Journal of Medicinal Plants Research Vol. 5(8), pp. 1367-1373, 18 April, 2011
Available online at http://www.academicjournals.org/JMPR
ISSN 1996-0875 ©2011 Academic Journals

Full Length Research Paper

Medicinal uses of *Berberis holstii* Engl. (Berberidaceae) in Malawi, the only African endemic barberry

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Accepted 22 February, 2011

Berberis **species are medicinally important due to the presence of alkaloids with different pharmacological activities. There are about 500 species of Berberis worldwide and only two are present in Africa namely: *Berberis vulgaris* (also present in Europe) and *Berberis holstii* (the only African endemic). The present study investigated utilization practices of *B. holstii,* a plant on high demand in northern Malawi but restricted to Nyika National Park. During the study 'focus group discussions, in-depth interviews and questionnaires' were employed. Based on the results obtained, *B. holstii* was ranked as number 1 priority species and its demand extended beyond Nyika as far away as 580 km. During survey, 34 medicinal uses were documented. The most common uses were as infusion for coughs, malaria, stomachache, sexually transmitted infections and pneumonia. The major difficulty recorded was that mainly the roots of this plant are employed to cure different disease states. During plant collection, the whole plant is dug out leaving no chance of its growth again. The medicinal uses of leaves and stem bark of *B. holstii* are reported for the first time in the present communication. Given the variety of ailments that *B. holstii* is reputed to cure, pharmacological investigations would be required to verify these popular claims. Since use of roots has detrimental effects on the survival of the plant, it would be desirable to investigate if properties that exist in roots are also present in aerial parts.**

Key words: *Berberis holstii* Engl. (Berberidaceae), ethnobotany, Nyika National Park, medicinal plants, ethno-medicine.

INTRODUCTION

Berberis species, also known as barberries, are medicinally important and are used for various purposes (Srivastava et al., 2006). Although in Europe they are mostly used as ornamentals, they are used for medicinal purposes in many parts of the world. Barberries are sometimes used for preparing jams and dyes (Heywood and Chant, 1982). *Berberis* species have therapeutic properties because of different alkaloids they contain. These alkaloids include berberine, oxyacanthine, berbamine and palmatine (Lauk et al., 2007). There are about 500 species of Berberis worldwide (Whittemore, 1997). Two species are present in Africa; *Berberis vulgaris*, naturally present in north-west Africa, but with a wider natural distribution in central and southern Europe and western Asia, and *Berberis holstii*, endemic to the mountains of eastern and southern Africa. Specifically, *B. holstii* is distributed in seven countries: Ethiopia, Somalia, Kenya, Uganda, Tanzania, Zambia and Malawi. Within Malawi it has only been recorded on the Nyika Plateau in Nyika National Park. The only published data on the uses of *B. holstii* Engl. (Berberidaceae) are those given earlier

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with focus on Tanzania (Hedberg et al., 1982), East Africa (Kokwaro, 1993), and Ethiopia (Bekele-Tesemma et al., 1993) respectively. The decoction of the roots is used in the treatment of jaundice (Hedberg et al., 1982) while and decoction of *B. holstii* root is used to cure stomach and abdomen pains; while external application of powdered root bark is used to heal wounds (Kokwaro, 1993). Bekele-Tesemma et al. (1993) stated the use of *B. holstii* for hedges and firewood. However, for Malawi, roots are also reported to be used medicinally but the exact uses have not been documented (Burrows and Willis, 2005).

There is a general impression by people working in Nyika National Park that *B. holstii* is on high demand. The Department of National Parks and Wildlife (DNPW) used to issue permits to collect *B. holstii*, but the practice was discontinued in 2001 due to the escalating demand. However, people collect *B. holstii* illegally. Even though this is the case, the precise uses of *B. holstii* have not been documented. The objective of present study was to investigate the reasons for the high demand of *B. holstii*. In addition, special attention was given to document the uses and associated utilisation practices.

