

**PRODUCTION OF WILD GINGER (*SIPHONCHILUS
AETHIOPICUS*) UNDER PROTECTION AND INDIGENOUS
KNOWLEDGE OF THE PLANT FROM TRADITIONAL HEALERS**

by

T. Z. MANZINI

Submitted in partial fulfillment of the requirements of the degree M. Inst.
Agrar: Plant Production (Horticulture)

Faculty of Natural and Agricultural Sciences
Department of Plant Production and Soil Science
University of Pretoria
Pretoria

February 2005

DECLARATION

I declare that this thesis, for the degree of M INST AGRAR (Horticulture): Plant Production, has never been submitted for any degree at any university. The research work reported is the result of my own original investigation, except where acknowledged.

TRYPHINE ZODWA MANZINI

DATE

ACKNOWLEDGEMENTS

I would like to thank God the Almighty, who gave me the power to persevere throughout the years during my studies. My gratitude goes to my supervisor, Dr P. Soundy, for his guidance in the execution and documentation of my studies. My husband and family provided assistance in many ways, always motivating and concerned about my progress.

A special thanks to Linda, manager at JOCOD, for allowing us to use the Center's tunnels for the trials. Mr Benny Naidoo of JOCOD, for all his assistance and his willingness to help despite his tight schedule.

CSIR provided rhizomes used in the trials.

I extend my appreciation to Mrs R. Owen and her team in the Dept. of Biometry and Statistics, who provided valuable help with experimental designs and statistical analysis of survey and field data.

Prof. E.S. du Toit, co-supervisor, is thanked for her valuable guidance and advice on the field experiment and for the fruitful discussions.

My colleagues and staff in the Department of Agriculture, Conservation, Environment and Land (DACEL) provided valuable moral support and understanding. Their contributions were really valuable. Victor Thindisa in particular, from the Economics and Marketing section, assisted in the drafting of tables and graphs.

Financial support in the form of a postgraduate bursary from NRF, Pretoria; graduate assistantship from the University of Pretoria, is gratefully acknowledged.

I would like to also extend my sincere gratitude to the University of Pretoria for providing me with the opportunity to study.

TABLE OF CONTENTS

CHAPTER	PAGE
DECLARATION	i
ACKNOWLEDGEMENTS	ii
LIST OF TABLES	vii
LIST OF FIGURES	viii
ABSTRACT	ix
INTRODUCTION	1
1 LITERATURE REVIEW	3
1.1 WILD GINGER	4
1.1.1 Leaves of wild ginger	4
1.1.2 Flowers of wild ginger	4
1.1.3 Tubers and rhizomes of wild ginger	5
1.1.4 Roots of wild ginger	5
1.1.5 Cultivation of wild ginger	6
1.1.6 Temperature requirements	6
1.1.7 Fertilizer management	6
1.1.8 Propagation of wild ginger	7
1.1.9 Marketing of wild ginger	8
1.1.10 Product information on wild ginger	8
1.1.11 Chemistry and pharmacology	8
1.2 HIGH VALUE MEDICINAL PLANTS AND THEIR USES	9
1.2.1 <i>Warburgia salutaris</i> (isibaha; pepperbark)	9
1.2.2 <i>Scilla natalensis</i> (blouberglelie; inguduza)	9
1.2.3 <i>Eucomis autumnalis</i> (pineapple flower)	10
1.2.4 <i>Curtisia dentata</i> (assegai tree; umlahleni)	11

1.2.5	<i>Bowie avolubitis</i> (climbing lily; igibisila)	11
1.2.6	<i>Ocotea bullata</i> (black stinkwood; unukani)	12
1.3	INDIGENOUS KNOWLEDGE (IK)	13
1.3.1	Definition of traditional healer	13
1.3.2	Indigenous versus western knowledge	13
1.3.3	Usefulness of indigenous knowledge	13
1.3.4	Current status of indigenous medicine	14
	1.3.4.1 The supply of indigenous medicine case study	14
	1.3.4.2 The demand for indigenous medicinal plants case study	15
2	INDIGENOUS KNOWLEDGE OF WILD GINGER AND OTHER MEDICINAL PLANTS	16
2.1	INTRODUCTION	16
2.2	METHODOLOGY	17
	2.2.1 Geographic location	17
	2.2.2 The case study time schedule	17
	2.2.3 Developing project ownership amongst the traditional healer players	18
	2.2.4 Collection of quantitative data	19
	2.2.5 Data coding	20
2.3	RESULTS	22
	2.3.1 The indigenous healers' profile	22
	2.3.2 General questions	22
	2.3.3 Knowledge of wild ginger	24

2.3.4	Popularity of medicinal plants	29
2.3.5	Information about the customers	32
2.4	DISCUSSION AND CONCLUSIONS	35
2.5	SUMMARY	37
3	YIELD ANALYSIS OF WILD GINGER GROWING UNDER A TUNNEL OR A SHADE NET	39
3.1	INTRODUCTION	39
3.2	MATERIALS AND METHODS	40
3.2.1	Location	40
3.2.2	Treatments	40
3.2.3	Tuber preparation	40
3.2.4	Rhizome growth	41
3.2.5	Records and statistical analysis	41
3.3	RESULTS AND DISCUSSION	42
3.3.1	Effects of harvesting period on yield	42
3.3.1.1	Number of enlarged roots	42
3.3.1.2	Number of rhizomes	42
3.3.1.3	Rhizome circumference	43
3.3.1.4	Fresh rhizome mass	43
3.3.1.5	Fresh enlarged root mass	43
3.3.2	Effect of growth structure on wild ginger	43
3.3.2.1	Number of enlarged roots	43
3.3.2.2	Number of rhizomes	43
3.3.2.3	Rhizome circumference	44
3.3.2.4	Fresh rhizome mass	44

3.3.2.5	Fresh enlarged root mass	44
3.3.3	Harvesting period and growth structure	45
3.4	SUMMARY	46
4	GENERAL DISCUSSION AND CONCLUSIONS	48
5	GENERAL SUMMARY	52
6	LIST OF REFERENCES	54
7	APPENDICES	59
	APPENDIX TABLES	59
	ANOVA TABLE	61
	QUESTIONNAIRE	62

LIST OF TABLES

	Page
Table 1.1 Nutrient ranges for good growth of medicinal plants	7
Table 2.1 Uses of wild ginger as perceived by traditional healers in order of importance	27
Table 2.2 Shelf life of wild ginger according to respondents	29
Table 2.3 The botanical name, Zulu name, number of respondents and plant ranking according to the number of traditional healers	30
Table 3.1 Effect of harvesting period on yield of wild ginger	42
Table 3.2 Effect of growth structures on yield of wild ginger	44

LIST OF FIGURES

	Page
Figure 1.1 Bright pink flowers of wild ginger	4
Figure 1.2 Swollen tubers and the aromatic roots of wild ginger	5
Figure 2.1 Public meeting of traditional healers	21
Figure 3.1 Fresh enlarged root mass as affected by harvesting date and growth structure	45

PRODUCTION OF WILD GINGER (*SIPHONCHILUS AETHIOPICUS*) UNDER
PROTECTION AND INDIGENOUS KNOWLEDGE OF THE PLANT FROM
TRADITIONAL HEALERS

by

T.Z MANZINI

Supervisor: Dr P. Soundy

Co-supervisor: Prof. E. S. du Toit

Department of Plant Production and Soil Science
Degree: M Inst. Agrar: Plant Production (Horticulture)

Abstract

A questionnaire survey was conducted in five different villages in Mpumalanga Province. Hundred and fifty traditional healers were interviewed. The aim of the survey was to record and document indigenous knowledge held by the traditional healers on wild ginger and eight other popular plants used by them.

The healing properties of wild ginger as perceived by traditional healers, ranged from healing coughs, colds, flu, hysteria, malaria and menstrual disorder, to protection against lightning. Majority (77%) said that there was no difference in medicinal value between cultivated and those grown in the wild. The majority of the traditional healers (72%) said they would appreciate proper training on how to domesticate these plants. Traditional healers do not have professional knowledge and skills to produce these medicinal plants. Therefore training is crucial to impart these skills. The income category of traditional healers ranged from less than R200 to a maximum of R3000. Traditional healers received as few as 1 to 5 patients per day. The consultation cost ranged from R20 to more than R95. People who gathered plants for traditional healers ranged from 1 to 10 depending on the popularity of the traditional healer and the size of his/ her surgery.

An experiment was carried out at Johannesburg Center for the disabled (JOCOD), Lenasia, South of Johannesburg, in a plastic tunnel and under a shade net. The objective of the experiment was to determine the effect of using a tunnel or a shade net on the yield of rhizome and to determine the effect of different harvesting periods on rhizome yield of wild ginger. The treatments were four in number, namely; two growing structures (tunnel and shade net) and two harvesting periods.

On the effect of harvesting periods on yield, although there was no significant differences in the number of enlarged roots harvested between the first harvesting period and the second harvesting period, the number of roots tended to be higher during the first harvesting period compared to the second harvesting period. There was a significant difference in the number of rhizomes between the first and the second harvesting periods. On the effect of growth structure on yield of wild ginger, the number of enlarged roots was significantly higher from plants grown in a tunnel compared with those grown in a shade net. There was a significant difference in rhizome circumference between plants grown in a plastic tunnel and those grown in a shade net. There were interactions between the harvesting date and growth structure for fresh enlarged root mass. Fresh mass of enlarged roots of wild ginger was greater during the first harvesting date than during the second harvesting date for plants grown in a plastic tunnel.

For small scale or resource poor farmers, herbalists and traditional healers who wish to grow wild ginger under protection, it is better to grow wild ginger in a plastic tunnel than under a shade net, probably because wild ginger performs well in warm conditions. The plastic tunnels have a tendency of maintaining warm temperatures during winter months. Early harvesting of wild ginger at the end of June 28/06 than harvesting in September. This could be because wild ginger grows rapidly throughout the summer season and in winter, the growth rate drops (dormant stage) making early winter the right time to harvest.

Keywords: Wild ginger, traditional healers, indigenous knowledge, questionnaire survey,

plastic tunnel, shade net

INTRODUCTION

Plants were once a primary source of all medicines and they continue to provide mankind with new remedies. Natural products and their derivatives represent more than 50% of all drugs in clinical use (Anon., 1996). Higher plants contribute no less than 25% to the total. Well known examples of plant-derived medicines include guanine, morphine, codeine, aspirin, atropine, reserpine and cocaine (Anon., 1996).

According to Bruneton (1995), in South Africa a large part of the day-to-day medicine is still derived from plants, and large volumes of plants or their extracts are sold in the informal and commercial sectors of the economy. In spite of this fact, the cultivation of medicinal plants is the most recent branch of agriculture and horticulture. One of the reasons for this phenomenon is that for a very long time the gathering, preparation and application of medicinal plants were associated with religious cults and magic (Bruneton, 1995).

It was only the rapid development of chemistry, phyto-chemistry and pharmacology during the nineteenth century which provided possibilities for the scientifically supported applications of plants (Anon., 1998). The growing demand of consumers worldwide for herbal and natural products to meet both their needs for health care and dietary supplements has opened up new opportunities for medicinal plants-based industries. However, this market-propelled demand has created tremendous pressure on the natural resources, which contribute more than 90% of the current demand for the raw materials of medicinal plants (Anon., 1998).

Owing to the widening knowledge on plants, metabolism of plants, products of metabolic processes and the physiological effects of these, the field of application has been ever increasing. Plants hardly known previously became significant, while other plants were put aside as their ineffectiveness was proved (Weiss, 1979).

According to Hutchings (1996), the significance of medicinal plants nowadays is also shown by the increasing need of established research centers for analyzing the active ingredients of plants and discovering new, biologically active natural materials. Wild plants that many people considered weeds are being turned into multi-million rand industries in international business.

The major concern now is that many of these medicinal plants, including wild ginger, are in danger of extinction. This is due to over-harvesting of the plants as well as the removal of the roots or rhizomes, which result in the complete destruction of the wild plant population. This has called for a research into ways of domesticating wild plants, especially wild ginger (Anon., 1998). Wild ginger is one of the popular plant species, which is widely used throughout South Africa. It is thought to heal several illnesses. Lack of appropriate cultivation skills of this plant by consumers also lead to scarcity of the plant, as it does not multiply after being harvested destructively (Anon., 1998).

A survey was initiated to investigate the economic feasibility of cultivating wild ginger and eight other medicinal plants of high value. The survey also looked at the indigenous knowledge of traditional healers about wild ginger and these eight other high value medicinal plants.

The motivation for investigating the other eight medicinal plants was for comparison purposes to determine which are more powerful than others, as recommended by traditional healers. This would help to prioritize should there be any future projects, which would embark on cultivation of these medicinal plants. Secondly, this research focuses on the production of wild ginger under protection.

CHAPTER 1

LITERATURE REVIEW

Wild ginger is a forest plant with aromatic rhizomatous roots. The generic name *Siphonochilus* is derived from the Greek *siphono* meaning tube, and *chilus* meaning lip in reference to the shape of the flower. The specific name *aethiopicus* means from southern Africa (Hutchings, 1996). This species was once more widespread than today. It occurred in KwaZulu-Natal and Mpumalanga, although it is now thought to be extinct in KwaZulu-Natal (Jackson, 1990).

