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

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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, Anarcardiaceae, 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 offinarum* (Stem), *Sucurinega virosa* (Root) and *Piper guineensii* (Seed) produced no result; *Garcinia kola* (Bark) did not exhibit any anticancer effect even at a concentration of 10u1/m1 while only one plant species was effective against the cancer cell line at 1u1/m1. It is therefore concluded that forest products are effective in the treatment of cancer.

Keywords: *medicinal plants; cancer; traditional medicine practitioners (TMPs); forest products and 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 (Largo) [1]. They also provide the basic raw material for the production of traditional medicines (FAO, 1995, 2005) [2, 3]. The collection and processing of medicinal plants provide employment and income opportunities for a large number of people in rural areas (Marshall, *et al.*) [4]. The importance of traditional medicinal plants in conservation of biological diversity also merits attention (Okoli) [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 (WHO, 2002, WHO, 2006, Olopade, Odugbemi) [6-9] reported that 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.

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 (IARC 2003, WHO 2008) [7,10]. 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 (WHO, 2006) [11] and this is a source of income for the growers of such plants and the TMPs (USAID, 2013) [12]. 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:

i. To determine the availability of medicinal plants used for the treatment of cancer in Southwest Nigeria.

ii. To determine the efficacy of some of the forest products used for the treatment of cancer in Southwest Nigeria.

iii. To investigate the stakeholders' socioeconomic characteristics and their involvement in the usage of forest products for the treatment of cancer in Southwest Nigeria.

iv. 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).

