

Medicinal and Economic Values of Forest Products in the Treatment of Cancer in Southwest Nigeria

Oluwakemi Osunderu*

Federal College of Complementary and Alternative Medicine, Federal Ministry of Health, Abuja, Nigeria

*Corresponding author: Oluwakemi Osunderu, Federal College of Complementary and Alternative Medicine, Federal Ministry of Health, Abuja, Nigeria, Tel: 09-7809339; E-mail: oaoluwakemi@gmail.com

Received: August 11, 2017; Accepted: August 22, 2017; Published: August 28, 2017

Copyright: © 2017 Osunderu O. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Medicinal plants are used to address the twin problems of promoting sustainable livelihoods and treatment of numerous illnesses in Nigeria. The study examined the medicinal value of forest products in the treatment of cancer in South-west Nigeria. Primary data was obtained in a cross-section survey of 327 respondents comprising 127 Traditional Medicine Practitioners (TMPs), 100 Orthodox Medicine Practitioners (OMPs) and 100 respondents from the General Public drawn by multistage sampling technique from the study area. Interview schedule was used in collection of data on the effectiveness of forest products in cancer treatment. The result showed that seven species were identified belonging to seven different families; Rutaceae, Asteraceae, Anacardiaceae, Annonaceae, Meliaceae, Guttiferaceae and Leguminaceae topped the TMPs priority list. Result of economic analysis shows minimal competition in the anti-cancer forest product market and a high level of monopoly with a Gini coefficient of 0.83. The rate of return on investment was 180.08% indicating that the TMPs were making profit. Five of the plants were tested against cancer cell lines MCF7 and Hs578T while Doxorubicin (a synthetic anticancer drug) was used as the control treatment. Three plants: *Saccharum officinarum* (Stem), *Scurinega virosa* (Root) and *Piper guineensii* (Seed) produced no result; *Garcinia kola* (Bark) did not exhibit any anticancer effect even at a concentration of 10 μ l/m¹ while only one plant species was effective against the cancer cell line at 1 μ l/m¹. It is therefore concluded that forest products are effective in the treatment of cancer.

Keywords: Medicinal plants; Cancer; Traditional medicine practitioners; Forest products; Southwest Nigeria

Introduction

Medicinal plants are important for a number of reasons. A large proportion of the world's rural population depends on these plants for their health care needs [1]. They also provide the basic raw material for the production of traditional medicines [2,3]. The collection and processing of medicinal plants provide employment and income opportunities for a large number of people in rural areas [4]. The importance of traditional medicinal plants in conservation of biological diversity also merits attention [5].

WHO has been conducting studies on medicinal plants. These studies prompted the initial identification of 20000 species of medicinal plants and a more detailed investigation of a short list of 200 [6]. A great number of these plants have their origins in the world's tropical forests and their present use is largely rooted in traditional medicines which play a major part in maintaining the health and welfare of both rural and city dwellers in developing countries [7,8].

More than 60% of world's total new annual cases occur in Africa, Asia and Central and South America. These regions account for 70% of the world's cancer deaths. It is expected that annual cancer cases will rise from 14 million in 2012 to 22 million within the next two decades [9,10]. Consequently, there is need to institute measures that will ensure the availability of anticancer forest products in the forest of Southwest Nigeria and ensure the sustainability of the practice of the TMPs who use forest products to treat cancer.

It has been estimated that as many as 75% to 90% of the world's rural people rely on herbal traditional medicine as their primary health care [6] and this is a source of income for the growers of such plants and the TMPs [11]. African flora is potential for new compounds with pharmacological activities. Such efforts have led to the isolation of several biologically active molecules that are in various stages of development as pharmaceuticals.

The main objective of this study is to evaluate the economic and medicinal value of forest products in the treatment of cancer in southwest Nigeria, particularly Ogun State and the specific objectives are:

1. To determine the availability of medicinal plants used for the treatment of cancer in Southwest Nigeria.
2. To determine the efficacy of some of the forest products used for the treatment of cancer in Southwest Nigeria.
3. To investigate the stakeholders' socioeconomic characteristics and their involvement in the usage of forest products for the treatment of cancer in Southwest Nigeria.
4. To determine the factors that affect the income of the TMPs in the study area and the market structure of forest products used for the treatment of cancer in Southwest Nigeria.