The plant is highly priced for its medicinal value and as a result has been over-harvested from the wild to a point just short of total extinction. The cone-shaped rhizomes and fleshy roots are dug and sold on the muthi markets around South Africa. Micropropagation by tissue culture has brought this species back from the brink of extinction although the wild populations are reportedly almost totally depleted (Anon., 1996). This plant is currently listed in the Red Data book of South African plants (Anon., 1996).

According to van Wyk & Gericke (2000), wild ginger belongs to the same family as the true ginger, which is widely used for culinary purposes. This family is reputed to contain a number of important spice plants such as tumeric and cardamom. There are also a number of very attractive garden plants that belong to this family.

According to Hutchings (1989), wild ginger is a deciduous plant with large hairless leaves developing annually from a small, cone-shaped rhizome. The spectacular flowers appear at ground level in early summer. The leaves and rhizomes have a smell similar to that of real ginger, *Zingiber officinale*.

1.1 WILD GINGER

1.1.1 Leaves of wild ginger

Wild ginger produces broad grass-like leaves that emerge in spring from the underground rhizome. The leaves are deciduous and sprout annually from the underground stem in spring. They may reach a height of up to 40 mm. The leaves are light green, lance shaped and borne on the end of stem-like leaf bases. The male and the female organs are borne on separate plants. Female plants tend to be smaller than the male plants. The small berry-like fruits are produced at or near ground level after the flowers (Arnold & de Wet, 1993).

1.1.2 Flowers of wild ginger

The wild ginger has tremendously attractive flowers, which are borne at ground level and are very short-lived (Fig. 1.1). Flowers often appear before the leaves in spring, perhaps to allow them to be more visible to pollinators (van Wyk & Gericke, 2000).



Fig. 1.1 The bright pink flowers of wild ginger (van Wyk & Gericke, 2000).

Reminiscent of orchid flowers, the blooms which are borne from October to February are delicate in texture, may vary in colour from bright pink, purple-pink, yellow to white with a yellow centre and are delicately scented. About 15 flowers are produced per plant over the flowering season, each lasting a single day (Nichols, 1989).

1.1.3 Tubers and rhizomes of wild ginger

Up to twenty swollen tubers may be attached to the rhizome, each connected by succulent roots (Fig. 1.2). The rhizome, which is coned-shaped and narrows to a tapering point, is dug up and sold (van Wyk & Gericke, 2000). Rhizomes harvested during the growing season will have roots on them. Those taken during the dormant season, when the plants are leafless, will have no roots on the tubers (van Wyk & Gericke, 2000).



Fig. 1.2 Swollen tubers and the aromatic roots of wild ginger (van Wyk & Gericke, 2000).

1.1.4 Roots of wild ginger

The highly aromatic roots have a variety of medicinal and traditional uses and the native South African people have cultivated this plant for many years. It is used by Zulu people

as a protection against lightning and snakes (Hutchings, 1996). Infusions of the rhizome and roots are used to treat epilepsy, hysteria and relieve dysmenorrhoea, which is a menstrual disorder experienced by a large percentage of the World's female population. The Swazi use the plant for the treatment of malaria (Dyer, 1963). Cold rhizome infusions of wild ginger are also administered to horses as prophylactics against horse sickness (Watt & Breyer-Brandwijk, 1962).

1.1.5 Cultivation of wild ginger

Wild ginger is easy to cultivate provided it is given a well drained, compost rich soil and a warm but shady position, either in a container or in the garden. Watering should be reduced to a minimum during the winter months, while the plant is dormant and may be resumed with the onset of spring. During the growing season plants respond very well to high levels of feeding with organic matter (Nichols, 1989).

1.1.6 Temperature requirements

Wild ginger requires a dominance of vegetative growth in the early stages of development. It means that the plant should produce more leaves and shoots and not flowers (Veale, Furman & Oliver, 1992). In the early stages of growth, the focus should be more on a warm growing medium temperature. Once the roots are well established and plants have grown enough shoots and leaves, then the temperature can be dropped by 2 to 3°C. During the early establishment phase when more roots are required, a growing medium temperature of between 20-22°C and air temperature of around 20°C should be maintained (Mirza, 1996).

1.1.7 Fertilizer management

According to Mirza (1996), in the early stages of plant development the requirement of phosphorus is high. Inorganic sources of phosphorus are fertilizers like mono ammonium phosphate (11-51-0), mono potassium phosphate (0-53-34), or NPK mixtures, like 10-52-10 and 9-45-15. Organic growers can use bone meal, fishmeal or other natural sources of phosphate.

In general, when plants are entering a rapid growth phase, higher nitrogen in relation to potassium should be used. Enough calcium and magnesium should also be made available through organic or inorganic sources during this phase (Acher, 1990). High levels of nitrogen relative to potassium makes the plants grow fast and vegetatively. Higher potassium than nitrogen makes the plants more flavourful and compact. Higher potassium contributes towards a better quality plant and helps with disease tolerance (Mirza, 1996).

According to Mirza (1996), nutrient ranges that could be supplied to achieve good growth of medicinal plant, is presented in Table 1.1.

Table 1.1 Nutrient ranges for good growth of medicinal plants (Mirza, 1996)

NUTRIENT	AMOUNT (mg/litre)	NUTRIENT	AMOUNT (mg/litre)
Nitrogen	100-200	Iron	1.5- 3.0
Phosphorus	25-50	Manganese	0.5-1.0
Potassium	150-400	Copper	0.1-0.2
Calcium	100-200	Zinc	0.1-0.15
Magnesium	50-70	Boron	0.02-0.12

1.1.8 Propagation of wild ginger

For propagation of wild ginger, the rhizomes are divided in winter when the plants are dormant. The rhizomes are then replanted into a well-drained growing medium and watered only in mid to late August, and fertilised well with manure and compost over the duration of summer growing period. Plants do not set much seed and splitting rhizomes is the best available option for plant propagation (Pooley, 1998).

According to Harris (1987), plants propagated from seed can take up to a year to germinate. An easier way to propagate the plant is by dividing the rhizomes when the plants are dormant in winter. One should be careful not to remove or damage the roots when splitting the rhizomes. Plants are also propagated by tissue culture.

1.1.9 Marketing of wild ginger

Wild ginger is frequently sold as pieces in shops and in healer practices (at a mean mass of 6 g) due to high prices, while in the street markets it is usually sold whole plant parts (at a mean mass of 35.6 g). An average sale mass of 21 g is used to estimate the number of sales, while the average mass of whole plants is used to estimate the numbers of plants sold (Mander, 1998).

1.1.10 Product information on wild ginger

This rare African plant of the ginger family is regarded as Africa's natural anti-inflammatory plant. Headache, influenza, mild asthma, sinusitis, sore throat, thrush, candidacies syndrome and menstrual cramps are cured by wild ginger (Lewis, 1989).

1.1.11 Chemistry and pharmacology

The conical rhizome and roots contain a high percentage of a known sesquiterpenoid, which is a key phytochemical active ingredient. Extracts of the rhizome have been demonstrated to be anti-inflammatory (prostaglandin-synthetase inhibition), bronchodilatory, smooth muscle relaxant, mild sedative, and anti-candidal. The presence of antiseptic monoterpenoids contributes to the bioactivity (Verotta & Rodgers, 1997).

1.2 HIGH VALUE MEDICINAL PLANTS AND THEIR USES

Conventional or modern medicine as we know it today has a relatively short history compared to traditional medicine, which has been practiced since time immemorial. Confronted with illness and disease, early man found by trial and error that certain plants were useful for the treatment of the many diseases that afflicted him (Jonathan, 1990).

1.2.1 *Warburgia salutaris* (pepper-bark, isibhaha)

The tree is known from only a few localities in the north-eastern parts of South Africa and has been heavily exploited for its bark, making it probably one of the most threatened plant species in the country. Pepper-bark is a medium tree of up to 10 m high, with a rough mottled bark, which is reddish on the inner side (van Wyk & Gericke, 2000).

The bark, which has a strong peppery taste, is used medicinally, and is a popular and widely used remedy for coughs, colds and chest complaints. It is particularly sought after for serious coughs, which produce sputum-containing pus. It is also used for numerous other ailments, including flu, rheumatism, malaria, venereal diseases, headache, toothache and gastric ulcers. Cold water infusions of the powdered bark are taken orally as expectorants (promoting the secretion or expulsion of mucous from the respiratory system), or the bark is smoked as a cough and cold remedy (van Wyk & Gericke, 2000).

1.2.2 *Scilla natalensis* (blouberglelie; inguduza)

This is a bulbous plant that has broad, sharply tapering leaves that arise from large bulbs of about 100 mm in diameter. The flowers often grow in large groups. The small blue or purplish-blue flowers are borne on long, slender stalks of about a meter in height (van Wyk & Gericke, 2000).

Bulb decoctions of *S. natalensis* are used as enemas for children and adults (Gerstner, 1941). They are also used as purgatives and as ingredients in infusions taken during pregnancy to facilitate delivery (Veale *et al.*, 1992). Dried ground leaves are given to a child who is late in walking (Hardin, 1968). The bulb is believed to be used by the umthakathi (sorcerer) to produce strife in the kraal or family (Gerstner, 1941).

It can also be used for sprains and fractures, as a purgative, and in enemas administered for internal tumors by the Sotho (Watt & Breyer-Brandwijk, 1962). It is used for boils and veld sores by the Swazi (van Wyk, van Oudtshoorn & Gericke, 1997).

1.2.3 *Eucomis autumnalis* (pineapple flower; umathunga)

This bulbous plant occurs along the eastern parts of South Africa, and there are two sub-species, which are geographically separated. It has long, broad, soft-textured leaves with wavy margins, and its numerous small, yellowish-green flowers are borne on a thick central stalk. Above the flowers is a rosette of green leaves, a characteristic feature, which gives the flower cluster the appearance of a pineapple (Watt & Breyer-Brandwijk, 1962).

The bulb is used medicinally. An enema of a bulb decoction is commonly used for backache in the lower region, to assist in post-operative recovery, and to aid the healing of fractures. A decoction of the bulbs is also used for a wide variety of other ailments including urinary diseases, stomachache, fevers, colic, flatulence, hangovers, syphilis, and to facilitate childbirth. One sub-species of this plant is also used to treat coughs and respiratory ailments, biliousness, lumbago, blood disorders, diarrhoea, venereal diseases, and to prevent premature childbirth (Watt & Breyer-Brandwijk, 1962).

1.2.4 *Curtisa dentata* (assegai tree; umlahleni)

This is a medium to large tree, usually around 10 m but sometimes reaching up to 20 m in height. It occurs in all the afro-montane forests of South Africa, from the Cape Peninsula to the Limpopo Province. It has become threatened in some areas because of over-exploitation (van Wyk *et al.*, 1997).

The bark, which is brown and smooth but which becomes dark and rough in older trees, is used medicinally. It is very popular in the Zulu culture and forms an important part of the commercial trade in medicinal plants in KwaZulu Natal. Zulus use it for stomach ailments and diarrhoea. It is also traditionally used as an aphrodisiac and to purify the blood. The bark of this tree was commonly included in bark mixtures known as “khubalo” but it has become scarce and is now only put into special mixtures (Roberts, 1990).

1.2.5 *Bowiea volubilis* (climbing lily; igibisila)

Bowiea volubilis has a greenish-white, fleshy, rubberous bulb, without any papery or fibrous outer scales. The upper ends of the fleshy scales form distinctive rings around the middle of the bulb, from where the thin, green, leafless climbing and creeping flowering stems arise. The flowers are small, greenish in colour and rather inconspicuous. *B. volubilis* is widely distributed in the eastern parts of South Africa. It grows in rocky places (van Wyk & Gericke, 2000).

The climbing lily has been used to treat a wide variety of ailments, including headaches. A hot water extract of the roasted bulb is taken as a purgative. The fresh bulb is taken for oedema (drops) and infertility in women. The fresh juice may be rubbed into the skin of a sick person or decoction applied as a lotion for sore eyes (van Wyk & Gericke, 2000). A hot water extract of the fresh outer bulb scales is a Zulu remedy for sterility and bladder complaints. All parts of the plant are extremely poisonous and internal use is potentially lethal (Long, 1978).

The main pharmacodynamic properties of cardiac glycosides are their ability to increase the force of heart muscle contraction, hence its therapeutic benefits in congestive heart failure. Toxic concentrations of cardiac glycosides can cause abnormalities of cardiac rhythm and disturbances of atrio-ventricular conduction, including complete atrio-ventricular block (van Wyk & Gericke 2000).

1.2.6 *Ocotea bullata* (black stinkwood; unukani)

This well-known and popular tree is widely distributed in the afro-montane forests along the southern and eastern parts of South Africa from the Cape Peninsula to KwaZulu-Natal, and in parts of Mpumalanga and the Limpopo Province. *Ocotea bullata* is a large evergreen tree reaching a height of up to 20 or 30 meters. The bark is pale brown and has a beautiful mottled appearance, but it may become dark brown and flaky in old trees (van Wyk & Gericke, 2000).

