; 27, Gelfand et al., 1985; 28, Gerstner, 1938; 29, Gerstner, 1939a; 30, Gerstner, 1939b; 31, Gerstner, 1941a; 32, Gerstner, 1941b; 33, Gibbs, 1984a; 34, Gibbs, 1984b; 35, Gibbs, 1984c; 36, Goodman and Hobbs, 1988; 37, Gordon, 1947; 38, Hakizamungu and van Puyvelde, 1988; 39, Hastings, 1990; 40, Hedberg and Staugard, 1989; 41, Hegnauer, 1977; 42, Howard, 1987; 43, Hulme, 1954; 44, Hutchings, 1989b; 45, Jacot Guillarmod, 1971; 46, Jain and Borthakur, 1986; 47, Jakupovic et al., 1986; 48, Juritz, 1915; 49, Kellerman et al., 1988; 50, Kelley et al., 1988; 51 Kokwaro, 1976; 52, Lassak and McCarthy, 1990; 53, Low, 1990; 54, Mahyar et al., 1991; 55, Mares, 1987; 56, Markham, 1988; 57, Mazzanti et al., 1983; 58, Merck, 1983; 59, Munday, 1988; 60, Niemann, 1988; 61, Oliver-Bever, 1986; 62, Pal et al., 1988; 63, Palmer and Pitman, 1972a; 64, Palmer and Pitman, 1972b; 65, Peigen, 1983; 66, Pham Huu Chanh et al., 1988; 67, Pujol, 1990; 68, Radford et al., 1986; 69, Rimpler and Saurbier, 1986; 70, Roberts, 1983; 71, Roddick, 1986; 72, Rose, 1972; 73, Ruijgrok, 1963; 74, Sener et al., 1988; 75, Sidwell et al., 1971; 76, Sidwell et al., 1975; 77, Smith, 1895; 78, Storrs and Pierce, 1982; 79, Trease and Evans, 1983; 80, van der Vijver, 1975; 81, van Puyvelde et al., 1989; 82, Villegas et al., 1988?; 83, Warthen et al., 1983; 84, Watt and Breyer Brandwijk, 1962; 85, Weiss, 1988; 86, Williamson and Evans, 1988; 87, Williamson, 1975; 88, Winkelman and Dobkin de Rios, 1989; 89, Ziegler et al., 1976.

General: CNS = central nervous system; incl. = including; sp. = species (singular); spp. = species (plural); * = reported in genus but no reports known to author in species; ** = reported in family but no reports known to author in genus.

Note: Voucher specimens have been cited only for species whose specific usage reported in the table has not previously been published, unless these species were well known to the informants by their local or botanic names and confirmation was achieved by means of reference to living material or illustrations.

one form of preparation is used in 11 species and more than one route of administration is used in nine species. No route of administration was reported for 15 species.

7.4. Confirmation and previously unpublished usage

Mr. Mhlongo was able to confirm usage of 21 of the 33 species reported from the literature to be used by the Zulu. He also reported previously unpublished usage by the Zulu of *Acokanthera oppositifolia* (Apocynaceae), *Asclepias physocarpa* (Asclepiadaceae), *Helichrysum nudifolium* (Asteraceae), *Plumbago auriculata* (Plumbaginaceae) and *Mikania capensis* (Asteraceae). Reference to *M. capensis* was from the Zulu name. The other four species were found growing on the campus of the University of Zululand.

7.5. Indications of possible therapeutic or harmful effects

Deductions made on possible therapeutic or harmful effects, emerging from the correlation of ethnomedical and bioscientific data cited in Table 1, are summarised below:

1. Possible analgesic effects were indicated in sixty-two species (67% of the species used). Four of these species, *Artemisia afra* (Asteraceae), *Datura metel* and *D. stramonium* (Solanaceae) and *Schinus molle* (Anacardiaceae) have been reported to have analgesic activity. Two species, *Mikania capensis* and *M. natalensis* (Asteraceae), are from a genus in which other species have been shown to have analgesic activity in in vivo screening tests. One species, *Erythrophleum lasianthum* (Fabaceae), contains compounds with known analgesic properties and two species, *Alchemilla woodii* (Rosaceae) and *Solanum mauritanium* (Solanaceae), are from genera with other species reported to contain compounds which are known to have potential analgesic activity. Twenty-five species are also used to treat pain in other ailments while 46 species are from genera, in which other species have been reported to be used to treat pain.