Sampling Method, Sample Selection and Data Collection

Data sources and collection

For the purpose of data collection in this study, field trips, collection of available medicinal plant species used for the treatment of cancer, determination of their species type, oral interviews of Traditional Medicine Boards officials, administration of structured questionnaires on relevant target groups, that is, Traditional Medicine Practitioners (TMPs), Orthodox Medicine Practitioners (OMPs) and the General Public (GP) were carried out. Ethno medicinal surveys were also conducted in the study area for collection of data related to the medicinal use of forest products in the treatment of cancer in addition to the pharmacological screening of the plants to determine the level of their efficacy in the treatment of cancer and to validate the claims of the TMPs. To identify the locations with high concentration of TMPs in the Study Area, primary data were obtained through oral interviews of the officials of the Hospital Management Department of the Federal Ministry of Health, Federal college of Complementary and Alternative Medicine (FEDCAM), Abuja and the Nigeria Natural Medicine Development Agency, Lagos. Multistage sampling technique was employed. The South-Western Nigeria was first stratified into six states to produce primary units namely: Ekiti, Lagos, Ogun, Ondo, Osun and Oyo. Out of these primary units, Ogun State was purposively sampled because of the high concentration of TMPs in the State (Figure 1).

Results

Availability of medicinal plants used for the treatment of cancer in South-Western Nigeria

Thirty-eight species of Medicinal Plants were identified from the information supplied by the TMPs. Table 1 shows the distribution of the species in relation to the source, availability status, parts of the plant used, form of the plant used, products and the species regeneration in the study area.

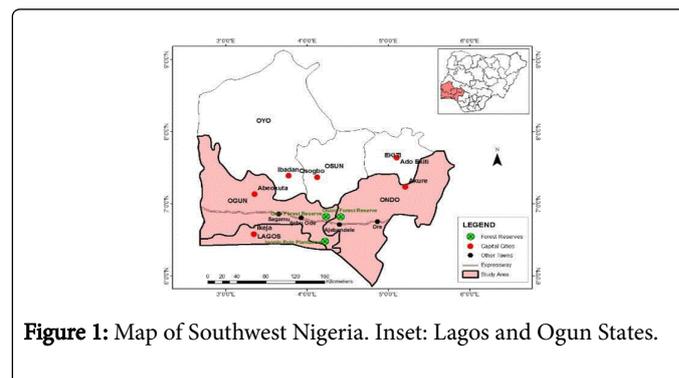


Figure 1: Map of Southwest Nigeria. Inset: Lagos and Ogun States.

S/No	Local Name	Species	Family	Floral Type	Source	Status of Availability	Parts used	Form used	Products
1	Eru	<i>Xylopia aethiopica</i> (Dunal) A. Rich	Annonaceae	Tree	Free areas	Abundant	Fruit, branches	Greendry (Water boiled)	Firewood, Medicinal
2	Oganwo	<i>Khaya ivorensis</i> A. Chev.	Meliaceae	Tree	Free areas	Rare	Stem, Branches, Bark	Dry	Firewood, Medicinal
3	Mango	<i>Magnifera indica</i> Linn.	Anacardiaceae	Fruit Tree	Free areas, Forest, plantation	Abundant	Leaves, fruits, bark, branches, stem	Greendry (Water boiled)	Fruit, firewood, medicinal
4	Kaju	<i>Anacardium occidentale</i> Linn	Anacardiaceae	Fruit Tree	Free areas, Farmland, forest, plantation	Abundant	Fruits, branches, stem	Green, dry (Water boiled)	Fruit, firewood, medicinal
5	Iyeye	<i>Spondias mombin</i> Linn.	Anacardiaceae	Fruit Tree	Farmland, Free areas, forest	Abundant	Fruits, bark	Green, dry (Water boiled)	Fruit, medicinal
6	Abo	<i>Annonase negalensis</i> Pers	Annonaceae	Shrub	Free areas, forest	Abundant	Leaves, fruits, stem	Green, dry (Water boiled)	Medicinal, fruit, firewood
7	Ahun	<i>Alstonia boonei</i> De Wild	Apocynaceae	Tree	Free areas, forest	Scarce	Leaves, bark, root	Green, dry (Water boiled)	Medicinal, firewood
8	Osanwewe	<i>Citrus medica</i> Linn.	Rutaceae	Shrub	Free areas, forest	Abundant	Leaves	Green, dry (Water boiled)	Medicinal
9	Oruwo	<i>Morinda lucida</i> Benth.	Rubiaceae	Tree	Free areas, forest	Abundant	Leaves	Green, dry (Cold water squeezed)	Medicinal

