

1 **Diversity, Ethnobotanical potential and sustainability assessment of plants**  
2 **used by traditional healers to treat human cancer in Boyo Division, North-**  
3 **West Region, Cameroon**

4 **Abstract**

5 **Aims:** Cancer is the leading cause of death in developing countries. Therefore, the  
6 knowledge on medicinal plants used to cure human cancer could be of great importance for  
7 their widespread use and scientific validation. The present study records information on  
8 anticancer plants in Boyo Division, in the western highland of Cameroon.

9 **Methods:** Thirty traditional healers, were interviewed to document their know-how on the  
10 type of human cancer cured, the plant species used as well as their use pattern. Guided field  
11 walks were made to the collection sites for plant and its habitat characterization as well as  
12 herbarium voucher collection. Ethnobotanical quantitative tools were used to analyze and  
13 summarize collected data. Sustainability of harvest was assessed using a vulnerability index  
14 based on seven parameters.

15 **Results:** A total of 25 medicinal plants cited were identified as belonging to 13 families and  
16 23 genera. The most represented families were Asteraceae (28%), Lamiaceae (16%),  
17 Fabaceae (12%) and Acanthaceae (8%). Out of the seven categories of cancer diseases  
18 reported, the highest number of plants species were reported to treat stomach, pancreas,  
19 liver, skin and breast cancers, with informant consensus factor (ICF) ranging from 0.79 to  
20 0.82. Leaves (60%) and bark (20%) were the major plant parts used mostly in form of  
21 decoction (45.45%) and concoction (38.18%). The result of Relative frequency citations  
22 (RFCs) revealed that 9 of the 25 plants species cited were the most frequently used with  
23 fidelity levels ranging from 92% (*Geniosporum rotundifolium* and *Ocimum* sp *Aframomum* sp.  
24 and *Entada abyssinica*) to 100% (*Coleus* sp, *Ocimum gratissimum*, *Eremomastax speciosa*,  
25 and *Dichrocephala integrifolia*). Six species were assessed as vulnerable ( $V_i \geq 2$ ), while two

26 species were rated as highly vulnerable namely *G. rotundifolium* ( $V_i = 2.71$ ) and *E.*  
27 *abyssinica* ( $V_i = 2.85$ ).

28 **Conclusion:** New anticancer plants were identified in the present study, some of which were  
29 already vulnerable for exploitation in their actual habitat. Plants with high ICF, RFCs and FL  
30 values should be subjected to further phytochemical and pharmacological investigations for  
31 scientific validation while those with high Vulnerability index should be recommended for  
32 participatory domestication by the main users.

33 **Keywords:** *anticancer medicinal plants, Cameroon, ethnobotany, human cancer categories,*  
34 *medicinal uses, pharmaceutical forms, vulnerability assessment.*

## 35 Introduction

36 Cancer is the third leading cause of death worldwide, only preceded by cardiovascular  
37 disease, infections and parasitic disease [1]. It is the second leading cause of death in developed  
38 countries and is one of the three leading causes of death for adults in developing countries. There are  
39 over 200 different types of cancer but four cancers: lung cancer, breast cancer, prostate cancer and  
40 large bowel cancer account for more than half of all cases [2]. Of the 12.4 million new cancer cases in  
41 2008, the most common cancers in terms of incidence were lung (1.52 million), breast (1.29 million)  
42 and colorectal (1.15 million) [3]. The International Agency for Research on Cancer estimates of the  
43 incidence of mortality and prevalence from major types of cancer, at national level, for 184 countries of  
44 the world revealed that there were 14.1 million new cancer cases, 8.2 million cancer deaths, and 32.6  
45 million people living with cancer (within 5 years of diagnosis) in 2012 worldwide [4]. By 2030, it is  
46 projected that there will be 26 million new cancer cases and 17 million cancer deaths per year [5]. The  
47 types of cancer vary around the world and there is significant variation in the risk of different cancers  
48 by geographic area. Most of this global variation is due to exposure to known or suspected risk factors  
49 related to lifestyle or environment and provides a clear challenge to prevention. In developed  
50 countries, many cancer cases are attributable to an unhealthy diet and inactive lifestyle such as  
51 smoking and obesity. Although a third of all cancer deaths are linked to cigarette smoking, obesity is  
52 associated with colon, breast, uterine, oesophageal and kidney cancer [3, 6]. However, some cancers  
53 are caused by biological carcinogens such as infections by viruses (hepatitis B/C and liver cancer and