2. Possible decongestant effects were indicated in 45 species (48% of the species used). Seventeen of these have reported decongestant or mucosa irritant properties and 13 species are from genera, in which other species are known to be used for head colds. Nineteen species are known to be aromatic.

3. Possible antispasmodic effects were indicated in 27 species (30% of the species used). Two of these species, *D. stramonium* and *D. metel* (Solanancea) have been used pharmaceutically for asthma. Seven species have been used in other traditional herbal preparations for asthma or other spasmodic ailments. Eight species are from genera in which other species are known to have been used in herbal preparations for asthma or other spasmodic ailments. Seventeen species are from genera in which antispasmodic activity has been observed in in vitro screening tests of other species.

4. Possible anti-inflammatory effects were indicated in 20 species (22% of the species used). Four of these species, *Heteromorpha trifoliata* (Apiaceae), *Helichrysum odoratissimum* (Asteraceae), *Mohria caffrorum* (Schizaceae), and *S. mauritianum* (Solanaceae) have been reported to contain chemical compounds with potential anti-inflammatory activity. Ten species are from genera in which anti-inflammatory activity has been noted in other species, while six species are from genera where the presence of chemical compounds with potential anti-inflammatory activity is known in other species.

5. Possible sedative effects were indicated in 20 species (22% of the species used). Seven of these are reported to have narcotic effects. They include *D. metel*, *D. stramonium* (Solanaceae), *Leonurus leonotis* (Lamiaceae), *Tarchonanthus camphoratus* and *A. afra* (Asteraceae), *Eucomis autumnalis* (Liliaceae), and *Boophane disticha*. (Amaryllidaceae). Thirteen species are from genera with other species known to have sedative or narcotic effects.

6. Possible hypotensive effects were noted in three species, while possible antidepressant effects in two species, but the role these properties might play in the immediate relief of headaches is not clear to the authors. Antidepressants are sometimes used in Western biomedicine for the long-term treatment of tension or migraine headaches (Orme, 1988; Henry, 1991).

7. Potential toxicity was observed in 56 species (58%). Seventeen of these species are reported to

have been suspected of causing human or animal deaths. Furthermore, ten other species are reported to have caused some form of morbid poisoning. Potentially toxic compounds or insecticidal properties have been reported in eleven species. Twelve species are from genera where related species are suspected of causing human or animal poisoning. Four species are reputed to be toxic but no reported cases of poisoning are known to the present authors. Two species are from genera, in which other species are known to be potentially toxic. Plants suspected of causing fatal human poisoning include *Acokanthera oppositifolia* (Apocynaceae), *Asclepias fruticosa* (Asclepiadaceae), *Bersama lucens* (Melianthaceae), *Boophane disticha* (Amaryllidaceae), *Bowiea volubilis* (Liliaceae), *Capparis tomentosa* Capparaceae), *Clutia pulchella*, *Spirostachys africana* and *Synadenium cupulare* (Euphorbiaceae), *Datura metel* and *D. stramonium* (Solanaceae), *Erythrophleum lasianthum* (Fabaceae), *Senecio retrorsus* (Asteraceae), and *Plumbago auriculata* (Plumbaginaceae). Genera in which other species are suspected or known to have caused human deaths include *Euclea* (Ebenaceae), *Indigofera* and *Tephrosia* (Fabaceae), *Knowltonia* (Ranunculaceae), *Gnidia* (Thymelaeaceae), *Lycium* and *Solanum* (Solanaceae), *Phyllanthus* (Euphorbiaceae) and *Rumex* (Polygonaceae).