10	Oori-nla	<i>Vitex doniana Sweet</i>	Verbenaceae	Tree	Free areas, forest	Abundant	Fruit, leaves	Green, dry (Water boiled)	Fruit, medicinal
11	Osopupa	<i>Enantia chlorantha Oliv.</i>	Annonaceae	Tree	Free areas, forest	Abundant	Bark	Green, dry (Water boiled)	Medicinal
12	Owu-elepa	<i>Piliostigma thinningi Redhead Milne</i>	Leguminosae Sub: Mimosoidae	Shrub	Free areas, forest	Abundant	Leaves	Green, dry (Water boiled)	Medicinal
13	Putu	<i>Ricinodendron heudelotii (Baill)</i>	Euphorbiaceae	Tree	Free areas, forest	Abundant	Leaves, bark	Green, dry (Water boiled)	Medicinal
14	Opoto	<i>Ficus sur Forssk.</i>	Moraceae	Tree	Free areas, forest	Abundant	Fruit, bark	Green, dry (Water boiled)	Fruit, medicinal
15	Asasa	<i>Margaritaria discoidea (Baill.)</i>	Euphorbiaceae	Tree	Free areas, forest, dry outliers	Scarce	Leaves, branches, stem, bark, roots	Green, dry (Water boiled)	Medicinal, firewood
16	Dongoyaro	<i>Azadirachta indica A. Juss</i>	Meliaceae	Tree	Free areas, plantation	Abundant	Leaves, branches, stem	Green, dry (Water boiled)	Medicinal, firewood
17	Atare	<i>Aframomum meleguata Lindl.</i>	Zingiberaceae	Shrub	Forest area, forest	Abundant	Fruits	Green, dry (Water boiled)	Medicinal
18	IgiFrutu	<i>Terminalia catappa Linn</i>	Combretaceae	Tree	Forest area, forest	Abundant	Leaves, fruit, branches, stem	Green, dry (Water boiled)	Fruit, medicinal, firewood
19	Apa	<i>Azalia africana (Smith) Sm.</i>	Leguminosae Sub: Caesalpinioideae	Tree	Forest area, forest	Scarce	Branches, stem, bark, root	Green, dry (Powder)	Medicinal, firewood
20	Oboo	<i>Erythrophleum suaveolens (Gull. and Perr.)</i>	Leguminosae Sub: Caesalpinioideae	Tree	Forest	Scarce	Leaves, branches, stem, bark, root	Green, dry (Water boiled)	Medicinal, firewood
21	Asofeyeje	<i>Rauvolfia vomitria Afzel</i>	Apocynaceae	Tree	Free areas, forest	Abundant	Leaves, fruit, bark, root	Green, dry (Powder)	Medicinal
22	Omo	<i>Cordia millenii Bak.</i>	Bignoniaceae	Tree	Free areas, forest	Scarce	Leaves, branches, stem	Green, dry (Water boiled)	Medicinal, firewood
23	Ewuro	<i>Vernonia amygdalina (Schreb) Del.</i>	Asteraceae	Tree	Free areas, forest	Abundant	Leaves, branches, bark, root	Green, dry (Juice)	Medicinal, chew-stick
24	Ope	<i>Elaeis guinensis G. Don.</i>	Palmae	Palm Tree	Swampy areas, forest	Abundant	Frond, exudate, bark	Green, dry (Water boiled)	Basket, palm
25	Iya	<i>Daniellia oliveri Rolfe</i>	Leguminosae Sub: Caesalpinioideae	Tree	Savannah forest, re-growth	Abundant	Branches, stem, bark, root	Green, dry (Powder, Juice)	wine, Firewood, medicinal
26	Ataile	<i>Zingiber officinale Rossae.</i>	Zingiberaceae	Herb	Free areas, forest	Abundant	Rhizome	Green, dry (Powder)	Medicinal
27	Ayan	<i>Distemonanthus benthamianus Benth</i>	Leguminosae Sub: Caesalpinioideae	Tree	Forest	Abundant	Leaves, branches, stem, bark, root	Green, dry (Water boiled)	Firewood, chew stick medicinal
28	Osankotu	<i>Sida acuta</i>	Malraceae	Herb	Forest/wild, cultivate	Abundant	Leaves, branches, stem, root	Green, dry (Water boiled)	Medicinal