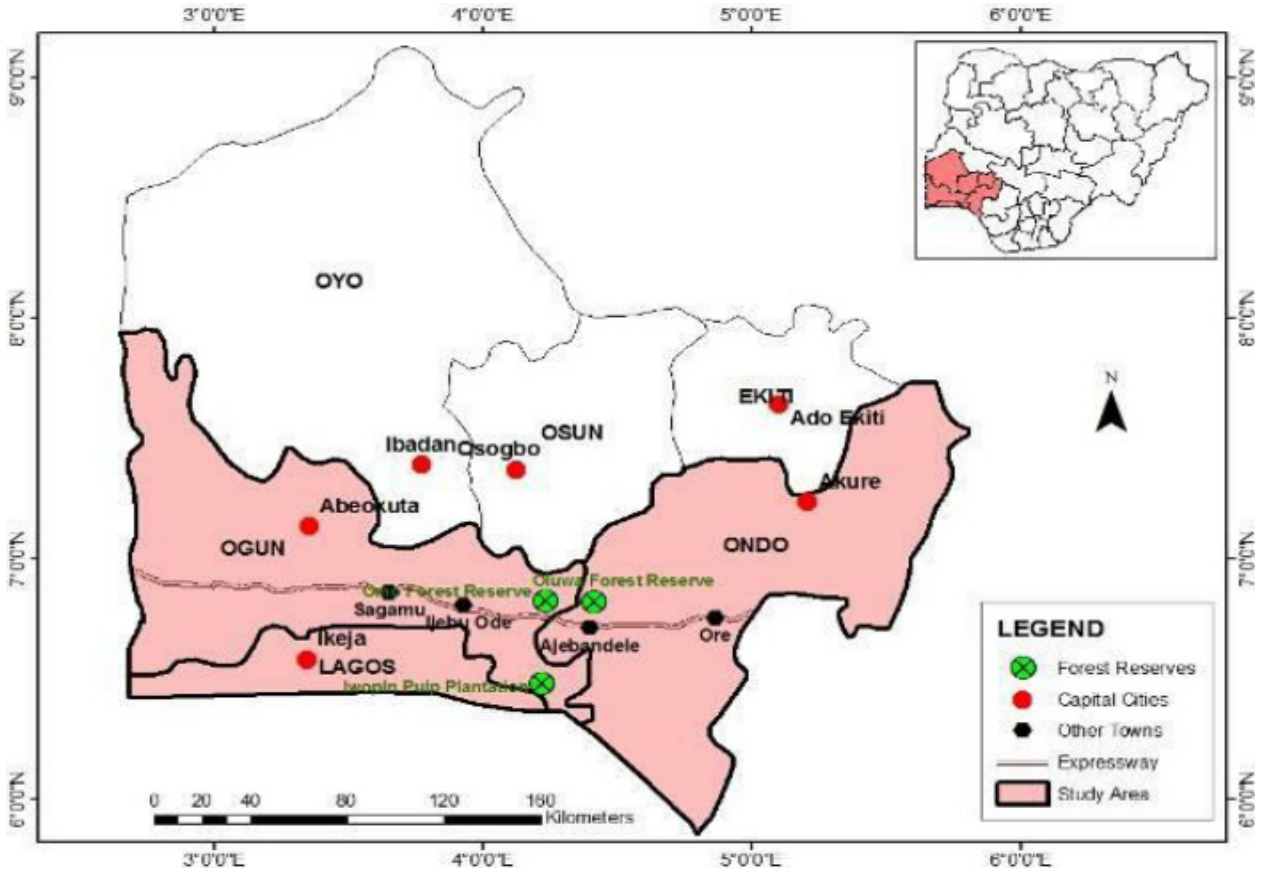

Figure 1. Map of Southwest Nigeria

Inset: Lagos and Ogun States

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.

The life forms of these plants (Table 1) shows that the trees constituted the highest number (66%), followed by shrubs (20%), herb (11%) and rhizome (3%) In all, the family *Leguminosae* was dominant with 4 species. This was followed by *Annonaceae, Anacardiaceae Euphorbiaceae, and Caesalpinioideae* (3 species each).The existence of other plant families in (Table 3) demonstrates the rich forest diversity in Southwest Nigeria. This also shows the dynamism in ecosystem maintenance. A number of them also serve economic purposes and are consumed as food in one way or the other (Malik) [13]. Some

of these include: *Anacardium occidentalis, A*, *Mangiferaindica*, *Musa sapientum, Citrus medica, Vernoniaamygdalina*, etc.

(Table 1) show 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. According to the reports by Gbile *et al*. [14] and Oguntala *et al*. [15] the Nigerian ecosystems are at greater risk of extinction if urgent attention is not given to the cultivation of medicinal plants. **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 [16].

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

S/No	Local Name	*Species*	Family	Floral Type	Source	Status of Availability	Parts used	Form used	Products
1.	Eru	*Xylopia aethiopica* (Dunal) A. Rich	Annonaceae	Tree	Free areas	Abundant	Fruit, branches	Green, dry(Water boiled).	Firewood, Medicinal
2.	Oganwo	*Khaya ivorensis* A. Chev.	Meliaceae	Tree	Free areas	Rare	Stem, Branches Bark	Dry	Firewood, Medicinal
3.	Mango	*Magnifera indica* Linn.	Anacardiaceae	Fruit Tree	Free areas, Forest, plantation	Abundant	Leaves, fruits, bark, branches, stem	Green, dry(Water boiled).	Fruit, firewood, medicinal
4.	Kaju	*Anacardium occidentalis* Linn	Anacardiaceae	Fruit Tree	Free areas, Farmland, forest, plantation	Abundant	Fruits, branches, stem	Green, dry(Water boiled).	Fruit, firewood, medicinal
5.	Iyeye	*Spondias mombin* Linn.	Anacardiaceae	Fruit Tree	Farmland, Free areas, forest	Abundant	Fruits, bark	Green, dry(Water boiled).	Fruit, medicinal
6.	Abo	*Annonasenegalensis* Pers	Annonaceae	Shrub	Free areas, forest	Abundant	Leaves, fruits, stem	Green, dry(Water boiled).	Medicinal, fruit, firewood
7.	Ahun	*Alstoniaboonei* De Wild	Apocynaceae	Tree	Free areas, forest	Scarce	Leaves, bark, root	Green, dry(Powder)	Medicinal, firewood
8.	Osanwewe	*Citrus medica* Linn.	Rutaceae	Shrub	Free areas, forest	Abundant	Leaves	Green, dry(Water boiled).	Medicinal
9.	Oruwo	*Morindalucida* Benth.	Rubiaceae	Tree	Free areas, forest	Abundant	Leaves	Green, dry(Cold water squeezed).	Medicinal
10.	Oori-nla	*Vitexdoniana* Sweet	Verbenaceae	Tree	Free areas, forest	Abundant	Fruit, leaves	Green(Water boiled).	Fruit, medicinal
11.	Osopupa	*Enantiachlorantha* Oliv.	Annonaceae	Tree	Free areas, forest	Abundant	Bark	Green, dry(Water boiled).	Medicinal
12.	Owu-elepa	*Piliostigmathinningi* Milne Redhead	Leguminosae Sub: Mimosoidae	Shrub	Free areas, forest	Abundant	Leaves	Green, dry(Water boiled).	Medicinal
13.	Putu	*Ricinodendronheudelotii* (Baill) Heckel	Euphorbiaceae	Tree	Free areas, forest	Abundant	Leaves, bark	Green, dry(Water boiled).	Medicinal
14.	Opoto	*Ficussur* Forssk.	Moraceae	Tree	Free areas, forest	Abundant	Fruit, bark	Green, dry(Water boiled).	Fruit, medicinal
15.	Asasa	*Margaritariadiscoidea* (Baill.) Webster	Euphorbiaceae	Tree	Free areas, forest, dry outliers	Scarce	Leaves, branches, stem, bark, roots	Green, dry(Water boiled).	Medicinal, firewood
16.	Dongoyaro	*Azadirachtaindica* A. Juss	Meliaceae	Tree	Free areas, plantation	Abundant	Leaves, branches, stem	Green, dry(Water boiled).	Medicinal, firewood
17.	Atare	*Afromomumeleguata* Lindl.	Zingiberaceae	Shrub	Free areas, forest	Abundant	Fruits	Green, dry(Water boiled).	Medicinal
18.	IgiFrutu	*Terminaliacatappa* Linn	Combretaceae	Tree	Free areas, forest	Abundant	Leaves, fruit, branches, stem	Green, dry(Water boiled).	Fruit, medicinal, firewood
19.	Apa	*Afzeliaafricana (*Smith) Sm.	Leguminosae Sub: Caesalpinioideae	Tree	Forest area, forest	Scarce	Branches, stem, bark, root	Green, dry(Powder)	Medicinal, firewood