Its expensive timber is used for high-quality furniture. The stem bark is used medicinally, and has become expensive because of its popularity and shortage of supply. When finely ground, the bark is used as a snuff or the smoke is inhaled to relieve headaches. It is also applied to the bladder in urinary disorders, and is claimed to be beneficial for stomach trouble and as an emetic (causing vomiting) for emotional and nervous disorders. An infusion of the powdered bark is said to be an effective remedy for infantile diarrhoea. The pharmacological effects, possibly pain relieving activity of these compounds, have not yet been studied (van Wyk & Gericke, 2000).

The plants can be used individually or in sophisticated mixtures depending on the illness or condition to be treated. Some mixtures are relatively well known recipes, such as 'ntezezi' and 'ubulawu' and are prepared for self-medication while other mixtures are complex and secret, and are only prepared and prescribed by indigenous healers. Up to eleven (11) different plant species may be used for the more sophisticated mixtures. Plants can be used for their chemical or magical properties or for the combination of both properties (van Wyk *et al.*, 1997).

1.3 INDIGENOUS KNOWLEDGE (IK)

According to Holdstock (1978), indigenous knowledge is the knowledge that people in a given community have developed over time, and continue to develop. It is based on experience, often tested over centuries of use, adapted to local culture and environment. It is also dynamic and changing.

1.3.1 Definition of traditional healer

According to Singer (1977) a traditional healer can be either a person with a spirit (witch doctor) or it can be a herbal doctor. Their training ordinarily consists of apprenticeship through an older healer. Their conceptual basis for their practice is the theological-philosophical worldview of their cultural peers. The knowledge and origins of powers possessed by the healer are ordinarily kept secret.

1.3.2 Indigenous versus western knowledge

Indigenous knowledge is often contrasted with western or modern knowledge developed by universities, research institutions and private firms using a formal scientific approach. In reality, there is a lot of overlap between indigenous and western knowledge, and it can be difficult to distinguish between them (Holdstock, 1978).

1.3.3 Usefulness of indigenous knowledge

According to Lange (1997) indigenous knowledge is the basis for self-sufficiency and self-determination for the following reasons:

- (a) People are familiar with indigenous practices and technologies. They can understand, handle, and maintain them better than introduced western practices and technologies.

- (b) Indigenous knowledge draws on local resources. People are less dependent on outside supplies, which can be costly, scarce and available only irregularly.
- (c) IK gives local people and development workers extra options when designing projects. Instead of searching only among western technologies for feasible solutions, they can choose from indigenous knowledge or combine indigenous and western technology.

1.3.4 Current status of indigenous medicine

1.3.4.1 The supply of indigenous medicines – case study

According to research conducted by Mander (1998), the supply of indigenous medicine is based on indigenous plants, which are generally harvested from wild plant stocks. The plant stocks and the harvesting of these stocks are not managed and little cultivation takes place. The combination of high demand and the lack of any significant resource management or production have resulted in a decline in the available plant stocks.

Mander (1998), in his findings, (survey conducted in KwaZulu-Natal) highlighted the following concerns on the supply of these medicinal plants:

- (a) A wide range of plant species is showing indications of unsustainable use, with the size of the products decreasing and some plants becoming unavailable in certain markets. Some popular plants have become extinct outside of protected areas in the province. Thus, the supply of indigenous medicinal plants is clearly not sustainable with the current harvesting strategies.
- (b) The scarcity of popular plants has led to their under-supply in the market, with considerable increases in product prices, imports into the province, and the use of substitute plants. In addition, there has been an increase in the application of destructive harvesting techniques, which aim at maximizing the harvest from the stock in order to maintain income levels in the short term.

Mander (1998) pointed out that there are, however, options for sustaining the supply of plants to markets. There are extensive areas of grasslands, woodlands and thickets on private property that have not been intensively harvested in the past. With effective management, these areas could supply a range of products to the markets in the long term. However, the volumes of plant resources available and the harvesting strategies, which may be applied, need to be investigated. In addition, the most popular plants irrespective of their habitat exist in such small quantities that management of existing stocks is unlikely to meet market demand.

The cultivation, management and enrichment planting of high value plants is, therefore, an important strategy to meet consumer demand and to reduce the impacts of markets on biodiversity. The success of cultivation trials has demonstrated the potential of this strategy. Fast-growing species could be supplied in sufficient quantities within a few years. However, the slow-growing popular trees are unlikely to supply the bark quantities demanded in the short term, and alternative products from these plants need to be investigated (Mander, 1997).

1.3.4.2 The demand for indigenous medicinal plant – case study

According to Mander (1997), the demand for medicinal plants in Bushbuckridge is large, with approximately between 200 to 700 tones per year being consumed. This level of demand is likely to increase in the future as a result of cultural imperatives, population growth and the increased use of indigenous medicines to treat AIDS and associated ailments. The demand for indigenous medicine is further sustained by black communities' reliance on a dual health care system that employs both western and indigenous practices. Indigenous medicine and the associated medicinal plants are a basic consumer good in Bushbuckridge.

CHAPTER 2

INDIGENOUS KNOWLEDGE OF WILD GINGER AND OTHER MEDICINAL PLANTS AMONG TRADITIONAL HEALERS

2.1 INTRODUCTION

There is currently a major concern that many medicinal plants are in danger of extinction, due to over-harvesting of the plants as well as the removal of the roots or rhizomes, which result in the complete destruction of the plants (Cooper & Cunningham, 1979).

The current demand for numerous popular plant species used for indigenous medicines exceeds supply. In South Africa, a large part of the medicines used by people are still derived from plants and large volumes of plants or their extracts are sold in the informal and formal sectors of the economy. In spite of this, cultivation of medicinal plants is a recent phenomenon in Agriculture and of horticulture (Ellis, 1986).

According to Lange (1997), one of the reasons for this phenomenon is that the gathering, preparation and application of medicinal plants were associated with religious cults and magic for a very long time. It was only the rapid development of chemistry, phyto-chemistry and pharmacology in the nineteenth century, which provided possibilities for the scientifically supported applications of plants.

As a result of the declining supply of medicinal plants and localized extinction that have occurred, Cunningham (1988) recommended the cultivation of indigenous medicinal plants. It became clear that there was insufficient knowledge of the economics of indigenous plant production and the associated markets. The lack of information has prevented individuals, organizations and government bodies from assessing opportunities in cultivating indigenous medicinal plants (Ellis, 1986).

A survey was conducted with the objective of documenting indigenous knowledge held by traditional healers on nine high-value medicinal plants, including wild ginger. The focus was on their cultivation potential (domestication of these medicinal plants), and on marketing of these medicinal plants by traditional healers.

2.2 METHODOLOGY

2.2.1 Study area

A survey was conducted in five different villages, viz. Block A, Block B, Block C, Mangweni, Drie-Koppies and three black townships were also surveyed, viz. Naas, Ka-Mhlushwa as well as eMjindini in Barberton. The initial plan was to interview two hundred traditional healers, however only 150 traditional healers were interviewed due to time constraint.

2.2.2 The case study time schedule

The fieldwork took place in April 2002 for a period of four weeks. The need to develop credibility with all the traditional healer participants was a lengthy process requiring regular meetings and discussions. Some traditional healers as well as indigenous medicinal plant growers were regularly robbed of their indigenous knowledge in the past by some researchers and other conservation authorities.

Confrontation between conservation authorities and traditional healers and indigenous medicinal plant growers has created suspicion and distrust among healers and growers towards outsiders, including researchers. The author had to develop credibility and trust among respondents before any work could take place. In addition, for the findings of the survey to be acknowledged and used by the healers, the project needed to develop ownership of the survey amongst traditional healer participants. The development of trust and ownership of the survey took a full week of regular meetings and communication. Links were developed with a key traditional healer leader, a healer organization and in some cases even chiefs were involved.

Numerous public meetings were held to inform the traditional healers of the survey and its objectives. The survey was to develop support for enabling the survey to take place, and to obtain accurate information. One the approaches adopted was to encourage the traditional healers to adopt the survey as a tool for them to use in improving their business opportunities and personal welfare.

2.2.3 Developing project ownership amongst the traditional healer players

The advantage of which the researcher had, was that the leadership recognized the value of information and consequently adopted the survey as an initiative of their respective organizations. Consequently at public meetings (Fig. 2.1) or organization membership meetings, the project was frequently referred to by the respective leadership as ‘their project’ and that the researchers were ‘working for the organization’. The researchers had to do little convincing for the membership to participate in the survey due to the active support of the leadership. This approach was, however, time consuming and expensive, but was essential to gain access to the traditional healers and to enhance trustworthiness of the information.



Fig. 2.1 Public meeting of traditional healers

2.2.4 Collection of quantitative data

Data collection was by means of a questionnaire survey complimented by field observation. The population covered by the survey consisted of traditional healers. The Questionnaires was designed to capture information about the supply and demand of medicinal plants, by focusing on the expertise of various key groups. For an example, plant gatherers were questioned intensively about the source and supply of wild plants, as they are the major harvesters of the plants. The questionnaire was designed following discussions with various role players. While the questionnaires focused on nine species of high value plants, there were also general questions that were designed to capture broader market information. The interviews took between 30 to 60 minutes to complete, and were carried out by Swazi speakers who were also proficient in English.

The major challenge in this study was to develop an understanding of the quantitative characteristics in the income generated by the traditional healers from the sales of the indigenous medicine. This is because they regard the income factor as confidential information, which cannot be disclosed anyhow. In designing the questionnaires it was

important to use a number of questions to enable quantitative assessment to be made. The survey attempted to capture the frequency of use/sale, the quantity used/sold, and the price of the product sold. For an example, to determine how much plant material was used for healing, the questionnaire respondents had to estimate how many times a day the product was given to the patient.

The indigenous healers were interviewed either at their practices or at meetings where several healers gathered. This group was generally difficult to interview, as many healers were reluctant to commit time to the interview. There was also considerable suspicion by the healers that other people wanting to make money from their knowledge may use the information.

Swazi culture does not accept concise conversation as being socially acceptable. Discussions were generally protracted, with conversations taking place before key issues were discussed. It is considered culturally unacceptable to get straight to the point and also not acceptable to have any discussion about a person's private business (work or personal) without the respondent having a clear understanding of the work being undertaken. In addition, when the respondent wished to discuss some associated issues with the interviewers, these discussions had to be completed before continuing with the questionnaire. Failure to allow the respondents to ask their own questions of the work being undertaken, and have them adequately answered, would be considered socially unacceptable, and would likely result in the respondent not wanting to continue with the discussion as it would be perceived as merely a one-way process.

2.2.5 Data coding

The information in the questionnaires was coded. All the variables for the answers were listed and given a number (code). These codes were then placed in a spreadsheet. Apart from collecting data through questionnaires, an important part of the survey was to make observations during the course of the work. The researcher took notes during formal and informal discussions, at public meetings and during fieldwork. This helped to provide

insights into the information, which were not possible to obtain from the structured interviews. Several lengthy discussions were also undertaken with various traditional healers and they helped to provide a depth of detail not obtainable from the structured questionnaires. These observations were particularly important during the initial stages of the survey as they helped focus the study and provided insights into the design of the questionnaires and the approaches for the survey.

2.3 RESULTS

2.3.1 The indigenous healers' profile

Indigenous healers were a diverse group of people from a wide range including males, females, wealthy, poor, highly educated, poorly educated and urban or rural. The most common factor amongst all the healers was that they had a calling from the ancestors, which directed them to practice as either a herbalist (inyanga) or a diviner (isangoma). Most of the healers' practices were located in rural homesteads, given that a large number of clients came from the local areas.

2.3.2 General questions

- Age group of respondents

The ages of the traditional healers interviewed ranged from as low as 18 to more than 66 years old. Those who were 18 to 25 years old were 2%, whilst those who were from 26 to 35 years old were 13 %. Those that ranged from 36 to 45 years old were 20%, whilst those that ranged from 46 to 55 years old were 30%. They were 21% whose age category ranged from 56 to 65 years. And those who were 66 years old and older were 14 %.

- Age by gender of respondents

The respondents were both males and females ranging from different ages, expressed in percentage. Majority of respondents (22%) were females ranging from 46-55 years. As opposed to females, majority of males (11%) were ranging from 56-65years (Table 2.1).

Table 2.1 Age and gender of respondents

AGE BY GENDER OF RESPONDENTS		
AGE (Years)	MALES (%)	FEMALES (%)
18 to 25	1	1
26 to 35	4	9
36 to 45	5	16
46 to 55	7	22
56-65	11	9
>66	8	9

- Income category of traditional healers per month

The income category of traditional healers ranged from lower than R200 to a maximum of R3000 per month. Traditional healers whose income was lower than R200 were 14%, whilst those whose income was between R200 to R500 were 23%. Majority (30%) of traditional healers earned between R550 to R1000 followed by those who earned between R1050 to R2000 (28%) per month. Those who earned between R2050 to R3000 per month were 5% and there was no traditional healer who earned more than R3000 per month.