29	Tana'poso	<i>Mirabilis nyctaginea</i>	Nyctaginaceae	Herb	Forest/wild, cultivate	Abundant	Leaves, branches, stem, root	Green, (Powder)	dry	Medicinal
30	Orin Ata	<i>Zanthoxylum zanthoxyloides</i>	Rutaceae	Herb	Forest/wild, cultivate	Abundant	Branches, stem, bark, root	Green, (Powder)	dry	Medicinal chew stick
31	Imiesu	<i>Agerantum conyzoides</i>	Compositae	Shrub	wild	Abundant	Leaves, branches, stem, root	Green, (Juice)	dry	Medicinal Insecticide Animal Feed
32	Ayu	<i>Allium sativum Linn</i>	Liliaceae	Rhizome	Forest/wild, cultivate	Abundant	Leaves	Green, (Powder)	dry	Medicinal
33	Sun Flower	<i>Helianthus annuus</i>	Asteraceae	Shrub	Forest/wild, cultivate	Abundant	Leaves, stem	Green, (Powder)	dry	Medicinal
34	Ewe Akintola	<i>Securinega virosa</i>	Euphorbiaceae	Shrub	Forest/wild, cultivate	Abundant	Leaves, stems, root	Green (Water boiled)	dry	Medicinal
35	Ori	<i>Vitellaria paradoxa</i>	Sapotaceae	Tree	Forest/wild, cultivate	Abundant	Fruit	Green, (Lotion)	dry	Medicinal
36	Ireke	<i>Saccharum officinarum</i>	Poaceae	Shrub	Forest/wild, cultivate	Abundant	Leaves, stems, roots	Juice		Medicinal
37	Kanafuru	<i>Piper guineensis</i>	Piperaceae	Shrub	Forest/wild, cultivate	Abundant	Leaves, stems, roots, fruits	Green, (Powder)	dry	Medicinal
38	Orogbo	<i>Garcinia koli</i>	Guttiferae	Tree	Forest/wild, cultivate	Abundant	Fruits, Leaves	Green, (Powder)	dry	Food

Table 1: List of plants used by the traditional medicine practitioners in the treatment of cancer. Estimated cost range=500-10,000 Naira/kg.

Table 1 shows that majority of the TMPs source their medicinal plants from free areas and rarely cultivate them. Table 1 shows that some of the plants are already scarce and species regeneration is by wilding. The Nigerian ecosystems are at greater risk of extinction if urgent attention is not given to the cultivation of medicinal plants [12,13]. Table 1 shows that 90% of the TMPs use the whole plant for treatment that is, they make use of the fruits, stems, barks and leaves at the same time. Table 1 also shows that the forest products used for the treatment of cancer are multipurpose; they are used as firewood, medicine, foods, chewing sticks and animal feeds (*Agerantum conyzoides*). This corroborate the works of Adekunle [14].

Table 2 projects the second objective of this work, it shows that 90% of the TMPs use the green and dry forms of the forest products; afterwards they use water to soak or boil them. Also, using water the TMPs make juices from plants like *Citrus medica*, *Morinda lucida*, *Vernonia amygdalina*, *Sida acuta* and *Agerantum conyzoides*. Table 2 shows that 65% of the TMPs administer their medications twice daily while 23% of the TMPs adopt the thrice daily dosage. This helps to ensure frequent interactions and effective communication between the TMPs and their clients unlike the orthodox physicians [15-17]. Weekly wash is employed by 14% of the TMPs.

