HEALING OR RECOVERY ABILITY OF HARVESTED STEM BARK OF A MEDICINAL PLANT, *KHAYA SENEGELENSIS* (DESR.) A. JUSS., IN A CULTIVATED ARBORETUM IN THE GREATER-ACCRA REGION OF GHANA.

Y. Ameyaw** and *I. Ampaw

Centre for Scientific Research into Plant Medicine, Mampong-

Akuapem, Eastern Region, Ghana.

** For all correspondence*

Abstract

Stem bark harvested from Ayikuma arboretum of the Centre for Scientific Research into Plant Medicine, Mampong-Akuapem was used for the research. The research was to investigate the healing or recovery strength or ability of *K. senegelensis* (Desr.) A. Juss. over a period of six months. The result showed varied healing or recovery strength or ability of the ten sampled plant species, which may be due to variation in edaphic factors, since environmental factors were uniform within the sampled plot.

Keywords: *Khaya senegelensis*, stem bark, edaphic factors

INTRODUCTION

About 300,000 – 400,000 plant species are known to be in existence on earth (Wolfender *et al*., 2000), and climatic or edaphic factors are important in giving local variation to the plants in a particular habitat. Thus, soil differences are reflected in differences in the vegetation therefore vegetation normally shows some form of zonation [Lawson (1966), Clausen and Hiesey (1958) and Clausen *et al.* (1940)].

The distribution of an outbreeding plant, *Agrostis tenuis* Sibth, although continuous, changes in distances of about 50m or less were enough to effectively separate population from one another (Bradshaw, 1959). He pointed out the species was able to develop under the influence of natural selection in response to local variations, more especially, edaphic factors, in the environment which evolved a mosaic pattern of differentiation in the populations.

Kimmins (1987) also observed that the development of vegetation of any habitat relies on at least the physical nature of the soil more especially on the moisture regime, pH and the levels of available mineral elements, with particular reference to nitrogen, phosphorus, potassium, calcium and magnesium.

It is estimated that today, plant materials are present in or have provided the models for 50% Western drugs (Robbers, 1996). The primary benefits of using plant-derived medicines are that they are relatively safer than synthetic alternatives, offering profound therapeutic benefits and more affordable treatment. Over 90% of the drugs in hospitals today have been introduced the last 50-60years; one can understand the important role that traditional medicine has played in the past (Boye, 1985). The World Health Organisation (WHO) estimates that up to 80% of the world's people rely on plants for their primary health care, since, western pharmaceuticals are often expensive, inaccessible or unsuitable.

In China, for example, traditional medicine is largely based on some 5,000 plants and is used to treat 40% of urban patients and 90% of patients in rural areas. In 1991, more than 700,000 tones of plant material were used for medicine, 80% collected from the wild (Botanic Gardens Conservation International, 2002).

In industrialized countries, the use of plants has declined but plants have contributed more than 7,000 different compounds in use today as heart drugs, laxatives, anti-cancer agents, hormones, contraceptives, diuretics, antibiotics, decongestants, analgesics, anesthetics, ulcer treatments and anti-parasitic compounds (Botanic Gardens Conservation International, 2002).

The successful health-care system in most developing countries is due to the support provided by traditional medicine to that of orthodox medicine. The present health status in Ghana would not have been attained without the involvement of traditional medicine in our health delivery system. Available figures show that between 60 – 70% of Ghanaians rely on traditional medical systems for their health needs (Sarpong, 2000).

THE PLANT SPECIES, *KHAYA SENEGELENSIS* (DESR.) A. JUSS.

The plant species, *Khaya senegelensis* (Desr.) A. Juss., belongs to the family Meliaceae of which there are fifty-one genera of variable sizes ranging from magnificent forest trees to small shrubs. It is also synonymously called *Swiitenia* senegalensis Desr. A deciduous tree up to between 15 to 20m tall and noted to reach 35m on fertile soils; diameter up to 1.5m with 8 – 16m; buttresses not prominent or absent. The bark is dark grey and the slash dark pink with red latex. Leaves are compound, up to 20cm long, with 3 to 7 pairs of usually opposite leaflets; each leaflet is 7 to 12cm long, 3 to 5cm wide, underside grey. The flowers are small, about 5mm, with white petals; unisexual, but with well-developed vestides of the opposite sex, making it difficult to distinguish between male and female flowers. Flowers are borne on

up to 20cm long, much branched inflorescences (Loken, 2003). The growth cycle has a typical rotation of 60 to 80 years. The tree fruits from March to July and sometimes later. *K. senegelensis* (Desr.) A. Juss manages well in light shade, possibly in a mixture with *Melicia excelsa*.

SIGNIFICANCE OF *K. SENEGELENSIS* (DESR.) A. JUSS.

In terms of timber, the wood weathers well and resists borers and termites, and moderately resistant to fungal decay. The timber saws well and inclined to be tough. It is a popular wood for furniture, flooring, paneling, and boat building.

Environmentally, it is used as a shade tree and as a windbreak in improving the land. Ethnomedicinally, the bark is bitter, similar to quinine, and is used for cold. Oil from the seed is rubbed into scalp to kill insects (Irvine, 1961).