54 human *Papillomavirus* (HPV) and cervical cancer), bacteria (*Helicobacter pylori* and gastric cancer)  
55 and parasites (*Schistosomiasis* and bladder cancer). In addition, excessive alcohol consumption is  
56 associated with several cancer types, including head and neck, oesophageal, throat, liver and breast  
57 cancer [3, 6]. Cancer may be uncontrollable and incurable, and may occur at any time at any age in  
58 any part of the body. It is caused by a complex, poorly understood interplay of genetic and  
59 environmental factors. A large number of chemopreventive agents are used to cure various cancers,  
60 but they produce side effects that prevent their extensive usage. Although more than 1500 anticancer  
61 drugs are in active development with over 500 of the drugs under clinical trials, there is an urgent need  
62 to develop much effective and less toxic drugs, for which the plant kingdom could play an important  
63 role [7]. In recent years, the use of traditional medicine information on plant research has received  
64 considerable interest. According to the world Health Organization (WHO), about three quarters of the  
65 world's population currently use herbs and other forms of traditional medicines to treat diseases [8, 9].  
66 It has been reported that 60% of the commercially available anticancer drugs are from natural sources.  
67 Treatment by herbal medicines may have some advantages over treatment by single purified  
68 chemicals [10]; as herbal medicine are a cocktail of metabolites with therapeutic or preventive  
69 properties, and so might be more active than single products alone. Moreover, plant products for  
70 cancer treatment could be available, affordable, and relatively cheap with little or no side effects [11,  
71 12, 13, 14]. In spite of pharmacological progress, urban and rural populations of Cameroon still  
72 depend on medicinal plants for their primary health and many plants species had already been  
73 reported for the treatment of various ailments including cancer [15, 16]. The country is known to be  
74 rich for its plant diversity, culture, language and tradition which contribute to the multiplicity of  
75 practices. However, these practices remain poorly documented and less accessible for modern  
76 research. Hence, the search for alternative anticancer drugs of plant origin in the country requires a  
77 basic ethnobotanical survey in different localities to document diverse knowledge owned by different  
78 ethnic groups. Only few workers [17, 18], have conducted ethnobotanical survey in some parts of  
79 North-West Cameroon. Therefore, very limited ethnobotanical literature is available in the region.  
80 Although various ethnobotanical surveys have been conducted in different parts of Cameroon [15, 19,  
81 20, 21, 22, 23], scientific documentation on plant used to treat human cancer is scarce at the country  
82 level. The overuse of plant' organs such as barks, roots, leaves and fruits for medicinal purpose are  
83 known to differently affect the species sustainability depending on a set of factors among which are

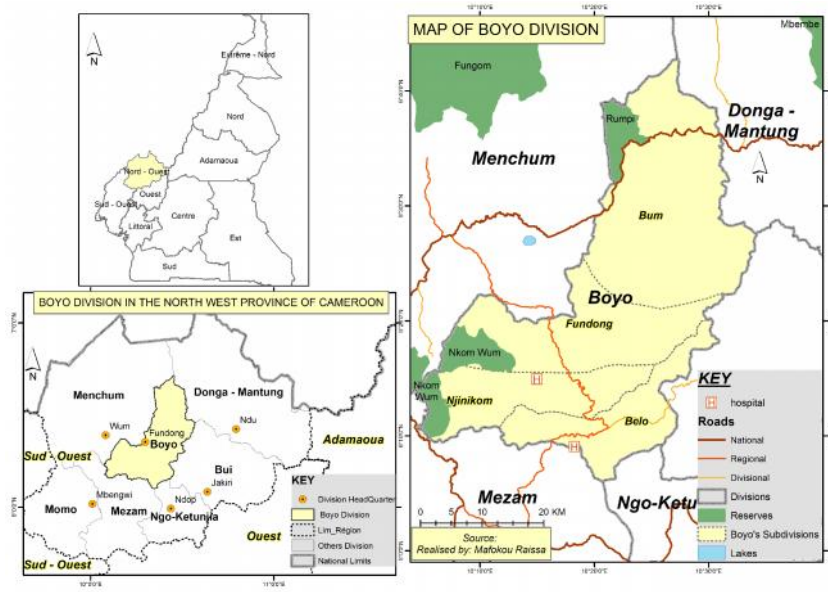
84 the species morphotype, the type of organ being used, the pharmaceutical form being administered,  
85 the harvest frequency and intensity, the characteristics of the species' habitat among others [24, 25,  
86 26, 27]. These factors have been compiled to elaborate a vulnerability index currently applied to raise  
87 awareness on species sustainability to harvest [24, 28]. Therefore, present survey aimed to provide,  
88 the first inventory and sustainability of medicinal plants used by traditional healers and the associated  
89 indigenous knowledge for the treatment of cancer affliction in the western highland of Cameroon.