- Patients visiting the traditional healers per day

The number of patients visiting traditional healers per day varied. Most traditional healers received as few as 1 to 5 patients per day, confirmed by 84% of the respondents. Those traditional healers who received between 6 to 10 patients per day were 15%. However, minority (1%) of the traditional healers confirmed that they received a maximum of 10 patients per day.

- Average cost of a consultation

The consultation cost ranged from R20 to R95, and differed from one traditional healer to another. Sixty-three percent of the traditional healers charged R20 to R50 per consultation, whilst 17% of traditional healers charged R55 to R70 per consultation. Eleven percent of the traditional healers charged R75 to R90 per consultation. Only 1% of the interviewed traditional healers charged more than R95 per consultation.

- People who gather plants for traditional healers

The number of people who gathered plants for traditional healers ranged from 1 to 10 depending on the popularity of the traditional healer and the size of his/ her surgery. The more famous the traditional healer, the bigger was the size of his surgery and the more plant gatherers he utilised. Traditional healers with 1 to 5 plant gatherers were the majority (94%), followed by those who had 6 to 10 gatherers (6%). There were no traditional healers who had more than 10 plant gatherers.

2.3.3 Knowledge of wild ginger

Traditional healers suspect that researchers often gather information for their own benefit, and this forces them to protect their indigenous knowledge from people they do not know. The result is that they are unwilling to respond honestly to the questions being asked. For an example, wild ginger is a popular plant known almost by all traditional healers, yet in the survey only 92% of the traditional healers had knowledge and a good background of the plant. Six percent of the respondents said they did not know wild ginger and 2% were not sure whether they know wild ginger or not. The majority of those who knew the plant were adults of over 40 years old.

- Period which they have been working with the plant

The majority (47%) of the traditional healers have been using this plant for healing purposes for over 15 years. Those who started working with the plants for the past 10 to 15 years were 6%, whilst 23% had at least 5 to 10 years' exposure of the plants. There was, however, a group (16%) that had only 5 years and less exposure to the plant. Those who did not know how long they have been using the plant for healing purposes were 8%.

- Obtaining plant material

Some individuals (5%) grew wild ginger. Those that bought the plant were 40%, whilst those that harvested the plant from the wild were in the majority (47%). Those who had other sources, which were not revealed during the survey, were 3%. The rest (5%) said they did not know where the plant was obtained from.

- Provinces where they harvest or buy wild ginger from

The main source of wild ginger and other popular plant species for the majority of traditional healers (96%) still remained the communal or tribal lands, where there is generally easy access to forest and grassland. However, respondents also indicated that they did travel outside the province such as to Limpopo, confirmed by 2%, and others still bought or harvested wild ginger in Kwa-Zulu Natal (2%).

- Availability of this plant in the wild

Many of the traditional healers (26%) indicated that wild ginger is very scarce in the wild, whilst 28% of the respondents noted the plant as scarce. There were those who considered the plant to be extinct (20%). Those who felt the plant is still plenty in the wild were 14% and only 12% responded that they did not know whether the plant is still available or not.

- Knowledge of the growing period of wild ginger

The majority of traditional healers do not grow wild ginger at the moment, such that their response for the growing period of wild ginger was a rough estimation. One percent had an underestimation of the growing period to be 0-4 months, while 15% estimated that the growing period ranged from 5 to 8 months. Six percent believed that it took 9 to 12 months to grow the plant. Interestingly 17% estimated that the growing period took up to 12 months. The majority of the respondents (61%) did not know how long it took for the plant from growing until to harvesting.

- Plant parts used for growing wild ginger

The plant parts used for growing wild ginger, which they regard as rhizomes, were well known by the traditional healers (89%). Two percent said tissue culture method is used to grow wild ginger, while 10% were not sure which plant parts are used to grow wild ginger.

- The uses of wild ginger

The uses of wild ginger (Table 2.2), as perceived by traditional healers, ranged from healing coughs, colds, flu, hysteria, malaria, menstrual disorders, to protection against lightning.

Table 2.1 Uses of wild ginger as perceived by traditional healers in order of importance

NAME OF THE DISEASE	NO. OF RESPONDENTS
Menstrual disorder	114
Coughs	109
Colds	108
Flu	108
Hysteria	104
Malaria	103
Protection against lightning	71
Research purposes	8
Other	5
None	9

- The area of focus if wild ginger is grown for research purposes

Majority of the respondents (60%) said, should a research be conducted for them, they would like to learn about different production practices. However, 23% said they would like the research to look into the domestication of the plant, and 17% said they would like the research to focus on other aspects, which were not specified.

- Difference in terms of medicinal value between cultivated wild ginger and that growing in the wild

Majority of the traditional healers have zeal in growing medicinal plants and, as a result, their response in terms of the difference in the medicinal value between the cultivated and the wild could be subjective. The majority (77%) said that there was no difference in medicinal value between the cultivated and the plants growing in the wild. This could be because the plant already suffers extinction and the only relief is for this plant to be domesticated. Some (22%) felt that there was a difference in that wild ginger from the wild had more healing power. The reasoning behind their response was that they believe

there was little human disturbance, compared to the one domesticated that would be subjected to a lot of production practices such as irrigation, fertilization and weeding. The rest of the respondents (1%) were not sure.

- Taboos associated with wild ginger

To support the fact that there is not much difference in terms of the medicinal value between wild and cultivated plants 75% of the respondents believed there were no taboos associated with the cultivation or harvesting of the plant. While, on the other hand, 16% said there were some restrictions when it comes to handling of medicinal plants, whether in the wild or at home. The belief is that one has to cleanse himself or herself before harvesting of any medicinal plants with some mixtures which were not disclosed during the survey. Nine percent did not know whether there were any taboos associated with the planting or harvesting of the plant.

- Age restriction for the medicinal usage of the plant

There is no age restriction when it comes to the medicinal usage of the plant, which was confirmed by 76% of the respondents. Anyone from infant to fairly mature age can consume the medicine as long as the right dosage is consumed. However, 13% felt there were some restrictions and 11% of the respondents were not sure whether there were any restrictions or not.

- Extraction of active ingredients

About 95% of the respondents confirmed that the essential oil that is found in both the rhizomes and the roots of the plant was extracted manually. After the plant had been harvested, it was washed and dried using newspapers. It was then kept in a dry and air-tied container. Once a prescription included the use of wild ginger, the rhizomes or the

roots were boiled for some minutes and half a cup was given to the patient depending on the illness. Sometimes the rhizomes are chewed raw to cure toothaches and headaches.

- Shelf life of wild ginger (months)

Majority of respondents who felt that shelf life of wild ginger is only up to six months were 46%. They were followed with 38% of the respondents who believed that the shelf life could be from 6 months to 1 year. Those who did not know the shelf-life of wild ginger were 2% (Table 2.2).

Table 2.2 Shelf-life of wild ginger according to respondents

SHELF-LIFE (MONTHS)	PERCENTAGE OF RESPONDENTS
Up to 6	46
6-12	38
12-18	8
18-24	4
>24	2
Do not know	2

2.3.4 Popularity of medicinal plants

- Describing the sales of medicinal plants

Four out of nine plants were ranked as number 1, viz. *Warburgia salutaris*, *Boweia volubilis*, *Ocotea bullata* and *Alepidea amatymbica*. *Eucomis autumnalis* as well as *Haworthia limofia* were ranked as number 2 in order of preference. Wild ginger and *Curtisa dentata* were ranked as number 3. *Scilla natalensis* seemed not to be of great value according to the findings and it was ranked as number 4. This was probably

because the plant is easy to obtain unlike other medicinal plants and not necessarily that it is not used frequently (Table 2.3).

Table 2.3 The botanical name, Zulu name, number of respondents and plant ranking according to the number of traditional healers

BOTANICAL NAME OF MEDICINAL PLANT	ZULU NAME	ENGLISH NAME	NO. OF RESPONDENTS	RANKING
<i>Siphonochilus aethiopicus</i>	Indungulu	Wild ginger	127	3
<i>Warburgia salutaris</i>	Isibhaha	Pepper-bark tree	129	1
<i>Boweia volubilis</i>	Igibisila	Climbing potato	129	1
<i>Eucomis autumnalis</i>	Umathunga	Pineapple flower	128	2
<i>Ocotea bullata</i>	Unukani	Black stinkwood	129	1
<i>Alepidea amatymbica</i>	Ikhathazo		129	1
<i>Curtisia dentata</i>	Umlahleni	Assegai	127	3
<i>Scilla natalensis</i>	Inguduza	Blouberglelie	126	4
<i>Harworthia limifolia</i>	Umathithibala		128	2

- The reasons for changes in sales over the last five years

The reasons why there were changes varied in the last five years in terms of demand and supply of these plants. Respondents who felt that the changes were due to scarcity were 45%. Those who did not know why there were economic changes in the last five years were 14%. There were those respondents who felt that these changes were due to transport constraints (37%). Only 1% felt that the changes were due to price variation, while 2% of the respondents felt that the changes were due to the fact that healers knew where to get the plants. Only 1% of the respondents felt that the changes were due to extinction of medicinal plants.

- Perception of whether the demand for medicinal plants will change or not

Most of the respondents (71%) felt that the demand for medicinal plants will grow. However, 2% felt that the demand would remain the same. On the other hand, 22% felt that the demand will decline and 4% of the respondents did not know the future status of medicinal plants.

- Substitutes and their effects

Before growing medicinal plants for traditional healing purposes, it is important to know whether the plants can be easily substituted with other plants. Thirty three percent of the respondents agreed that the plants have substitutes, which are effective. However, 65% of the respondents felt that although the plants have substitutes, they were not as effective.

- Measure that is used for selling wild ginger

From the respondents, 96% indicated that they used thickness of the bulb to determine the selling price of the plants. Four percent of the respondents said they used a cup to measure.

- Places where these medicinal plants are obtained/bought

Traditional healers said that medicinal plants were mainly bought from street sellers, confirmed by 56% of the respondents. However, 40% of the traditional healers gathered medicinal plants on their own and 4% said they bought medicinal plants from muthi shops.

- Differences in prices of medicinal plants during different times of the year

A question was asked to determine whether the demand or sales of medicinal plants varied during different seasons of the year. The main impression (69%) was that there

was no seasonal variation. However, 12% of the respondents felt that there was a small variation and 19% of the respondents felt there was large seasonal variations.

- Availability of specific medicinal plants

If the medicinal plants were not available for the customers, 91% of the traditional healers said that the patients would settle for an alternative. Those who said the patients would leave and look elsewhere were 5%. Four percent of the respondents were not sure what would happen, probably because they never came across such an incident.

2.3.5 Information about the customers

- Areas where customers are coming from

Most customers (68%) were coming from the local village, while some from other villages (8%), and the remaining 23% were coming from other provinces besides Mpumalanga.

- Medical consultation

During consultation, 1% of traditional healers indicated that patients asked for the medicinal plant by name. Majority of traditional healers (99%) said that patients described their illnesses and asked the traditional healers to prescribe the medicine for them.

- Reasons for consulting traditional healers instead of visiting the clinic

Most of the patients (88%) who visited the traditional healers could not be cured at the clinic. Nine percent preferred traditional medicine and 2% felt that other medicines were too expensive.

- Comfortability of patients during consultation

The responses for the above question might be bias since only one side of the story is received i.e. the traditional healer's point of view. Majority of the healers (88%) said that their patients were comfortable during consultation. However, 10% felt that their customers were not comfortable. The reason being the fact that people who normally visit traditional healers are associated with witchcraft. In addition, 2% did not know the feeling of their patients.

- Bargaining of prices during consultation

Majority of patients did bargain for the prices set by traditional healers as confirmed by 59% of the traditional healers, while 41% of traditional healers said that their patients accepted the prices as they were set. None of the traditional healers indicated that their patients left the practice whenever they felt that the prices were too high, instead, they rather bargained.

- Concern about quality

Majority of the traditional healers (65%) felt that their patients were very concerned about quality medicine. However, 21% of the traditional healers felt that their patients were not concerned about quality and 14% of the traditional healers did not know whether their patients were concerned or not.

- Modern packaging of medicine

The reaction of the patients if plants were to be packed in modern packaging as perceived by traditional healers varied. Fifteen percent of the traditional healers said patients would buy less medicine if the medicine were to be sold in modern packaging. Majority (71%) said they would buy more if medicine were to be sold in modern packaging, whilst 14% said they would not be any change in their demand irrespective of the modern packaging.

- Support that the traditional healers need

Support that the traditional healers needed in order to perform their task as effective as possible varied. The majority of the traditional healers (72%) said they would appreciate proper training on how to domesticate these plants. Some (18%) said they would be very happy if they could get funding and have their own place to plant (nursery). Those who said they would like to be supported financially were 4%. There were those (4%) however, who felt that support in the form of Reconstruction and Development houses to serve as a surgery would be of great assistance. A minority (2%), however, felt that if they could have a pharmaceutical outlet where they could formally sell their medicine, it would be a great achievement.

2.4 DISCUSSION AND CONCLUSIONS

Indigenous healers that were surveyed in Mpumalanga province were a diverse group of people from a wide background, including young and old males and females, poorly and highly educated, wealthy or poor and urban or rural. Most of the indigenous healers were well experienced in the field of healing. The common factor amongst the healers was a calling from the ancestors, which directed them to practice as either a herbalist (inyanga) or a diviner (isangoma).