S/No	Local Name	*Species*	Family	Floral Type	Source	Status of Availability	Parts used	Form used	Products
20.	Oboo	*Erythrophleumsuaveolens* (Gull. and Perr.)	LeguminosaeSub: Caesalpinioideae	Tree	Forest	Scarce	Leaves, branches, stem, bark, root	Green, dry(Water boiled).	Medicinal, firewood
21.	Asofeyeje	*Rauvolfiavomitria* Afzel	Apocynaceae	Tree	Free areas, forest	Abundant	Leaves, fruit, bark, root	Green, dry(Powder)	Medicinal
22.	Omo	*Cordiamillenii* Bak.	Bignoniaceae	Tree	Free areas, forest	Scarce	Leaves, branches, stem	Green, dry(Water boiled).	Medicinal, firewood
23.	Ewuro	*Vernoniaamygdalina* (Schreb) Del.	Asteraceae	Tree	Free areas, forest	Abundant	Leaves, branches, bark, root	Green, dry(Juice)	Medicinal, chew-stick
24.	Ope	*Elaeisguinensis* G. Don.	Palmae	Palm Tree	Swampy areas, forest,	Abundant	Frond, exudate, bark	Green, dry(Water boiled).	Basket, palm wine,
25.	Iya	*Danielliaoliveri* Rolfe	Leguminosae Sub: Caesalpinioideae	Tree	Savannah forest, re-growth	Abundant	Branches, stem, bark, root	Green, dry(Powder, Juice)	Firewood, medicinal
26.	Ataile	*Zingiberofficinale* Rossae.	Zingiberaceae	Herb	Free areas, forest	Abundant	Rhizome	Green, dry(Powder)	Medicinal
27.	Ayan	*Distemonanthus benthamianus* Benth	LeguminosaeSub: Caesalpinioideae	Tree	Forest	Abundant	Leaves, branches, stem, bark, root	Green, dry(Water boiled).	Firewood, chew stick medicinal
28.	Osankotu	*Sidaacuta*	Malraceae	Herb	Forest\wild, cultivate	Abundant	Leaves, branches, stem, root	Green, dry(Water boiled).	Medicinal
29.	Tana'poso	*Mirabilis nyctaginea*	Nyctaginaceae	Herb	Forest\wild, cultivate	Abundant	Leaves, branches, stem, root	Green, dry(Powder)	Medicinal
30.	Orin Ata	*Zanthoxylumzanthoxyloides*	Rutaceae	Herb	Forest\wild, cultivate	Abundant	Branches, stem, bark, root	Green, dry(Powder)	Medicinal chew stick
31.	Imiesu	*Agerantumconyzoides*	Compositae	Shrub	Wild	Abundant	Leaves, branches, stem, root	Green, dry(Juice)	Medicinal Insecticide Animal Feed
32.	Ayu	*Allium sativum Linn*	Liliaceae	Rhizome	Forest/wild, cultivate	Abundant	Leaves, stem	Green, dry(Powder)	Medicinal
33	Sun Flower	*Helianthus annuus Securinegavirosa*	Asteraceae	Shrub	Forest\wild, cultivate	Abundant	Fruits, branches, stem	Green dry (Water boiled).	Medicinal
34.	Ewe Akintola	*Vitellariaparadoxa*	Euphorbiaceae	Shrub	Forest\wild, cultivate	Abundant	Fruit	Green dry (Water	medicinal
35.	Ori	*Saccharum officinarum*	Sapotaceae	Tree	Forest/wild, cultivate	Abundant	Leaves, fruits, stem	Juice	Medicinal,
36.	Ireke	*Piper guineensis*	Poaceae	Shrub	Forest\wild, cultivate	Abundant	roots	Green, dry(Powder)	Medicinal,
37.	Kanafuru	*Piper guineensis*	Piperaceae	Shrub	Forest\wild, cultivate	Abundant	Leaves, stems, roots, fruits	Green, dry(Powder)	Medicinal Food
38.	Orogbo	*Morindalucida*Benth.	Guttiferae	Tree	Forest\wild, cultivate	Abundant	Fruits, Leaves	Green, dry(Powder)	Medicinal Food