## 90 **Materials and Methods**

### 91 **Research setting/ Description of the study area**

92 The study was carried out in Boyo division (**Figure 1**). Boyo is about 1557.5 Km<sup>2</sup>, and it is  
93 situated between 6°09-6°17 North and 10°16-10°20 East. Boyo has four subdivision, which are:  
94 Fundong, Njinikom, Belo and Bum, All the four subdivision, well reputed for the competence of their  
95 traditional healers in treating many hopeless illness such as cancer [29] were considered in this study.  
96 Temperature ranges from 15°C to 38° C with average temperature of 24.5 to 29.7°C. Average annual  
97 rainfall stands at 2400 mm per annum and humidity of 82% with two seasons. The rainy season  
98 begins from mid-march to mid-October and a dry season that extends from mid-October to mid-march.  
99 The climate is Cameroonian humid tropical type with two seasons (rainy season from mid-march to  
100 mid-November, and dry season from mid-November to mid-march) [30]. Boyo division has 128, 425  
101 total population. The population density is about one per 82 per km<sup>2</sup>. People mainly depend on  
102 agriculture for their livelihoods. This division is characterized by the great diversity of its relief, climate,  
103 vegetation and soils [31]

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105

106 **Figure 1: Map showing the Boyo Division in the North-West region of Republic of Cameroon**107 **Ethnobotanical survey and data collection**

108 The primary goal of this survey was to collect ethnobotanical information about medicinal  
 109 herbs for cancer treatment. The informants were selected among traditional healers members of the  
 110 Mixed Farmer common Initiative groups (MIFACIGs), a community based organization collaborating  
 111 with the World Agroforestry Centre (ICRAF) in the framework of the project on participatory  
 112 domestication of indigenous fruit trees and medicinal plants in the African Humid Tropics region.  
 113 Therefore, their willingness to participate to the study was very high. The data were collected between  
 114 the months of May to September 2006 Traditional healers were chosen because they are likely to  
 115 encounter a wide range of cancer patients. Indeed a total of 30 traditional healers were chosen using  
 116 snowball sampling method [32]. Individual ethnobotanical semi-structured interviewing techniques  
 117 were used for data collection [33, 34]. The questionnaire were constructed in English. However, for  
 118 ease in communicating with the traditional healers during interviews, *Piging-english* was used. Among  
 119 the questions asked during the interviews were age, sex, years of experience. Data were also focused  
 120 on the uses of each cited medicinal plant which incorporated local names, cancer type treated, parts  
 121 used, preparation methods, administration route, dosage, habits and habitats, and the medicinal plant  
 122 conservation practices. Guided field walks were conducted with interviewed traditional healers to  
 123 collect medicinal plant voucher specimens. Further identification and authentication was done by a

124 taxonomist in the Cameroon National Herbarium Yaoundé. Voucher specimens were prepared,  
125 labeled and deposited in the Herbarium of Forestry Department, University of Dschang Cameroon.

126 **Vulnerability assessment:** seven (7) criteria were adapted from [28, 35, 36] and used for the  
127 assessment of the vulnerability of harvest for the most common anticancer species cited in the study  
128 site. Such criteria included: gathering method, the life form or morphology, the vegetative organ  
129 harvested, the popularity of the species in a given site, the pharmaceutical form being used, and the  
130 type of habitat and conservation status as well as the development stage at harvesting (**Table 1**). A  
131 scale value from 1 to 3 were assigned to each of the criteria used for the assessment, which affected  
132 the survival of the species within a particular habitat type. The overall vulnerability index ( $V_i$ ) was  
133 estimated by calculating the average of the values obtained for all the 7 parameters considered in  
134 table 1, with:

- 135 -  $1 < V_i \leq 2$ , meaning that the plant is not vulnerable and the natural potential is still quite  
136 appropriate for exploitation.
- 137 -  $2 < V_i \leq 2.5$  indicates that the plant is becoming vulnerable in the given environment.
- 138 -  $V_i \geq 2.5$  shows that the plant is highly vulnerable and need sustainable management  
139 strategies.