MATERIALS AND METHODS

Study area

The study took place in Nyika National Park, northern Malawi (10°15'-10°50' S and 33°35'-34°05' E). Nyika National Park covers an area of 3,200 with 80 km^2 being in Zambia (Dowsett-Lemaire et al., 2002). The park comprises a mountain plateau, hills and escarpments (Department of National Parks and Wildlife, 2004), rolling grassland and montane evergreen forest patches (Brass, 1954; Dowsett-Lemaire, 1985; Johnson, 1994; Department of National Parks and Wildlife, 2004). Malawi's Nyika National Park is surrounded by Chitipa, Karonga and Rumphi Districts (Department of National Parks and Wildlife, 2004). The present study focused on Malawi's Nyika National Park. The park is located at an altitudinal range of 600 m to 2607 m (Department of National Parks and Wildlife, 2004) and comprises a plateau which accounts for 1320 km^2. Biologically, Nyika National Park is important because it has a broad range of habitats (Johnson, 1994) and is one of Africa's centres of plant diversity (Southern Africa Botanical Network, 2000; Burrows and Willis, 2005). In an attempt to ensure sufficient conservation of biological resources within the park, in 1978, the government relocated the people living in it.

Data collection

Participatory rapid appraisal (PRA) comprising four focus group discussion (FGD) sessions, and 25 in depth interviews (IDIs) were conducted in July 2004. Three localities surrounding Nyika National Park were visited. These localities were: Therere (in the District of Chitipa), Njalayankhunda (Karonga District) and Ntchenachena (Rumphi District). The districts were purposively selected because they surround the park and consequently, most people that were relocated from the park settled there. Chilinda camp, inside Nyika National Park, was also chosen because it is the only place in the park that is currently inhabited (Figure 1). Inhabitants are Department of National Parks and Wildlife and Nyika Safari Company employees, as well as the transient tourists.

The interviewees were selected through a snowballing technique (Magnani et al., 2005, Sullivan et al., 2001). All the interviews were recorded using a Sony micro-cassette recorder. The recorded information was transcribed afterwards and themes extracted. Questionnaire interviews were also employed to ensure thorough documentation of the issues (Narayanasamy et al., 2001). Prior to the interviews, the questionnaire was pre-tested to remove ambiguities (Drennan, 2003). Due to time and financial constraints, only areas that were within easy reach were visited during the main survey. To maximise the number of interviewees, any person we came across in each area was interviewed. Tape recorders were used to record each interview.

The data was analysed employing SPSS 15.0 for Windows. Frequencies were derived for all variables. Data on socio-economic variables (age, sex, employment and education) was cross-tabulated with knowledge and use of B. holstii. Pearson Chi-square statistics was used to assess the association between the variables (SPSS Inc., 2006).

RESULTS

Knowledge surrounding utilization of *B. holstii*

B. holstii was known to 53% of respondents, with 43% of those knowledgeable having learnt about the plant from their parents, 28% from friends and 17% from other relatives (Figure 2). In contrast, the information gathered from PRA gave a different picture. Traditional medical practitioners (TMPs) mentioned that they knew about *B. holstii* from their ancestors, who told them about the plant through dreams.

Irrespective of source, knowledge of *B. holstii* was not significantly associated with the respondents' age and sex, but was significantly associated with their level of education and employment status (2-tailed λ^2 = 6.215, 0.955, 9.268, 17.706; df = 9, 3, 9, 24; p = 0.102, 0.374, 0.055, 0.024, respectively).

People's perception of *B. holstii*

The PRA findings showed that *B. holstii* is considered an important plant species. It was ranked as number 1 priority species in all focus group discussions. This suggested that the species has been important for a long time. People ascribe this importance to its effectiveness when used in isolation. When mixed with other plants (e.g., *Cassia abbreviata* and *Rhamnus prinoides*), *B. holstii* is still the main component of the mixture.

The questionnaire interviews also revealed the high incidence of use of *B. holstii.* About 74% of those who knew about it had used it. Of the 26% of respondents who had never used *B. holstii*, the most common reasons given were religious beliefs that ban the use of traditional medicine and difficulties in accessing the plant. In the case of those that had used *B. holstii*, there was no association between socio-economic status of the respondent (age, sex, education and employment) and