Healers' practices were located in areas where their clients work, live or travel to, such as residential townships and rural homesteads. Infrastructurally, practices varied according to the location of trading. In townships, practices tended to be in modest consulting rooms or within simple homesteads. Some of the wealthy healers had consulting rooms situated on their private property. Rural healers tended to have a separate traditional hut as a consulting room situated within the homestead. Practices had a large number of both plants and dead animals on display. This study found that there were considerable differences in the number of patients that a healer may see in a day, varying between an average of two patients in rural areas to five people in the township. The number of healers, therefore, did not give an indication of the magnitude of the services provided by healers. Furthermore, the study was not able to obtain any membership list of healers's associations that would support the reported membership numbers.

The healers' clients were both consumers wanting to purchase a product without a prescription and patients requiring a consultation for a prescribed medicine. As many healers were located within residential areas, clients were attracted to purchase from them due to convenience. In addition, some consumers were reluctant to purchase medicine from the street markets for various reasons:

- the unhygienic way in which medicine are placed on the streets;
- they may not wish to be seen buying indigenous medicine on the street;
- they may have built up a patient/ healer relationship with a healer who suited them;
- they may not have confidence in the street traders' ability to treat their illness.

Plants were used to treat a range of ailments from typical everyday ailments like colds, flu, menstrual disorder, backache, to psychological and socio-economic problems. Over 400 plant species were traded. These products ranged from simple raw products, for an example whole plants, through to complex mixtures of ground and burnt plants. Animal products were also added to such mixtures. Products were traded in a range of quantities, from a teaspoon–full to a large shopping bag, depending on a client's needs. Quantities demanded were probably greater than quantities traded as there was considerable wastage in the industry. Healers were most busy towards the end of the month, with a peak at Christmas break. Healers reported that they were relatively uniformly busy during weekdays but were busier on Saturdays.

Given the potential that exist within this industry, programs for the management of wild plants and the cultivation of plants are required at a range of scales to supply indigenous healers. Investment in cultivation must be made to reduce the reliance on wild plant stocks for the medicinal plant industry. The most popular species are an immediate priority that should be focused on. They include the nine species which were the focus of this survey. Research needs to quantify and identify sustainable harvesting strategies for the wild plant stocks. Research should identify genotypes with high potential for commercial purposes, and then conduct trials for the selection of high yielding varieties. High yielding variations within species need to be propagated and disseminated to indigenous healers and farmers.

2.5 SUMMARY

A questionnaire survey was conducted in five different villages in Mpumalanga Province. Hundred and fifty traditional healers were interviewed. The aim of the survey was to gain indigenous knowledge from the traditional healers on wild ginger and eight other popular plants used by them.

From the results of the survey, it was interesting to note that even though the majority of the traditional healers were matured adults, there were also traditional healers who would be classified as young adults, because they were between the ages of 18-25 years (2%). In terms of gender, majority (65%) of the respondents were females. It was surprising however, to note that majority (62%) of the respondents did not grow wild ginger. Those that grew wild ginger were growing it either as a group or as individuals. The main uses of wild ginger, as identified by traditional healers, were for coughs, colds, flu, malaria and menstrual disorders.

The income categories of traditional healers ranged from less than R200 to a maximum of R3000 per month. The number of patients visiting traditional healers per day varied. Some traditional healers received as few as 1 to 5 patients per day, whilst others received up to 10 patients per day. The consultation cost ranged from R20 to more than R95. The number of people who gathered plants for traditional healers ranged from 1 to 10 depending on the popularity of the traditional healer and the size of his/ her surgery. Majority (47%) of the traditional healers have been using this plant for healing purposes for over 15 years. The main source of wild ginger and other popular plant species for the majority of traditional healers (96%) still remained the communal or tribal lands where there is generally easy access to forest and grassland.

Many of the traditional healers (26%) confirmed the fears that wild ginger is very scarce in the wild. The majority of traditional healers do not grow wild ginger at the moment, such that their knowledge of the growing period of wild ginger was a rough estimation.

Majority of respondents (61%) did not know how long it took for the plant from growing to harvesting. The plant parts used for growing wild ginger, which they regard as rhizomes, were well known by the traditional healers (89%).

Majority of the traditional healers (65%) felt that their patients were very concerned about quality medicine. The reaction of the patients varied if plants were to be packed in modern packaging, as perceived by traditional healers. Majority (71%) said they would buy more if medicine were to be sold in modern packaging. A question was asked to determine whether the demand or sales of medicinal plants varied during different seasons of the year. The main impression (69%) was that there was no seasonal variation. Support that the traditional healers need in order to perform their task as effective as possible varied. The majority of the traditional healers (72%) said they would appreciate proper training on how to domesticate these plants. Traditional healers do not have professional knowledge and skills to produce these medicinal plants. Therefore training is crucial to impart these skills.

Given the potential that exist within this industry, programs for the management of wild plants and the cultivation of plants are required to supply indigenous healers. The most popular species are an immediate priority and include the nine species which were a focus of the current survey.

CHAPTER 3

YIELD OF WILD GINGER GROWN IN A TUNNEL OR UNDER A SHADE NET

3.1 INTRODUCTION

Growing chambers have the potential of modifying and creating an ideal protected microclimate, in which to produce high quality plants (Johen & Cohen, 2003). Plants and crops suffer stress from excessive heat, strong winds and UV burn, which generally results in smaller, lower quality yields. Hail, severe storms, insects and birds too can cause considerable damage to plants and crops (Zoecklein, Fugelsang, Gump & Nury, 1989).

According to Mirza (1996), the advantage of greenhouse production is that one can control weeds easily. It is also relatively easy to provide extra carbon dioxide to plants. Furthermore, one can control watering and fertilization and thus improve the quality of plants to a greater extent than in field production. Hydroponics is the practice of growing plants in a solution of nutrient-enriched water. Since hydroponic plants have access to unlimited nutrition and water, they can grow up to ten times faster and healthier than their soil grown counterparts (Rasoanaivo & Ratsimang-Urverg, 1993).

Wild ginger is easy to cultivate provided it is given a well drained, compost-rich soil and a warm, but shady position either in a container or in a greenhouse (Nichols, 1989). Nichols further suggests that most medicinal plants require dominance of vegetative growth in the early stages of development. It means that the plant should produce mainly leaves and shoots and not flowers. Therefore, temperature management becomes critical and with the aid of a controlled environment such as in a greenhouse or shade net, the required temperature regime can be achieved.

The aim of the experiment, therefore, was to measure the yield of rhizomes grown in either a plastic tunnel or a shade-net and to determine the effect of different harvesting periods on yield of wild ginger.

3.2 MATERIALS AND METHODS

3.2.1 Location

The experiment was carried out at Johannesburg Center for the Disabled (JOCOD), Lenasia, south of Johannesburg, in a tunnel and under a shade net. The plastic tunnel was 10 x 30 m in size, covered with a single layer of 240 microns of light grey stabilized polyethylene film with two flaps on top for ventilation. The 30% shade net was also 10 x 30 m in size and white in colour. Both structures were erected by Chris Hefer Construction.

3.2.2 Treatments

The treatments were four in number, viz. two growing structures (tunnel and shade net) and two harvesting periods. One hundred plants were planted in each one. Plants were harvested on two different dates. Ten plants were harvested on 28/06/02 and 29 plants were harvested on 28/09/02 from each growing structure. The reason for harvesting only ten plants during the first harvesting date was because of the bad weather condition on the 28/06/02, however the program took care of the differences on the number of plants during analysis.

3.2.3 Tuber preparation

The tubers (planting material) were harvested manually from a field established by the CSIR. They were prepared by means of pruning scissors on 14/06/2001 and weighed to determine the fresh rhizome mass. With the aid of a measy vernier calliper, the circumference of the rhizomes was determined. Tubers were then dipped into copper oxychloride (a wettable powder fungicide) for the control of fungal diseases. The dosage was copper oxychloride (850 g/kg) equivalent to 500 g/kg metallic copper.

The tubers were wrapped with newspapers and left to dry. They were then put in a cardboard box and were stored in a cool and dry condition in a storeroom to promote the quiescent stage.

3.2.4 Rhizome growth

The tubers were planted on 20/12/2001. They were planted in 4-litre plastic bags containing pine bark as medium. A residential irrigation control (Hunter 6 station, indoor or outdoors version timer) was used to control irrigation intervals. From the first day of planting, tubers were fertigated twelve (12) times a day for two (2) minutes at one (1) hour intervals from 6 am to 6 pm. A solution containing nutriplex and nutrigro was mixed and used for fertigation. Nutrigro consisted of the following elements: 146 g/kg nitrogen, 154 g/kg calcium and 20 g/kg magnesium. Nutriplex consisted of the following elements: 46 g/kg nitrogen, 45 g/kg phosphorus, 244 g/kg potassium and 24 g/kg magnesium. The trace elements in the nutriplex were as follows: 2175 mg/kg iron EDTA chelated, 450 mg/kg manganese EDTA chelated, 275 mg/kg zinc EDTA chelated, 30 mg/kg copper EDTA chelated, 550 mg/kg boron and 50 mg/kg molybdenum.

3.2.5 Records and statistical analysis

During the first harvest date (28/06/02) ten plants from the plastic tunnel and ten from the shade-net were carefully harvested from the plastic bags. During the second harvesting date (28/09/02) twenty-nine plants from the plastic tunnel and twenty-nine plants from the shade-net were also harvested. The leaves were removed and the plants were washed keeping the rhizome and the roots as intact as possible. The number of enlarged roots and the number of rhizomes were counted. The circumference of rhizomes was measured using a vernier caliper, while fresh rhizome mass and fresh enlarged root mass were also determined. The data was analyzed with the aid of Statistical Analysis System (SAS) and least significant differences (LSD) were calculated at the 5% level of significance.

RESULTS AND DISCUSSION

3.3.1 Effect of harvesting period on yield

3.3.1.1 Number of enlarged roots

Although there were no significant differences in the mean number of enlarged roots harvested between the first harvesting period and the second harvesting period, the number of roots tended to be better during the first harvesting period compared to the second harvesting period (Table 3.1).

3.3.1.2 Number of rhizomes

There was a significant difference in the mean number of rhizomes between the first and the second harvesting period (Table 3.1). There were 14 more rhizomes in the first harvest compared to the second harvest.

Table 3.1 Effect of harvesting period on the yield of wild ginger

Variates	Harvesting periods		P value
	28/06/02	6/09/02	
1. Number of enlarged roots/ plant	19	17	0.2542 ^{ns}
2. Number of rhizomes/ plant	49	35	0.0104*
3. Rhizome circumference/ plant (mm)	66.1	57.1	0.1426 ^{ns}
4. Fresh rhizome mass/ plant (g)	89.8	121.9	0.0972 ^{ns}
5. Fresh enlarged root mass/ plant (g)	111.3	110.3	0.9539 ^{ns}

3.3.1.3 Rhizome circumference

Although there were no significant differences, the mean rhizome circumference of the plants harvested on the first harvesting period tended to be better than those harvested during the second harvesting period (Table 3.1).

3.3.1.4 Fresh rhizome mass

There were no significant differences in the mass of rhizomes harvested during the first harvesting period compared to the second harvesting period (Table 3.1), but the fresh rhizome mass tended to be better during the second harvesting period compared to the first harvesting period.

3.3.1.5 Fresh enlarged root mass

There was no significant difference in the fresh enlarged root mass from plants harvested during the first period compared to the second harvesting period (Table 3.1).

3.3.2 Effect of growth structure on yield of wild ginger

3.3.2.1 Number of enlarged roots

Number of enlarged roots was significantly higher from plants grown in a tunnel compared with those grown under a shade net (Table 3.2). Plants grown in the tunnel produced more than double the number of enlarged roots than plants grown under the shade net.

3.3.2.2 Number of rhizomes

In terms of the number of rhizomes, there were no significant differences between the number of rhizomes from plants grown in a tunnel compared to those grown in a shade

net (Table 3.2). There was, however, a tendency for improved number of rhizomes being produced by plants grown under the plastic tunnel.

3.3.2.3 Rhizome circumference

There was a significant difference in rhizome circumference between plants grown in a plastic tunnel and those grown under a shade net (Table 3.2). The circumference was larger for rhizomes harvested from plants grown under the plastic tunnel compared to those grown under the shade net.

3.3.2.4 Fresh rhizome mass

There were no significant differences in fresh rhizome mass due to growth structure (Table 3.2).

3.3.2.5 Fresh enlarged root mass

In terms of enlarged root mass, there was no significant difference between plants grown in a tunnel compared to those grown in a shade net (Table 3.2).

Table 3.2 Effect of growth structures on yield of wild ginger

Variates	Growth structure		
	Plastic tunnel	Shade-net	P value
Number of enlarged roots/ plant	25.0	11.0	<0.0001**
Number of rhizomes/ plant	45.0	39.0	0.2995 ^{ns}
Rhizome circumference)/ plant (mm)	68.4	54.9	0.0296*
Fresh rhizome mass/ plant (g)	105.2	106.5	0.9493 ^{ns}
Fresh enlarged root mass/ plant (g)	111.4	110.2	0.9448 ^{ns}

3.3.3 Harvesting period and growth structure

There were interactions between the harvesting period and growth structure (Fig. 3.1). Fresh mass of enlarged roots of wild ginger was greater during the first harvesting date than the second harvesting date for plants grown in a plastic tunnel. The opposite was true for plants grown in the shade net in that fresh enlarged root mass was greater during the second harvesting date compared to the first harvesting date.