#### 140 **Data analysis**

141 All the recorded data values were tabulated by using Microsoft Excel 2010. Three  
142 ethnobotanical parameters were calculated i.e., relative frequency of citation (RFCs), fidelity level (FL)  
143 and informants consensus (IFC). Relative frequency citation reveals the importance of each species  
144 and is calculated on the basis of the frequency of citation (FC) (the number of informants mentioning  
145 the use of species), by using the following formula:  $RFCs = FCs / N$  (the FC value is divided by total  
146 number of informants participating in the survey (N), without considering the use-categories. Where,  
147 **FCs** is the number of informants who mentioned the use of a plant species and N is the total number  
148 of informants [37, 38]. Fidelity level (**FL**) was calculated to determine the percentage of informants  
149 which reported the uses of a medicinal plant as a remedy for the same major ailment using the  
150 formula:  $FL = (I_p / I_u) \times 100$ , where  $I_p$  is the number of informants who independently indicated the use of  
151 a species for the same major ailment and  $I_u$  the total number of informants who mentioned the plant for  
152 any major ailment [39].

153 **Table 1: Parameters used for the assessment of the vulnerability index (Vi) of the common**  
 154 **anticancer plants species of the Boyo Division, Northwest province Cameroon**

Parameters	Vulnerability scales		
	Weak (Scale 1)	Medium (Scale 2)	High (Scale 3)
Life form (LF)	Herbs	Shrub	Tree
Popularity (Pop)	Not popular (RFL<20%)	Less popular (20% <RFL<60%)	Popular (RFL>60%)
Organ (s) harvested (Oh)	Leaves	Fruits	Bark, roots and wood
Gathering methods (GM)	Leaves harvesting/ ground picking of the fruits	Fruit an seeds Harvesting	Debarking and felling
Pharmaceutical forms (PhF)	crush concoction	Powder/crush concoction	Decoction/maceration
Habitat and conservation status (HCs)	cultivated	Preserved in human managed systems	wild
Development stage at harvesting (Dst)	Mature	growing stage	juvenile

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156 The informant consensus factor (ICF) was calculated to determine the agreements of the informants  
 157 on each remedy using the formula:  $ICF = \frac{Nur-nt}{Nur-1}$ , where number of use citations in each  
 158 category (**Nur**) minus the number of species used (**nt**), divided by the number of use citations in each  
 159 category minus one, where **Nur** is the number of use citations and **nt** is the number of species used  
 160 [40]. IFC values range between 0 and 1, "1" indicates the highest level of consensus. Thus, high IFC  
 161 can be used to identify important plant species for search of novel bioactive compounds [41].

## 162 **Results**

### 163 **Informant's characteristics**

164 The informants interviewed in this study had received the lowest levels of formal education.  
 165 The majority had attained only primary education (83.33%), and 16.67% had not attained any formal  
 166 education. The occupation of the Informants were healing jobs and crop farming. All the 30 key  
 167 informants were males; they were well-known in the locality due to their long practice in providing  
 168 services related to traditional health care. Their ages ranged from 37 to 79 years, with 53% of them  
 169 having more than 60 years old. All informants reported that, majority of their knowledge was received  
 170 from their family members secretly, and sometime by dream. Yet, if it is not practiced secretly, they  
 171 think that the potential of the medicinal values of the plants will be weakened.

## 172 **Plants reported as anticancer and Relative Frequency citation**

173 A total of 25 medicinal plant species belonging to 13 families were documented as being used  
174 by traditional healers in Boyo division, north-west Cameroon (**Table 2**). These were reported to be  
175 useful in controlling seven categories of cancer diseases. The families Asteraceae, Lamiaceae,  
176 Fabaceae and Acanthaceae were represented by seven, four, three and two anticancer plants  
177 respectively, and the rest by one anticancer plant each. One of the species recorded (*Prunus africana*)  
178 is also listed in the IUCN (International Union for Conservation of Nature) red list as vulnerable to  
179 extinction [42, 43]. Most of the reported anticancer plants were herbs (68%), followed by tree (24%)  
180 and shrubs (8%). Leaves were the most preferred plant part (60%) used in herbal drug recipe,  
181 followed by barks (20%), fruits (10%), whole plant (6.67%) and stem (3.33%) (**Table 2**). The most  
182 frequently cited anticancer plant species were *Coleus* spp, *Ocimum gratissimum*, *Geniosporum*  
183 *rotundifolium*, *Ocimum* spp, *Eremomastax speciosa*, *Dichrocephala integrifolia*, *Aframomum* spp,  
184 *Entada abyssinica* and *Setaria barbata*. The RFCs of the reported species ranged from 3.33 to  
185 96.66%, with the highest values obtained for *Coleus* spp (96.66), *Ocimum gratissimum* (93.33),  
186 *Geniosporum rotundifolium* (83.33), *Ocimum* sp. (73.33), *Eremomastax speciosa* (63.33),  
187 *Dichrocephala integrifolia* (63.33) and *Aframomum* sp. (40). These plants species were reported by a  
188 maximum number of traditional healers, therefore having high frequency of citation. Traditional healers  
189 assigned vernacular names to all of the documented medicinal plants (**Table 2**).