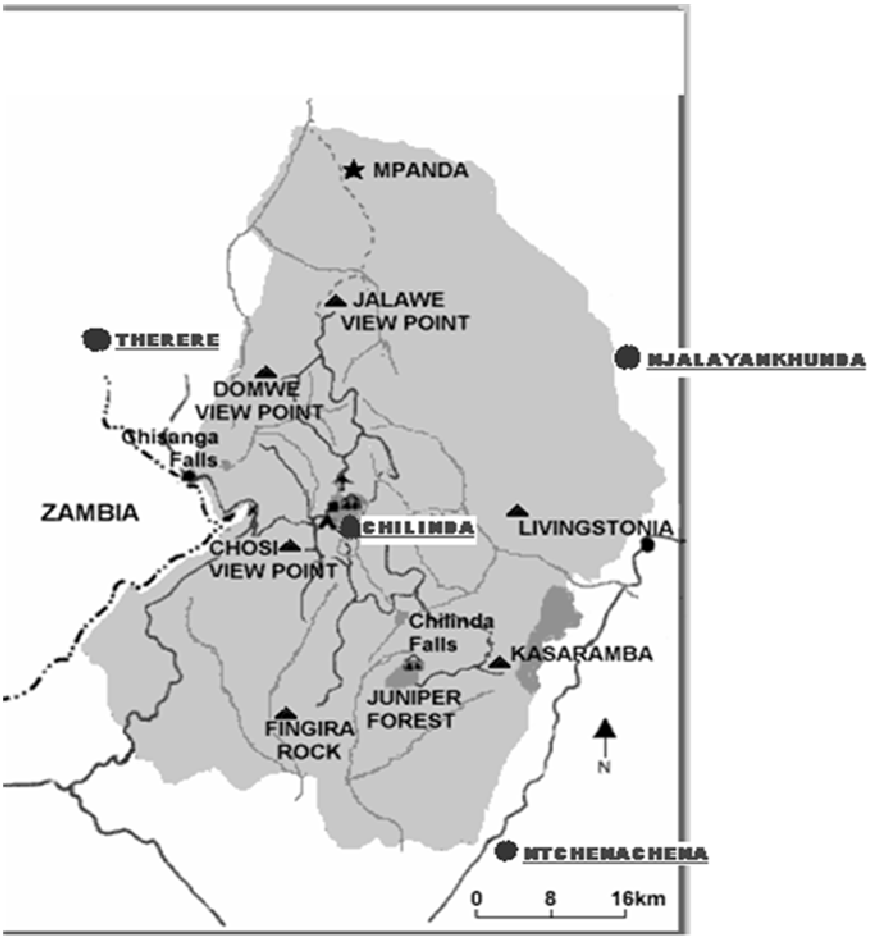

Figure 1. Sites where participatory rapid appraisal sessions were undertaken in Nyika National Park ( ).

usage (2-tailed λ^2 =12.804, 5.415, 11.774, 33.776; df = 9, 3, 12, 24; p = 0.172, 0.144, 0.464, 0.089, respectively). Both PRA and questionnaire interviews showed that the plant is used more often by men than by women.

Uses of *B. holstii*

A total of 35 medicinal uses were recorded (Figure 3 and Table 1). Cough ranked by far the highest (mentioned by over 40% of the respondents) followed by malaria, stomach ache and sexually transmitted infections (STIs) (Figure 3). Other conditions mentioned (excluded from Figure 3) were asthma, backache, hematuria, menorrhagia, body pains and sore throat (0.8% each).

Preparation and application methods

The root was the most commonly used part of the plant (reported by about 90% of the respondents). About 80% of the respondents said they know of other people who used roots too (Figure 4). However, 84% of respondents said *B. holstii* was prepared as a root infusion and the rest said it is consumed raw. The infusion was prepared by either soaking or boiling the roots. The infusion was either drunk, poured/rubbed over the body or added to porridge. With the exception of one respondent, all the others (29) said there were no associated side effects. The side effect mentioned was possible miscarriage and even death as a consequence of using the plant while pregnant.