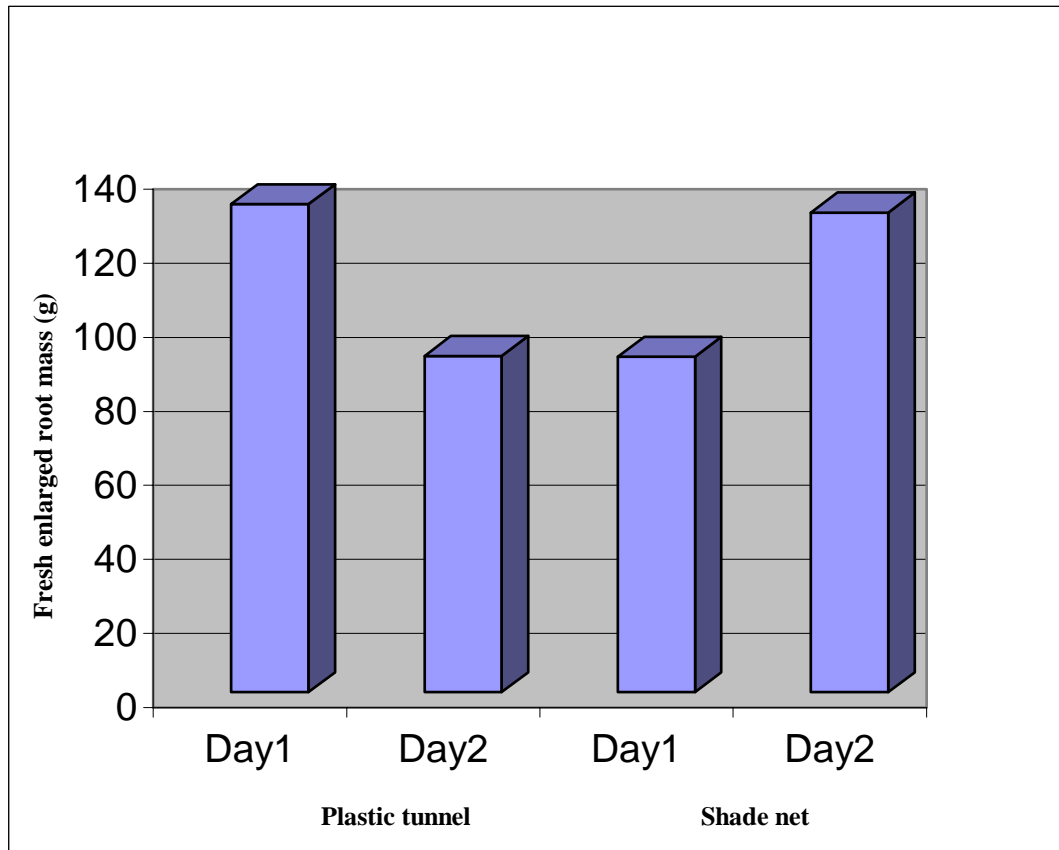


Fig. 3.1 Fresh enlarged root mass as affected by harvesting date and growth structure

3.4 SUMMARY

An experiment was carried out at Johannesburg Center for the Disabled (JOCOD), Lenasia, south of Johannesburg, in a greenhouse and under a shade net. The aim of the experiment was to measure the yield of rhizomes for plants grown in either a plastic tunnel or a shade net and to determine the effect of different harvesting periods on rhizome yield of wild ginger. The treatments were four in number, viz. two harvesting periods and two growing structures (tunnel and shade net).

On the effect of harvesting periods on yield, although there was no significant differences in the number of enlarged roots harvested between the first harvesting period and the second harvesting period, the number of roots tended to be better during the first harvesting period compared to the second harvesting period. There was a significant difference in the number of rhizomes between the first and the second harvesting periods. There were 14 more rhizomes in the first harvest compared to the second harvest.

There were no significant differences in the rhizome circumference between the plants harvested during the first harvesting period and those harvested during the second harvesting period. There was no significant difference in the mass of rhizomes harvested during the first harvesting period compared to the second harvesting period. However, the fresh rhizome mass tended to be better during the second harvesting period compared to the first harvesting period.

On the effect of growth structure on yield of wild ginger, the number of enlarged roots was significantly higher from plants grown in a tunnel compared with those grown under a shade net. There was more than double the number of enlarged roots in plants grown a tunnel compared to these grown in a shade net. In terms of the number of rhizomes, there was no significant difference between the number of rhizomes from plants grown in a tunnel compared to those grown in a shade net. There was, however, a tendency for better numbers of rhizomes among plants grown in the plastic tunnel.

There was a significant difference in rhizome circumference between plants grown in a plastic tunnel and those grown in a shade net. The circumference was larger for rhizomes

harvested from plants grown under the plastic tunnel compared to those grown under the shade net. There were no significant differences in fresh rhizome mass due to growth structure. In terms of enlarged root mass, there was no significant difference between the enlarged root mass from plants grown in a tunnel compared to those grown in a shade net.

The results also showed that there were interactions between the harvesting date and growth structure for fresh enlarged root mass. Fresh mass of enlarged roots of wild ginger was greater during the first harvesting date than the second harvesting date for plants grown in a plastic tunnel. The opposite was true for plants grown in the shade net in that fresh enlarged root mass was greater during the second harvesting date compared to the first harvesting date.

For traditional healers, small-scale or resource-poor farmers and herbalists who wish to grow wild ginger under protection, the results of this experiment showed that it is better to grow wild ginger in a plastic tunnel than under a shade net. For traditional healers, small-scale or resource-poor farmers and herbalists who wish to grow wild ginger, early harvesting of wild ginger at the end of June is better than at the beginning of September.

GENERAL DISCUSSION AND CONCLUSIONS

While the cost of consulting healers may be relatively expensive when compared to clinics, it is important to note that self-medication, using indigenous medicines, is the most accessible form of health care available. This is especially relevant to rural communities. Unlike in the cities, where clinics may be relatively easily accessible, rural areas have few clinics and consequently rural communities have little or no choice in the health care systems used. Indigenous health care is the only accessible system for a large proportion of the people given the distances to travel to clinics and the cost of transport. This is supported by the fact that majority of traditional healers (59%), confirmed that their patients did not bargain for the prices set by traditional healers irrespective of price increases.

Majority of the patients of traditional healers (77%) felt that the demand for medicinal plants would be higher in the future. With the AIDS pandemic in the region, and the growing international demand for South African medicinal products, this is likely to increase the demand for indigenous medicinal products in the future. The survey showed little or no evidence of any positive relationship between low education, and income levels and frequency of visits to healers. In view of the above attitudes, indigenous medicine could be classified as a basic consumer good, such as food, clothing, western medicine and housing.

Through informal discussion and observations, it was clear that there were numerous healer organizations, which served the healers' interests. However, as they focus largely on healing issues, little investment is made at sector level. There is a lot of competition, which limits the sharing of knowledge amongst traditional healers. The lack of sharing limits the development of the indigenous healing profession, with healers largely relying on their own experiences. There is no literature available at present which healers can use as a reference for administering indigenous medicine.

From the above observations, one may conclude by saying: though the sector has a potential of growing economically, the major concern at the moment is that there is lack

of collaboration among traditional healers. Traditional healers do not have professional knowledge and skills in production practices of medicinal plants. Therefore, training is very crucial to ensure that they get skills in basic cultivation methods of medicinal plants. To add economic and business value to the skills which the traditional healers already have the following actions might also assist in addressing their needs:

1. Education and training (capacity building)

There are few opportunities for training and capacity building for small-scale producers in Mpumalanga.

- Phindulwandle Medicinal Nursery offers short courses to healers, gatherers, and interested public to train in the propagation of medicinal species. This training is being expanded to incorporate low input farming techniques, which can be utilized by the majority of traditional healers active in the industry.
- In eastern South Africa, the Institute of Natural Resources has produced a handbook on the cultivation of 31 of the most popular medicinal species, and this is being distributed by a number of institutions for education and training purposes.

2. Extension services

There are few formally constituted extension programs regarding the production of medicinal products for the indigenous medicine industry:

- The Institute of Natural Resource should undertake a small project to encourage the cultivation of medicinal plants within a limited geographical area.
- The Department of Agriculture and Land Affairs has a large number of extension officers in the Mpumalanga Province, who with appropriate training and support could promote the development of the medicinal plant industry in the region.

- The Mpumalanga Parks Board should expand this extension programme by introducing the concept of cultivating indigenous medicinal plants into their nature conservation extension program.

-

3. Implementing a wild plant management program

A large number of medicinal plants still exist on communal and commercial rangelands within the region. The project should promote the management of these plant stocks to promote a sustainable supply of plants for the trade. The priority species are the slow growing species, which cannot be easily replaced by cultivated systems. This can be achieved through the following strategies:

- Identification of important stocks of plants through community discussions and networking.
- Inform communities and land owners regarding the values and opportunities for sustainable plant farming.
- Identify appropriate pilot sites for management projects and also establish village or farm tree/plant cultivation and harvesting committees, that could help coordinate the pilot projects.
- Arrange village information/training days and demonstrate appropriate management, cultivation and harvesting techniques.
- Encourage liason between village tree committees and service providers such as Mpumalanga Parks Board and local institutions such as the Lowveld College of Agriculture which can carry out research into sustainable harvesting approaches for various plant forms.

4. Promoting medicinal plant cultivation at healers' and consumers' homesteads.

- Arrange public days at demonstration nurseries like that of Phindulwandle Medicinal Plant Nursery or at demonstration farms, if any, for healers and any local organizations.
- Sell popular medicinal plants at demonstration nurseries and distribute planting guidebooks.

- Extension service (follow up visits) should be an ongoing process where cultivation is taking place to provide guidance and information to growers.

For traditional healers, small-scale or resource-poor farmers and herbalists who wish to grow wild ginger under protection, the results of this experiment showed that it is better to grow wild ginger in a plastic tunnel than under a shade net. This could be attributed to the fact that wild ginger performs better in warm conditions but not very hot and plastic tunnels have a tendency of maintaining warm temperatures in winter at which time the plants were maturing in this experiment. For traditional healers, small-scale or resource-poor farmers and herbalists who wish to grow wild ginger, early harvesting of wild ginger at the end of June is better than at the beginning of September. This could be because the growth rate of wild ginger drops or reaches (dormant stage) in winter, which becomes the right time to harvest. After winter the plant resumes vegetative growth, and starting using the reserves in the rhizomes. That is probably why the yield was lower during the second harvesting period.

GENERAL SUMMARY

A questionnaire survey was conducted in five different villages in Mpumalanga Province. Hundred and fifty traditional healers were interviewed. The aim of the survey was to gain indigenous knowledge from the traditional healers on wild ginger and the eight other popular plants used by them.

Surveyed indigenous healers in Mpumalanga Province were a diverse group of people from a diverse background, including young and old males and females, poorly educated, highly educated, wealthy or poor and urban or rural. Most of the indigenous healers were well experienced in the field. The common factor amongst the healers was a calling from the ancestors, which directed them to practice as either a herbalist (inyanga) or a diviner (isangoma).

Most of the traditional healers do not have professional knowledge and skills on production practices of these medicinal plants. Therefore training is very crucial to ensure that they get skills on basic cultivation methods of these medicinal plants. The healers' clients were both consumers wanting to purchase a product without a prescription and patients requiring a consultation with a prescribed medicine. Given the potential that exist within this industry, programs for the management of wild plants and the cultivation of plants are required at a range of scales to supply indigenous healers. Investment in cultivation must be made to reduce the reliance on wild plant stocks for the medicinal plant industry. The most popular species are an immediate priority that should be focused on, and include the nine species which were the focus of the survey.

An experiment was carried out at Johannesburg Center for the disabled (JOCOD), Lenasia, south of Johannesburg, in either a greenhouse or a shade net. The aim of the experiment was to measure the yield of rhizome grown in a plastic tunnel and shade net and to determine the effect of different harvesting periods on rhizome yield of wild ginger. The treatments were four in number, namely; two growing structures (tunnel and shade net) and two harvesting periods.

The results showed that there were interactions between the harvesting date and growth structure for fresh enlarged root mass. Fresh mass of enlarged roots of wild ginger was greater during the first harvesting date than the second harvesting date for plants grown in a plastic tunnel. The opposite was true for plants grown in the shade net in that fresh enlarged root mass was greater during the second harvesting date compared to the first harvesting date.

For small scale or poor resource farmers and herbalists/ traditional healers who wish to grow wild ginger under protection, growing plants in a plastic tunnel resulted in improved yield of wild ginger.