Source: Field survey, 2016.

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. This was also reported by Adodo in 2003, 2004 and 2005 [17-19, 20]. Weekly wash is employed by 14% of the TMPs.

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

Name of Plant	Species	Form Used	Method of Usage	No of times taken
Eru	*Xylopia aethiopica* (Dunal) A. Rich	Fresh and dry forms	By boiling in water for drinking	2ce.Daily
Oganwo	*Khayaivorensis*A. Chev.	Dry	By boiling in water for drinking	3ce. Daily
Mango	*Magniferaindica*Linn.	Green, fresh and dry.	Juicing with coldwater	2ce.Daily
Kaju	*Anacardiumoccidentalis*Linn	Green, dry	By boiling in water for drinking	3ce. Daily
Iyeye	*Spondiasmombin*Linn.	Green, dry.	By boiling in water for drinking	3ce. Daily
Abo	*Annonasenegalensis*Pers	Green, dry	By boiling in water for drinking and bathing	3ce. Daily
Ahun	*Alstoniaboonei* De Wild	Green, dry	By boiling in water for bathing	2ce.Daily
Osanwewe	*Citrus medica*Linn.	Green, dry.	By boiling in water, Juice	2ce.Daily
Oruwo	*Morindalucida*Benth.	Green, dry.	By boiling in water, Cold water squeezed	2ce.Daily
Oori-nla	*Vitexdoniana*Sweet	Green	By boiling in water for drinking	3ce. Daily
Osopupa	*Enantiachlorantha*Oliv.	Green, dry	By boiling in water,soaking in cold water	2ce.Daily
Owu-elepa	*Piliostigmathonningi*Milne Redhead	Green, dry (Water boiled).	By boiling in water for drinking	3ce. Daily
Putu	*Ricinodendronheudelotii*(Baill) Heckel	Green, dry	soaking in cold water	3ce. Daily
Opoto	*Ficussur*Forssk.	Green, dry.	By boiling in water for drinking	Weekly wash
Asasa	*Margaritariadiscoidea*(Baill.) Webster	Green, dry	By boiling in water for drinking	2ce. Daily
Dongoyaro	*Azadirachtaindica*A. Juss	Green, dry	By boiling in water for drinking and bathing	2ce.Daily
Atare	*Afromomumeleguata*Lindl.	Green, dry	By boiling in water, mixing with pap.	2ce.Daily
IgiFrutu	*Terminaliacatappa*Linn	Green, dry	Ground, boiling in water for drinking and bathing	2ce.Daily
Apa	*Afzeliaafricana*(Smith) Sm.	Green, dry	By boiling in water for drinking and bathing	Weekly Wash
Oboo	*Erythrophleumsuaveolens*(Gull. and Perr.)	Green, dry	By boiling in water for drinking and bathing	2ce.Daily
Asofeyeje	*Rauvolfiavomitria*Afzel	Green, dry	By boiling in water for drinking	2ce.Daily
Omo	*Cordiamillenii*Bak.	Green, dry	By boiling in water for drinking	2ce.Daily
Ewuro	*Vernoniaamygdalina*(Schreb) Del.	Green, dry	By boiling in water, Juicing	Once Daily
Ope	*Elaeisguinensis*G. Don.	Green, dry	By boiling in water for drinking	2ce.Daily
Iya	*Danielliaoliveri*Rolfe	Green, dry	By boiling in water for drinking	2ce.Daily
Ataile	*Zingiberofficinale*Rossae.	Green, dry	By boiling in water for drinking	2ce.Daily
Ayan	*Distemonanthusbenthamianus*Benth	Green, dry	Heating	Weekly Wash
Broom weed	*Sidaacuta*	Green, dry	By boiling in water, Juicing	2ce Daily
Tana'poso	*Mirabilis nyctaginea*	Green, dry	By boiling in water for drinking	2ce.Daily
Fagara	*Zanthoxylumzanthoxyloides*	Green, dry	By boiling in water for drinking	2ce.Daily
Goat Weed	*Agerantumconyzoides*	Green, dry	By boiling in water, Juicing for drinking	2ce.Daily
Garlic	*Allium sativum Linn*	Green, dry	By boiling in water for drinking	2ce.Daily
Sun Flower	*Helianthus annuus*	Green, dry	By boiling in water for drinking	3ce. Weekly
Bush Weed	*Securinega virosa*	Green, dry	By boiling in water for drinking and bathing	2ce.Daily
African Shea Butter	*Vitellaria paradoxa*	Green	Processed into lotion to rub on affected parts of the body	2ce.Daily
Sugar Cane	*Saccharum offinarum*	Fresh, Green	Juice	2ce.Daily
African pepper	*Piper guineeensis*	Green, dry	Adjunct to other preparation	2ce.Daily
Bitter Kola	*Garcinia koli*	Green, dry,, wet form	By boiling in water and chewing	2ce.Daily