DISCUSSION

Knowledge, attitude and practice surrounding utilisation of *B. holstii*

The results of the present study demonstrated excessive demand of *B. holstii* in the study area. It was also observed that, despite the plant being restricted to Nyika,

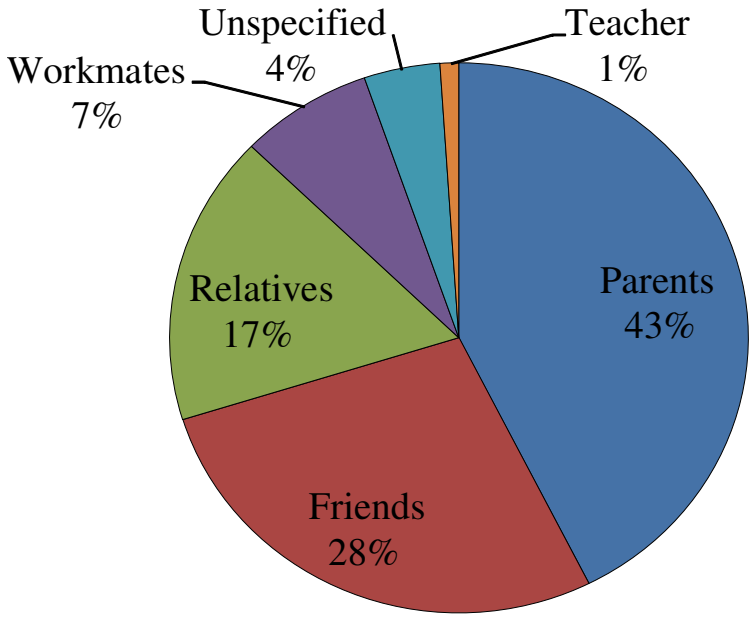

Figure 2. Sources of knowledge about the utilization of *B. holstii.*

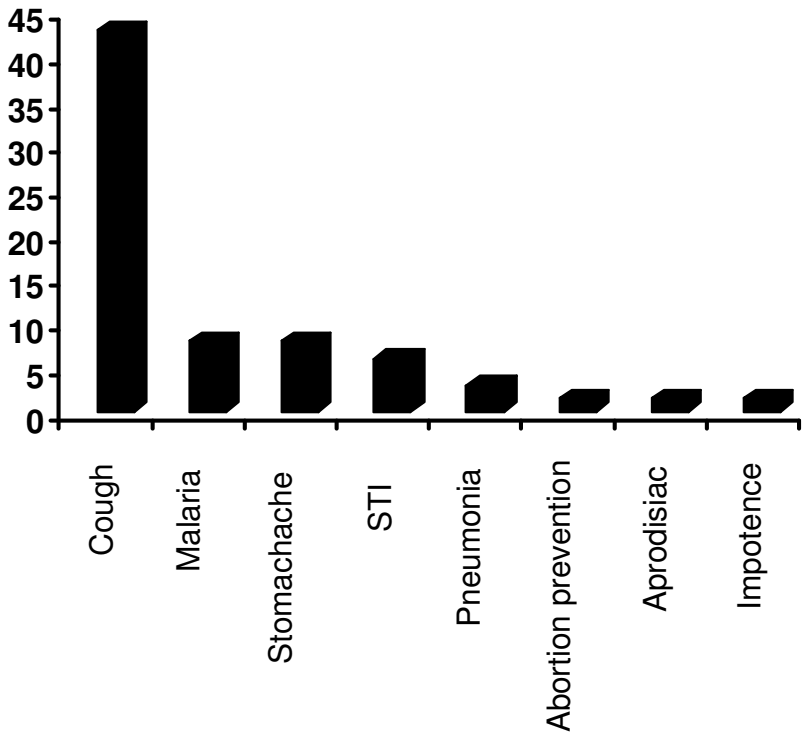

Figure 3. Most commonly reported uses of *B. holstii*.

its demand extended to areas located far away, such as Lilongwe and Blantyre (380 and 580 km, respectively). It was interesting to notice that relocation of people in 1978 did not affect the appreciation and use of *B. holstii*. It appears that, faced with lack of alternative resources, people's awareness of the importance of park resources increased. The understanding about the use of medicinal plants and indigenous traditional acquaintance seemed to