S.NO	Name of Plant	Species	Form Used	Method of Usage	No of times taken
1	Eru	<i>Xylopi aethiopica (Dunal) A. Rich</i>	Fresh and dry forms	By boiling in water for drinking	2ce. Daily
2	Oganwo	<i>Khaya ivorensis A. Chev.</i>	Dry	By boiling in water for drinking	3ce. Daily
3	Mango	<i>Magnifera indica Linn.</i>	Green, fresh and dry	Juicing with cold water	2ce. Daily
4	Kaju	<i>Anacardium occidentale Linn</i>	Green, dry	By boiling in water for drinking	3ce. Daily
5	Iyeye	<i>Spondias mombin Linn.</i>	Green, dry	By boiling in water for drinking	3ce. Daily

6	Abo	<i>Annona senegalensis Pers</i>	Green, dry	By boiling in water for drinking and bathing	3ce. Daily
7	Ahun	<i>Alstonia boonei De Wild</i>	Green, dry	By boiling in water for bathing	2ce. Daily
8	Osanwewe	<i>Citrus medica Linn.</i>	Green, dry	By boiling in water, Juice	2ce. Daily
9	Oruwo	<i>Morinda lucida Benth.</i>	Green, dry	By boiling in water, Cold water squeezed	2ce. Daily
10	Oori-nla	<i>Vitex doniana Sweet</i>	Green	By boiling in water for drinking	3ce. Daily
11	Osopupa	<i>Enantia chlorantha Oliv.</i>	Green, dry	By boiling in water, soaking in cold water	2ce. Daily
12	Owu-elepa	<i>Piliostigma thonningii Milne Redhead</i>	Green, dry (Water boiled)	By boiling in water for drinking	3ce. Daily
13	Putu	<i>Ricinodendron heudelotii (Baill) Heckel</i>	Green, dry	soaking in cold water	3ce. Daily
14	Opoto	<i>Ficus sur Forssk.</i>	Green, dry	By boiling in water for drinking	Weekly wash
15	Asasa	<i>Margaritaria discoidea (Baill.) Webster</i>	Green, dry	By boiling in water for drinking	2ce. Daily
16	Dongoyaro	<i>Azadirachta indica A. Juss</i>	Green, dry	By boiling in water for drinking and bathing	2ce. Daily
17	Atare	<i>Aframomum meleguata Lindl.</i>		By boiling in water, mixing with pap.	2ce. Daily
18	IgiFrutu	<i>Terminalia catappa Linn</i>	Green, dry	Ground, boiling in water for drinking and bathing	2ce. Daily
19	Apa	<i>Afzelia africana (Smith) Sm.</i>	Green, dry	By boiling in water for drinking and bathing	Weekly Wash
20	Oboo	<i>Erythrophleum suaveolens (Gull. and Perr.)</i>	Green, dry	By boiling in water for drinking and bathing	2ce. Daily
21	Asofeyeje	<i>Rauvolfia vomitria Afzel</i>	Green, dry	By boiling in water for drinking	2ce. Daily
22	Omo	<i>Cordia millenii Bak</i>	Green, dry	By boiling in water for drinking	2ce. Daily
23	Ewuro	<i>Vernonia amygdalina (Schreb) Del</i>	Green, dry	By boiling in water, Juicing	Once Daily
24	Ope	<i>Elaeisguinensis G. Don</i>	Green, dry	By boiling in water for drinking	2ce. Daily
25	Iya	<i>Daniellia oliveri Rolfe</i>	Green, dry	By boiling in water for drinking	2ce. Daily
26	Ataile	<i>Zingiber officinale Rossae</i>	Green, dry	By boiling in water for drinking	2ce. Daily
27	Ayan	<i>Distemonanthus benthamianus Benth</i>	Green, dry	Heating	Weekly Wash
28	Broom weed	<i>Sida acuta</i>	Green, dry	By boiling in water, Juicing	2ce Daily
29	Tana'poso	<i>Mirabilis nyctaginea</i>	Green, dry	By boiling in water for drinking	2ce Daily
30	Fagara	<i>Zanthoxylum zanthoxyloides</i>	Green, dry	By boiling in water for drinking	2ce Daily