LIST OF REFERENCES

- ACHER, F.M., 1990. African uses of plants in Namaqualand (South Africa). *Mitt Inst.Allg. Bot. Hamburg* 23:959-972.
- ANON., 1996. Culture and Health, Orientation text. World Decade for Cultural Development 1988-1997, Document CLT/DEC/ORO. Paris, France, 129.
- ANON., 1998. Promotion of Ethnobotany and the sustainable use of plant resources in Africa. Fit/504 – RAF – 48 Terminal Report:
- ARNOLD, T.H. & de Wet, B.C., 1993. Plants of southern Africa: names and distribution Memoirs of the botanical Survey of South Africa No 62. National Botanical Institute: Pretoria.
- BOT, G.P.A., 1981. Heating load of a glasshouse from the physical point of view. *Acta Hortic.* 115: 335-340.
- BRUNETON, J., 1995. Pharmacognosy, Phytochemistry, Medicinal Plants. Intercept, Hampshire.
- COOPER, K.H. & CUNNINGHAM, A.B., 1979. The conservation status of indigenous forest in Transvaal and KwaZulu-Natal, South Africa. Durban: Wildlife Society of S.A.
- CUNNINGHAM, A.B., 1988. An investigation of the herbal medicine trade in KwaZulu-Natal. Investigational report no. 29, Institute of Natural Resources. University of Natal.
- DYER, R.A., 1963. *Plumbaginaceae*. In: Flora of Southern Africa 26. Botanical Research institute, Pretoria.

- ELLIS, C. G., 1986. Medicinal plant use: a survey. *Veld and Flora* 72 (3): 56-57.
- GESTNER, J., 1941. A preliminary checklist of Zulu names of plants with short notes. *Bantu*. 15 (3): 277-301, (4) 363-364.
- HARRIS, D., 1987. The South African guide to gardening without soil. A practical handbook for beginners, hobbyists and commercial growers. C. Struik Publishers. Foreshore, Cape Town.
- HARDIN, G., 1968. The tragedy of the commons. *Science* 162: 1243- 1248.
- HOLDSTOCK, T.L., 1978. Proceedings of a conference on Traditional Medicine. *The Leech* 48 (2):18-28.
- HUTCHINGS, A., 1989. A survey and analysis of traditional medicinal plants as used by the Zulu, Xhosa, and Sotho. *Bothalia* 19: 111-123.
- HUTCHINGS, A., 1996. Zulu medicinal plants. University of Natal Press, Pietermaritzburg.
- JACKSON, W.P.U., 1990. Origins and meanings of names of South African plant genera. UCT Ecolab: Cape Town.
- JOHEN, J. & COHEN, S., 2003. The effect of small shade net on the properties of wind and selected boundary layer parameters above and within a citrus orchard. *Biosystems Engineering* 84 (1): 57-67.
- JONATHAN, L.T., 1990. A comparative study of the stem – bark drimane sesquiterpenes and leaf volatile oils of *Warburgia ugandensis* and *W. stuhlmannii*. *Phytochemistry* 29 (11), 3535- 3538.

- LAMBERT, J., SRIVASTAVA, J. & VIETMEYER, N., 1997. Medicinal plants: rescuing a traditional heritage. Washington D.C.: World Bank, Agriculture and Natural Resources Department.
- LANGE, D., 1997. The trade in plant material for medicinal and other purposes: a *German case study*. Cambridge : Traffic International.
- LEWIS, D.A., 1989. Anti-inflammatory drugs from plant and marine sources. Agents and Actions Supplements, vol. 27. Birkhauser.
- LONG, K., 1978. Introductory guide to thatching. National Building Research Institute, CSIR. Pretora.
- MANDER, M., 1997. Medicinal plant marketing and strategies for sustaining the supply in the Bushbuckridge area and Mpumalanga Province. Nelspruit: DANCED/ Department of Water Affairs and Forestry.
- MANDER, M., 1998. Marketing of indigeneous medicinal plants in South Africa: A case study in KwaZulu-Natal. Food and Agriculture Organization of the United Nations, Rome, Italy.
- MIRZA, M., 1996. Green House Production of Medicinal Plants: *Opportunities for diversification*. Crop Diversification Centre North. *Botanica Helvetica* 99 (2), 203-205.
- MONTEITH, J.L., 1980. Principles of environmental physics. Edw. Arnold. 241 p.
- NICHOLS, G., 1989. Some notes on the cultivation of Natal ginger *Siphonochilus aethiopicus*). *Veld & Flora* 75(3)92-3.
- POOLEY, E., 1998. A field guide to wild flowers of KwaZulu-Natal and the Eastern Region Natal Flora. Publication Trust: Durban.

- RASOANAIVO, P., RATSIMAMANGA- URVERG, S., 1993. Biological evaluation of plants with reference to the Malagasy flora. Windhoek Publications, Namibia.
- ROBERTS, M., 1990. Indigenous Healing Plants. Southern Book Publishers, Halfway House.
- ROMER, J., 1993. Hydroponic Crop Production. Kangaroo Press Pty Ltd. 3 Whitehall.
- SINGER, P., 1977. Traditional Healing. New Science or New Colonialism? Essays in Critique of Medical Anthropology. Conch Magazine Limited Publishers. Allport College of Behavioral Sciences. Oakland University, Michigan.
- VAN WYK, B-E, VAN OUDTSHOORN, B. & GERICKE, N., 1997. Medicinal plants of South Africa. Briza Publications. Acardia, Pretoria, South Africa.
- VAN WYK, B-E. & GERICKE N., 2000. People's plants. A guide to useful plants of Southern Africa. 1st edition. Briza Publication Pretoria. South Africa.
- VEALE, D. J. H., FURMAN, K. & OLIVER, D.W., 1992. South African traditional traditional herbal medicines used during pregnancy and childbirth. *J. Ethnopharmacology* 36: 185-191.
- VEROTTA, L. & RODGERS, C.B., 1997. The Hiccupnut: Combretum species as a source of bioactive Natural Compounds. Research signpos, Trivandrum, India.
- WATT, J.M. & BREYER-BRANDWIJK, M.G., 1962. The medicinal and poisonous plants of Southern and Eastern Africa. 2nd edition. Livingstone, London.
- WEISS, E.A., 1979. Some indigenous plants used domestically by East African coastal fisherman. *Econ. Bot.* 31(1) : 35-55.

ZOECKLEIN, B.W., FUGELSANG, K.C., GUMP B.H. & NURY F.S., 1989. Production wine analysis. 1st Ed., Van Nostrand Reinhold, New York.

APPENDICES

A: DESCRIPTIVE STATISTICS FROM THE QUESTIONNAIRE SURVEY

Table A1 Age category of traditional healers

Age group	Percentage
18-25	2
26-35	13
36-45	21
46-55	29
56-65	19
66+	16

Table A2 Age and gender category of traditional healers (%)

<u>AGE BY GENDER OF RESPONDENTS</u>		
Age	Male (%)	Female (%)
18-25	1	1
26-35	4	9
36-45	5	16
46-55	7	22
56-65	11	9
66+	8	9

Table A3 Income category of traditional healers per month

Income	Percentage
< R200	14
R200-R500	23
R550-R1000	30
R1050-R2000	28
R2050-R3000	5
>R3000	0

Table A4 Shelf-life of wild ginger

Months	Percentage
Up to 6 months	46.2
6-12 months	38.0
12-18 months	8.0
18-24 months	4.0
< 24 months	2.0
Do not know	3.1

Table A5 The reasons for the changes in the last five years (expressed in percentages)

Causes of changes	Percentage
1. Scarcity	45
2. Do not know	14
3. Transport	24
4. Distance	13
5. Price variation	1
6. Healers know where to get the plants	2
7. Extinction	1

B: ANOVA TABLE

Table B Analysis of variance for fresh rhizome and root characteristics as effected by harvesting period and growth structure

Source of variation	Mean squares ^Z No. of enlarged roots	No. of rhizomes	Rhizome circumference	Fresh rhizome mass	Fresh enlarged root mass
	(x 10) mm	(x 10)	(x 10 ²) mm	(x 10) g	(x10) g
Period	86	316*	12*	1509	2
Structure (S)	319**	50	27	2	2
D X S	9	3	5	1632	2359*
Error	7	46	5	534	439

^ZF values significant at 5% level of probability (*) or highly significant at 1% level of probability (**)

C: QUESTIONNAIRE SURVEY

Please answer each question by circling the appropriate number in a shaded box, or write your answer in the shaded space provided

For office use

<p>TRADITIONAL HEALER QUESTIONNAIRE No.</p> <p style="text-align: right;">Area/District</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 80%;"></td> <td style="width: 20%; text-align: center;">1.</td> </tr> <tr> <td></td> <td style="text-align: center;">2.</td> </tr> <tr> <td></td> <td style="text-align: center;">3.</td> </tr> </table>		1.		2.		3.	<p>V1 <table border="1" style="display: inline-table; width: 30px; height: 20px; vertical-align: middle;"><tr><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td></tr></table> 1-3</p> <p>V2 <table border="1" style="display: inline-table; width: 30px; height: 20px; vertical-align: middle;"><tr><td style="width: 10px; height: 10px;"></td></tr></table> 4</p>																				
	1.																										
	2.																										
	3.																										
<p>A. SIPHONCHILUS AETHIOPICUS</p> <p>1. Do you know the medicinal plant <i>Siphonochilus aethiopicus</i> (wild ginger) or isiphephetho, indungulu?</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 80%;">Yes</td> <td style="width: 20%; text-align: center;">1.</td> </tr> <tr> <td>No</td> <td style="text-align: center;">2.</td> </tr> <tr> <td>Not sure</td> <td style="text-align: center;">3.</td> </tr> </table>	Yes	1.	No	2.	Not sure	3.	<p>v3 <table border="1" style="display: inline-table; width: 30px; height: 20px; vertical-align: middle;"><tr><td style="width: 10px; height: 10px;"></td></tr></table> 5</p>																				
Yes	1.																										
No	2.																										
Not sure	3.																										
<p>2. If yes, how long have you been working with the plant?</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 80%;">0-5 yrs</td> <td style="width: 20%; text-align: center;">1.</td> </tr> <tr> <td>5-10 yrs</td> <td style="text-align: center;">2.</td> </tr> <tr> <td>10-15 yrs</td> <td style="text-align: center;">3.</td> </tr> <tr> <td>Over 15 yrs</td> <td style="text-align: center;">4.</td> </tr> </table>	0-5 yrs	1.	5-10 yrs	2.	10-15 yrs	3.	Over 15 yrs	4.	<p>v4 <table border="1" style="display: inline-table; width: 30px; height: 20px; vertical-align: middle;"><tr><td style="width: 10px; height: 10px;"></td></tr></table> 6</p>																		
0-5 yrs	1.																										
5-10 yrs	2.																										
10-15 yrs	3.																										
Over 15 yrs	4.																										
<p>3. Where do you obtain the planting material from?</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 45%;">Grow</td> <td style="width: 10%; text-align: center;">1.</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 15%;"></td> </tr> <tr> <td>Buy</td> <td style="text-align: center;">2.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Harvest from the wild</td> <td style="text-align: center;">3.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Other sources</td> <td style="text-align: center;">4.</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Grow	1.				Buy	2.				Harvest from the wild	3.				Other sources	4.									<p>V5 <table border="1" style="display: inline-table; width: 30px; height: 20px; vertical-align: middle;"><tr><td style="width: 10px; height: 10px;"></td></tr></table> 7</p>	
Grow	1.																										
Buy	2.																										
Harvest from the wild	3.																										
Other sources	4.																										

4. If you harvest from the wild or buy it, which Province do you travel to, to obtain the plant?

v6 8

Local	1.
Kwa Zulu-Natal	2.
Limpopo Province	3.
Research Institution	4.
Other sources	5.

5. If you still harvest from the wild, is the plant still available?

v7 9

Plenty	1.
Scarce	2.
Very scarce	3.
Extinct	4.

6. If you grow it, where do you get the planting material from?

v8 10

Wild	1.		
Own nursery	2.		
Research institution	3.		
Other traditional healers	4.		
Mpumalanga Parks Board	5.		
Other sources	6.		

7. If you grow it, how long does it take from planting until harvesting?

v9 11

0-4 Months	1.
5-8 Months	2.
4-8 Months	3.
9-12 Months	4.

8. Which plant parts do you use to grow the plant?

Tissue culture materials	1.
Seeds	2.
Rhizomes	3.

V10 12

9. Do you grow this plant alone, or as a group?

Alone	1.
As a group	2.
Do not grow	3.

V11 13

10. What are the uses of the plant that you know?

Coughs	1.
Colds	2.
Flu	3.
Hysteria	4.
Malaria	5.
Menstrual disorder	6.
Protection against lightning	7.
Horse sickness	8.
Research purposes	9.
Other uses	10
None	11

V12 14-15

11. If it is for research purposes, what is your area of focus?

Domestication of the plant	1.
Looking at different production practices	2.
Other	3.