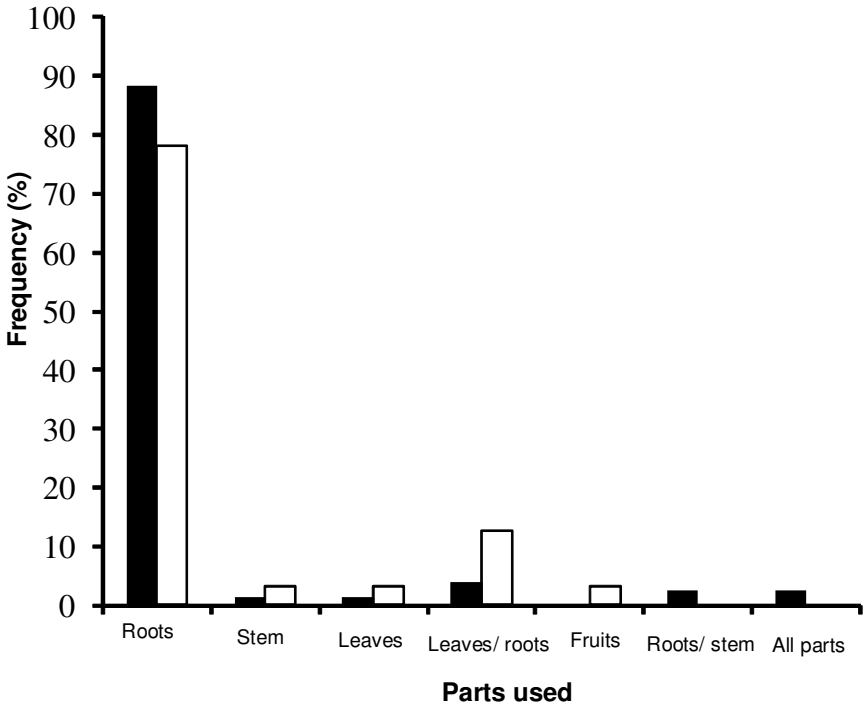

Figure 4. Parts used in preparation of *B. holstii*. Filled bars represent parts used by respondents. White bars are parts that respondents have heard are used by other people.

Table 1. Other medicinal uses of *B. holstii*.

Abortion	0.8547
Asthma	0.7692
Backache	0.7692
Bilharzia	0.8547
Bloody urine	0.7692
Body cleansing for prostitutes	0.8547
Body pains	1.62
Boil	0.8547
Ceaseless menstruation	0.7692
Epilepsy	0.8547
Fever	2.47
Headache	3.33
Induce labour	2.5641
Induce pregnancy	1.7094
Infertility	0.8547
Influenza	0.8547
Mental disturbance	1.7094
Puberty in boys	0.8547
Rheumatism	0.8547
Safe child delivery	0.8547
Sex reversal	0.8547
Snake bites	1.7094
Sore throat	0.7692
Sunken Fontanelle	1.7094
Withdrawn behaviour	0.8547
Yellow fever	2.48

continue and it passed on to the next generations. *B. holstii* use provided an example of people trusting their alternative sources of medicine and the information propagated reaching beyond the boundaries and distances (Kokwaro, 1995; Van Der Geest, 1997). Traditional healers, on the other hand, guard this information more jealously.

The results of the present study revealed that over 70% of the people are aware of the existence and recognition of *B. holstii* and they practically used it for the cure of some ailments. Most likely, this popularity is due to its many reputed uses and properties. In a country like Malawi, where healthcare facilities are not only insufficient but also inaccessible, the use of medicinal plants and traditional remedies are part of primary healthcare (McCoy et al., 2005).

During present study 34 medicinal uses of *B. holstii* were recorded. Among these uses cough, malaria, stomachache, sexually transmitted infections and pneumonia were the most commonly mentioned uses. These uses account for the high demand of *B. holstii.* Although no pharmacological studies of *B. holstii* have been conducted, the fact that some of the medicinal uses are similar to those of other Berberis species suggests that it may contain similar properties. For example, in the case of the topmost mentioned ailments, the following Berberis species have been confirmed to have the required properties:

(i) Cough: *B. lyceum* has properties that suppress cough (Asif et al., 2007).
(ii) Malaria: *B. erectica* has antimalarial properties (Fokialakis et al., 2007).
(iii) Stomachache: *B. aristata* and *B. lyceum* have properties for treating acute dysentery (Asif et al., 2007, Sack and Froehlich, 1982).
(iv) Sexually transmitted infections: *B. heterophylla*, *B. aetnensis* and *B. sibirica* have antifungal activity against Candida species which is responsible for genital tract infections (Freile et al., 2003; Iauk et al., 2007; Istatkova et al., 2007; Levine et al., 1998; Wawer et al., 1999).
(v) Pneumonia: *B. aristata*, *B. asiatica*, *B. chitria* and *B. lycium* have antimicrobial activity against *Streptococcus pneumoniae*, the main cause of pneumonia (Heffelfinger et al., 2000; Ruiz-González et al., 1999; Singh et al., 2007).