8. Discussion and conclusions

Our results show that 89% of plants used for headaches by the Zulu, Xhosa and Sotho may possess one or more useful therapeutic properties, while 58% of the plants may contain potentially toxic compounds. These findings are tentatively presented, in view of the following observations:

1. Chemical compounds found in a species may not be present in other members of the genus, and those found in one part of a plant may not be present in other parts of the plant (Gibbs, 1974a).
2. Chemical compounds found in a plant species may vary, even within a population, and also with natural factors, such as habitat and stage of development (Trease et al., 1989).
3. Active principles found in plant extracts may not be present in the medicinal preparations as they are prepared (Trease et al., 1983).
4. Active principles tested on animals do not necessarily produce the same effects on humans (Grundy, 1990). Human responses to medicines are also known to vary with the individual.

Since no scientific investigation of the medicines as they are prepared and administered has been undertaken, it is difficult to draw firm conclusions on either their possible efficacy or safety. As Russo (1992) points out, the conversion of ethnobotanical information is particularly problematic for headache research, and is compounded by the lack of an animal model for clinical headaches. In his study of headache treatments by the Amazon Indians of Ecuador, Russo (1992) adopts a ranking system that allots five points out of a possible nine for medicines ingested. In our study, 80% of the medicines are inhaled in one form or another. Only nine of the medicines are ingested, and only two of the species used in this way, *Alepidia amatymbica* (Apiaceae) and *Conyza scabrida* (Asteraceae), are not reported to have toxic indications. Both of these species have undergone some form of preliminary screening but the results do not indicate any apparently useful activity relating to headache treatment. Antihypertensive, antimicrobial and diuretic effects have been reported in extracts from *A. amatymbica* (Hutchings, 1989b), while diaphoretic activity was observed in *C. scabrida* (Watt and Breyer-Brandwijk, 1962).

Use of *Datura* species (Solanaceae) for asthma and *Adiantum capillus-veneris* (Adiantaceae) in cough mixtures indicates some possible support for the usage reported in our study. Other possible support is indicated from preliminary screening tests by a South African pharmaceutical company (Hutchings, 1989b). These tests indicate antihistamine and narcotic analgesic activities in extracts from *A. afra* (Asteraceae), and analgesic, anti-inflammatory and anti-hypertensive activity in extracts from *Schinus molle* (Anacardiaceae), but weak CNS-depressant and antidepressant activity in extracts from *Xysmalobium undulatum* (Asclepiadaceae). The effects which inhaled substances with the above properties might have is not clear, however.

Inhaled substances can have strong physiological effects. The potentially harmful effects of passive and active tobacco smoking are well documented, even in the popular press. Damaging sniffed substances abused for their euphoric or stimulant properties include glue and cleaning solvents, such as benzine, carbon tetrachloride and also cocaine; the last is reported to lose its potency when taken by mouth (Lingeman, 1969). Inhaled substances used in modern biomedicine include nitrous oxides used for anaesthetics and various preparations used for treating asthma, migraine headaches and sinusitis. Examples of substances found effective only when used as inhalants include amyl nitrite, formerly used in glass vials to be snapped and inhaled for pain in *angina pectoris* attacks (Lingeman, 1969), and sodium cromoglycale, currently used for the prevention of bronchial asthma (Grundy, 1990). All of the above mentioned substances are used for their rapid effects. This form of administration can minimize systemic side effects of the substances used and sometimes, as in the case of anaesthetics, allow for the 'fine tuning' of dosage (Grundy, 1990). Potential dangers include the possibility that some vital area, such as the respiration or cardiovascular centre, might be suddenly exposed to lethal concentrations of the drugs (Grundy 1990). Relatively minor effects include hoarseness and local superinfection. Although steam is known to liquify excess mucus and to limit secretion and reduce swelling (Henry, 1991), few studies appear to have been undertaken on the potential beneficial uses of inhaled herbal preparations. A study by Ferley et al. (1989) claims to be one of the first attempts to clinically evaluate the therapeutic effects of aromatherapy as a prophylactic treatment of bronchial infections.