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-Douglass, 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 3: Regression analysis result to determine demographic factors that affect the profit of the Traditional Medicine Practitioners

Variables	Linear Model	Semi-log Model	Double log Model
(Constant)	-191633.751 (-0.863)	-6120497.800*** (-7.560)	3.015*** (7.520)
Number of Patients Received	5668.860** (2.046)	1.154* (1.671)	0.102** (2.218)
Total Cost of Production	0.781*** (3.659)	724844.917*** (5.356)	0.321*** (4.627)
Age	12712.758*** (2.770)	1351390.068*** (3.144)	0.614*** (2.954)
Years of Experience	17349.115** (2.108)	821488.191** (2.373)	1.134* (1.837)
State of Origin	0.989 (-0.151)	0.976 (-0.335)	1.052 (0.689)
Occupation	1.041 (0.559)	1.030 (0.415)	1.015 (0.219)
Gender	1.048 (0.647)	1.022 (0.307)	1.036 (0.500)
Marital Status	1.073 (0.969)	1.091 (1.177)	1.094 (1.268)
Religion	1.015 (0.216)	1.009 (0.127)	1.052 (0.745)
Educational Level	0.890 (-1.643)	0.918 (-1.227)	0.918 (-1.264)
R^2	0.404	0.394	0.437
Adjusted R^2	.385	0.379	0.423
F-statistics	20.717	26.622	31.841

Dependent Variable: Profit

*** - significant at 1% level

** - significant at 5% level

* - significant at 10% level

Computed t-values in parenthesis

Source: Computed from Analysis of Field Data, 2016.

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.

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

Variables	Coefficients	t - values
Constant	-15021498.169	2.526**
Number of patients treated	41022.624	1.331
Number of relatives affected	5605.058	.051
Number of people dead	-49103.012	-.354
Number of patients per year	506016.983	2.106*
Number of people referred	-531373.962	2.514**
Duration of treatment	1283050.431	2.761**
Remedy shelf-life	246731.646	2.676**
Method of production	762933.303	1.599
Daily Application	793581.374	2.018**
Time of Harvest	1369993.310	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

Source: Computed from Analysis of Field Data, 2016.