Hedberg et al. (1982) and Kokwaro (1993) reported that roots are used in Tanzania and Kenya, respectively, and the utilization of *B. holstii* roots was extended up to Malawi (Burrows and Willis, 2005). The use of leaves and stem bark is reported for the first time in present communication.

The high demand and utilization of roots has potential conservation consequences. If the medicinal properties of the plant are real and these properties are present in different plant organs, diversification of organ use may allow a more efficient use of the plant. For example, cautious use of leaves (which are produced continuously throughout the growing season) could prolong the use of individual plants considerably.

Conclusion

This study has documented medicinal uses which people report to use. Given the variety of ailments that *B. holstii* is reputed to cure or palliate, it would be beneficial to investigate these claims from a pharmacological point of view. Considering the detrimental effects that use of roots has on the survival of the plant, it would be desirable to investigate if properties that exist in roots are also present in aerial parts.

ACKNOWLEDGEMENTS

We are grateful to Dr. Miguel Franco, Dr Paul Ramsay and Dr Mick Utley for the intellectual support; Norwegian Government for the Norwegian Agency for Development Cooperation (NORAD) scholarship, Newby Trust and an anonymous Trust for the financial contribution; Department of National Parks and Wildlife (Nyika) staff, and Centre for Social Research for the technical support; and respondents for their invaluable information.

REFERENCES

Asif A, Kakub G, Mehmood S, Khunum R, Gulfraz M (2007). Wound healing activity of root extracts of *Berberis lyceum* Royle in rats. Phytother. Res., 21: 589-591.

Bekele-Tesemma A, Birnie A, Tengnas B (1993). Useful Trees and Shrubs for Ethiopia: Identification, Propagation and Management for Agricultural and Pastoral Communities. Regional Soil Conservation Unit, Nairobi.

Brass LJ (1954). Vernay Expedition Report. Nyasaland. 7: 35-38.

Burrows J, Willis C (2005). Plants of the Nyika Plateau: an account of the vegetation of the Nyika National Parks of Malawi and Zambia. Southern African Botanical Diversity Network (SABONET), Pretoria.

Department of National Parks and Wildlife (2004). Nyika National Park Master plan Unpublished. Department of National Parks and Wildlife, Lilongwe.

Dowsett-Lemaire F (1985). The forest vegetation of Nyika Plateau (Malawi-Zambia): ecological and phenological studies. Bulletin-Jardin Botanique National de Belgique, 55: 301-392.

Dowsett-lemaire F, Dowsett R J, Dyer M (2002). Malawi. In Fishpool LDC, Evans MI (eds.).Important bird areas in Africa and associated islands: Priority sites for conservation. Birdlife International and Pisces Publications, London.

Drennan J (2003). Cognitive interviewing: verbal data in the design and pretesting of questionnaires. J. Adv. Nurs., 42: 57-63.

Facchini PJ, St-Pierre B (2005). Synthesis and trafficking of alkaloid biosynthetic enzymes. Current Opinion in Plant Biol., 8: 657-666.

Fokialakis N, Kalpoutzakis E, Tekwani B, Khan S, Kobaisy M, Skaltsounis A, Duke S (2007). Evaluation of the antimalarial and antileishmanial activity of plants from the Greek island of Crete. J. Nat. Med., 61: 38-45.

Freile M, Giannini F, Pucci G, Sturniolo A, Rodero L, Pucci O, Balzareti V, Enriz R (2003). Antimicrobial activity of aqueous extracts and of berberine isolated from Berberis heterophylla. Fitoterapia, 74: 702-705.