Khaya senegelensis (Desr.) A. Juss commonly referred to African mahogany is among some of the plant species cultivated in the Centre for Scientific Research into Plant Medicine's (CSRPM) arboretum at Ayikuma in the GaDangbe District. The stem bark of *K. senegelensis* (Desr.) A. Juss. is commonly used by CSRPM, Traditional Medical Practitioners and other Alcoholic Beverage Brewers in Ghana in preparing tonics for anaemia and appetizers. The ever-increasing demand for the prepared decoctions and alcoholic products obtained from the harvested stem bark of the plant species has actually endangered the plant species.

Therefore, the main aim of this research is to ascertain the healing or recovery ability of the harvested stem bark of *K. senegelensis* (Desr.) A. Juss. over a period of six months.

MATERIALS AND METHODS

STUDY AREA

The study was carried out in a cultivated farm of the Centre for Scientific Research into Plant Medicine at Ayikuma, which is about 15 km from Dodowa in the GaDangbe District of the Greater Accra Region, Ghana. Ayikuma falls within the dry equatorial coastal savanna type with the main rainy season occurring in May/June while the minor occurs in October with the mean monthly rainfall averaging 111.1mm. The average annual temperature of the area is around 30°C.

ANALYSIS OF PLANT MATERIALS

Ten trees were randomly selected from stands planted in 1985 and the following parameters: stem girth, tree height, fresh and dry weights of harvested stem bark and percentage yield of harvested stem bark after six months (18th November, 2003 to 18th May, 2004) were determined.

MEASUREMENT OF STEM GIRTH

Stem girth of the plant species was determined at a breast height of 1.3m using a measuring tape as outlined by Kohl, 1992.

MEASUREMENT OF PLANT SPECIES HEIGHT

Plant species heights were determined using the Optical Reaching Clinometer PM-5 stipulated by Borshch-Komponiets *et al.*, 1966.

FRESH AND DRY WEIGHTS DETERMINATION

Fresh and dry weights of stem bark harvested after six months of the initial harvesting from half the girth were determined using the weighing balance. Harvested stem bark was dried in a solar drier at the Centre for Scientific Research into Plant Medicine, Mampong-Akuapem. The percentage yield of dry stem bark per tree was calculated.

Statistical analysis

MStatc was fitted to the dataset to determine whether there was variation in the plant species, *K. senegelensis* collected from the sample location. The Duncan's Multiple Range Test was applied to assess the level of significant differences between the variables.

RESULTS

The Table below show the parameters recorded under the materials and methods:

Table showing some parameters of harvested stem bark of *K. senegelensis* after six months.

Tree no.	Tree height (m)	Fresh wght (Kg)	Dry wght (Kg)	Fresh wght (Kg) after 6months	Dry wght (Kg) after 6months	Recovery % yield of stem bark after 6 months
1	6 e	7.5 de	4.1 cd	2.25 de	1.21 e	30 d
2	17 ab	12.0 b	6.4 ab	1.2 de	0.64 g	10 e
3	20 a	16.0 a	7.0 ab	14.4 a	6.3 b	90 a

4	15 bc	8.0 de	4.4 cd	3.2 cde	0.44 h	40 c
5	16 bc	9.5 cd	4.5 cd	0.48 e	0.23 i	5 f
6	17 ab	7.5 de	3.4 d	0.75 e	0.34 hi	10 e
7	11 d	6.0 e	3.0 d	3.0 cde	0.9 f	50 b
8	13 cd	11.0 bc	5.6 bc	5.5 c	2.8 c	50 b
9	6 e	8.0 de	4.2 cd	4.0 cd	2.1 d	50 b
10	20 a	10.0 bcd	7.3 a	9 b	6.6 a	90 a

Note: * Figures followed by the same letter in each column do or do not differ significantly (P = 0.05).

From the above Table, Duncan's Multiple Range Test do indicate that parameters in each column do or do not differ significantly at a p = 0.05. There was no significant recoverage difference between tree numbers 2 and 6, 3 and 10 as well as 7, 8 and 9. Tree numbers 1, 4 and 5 were significantly different, respectively from each other and again, with the rest of the other plant species as shown in the Table above.

DISCUSSION

The idea of having the same healing or recovery ability or not of the tree species in the same sample plot as outlined in the above result cannot be attributed to environmental factors, such as temperature, rainfall, duration of sunshine or relative humidity but rather to variation in edaphic factors as suggested by Kimmins (1987), Lawson (1966), Bradshaw (1959), Clausen and Hiesey (1958), Clausen *et al.* (1940). This really brought about the variation in the percentage yield of the healed or recovered stem bark of the trees.

CONCLUSION

Therefore, the slashed or harvested bark of the tree species healed or recovered all right but at varied rates within the six months of the research. Hence, harvesters of tree barks for medicinal purposes should always assess or analysis the soil before cultivating plant farms or arboreta to enable them reap the maximum yield of plant materials always after the initial harvesting.

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