The large number of the listed species with indicated potential therapeutic values makes it difficult to select those most worthy of further research. We have therefore recently initiated a preliminary broad-screening project to investigate possible prostaglandin synthesis inhibitory activity in a wide selection of the species used by the study group. This is to be done in collaboration with a pharmacist, Dr A. Jager, who has recently joined the Department of Botany at the University of Natal in Pietermaritzburg. The bark of locally grown *Erythrophleum lasianthum* and some commercially available preparations, thought to have been derived from the species, are also currently being investigated by us in collaboration with members of the Department of Chemistry at the University of Natal, Pietermaritzburg. The choice of this plant was from observations made by Mr. Mhlongo, who was asked which plants he would consider most effective for the treatment of headaches. He selected *E. lasianthum* (Fabaceae) and the two *Mikania* species (Asteraceae).

The selection of *E. lasianthum* is interesting in view of the known analgesic effects of erythrophleine, which was at one time recommended for use as a dental anaesthetic (Uphof, 1968), although it is doubtful, that it ever was used in this way because of its known toxic effects. The stembark of several *Erythrophleum* species has been used as an ordeal poison in various parts of Africa and Madagascar, from which various cardioactive alkaloids, known to be capable of causing death from respiratory or cardiac arrest, have been isolated (Oliver-Bever, 1986). These include cassadine and erythrophleine, both of which are categorised pharmaceutically as cardiac tonics (Merck, 1983). Like other compounds with digitalis-like activity, there may be a narrow margin between therapeutic and dangerous doses. The stem bark of *E. lasianthum* is one of the most popular headache remedies sold in traditional herbal shops in Natal/KwaZulu. It is usually sold in small doses of powder, wrapped in a screw of paper, and is known by the Zulu name, 'mbhemiso'. In a recent short survey on the herbal histories of hospital patients undertaken by one of us (A.H.) in two local Zulu hospitals, five patients reported that they had recently taken 'mbhemiso' as a snuff for headaches. All reported that they found it effective and none of them had been admitted for ailments that suggested herbal poisoning. A.H. has also used 'mbhemiso' obtained from a local shop as a snuff for a tension headache. It was effective within half an hour and produced no ill effects. When Mr. Mhlongo was shown the material used, he remarked that it was dangerous because it had not been finely enough ground and would therefore not be expelled quickly enough.

The selection of *M. capensis* DC. and *M. natalensis* DC. is interesting in view of recent studies conducted on extracts of *M. cordata* (Burm. f.) Robinson, in which it was shown that not only did they have anti-inflammatory and analgesic effects, they also prevented and even healed gastric lesions in experimental animals (Pal et al., 1988). Many anti-inflammatory drugs are known to be ulcerogenic. *M. capensis* DC. and *M. natalensis* DC. were at one time considered synonymous with *M. cordata* Burm. f. (Hilliard, 1977). A later revision distinguishes the two South African species on grounds of distribution and morphological differences (Holmes, 1982). *M. cordata* (Burm. f.) Robinson is restricted to the Asian–East Indian region and differs from *M. capensis* and *M. natalensis* in head size, phyllary apex form and capitulum density. *M. natalensis* is a little-known plant and may be distinguished from *M. capensis* by its lack of hastate leaf bases and its relatively smaller corolla teeth. No chemical or biological screening is known to have been undertaken on these two species.

Capparis tomentosa (Capparaceae) was selected by the group of healers interviewed by A.H. at Valley Trust in Natal, as being a particularly important and useful plant for many ailments, including psychiatric disturbances. Mr. Mhlongo concurred with this opinion. In view of the known anticonvulsive and anti-inflammatory properties and wide usage of other *Capparis* species, *C. tomentosa* would appear to be eminently worthy of further investigation.