Hedber I, Hedberg O, Madati PJ, Mshigeni KE, Mshiu EN,

Samuelsson G (1982). Inventory of plants used in traditional medicine in Tanzania I. Plants of the families Acanthaceae - Cucurbitaceae. J. Ethnopharmacol., 6: 29-60.
Heffelfinger JD, Dowell SF, Jorgensen JH, Klugman KP, Mabry LR, Musher DM, Plouffe JF, Rakowsky A, Schuchat A, Whitney CG (2000). Management of Community-Acquired Pneumonia in the Era of Pneumococcal Resistance. Arch. Intern. Med., 160: 1399-1408.
Heywood VH, Chant SR (1982). Popular encyclopedia of plants. Cambridge University Press, Cambridge.
Iauk L, Costanzo R, Caccamo F, Rapisarda A, Musumeci R, Milazzo I, Blandino G (2007). Activity of *Berberis aetnensis* root extracts on Candida strains. Fitoterapia, 78: 159-161.
Istatkova R, Philipov S, Tuleva P, Amgalan S, Samdan J, Dangaa S (2007). Alkaloids from Mongolian species *Berberis sibirica* Pall.Cr. Acad. Sci., 60: 1177-1182.
Johnson SA (1994). A visitor's guide to Nyika National Park, Malawi, Blantyre, The Mbabzi Book Trust, Lilongwe.
Kokwaro JO (1993). Medicinal plants of East Africa. Kenya Literature Bureau, Nairobi.
Kokwaro JO (1995). Ethnobotany in Africa. In Schultes RE, Von Reis S (eds.). Ethnobotany: Evolution of a Discipline. Dioscorides Press, Oregon.
Levine WC, Pope V, Bhoomkar A, Tambe P, Lewis JS, Zaidi AA, Farshy CE, Mitchell S, Talkington DF (1998). Increase in endocervical CD4 lymphocytes among women with nonulcerative sexually transmitted diseases. J. Infect. Dis., 177: 167-174.
Magnani R, Sabin K, Saidel T, Heckathorn D (2005). Review of sampling hard-to-reach and hidden populations for HIV surveillance. Aids, 19: S67-S72.
Mccoy D, Chopra M, Loewenson R, Aitken JM, Ngulube T, Muula A, Ray S, Kureyi T, Rowson M (2005). Expanding Access to Antiretroviral Therapy in Sub-Saharan Africa: Avoiding the Pitfalls and Dangers, Capitalizing on the Opportunities. Am. J. Public Health, 95: 18-22.
Narayanasamy N, Boraian MP, Baskar B (2001). Efficacy of participatory methods: a micro probe in a rural cluster. J. Rural Dev., 20: 273-297.
Ruiz-González A, Falguera M, Nogués, A, Rubio-Caballero M (1999). Is Streptococcus pneumoniae the leading cause of pneumonia of unknown etiology? A microbiologic study of lung aspirates in consecutive patients with community-acquired pneumonia. Am. J. Med., 106: 385-390.
Singh M, Srivastava S, Rawat A (2007). Antimicrobial activities of Indian Berberis species. Fitoterapia, 78:574-576.
Southern Africa Botanical Network (2000). Plants of the Nyika - Preliminary Checklist. Southern Africa Botanical Network, Pretoria.
SPSS Inc (2006). SPSS 15.0 for Windows. 15.0 edition. SPSS Inc., Chicago.
Srivastava S, Rai V, Srivastava M, Rawat A, Mehrotra S (2006). Estimation of heavy metals in different Berberis species and its market samples. Environ. Monit. Assess., 116: 315-320.
Sullivan M, Kone A, Senturia KD, Chrisman NJ, Ciske SJ, Krieger JW (2001). Researcher and researched-community perspectives: toward bridging the gap. Health Educ. Behav., 28: 130-49.
Van Der Geest S (1997). Is there a role for traditional medicine in basic health services in Africa? A plea for a community perspective. Trop. Med. Int. Health, 2: 903 - 911.
Wawer MJ, Sewankambo NK, Serwadda D, Quinn TC, Paxton LA, Kiwanuka N, Wabwire-Mangen F, Li C, Lutalo T, Nalugoda F, Gaydos CA, Moulton LH, Meehan MO, Ahmed S, Gray RH (1999). Control of sexually transmitted diseases for AIDS prevention in Uganda: A randomised community trial. Lancet., 353: 525-535.
Whittemore AT (1997). Berberis Linnaeus. Flora of North America Editorial, 3: 276-286.