31	Goat Weed	<i>Agerantum conyzoides</i>	Green, dry	By boiling in water, Juicing for drinking	2ce Daily
32	Garlic	<i>Allium sativum Linn</i>	Green, dry	By boiling in water for drinking	2ce Daily
33	Sun Flower	<i>Helianthus annuus</i>	Green, dry	By boiling in water for drinking	3ce. Weekly
34	Bush Weed	<i>Securinega virosa</i>	Green, dry	By boiling in water for drinking and bathing	2ce Daily
35	African Shea Butter	<i>Vitellaria paradoxa</i>	Green	Processed into lotion to rub on affected parts of the body	2ce Daily
36	Sugar Cane	<i>Saccharum offinarum</i>	Fresh, Green	Juice	2ce Daily
37	African pepper	<i>Piper guineensis</i>	Green, dry	Adjunct to other preparation	2ce Daily
38	Bitter Kola	<i>Garcinia koli</i>	Green, dry, wet form	By boiling in water and chewing	2ce Daily

Table 2: The form and method of usage by the traditional medicine practitioners in the treatment of cancer.

S. No	Variables	Linear Model	Semi-log Model	Double log Model
1	(Constant)	-191634 (-0.863)	-6120497.800*** (-7.560)	3.015*** -7.52
2	Number of Patients Received	5668.860** -2.046	1.154* -1.671	0.102** -2.218
3	Total Cost of Production	0.781*** -3.659	724844.917*** -5.356	0.321*** -4.627
4	Age	12712.758*** -2.77	1351390.068*** -3.144	0.614*** -2.954
5	Years of Experience	17349.115** -2.108	821488.191** -2.373	1.134* -1.837
6	State of Origin	0.989 (-0.151)	0.976 (-0.335)	1.052 -0.689
7	Occupation	1.041 -0.559	1.03 -0.415	1.015 -0.219
8	Gender	1.048 -0.647	1.022 -0.307	1.036 -0.5
9	Marital Status	1.073 -0.969	1.091 -1.177	1.094 -1.268
10	Religion	1.015 -0.216	1.009 -0.217	1.052 -0.745
11	Educational Level	0.89 (-1.643)	0.918 (-1.227)	0.918 (-1.264)
12	R ²	0.404	0.394	0.437
13	Adjusted R ²	0.385	0.379	0.423

Dependent Variable: Profit
*** - significant at 1% level
** - significant at 5% level
* - significant at 10% level
Computed t-values in parenthesis

Table 3: Regression analysis result to determine demographic factors that affect the profit of the Traditional Medicine Practitioners.

Inferential statistics results for TMPs in Southwest Nigeria

Inferential Statistics is used to further achieve objectives three and four. Table 3 is the result of the regression analysis showing the relationship between the profit of the Traditional Medicine Practitioners (TMPs) and their demographic data. Three (3) functional forms of production model including linear, semi-log and Cobb-Douglas (double-log) functions were fitted for the regression analysis. This was done to select the function which gave the result with the best fit. The estimated functions were evaluated in terms of the statistical significance of the coefficient of multiple determination (R^2) as indicated by F value, the significance of the coefficients and the magnitude of the standard errors. The R^2 is the coefficient of multiple determinations which measures the extent to which the variation in the dependent variable is explained by the explanatory variables. The F-value measures the goodness of fit of the model. Based on these statistical and economic criteria, Cobb-Douglas functional form was selected as the lead equation. The coefficient of multiple determination (R^2) obtained for the Cobb-Douglas, that is, 0.437 shows that 43.7% of the variation in the profit of the TMPs were explained by the included

explanatory variables, while the remaining 56.3% unexplained was due to the variables not included in the model which was the error term. Number of patients received, total cost of production, age of the practitioners and their years of experience are the significant factors influencing the profit of the practitioners; each of these variables has positive sign, which suggests that an increase in these variables would lead to an increase in the profit of the practitioners.

Table 4 gives the regression analysis result showing the relationship between the profit of the Traditional Medicine Practitioners (TMPs) and some selected variables other than the demographic data of the practitioners. Number of patients per year, duration of treatment, remedy shelf-life, daily application, and time of harvest are shown to have significant positive influence on the profit of the TMPs, which suggests that an increase in these variables would lead to an increase in the profit of the TMPs. However, number of people referred is shown to have a significant negative influence on the profit suggesting that the more that number of people referred by the TMPs the lesser their profits just as it would be expected.