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 (₦17,246.58), OMPs (₦106,750.00). However, the result shows that there is no significant difference in the number of patients treated by the two groups of practitioners.

Table 5: t-test analysis showing comparison of some selected parameters of the Traditional Medical Practitioners (TMPs) and the Orthodox Medical Practitioners (OMPs).

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)
Cost of production	TMPs (₦17,246.58), OMPs (₦106,750.00)

Table 6: t-Tests analysis comparing some selected variables from the Traditional Medicine Practitioners (TMPs) and the orthodox medical practitioners (OMPs)

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	17246.58	106750.00	6.530**

** Significant at 1% ($p<0.01$) level

* Significant at 5% ($p<0.05$) level

Source: Computed from Analysis of Field Data, 2016.

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 8). Net profit was ₦650,769.98 **(Table 7).** 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.

Table 7: Annual Average Costs and Returns Analysis

Item	Value
Total Revenue (TR)	1012142.86
Total Cost (TC)	361372.88
Net Profit(NP)	650769.98
Rate of Return (ROR)	280.08%
Rate of Return on Investment (RORI)	180.08%

Table 9 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 10u1/m1 while *Erythropleum sauveoleons* was effective against the cancer cell line at 1u1/m1.i

Table 10 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 10u1/m1 while *Erythropleum sauveoleons* was effective against the cancer cell line at 1u1/m1.i

Table 8. Market structure of the anticancer forest product market

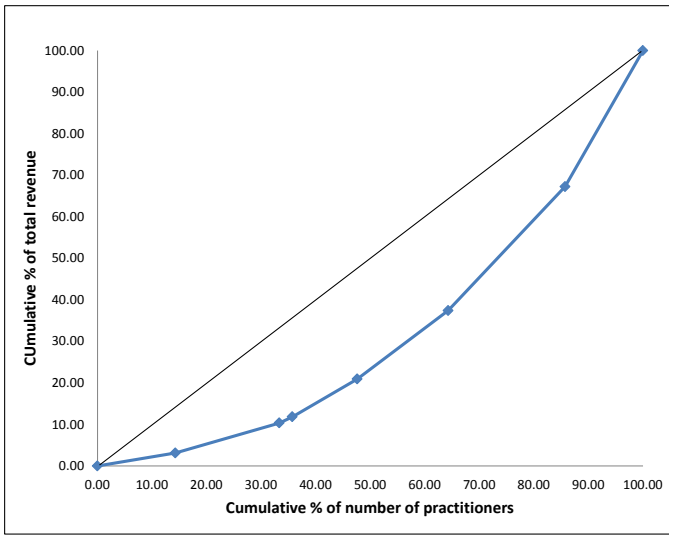

Figure 4: Gini curve

Table 9. Treatment of identified plants in comparison with Doxorubicin against breast cancer cell line (HS 578T)

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
Plant1-10ul/ml	0.759	0.728	0.77	0.719	0.744	0.02437
plant1-5ul/ml	0.78	0.782	0.789	0.723	0.7685	0.03058
Plant1-1ul/ml	0.73	0.786	0.737	0.737	0.7475	0.02588
Plant2-10ul/ml	0.83	0.843	0.825	0.815	0.82825	0.01164
plant2-5ul/ml	0.818	0.802	0.853	0.829	0.8255	0.02142
Plant2-1ul/ml	0.8	0.793	0.809	0.799	0.80025	0.0066

Table 10. Treatment of identified plants in comparison with Doxorubicin against breast cancer cell line (MCF7)

After three days of treatment					
Con	0.933	0.921	0.902	0.91867	0.01563
Doxorubicin	1.035	0.985	1.02	1.01333	0.02566
Plant1-10ul/ml	1.005	0.964	0.893	0.954	0.05667
plant1-5ul/ml	1.03	1.009	0.986	1.00833	0.02201
Plant1-1ul/ml	1.027	0.972	0.898	0.96567	0.06473
Plant2-10ul/ml	0.944	0.889	0.934	0.92233	0.0293
plant2-5ul/ml	0.877	0.918	0.861	0.88533	0.0294
Plant2-1ul/ml	0.902	0.88	0.84	0.874	0.03143

Conclusion

Forest products are effective in treatment of cancer; therefore inorder 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.

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