V13 16

<p>12. Is there any difference in terms of medicinal value between the cultivated and the plants grown from the wild?</p> <table border="1" data-bbox="224 390 907 468"> <tr> <td>Yes</td> <td>1.</td> </tr> <tr> <td>No</td> <td>2.</td> </tr> </table>	Yes	1.	No	2.	<p>V14 <input type="text"/> 17</p>								
Yes	1.												
No	2.												
<p>13. If yes, please explain how it differs.</p> <table border="1" data-bbox="224 613 907 842"> <tr> <td>Cultivated less value</td> <td>1.</td> </tr> <tr> <td>Wild less value</td> <td>2.</td> </tr> <tr> <td>Cultivated more value</td> <td>3.</td> </tr> <tr> <td>Wild more value</td> <td>4.</td> </tr> <tr> <td>The same</td> <td>5.</td> </tr> <tr> <td>Do not know</td> <td>6.</td> </tr> </table>	Cultivated less value	1.	Wild less value	2.	Cultivated more value	3.	Wild more value	4.	The same	5.	Do not know	6.	<p>V15 <input type="text"/> 18</p>
Cultivated less value	1.												
Wild less value	2.												
Cultivated more value	3.												
Wild more value	4.												
The same	5.												
Do not know	6.												
<p>14. Are there any taboos/believes associated with the cultivation or harvesting of the plant?</p> <table border="1" data-bbox="224 1062 883 1178"> <tr> <td>Yes</td> <td>1.</td> </tr> <tr> <td>No</td> <td>2.</td> </tr> <tr> <td>Do not know</td> <td>3.</td> </tr> </table>	Yes	1.	No	2.	Do not know	3.	<p>V16 <input type="text"/> 19</p>						
Yes	1.												
No	2.												
Do not know	3.												
<p>15. Is there any age restriction for the medicinal usage of the plant?</p> <table border="1" data-bbox="224 1396 883 1512"> <tr> <td>Yes</td> <td>1.</td> </tr> <tr> <td>No</td> <td>2.</td> </tr> <tr> <td>Not sure</td> <td>3.</td> </tr> </table>	Yes	1.	No	2.	Not sure	3.	<p>V17 <input type="text"/> 20</p>						
Yes	1.												
No	2.												
Not sure	3.												
<p>16. How do you extract the essential oil from the plant?</p> <table border="1" data-bbox="201 1692 894 1808"> <tr> <td>By hands</td> <td>1.</td> </tr> <tr> <td>Using special equipments</td> <td>2.</td> </tr> <tr> <td>Keep until required by a patient</td> <td>3.</td> </tr> </table>	By hands	1.	Using special equipments	2.	Keep until required by a patient	3.	<p>V18 <input type="text"/> 21</p>						
By hands	1.												
Using special equipments	2.												
Keep until required by a patient	3.												

17. For how long can one keep the harvested material?

Up to 6 Months	1.
6-12 Months	2.
12-18 Months	3.
18-24 Months	4.
> 24 Months	5.

V19

22

B. Popularity

Producing medicinal plants for the market or the patients requires that growers have some understanding of the demand for plants. A traditional healer will produce plants that he/ she knows will be easy to sell. We need to find out how big is the demand for the following:

18. Describe the sales of each of the following medicinal plants.

Name of medicinal plant	High 1.	Moderate 2.	Low 3.	None 4.			
Indungulu, Isiphephetho					V20		23
Isibhaha					V21		24
Igibisila					V22		25
Umathunga					V23		26
Unukani					V24		27
Ikhathazo					V25		28
Umlahleni					V26		29
Inguduza					V27		30
Umathibala					V28		31

19. Have the sales of these medicinal plants changed in the last five years?

Name of medicinal plant	1. More	2. Same	3. Less			
Indungulu, Isiphephetho				V29		32
Isibhaha				V30		33
Igibisila				V31		34
Umathunga				V32		35
Unukani				V33		36
Ikhathazo				V34		37
Umlahleni				V35		38
Inguduza				V36		39
Umathibala				V37		40

20. Please give reasons why you think there have been changes.

	V38		41
	V39		42
	V40		43

21.1 Do you think the demand for these medicinal plants will be high or low in the future?

V41 44

Demand will be higher	1.
Demand will remain the same	2.
Demand will decrease	3.
I cannot tell	4.

22.2 Give reasons for your answer in 21.1

V42 45

	1.
	2.
	3.

B. SUBSTITUTABILITY

Before growing medicinal plants for traditional healing purposes, it is important to know whether the plants can be easily substituted with other plants or not. For an example, if isibhaha can be substituted by umdlangwenya or umkhondweni, then it may not be worthwhile to grow isibhaha. We would like therefore to understand the substitutability of the plants.

23. Do these medicinal plants have any substitutes? Please give name of substitute and indicate the effectiveness if the answer is yes.

Name of medicinal plant	Substitutability		Name of Substitute	Effectiveness						
	1. Yes	2. No		Same effective	Not effective					
Indungulu, isiphephetho						V43				46-48
Isibhaha						V44				49-51
Igibisila						V45				52-54
Umathunga						V46				55-57
Unukani						V47				58-60
Ikhathazo						V48				61-63
Umlahleni						V49				64-66
Inguduza						V50				67-69
Umathibala						V51				70-72

24. What is causing substitution to take place?

	V52		73
	V53		74
	V54		75
	V55		76

C. USAGE

A farmer must have an idea how many plants he/she can sell to the market every year. We need an indication of how many medicinal plants were sold in the market last year.

25. What measure do you use for selling the medicinal plants?

Name of medicinal plant	1. Cup, handful, etc	2. Weight	3. Size (thickness of bark or bulb)			
Indungulu				V56		77
Isibhaha				V57		78
Igibisila				V58		79
Umathunga				V59		80
Unukani				V60		81
Ikhathazo				V61		82
Umlahleni				V62		83
Inguduza				V63		84
Umathibala				V64		85

26. How long can you keep the medicinal plants before they lose their healing properties?

Name of medicinal plant	Shelf life (Months)				
Indungulu, Isiphephetho		V65			86-87
Isibhaha		V66			88-89
Igibisila		V67			90-91
Umathunga		V68			92-93
Unukani		V69			94-95
Ikhathazo		V70			96-97
Umlahleni		V71			98-99
Inguduza		V72			100-101
Umathibala		V73			102-103

27. Who do you buy these medicinal plants from?
(Self gather, street sellers, muthi shops)

Name of medicinal plant	Self gather	Street seller	Muthi shop			
Indungulu, isiphephetho				V74		104
Isibhaha				V 75		105
Igibisila				V 76		106
Umathunga				V 77		107
Unukani				V 78		108
ikhathazo				V 79		109
Umlaheni				V 80		110
Inguduza				V 81		111
Umathibala				V 82		112

28. Where do most of your customers come from?

V83 113

Within the local village	1.
From other villages	2.
From other provinces	3.
Do not know	4.

29. Do your customers:

V84 114

Ask for the medicinal plants by name	1.
Describe their illness & ask you to prescribe the appropriate medicine?	2.

30. Why do customers come to your shop instead of visiting clinics?

V85 115

Customers want Traditional medicine	1.
Customers could not be cured at the clinic	2.
Other medicines are too expensive	3.

<p>31. Do you think your customers are comfortable visiting you?</p> <table border="1" data-bbox="224 317 1015 436"> <tr> <td>They are comfortable</td> <td>1.</td> </tr> <tr> <td>They are not comfortable</td> <td>2.</td> </tr> <tr> <td>I do not know</td> <td>3.</td> </tr> </table>	They are comfortable	1.	They are not comfortable	2.	I do not know	3.	<p>V86 <input type="checkbox"/> 116</p>
They are comfortable	1.						
They are not comfortable	2.						
I do not know	3.						
<p>32. How readily do your customers accept your price?</p> <table border="1" data-bbox="224 621 1015 741"> <tr> <td>They bargain with you</td> <td>1.</td> </tr> <tr> <td>They accept your prices</td> <td>2.</td> </tr> <tr> <td>They leave if your prices are too high</td> <td>3.</td> </tr> </table>	They bargain with you	1.	They accept your prices	2.	They leave if your prices are too high	3.	<p>V87 <input type="checkbox"/> 117</p>
They bargain with you	1.						
They accept your prices	2.						
They leave if your prices are too high	3.						
<p>33. If the medicinal plant the customers/patients are looking for is not available, would you say patients would:</p> <table border="1" data-bbox="224 957 1015 1077"> <tr> <td>1. Settle for an alternative</td> <td>1.</td> </tr> <tr> <td>2. Leave the shop and look elsewhere</td> <td>2.</td> </tr> <tr> <td>3. Not sure</td> <td>3.</td> </tr> </table>	1. Settle for an alternative	1.	2. Leave the shop and look elsewhere	2.	3. Not sure	3.	<p>V88 <input type="checkbox"/> 118</p>
1. Settle for an alternative	1.						
2. Leave the shop and look elsewhere	2.						
3. Not sure	3.						
<p>34. Would you say the patients or customers are concerned about quality?</p> <table border="1" data-bbox="224 1329 704 1446"> <tr> <td>Not concerned</td> <td>1.</td> </tr> <tr> <td>Do not know</td> <td>2.</td> </tr> <tr> <td>Very concern</td> <td>3.</td> </tr> </table>	Not concerned	1.	Do not know	2.	Very concern	3.	<p>V89 <input type="checkbox"/> 119</p>
Not concerned	1.						
Do not know	2.						
Very concern	3.						
<p>35. How would your customers/ patients react if traditional medicines were sold in modern packaging?</p> <table border="1" data-bbox="224 1696 920 1816"> <tr> <td>They would buy less</td> <td>1.</td> </tr> <tr> <td>They would buy more</td> <td>2.</td> </tr> <tr> <td>They would not change their use</td> <td>3.</td> </tr> </table>	They would buy less	1.	They would buy more	2.	They would not change their use	3.	<p>V90 <input type="checkbox"/> 120</p>
They would buy less	1.						
They would buy more	2.						
They would not change their use	3.						

D. PRICES AND SEASONAL VARIATIONS

If medicinal plants will be grown for the market, then farmers need to have some understanding of their prices and variations that can be expected in the market to determine whether growing these plants will be profitable or not. We need to compare the costs of producing the plants and the prices that may be received in various places within the market. For an example a farmer would need to know what prices could be expected at different times of the year, in different regions, and from different buyers.

36. What are the selling prices for the medicinal plants listed below?

Name	Unit	Price				
Indungulu, Isiphephetho			V91			121-123
Isibhaha			V92			124-126
Igibisila			V93			137-139
Umathunga			V94			130-132
Unukani			V95			133-135
Ikhathazo			V96			136-138
Umlahleni			V97			139-141
Inguduza			V98			142-144
Umathithibala			V99			145-147

37. Are there any price variations in the different areas you buy your medicinal plants from?

V100 **148**

Prices differ depending on where you buy from?	1.
The prices tend to be the same in different areas	2.
I do not know	3.

38. Indicate whether or not there are differences in the prices of the medicinal plants during different times of the year.

Name	1. Large seasonal variation in prices	2. Small price variation	3. No price variation	V		B
Indungulu, Isiphephetho				V101		149
Isibhaha				V102		150
Igibisila				V103		151
Umathunga				V104		152
Unukani				V105		153
Ikhathazo				V106		154
Umlahleni				V107		155
Inguduza				V108		156
Umathithibala				V109		157

39. What reasons would you give for the price variation?

V110

158

	1.
	2.

E. INFORMATION ON CULTIVATION OF MEDICINAL PLANTS

An important factor in the marketing of medicinal plants is the attitudes which users will have towards cultivated plants. We need to understand how traders, traditional healers and other users feel about cultivated plants to assess the potential for cultivating these plants.

40. If these medicinal plants had to be cultivated, would you accept them or not?

Name	1. Accept them	2. Not accept them	V	B
Indungulu, Isiphephetho			V111	159
Isibhaha			V112	160
Igibisila			V113	161
Umathunga			V114	162
Unukani			V115	163
Ikhathazo			V116	164
Umlahleni			V117	165
Inguduza			V118	166
Umathithibala			V119	167

41. If you answered ‘not acceptable’ to any of the medicinal plants above, please explain why?

V120

--	--

168-169

	1.
	2.
	3.
	4.

42. What would you use if certain medicinal plants are no longer available?

V121

--	--

170-171

	1.
	2.
	3.

43. Would you be interested in buying cultivated plants from the growers?

Yes	1.
No	2.
I do not know	3.

V122 172

F. GENERAL QUESTIONS

44. Which of the age categories do you belong to?

V123 173

18-25	1.
26-35	2.
36-45	3.
46-55	4.
56-65	5.
66+	6.

45. Gender

V124 174

Male	1.
Female	2.

46. It is optional to answer this question
which category best describes your income per month?

V125 175

< R200	1.
R200-R500	2.
R550-R1000	3.
R1050-R2000	4.
R2050-R3000	5.
> R3000	6.

47. How many patients do you see per day?

V126 176

1-5	1.
6-10	2.
10+	3.

48. What is the average cost per visit?

V127 177

R20-R50	1.
R55-R70	2.
R75-R90	3.
>R95	4.

49. How many people gather plants for you?

V128 178

1-5	1.
6-10	2.
>10	3.

50. Would you be prepared to buy bark that has been already ground if people had been trained to do it?

V129 179

Yes	1.
No	2.

51. What support would you appreciate if there can be any?

V130 180

THANK YOU FOR YOUR INPUT.