While it is difficult to assess the overall safety of traditional headache treatment by the study group, it should be pointed out that the number of acute poisoning cases known from medicinal plant ingestion by the Zulu and Xhosa appears to be comparatively low (Hutchings, 1991). Although the use of all the species listed as potentially toxic in Table 1 should be viewed with caution, it should also be noted that no reports of poisoning are known to the authors to have been attributed to usage of the listed plants for headaches or to their usage as inhalants. Traditional healers are often, but not always, aware of the potential hazards of the plants they use. Again their views are pertinent. The group of healers interviewed by one of us (A.H.) at St Elizabeth's Hospital in Lusikisiki, Transkei, were asked what the most dangerous groups of medicines would be if wrongly ingested by children. They had no hesitation in saying that these would be the snuffs used for headaches. This would account for the very small amounts that are sold in the form already described for 'mbhemismo'. The healers also reported that they often deliberately prescribe low doses of various medicines because patients are known to take larger doses than those prescribed, in the hope of faster recovery. They also claimed that some of the species used counteract the harmful effects of others, in medicines made from more than one species. Other precautions taken include avoidance of usage at certain stages of growth and the selection of plant parts and routes of administration. Methods of preparation involving heating or drying may destroy some toxic principles.

One of the healers from Lusikisiki was horrified to hear that *Ranunculus multifida* (Ranunculaceae) was sometimes administered as a ritual weaning purge to babies (Savage and Hutchings, 1987). He remarked that it should never be used internally as it would 'burn' excessively. This must refer to the well-known vesicant properties related to protoanemonin. Another member of the family, *Clematis brachiata*, is used in the same way as various other *Clematis* species reported to be used in Europe, Australia and various parts of Africa, namely, the leaves are crushed and sniffed. Low (1990) describes the effects of inhaling *Clematis glycinoides* DC., commonly known in Australia as the 'headache vine', as follows:

> ...If you crush a handful of leaves and inhale deeply, any headaches or nasal congestion is soon left behind as the nose starts smarting, the eyes shed water and a throbbing head becomes an exploding furnace...

Such effects are, presumably, short-lived. Chronic poisoning is likely to be more problematic as the results may not be observed to be related to the medicines used. This may apply in cases of accumulative liver damage and also to carcinogenic effects. For example, the use of *Acokanthera op-*

positifolia (Apocynaceae) might present problems on account of the cumulative effects noted for activenoside. Mr. Mhlongo was surprised to hear that the species was considered toxic, but reported that very small amounts were used on account of the strength of the medicine. *Senecio* species may also present hepatotoxic problems on account of the possible presence of pyrrolizidine alkaloids.

The usage of *Myrica* (Myricaceae) and *Gnidia* (Thymelaeaceae) species may create some problem on account of carcinogenic properties known within the genera. As Weiss (1988) points out, however, the high dosage of carcinogenic material administered to experimental animals far exceeds those given in normal therapeutic doses. The irritant properties of the plants may be limiting factors in dosage and duration of treatment.

As a final conclusion, it may be pointed out that related plant usage by other ethnic groups and known biological activity in related plants indicate a possible high rate of efficacy in the treatment of headaches in traditional Zulu, Xhosa and Sotho medicine. Observations made by healers suggest an acute awareness of some of the potentially harmful effects of the plants concerned. More research into the plants used and, in particular, into the effects of inhaled herbal preparations is strongly indicated. The abuse of pharmaceutical analgesic preparations is now so common in South Africa that the conditions provoked are sometimes referred to as 'diseases of choice'. Validation studies on locally used preparations for headaches could lead to the adoption of some safe and affordable remedies acceptable to patients, practitioners and medical authorities alike. This would facilitate the much needed recognition of the role of traditional healers in the State's health care system and enhance the opportunities for collaboration and the development of the rich plant and human resources, in a quest for improved health care for all South Africans. If new therapeutic agents for the treatment of headaches were discovered, the benefits could obviously extend well beyond South African borders.

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