Variables	Coefficients	t-values
Constant	-2E+07	2.526**
Number of patients treated	41022.6	1.331
Number of relatives affected	5605.06	0.051
Number of people dead	-49103	-0.354
Number of patients per year	506017	2.106*
Number of people referred	-531374	2.514**
Duration of treatment	1283050	2.761**
Remedy shelf-life	246732	2.676**
Method of production	762933	1.599
Daily Application	793581	2.018**
Time of Harvest	1369993	3.450***
Dependent Variable: Profit		
***-significant at 1% (p<0.01) level		
** -significant at 5% (p<0.05) level		

*-significant at 10% (p<0.1) level

Table 4: Regression analysis showing relationship between some selected factors and the profits of the Traditional Medicine Practitioners.

Table 5 is the result of the t-test analysis showing comparison of some selected parameters of the Traditional Medical Practitioners (TMPs) and the Orthodox Medical Practitioners (OMPs). The result shows that there is significant difference in the number of patients recovered, number of deaths recorded, number of referral and the cost of production between the two groups of practitioners with the mean values estimated as follows: number of patients recovered-TMPs (11.92), OMPs (1.99); number of deaths recorded-TMPs (1.75), OMPs (6.61); number of referral-TMPs (3.32), OMPs (8.26) and cost of production-TMPs (N17, 246.58), OMPs (N106, 750.00). However, the result shows that there is no significant difference in the number of patients treated by the two groups of practitioners (Figure 2).

Variables	TMPs (Mean Values)	OMPs (Mean Values)	t-values
Number of Patients Treated	16.13	19.02	1.106
Number of Patients Recovered	11.92	1.99	6.110**
Number of Deaths Recorded	1.75	6.61	6.096**
Number of Referral	3.32	8.26	2.129*
Cost of Treatments	17246.6	106750	6.530**

**Significant at 1% (p<0.01) level
*Significant at 5% (p<0.05) level

Table 5: t-Tests analysis comparing some selected variables from the Traditional Medicine Practitioners (TMPs) and the orthodox medical practitioners (OMPs).

Result of the economic analysis shows minimal competition in the anti-cancer forest product market and a high level of monopoly with a Gini coefficient of 0.83 (Table 7). Net profit was N650,769.98 (Table 6). Table 7 also shows Rate of Return (280.08%) and the Rate of Return on Investment (180.08%) indicating that the TMPs are making profit.

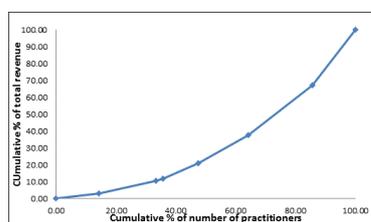


Figure 2: Gini Curve.

Item	Value
Total Revenue (TR)	1012143

Total Cost (TC)	361373
Net Profit(NP)	650770
Rate of Return (ROR)	280.08%
Rate of Return on Investment (RORI)	180.08%

Table 6: Annual Average Costs and Returns Analysis.

After three days of treatment						
Con	0.738	0.785	0.765	0.693	0.74525	0.0398
Doxorubicin	0.661	0.666	0.638	0.642	0.65175	0.01382
Plant 1-10 µl/ml	0.759	0.728	0.77	0.719	0.744	0.02437
Plant 1-5 µl/ml	0.78	0.782	0.789	0.723	0.7685	0.03058
Plant 1-1 µl/ml	0.73	0.786	0.737	0.737	0.7475	0.02588
Plant 2-10 µl/ml	0.83	0.843	0.825	0.815	0.82825	0.01164
Plant 2-5 µl/ml	0.818	0.802	0.853	0.829	0.8255	0.02142
Plant 2-1 µl/ml	0.8	0.793	0.809	0.799	0.80025	0.0066

Table 7: Treatment of identified plants in comparison with Doxorubicin against breast cancer cell line (HS 578T).

Table 8 shows the test result against cancer cell lines Hs578T while Doxorubicin (a synthetic anticancer drug) was used as the control treatment. *Garcinia kola* (Bark) did not exhibit significant anticancer effect even at a concentration of 10 µl/ml while *Erythroleum sauveoleons* was effective against the cancer cell line at 1 µl/ml.

After three days of treatment					
Doxorubicin	0.933	0.921	0.902	0.91867	0.01563
Plant 1-10 µl/ml	1.035	0.985	1.02	1.01333	0.02566
Plant 1-5 µl /ml	1.005	0.964	0.893	0.954	0.05667
Plant 1-1 µl /ml	1.03	1.009	0.986	1.00833	0.02201
Plant 2-10 µl /ml	1.027	0.972	0.898	0.96567	0.06473
Plant 2-5 µl /ml	0.944	0.889	0.934	0.92233	0.0293
Plant 2-1 µl /ml	0.877	0.918	0.861	0.88533	0.0294
Doxorubicin	0.902	0.88	0.84	0.874	0.03143

Table 8: Treatment of identified plants in comparison with Doxorubicin against breast cancer cell line (MCF7).

Table 8 shows the Test result against cancer cell lines MCF7 while Doxorubicin (a synthetic anticancer drug) was used as the control treatment. *Garcinia kola* (Bark) did not exhibit significant anticancer

effect even at a concentration of 10 $\mu\text{l}/\text{ml}$ while *Erythroleum sauveoleons* was effective against the cancer cell line at 1 $\mu\text{l}/\text{ml}$.

Conclusion

Forest products are effective in treatment of cancer; therefore, in order to achieve the millennium development goals on health; there is need for government to ensure the uniformity of herbal medicine practices. Factors such as, sources and identity of the plant, physical characteristics, chemical constituents, the pharmacological and biological activities of the crude drug and method of preparation, uses and storage, amongst others, need to be identified and documented. This study has justified the importance of plant species in the maintenance of ecosystem and as a source of livelihood for man.

References

1. Largo M (2014) The Big, Bad Book of Botany: The World's Most Fascinating Flora Out now from William Morrow, an imprint of HarperCollins Publishers. Slate's animal blog.
2. FAO (2005) The Support Role: The Use of Forest Resources in other Production Sectors. World Bank Publication, 2004-2005.
3. FAO (1987) Forest Products Yearbook.
4. Marshall E, Newton AC, Schreckenber K (2003) Commercialization of non-timber products: First steps in analysing the factors influencing success. Interna Fores Rev 5: 128-137.
5. Okoli RI, Aigbe O, Ohaju-Obodo JO, Mensah JK (2007) Medicinal herbs used for managing some common ailments among esan people of edo state, Nigeria. Pak J Nutr 6: 490-496.
6. WHO (2006) Report on traditional medicine, my documents/WHO traditional medicine.
7. Olapade EO (2002) The herbs for good health. The 50th Anniversary Lecture of University of Ibadan. Nature Cure Ser 3: 230.
8. Odugbemi T (2008) A Textbook of Medicinal Plants from Nigeria. University of Lagos Press, Lagos, Nigeria, p: 628.
9. IARC (2003) World cancer report 2003. Lyon, International Agency for Research on Cancer.
10. WHO (2008) The global burden of disease: 2004 update.
11. USAID (2013) Nigeria biodiversity and tropical forests 118/119 assessment. USDA Forest Service Office of International Programs, USA.
12. Gbile ZO, Ola-Adams BA, Soladoye MO (1981) Endangered species of the Nigerian flora. Niger J For 8: 14-20.
13. Oguntola AB, Soladoye MO, Ugbogu OA, Fasola TR (1996) A review of endangered tree species of cross river state and environs. Proceedings of the Workshop on Rain Forest of South Eastern Nigeria and South Western Cameroon, October 20-24, 1996, Calabar, Nigeria, pp: 120-125.
14. Adekunle AA (2001) Ethnobotanical studies of some medicinal plants from Lagos State, Nigeria. Niger J Bot 10: 61-80.
15. Adodo A (2003) The Healing Radiance of the Soul: A Guide to Holistic Healing. Agelex Publications, Nigeria.
16. Adodo A (2004) Nature and Power: A Christian Approach to Herbal Medicine. Benedictine Pub Nigeria, p: 289.
17. Adodo A (2005) New Frontiers in African Medicine. Pax Herbal clinic Nig. Ltd. Ewu Edo State, p: 199.