190

191 Table 2: Human anticancer medicinal plants characteristics, parts used and preparations by traditional healers in Boyo Division

Scientific name/ Family	Local name	Habit	Plant status	Medicinal uses	Parts used	Preparation & administration	Dosage	RFCs (%)
<i>Acanthus montanus</i> <b>Acanthaceae</b>	Nyo I nyo i	Herb	W	Skin cancer, liver cancer, stomach and pancreas cancer	Leaves	Decoction/I, concoction of leaves powder with palm oil /I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	3.33
<i>Aframomum spp</i> <b>Zingiberaceae</b>	Fessuifegang	Herb	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and brain cancer	Leaves, fruits	Decoction/I, concoction of leaves powder with palm oil /I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	40
<i>Ageratum conyzoides</i> <b>Asteraceae</b>	Abve akedjem	Herb	W	Breast cancer, skin cancer, liver cancer, stomach and pancreas cancer	Whole plant	Decoction/I, concoction of leaves powder with palm oil /I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	3.33
<i>Albizia spp</i> <b>Fabaceae</b>	Fowoom	Tree	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and lung cancer	Barks	Decoction/I, Crush/I & E	2 - 3 cups a day of decocted or crushed extract are taken orally and crushed extract is rubbed on areas where pain felt	10
<i>Aloe vera</i> <b>Asparagaceae</b>	Aloe	Herb	C	Breast cancer, skin cancer, liver cancer, stomach and pancreas cancer	Leaves	Decoction/I, concoction of leaves powder with palm oil /I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	3.33

193 Table 2: Human anticancer medicinal plants characteristics, parts used and preparations by traditional healers in Boyo Division (continued)

Scientific name/ Family	Local name	Habit	Plant status	Medicinal uses	Parts used	Preparation & administration	Dosage	RFCs (%)
<i>Aspilia africana</i> <b>Asteraceae</b>	Ahovesse	Herb	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and brain cancer	Whole plant	Decoction/I, concoction of leaves powder with castor oil /E	2 - 3 cups a day of decocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	3.33
<i>Bidens pilosa</i> <b>Asteraceae</b>	Fesse enou	Herb	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and brain cancer	Leaves	Decoction/I, concoction of leaves powder/I	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	6.66
<i>Chromoleana odorata</i> <b>Asteraceae</b>	Tchakassala	Herb	W	Breast cancer, skin cancer, liver cancer, stomach and pancreas cancer	Leaves	Decoction/I, concoction of leaves powder with palm oil /I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	3.33
<i>Cleome spp</i> <b>Capparidaceae</b>	Y bany be	Herb	W	Breast cancer, skin cancer, liver cancer, stomach and pancreas cancer	Leaves	Decoction/I, concoction of leaves powder with palm oil /I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	3.33
<i>Coleus spp</i> <b>Lamiaceae</b>	Banguim femelle	Herb	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung and brain cancer	Stems	Decoction/I, concoction of leaves powder with palm oil /I, Crush/I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug and crushed extract are taken orally and crushed extract rubbed on areas where pain felt	96.66

194 E: External; I: Internal; C: Cultivated; W: Wild; RFCs: Relative frequency citations

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**Table 2: Human anticancer medicinal plants characteristics, parts used and preparations by traditional healers in Boyo Division (continued)**

Scientific name/ Family	Local name	Habit	Plant status	Medicinal uses	Parts used	Preparation & administration	Dosage	RFCs (%)
<i>Dichrocephala integrifolia</i> <b>Asteraceae</b>	Fessuifesse	Herb	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung and brain cancer	Leaves	Decoction/I, concoction of leaves powder/I	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	63.33
<i>Entada abyssinica</i> <b>Fabaceae</b>	Feloung	Tree	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and lung cancer	Leaves, Barks	Decoction/I, concoction of leaves powder/I & E	2 - 3 cups a day of decocted drug or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	40
<i>Eremomastax speciosa</i> <b>Acanthaceae</b>	Banguim male	Herb	C	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung and brain cancer	Leaves	Decoction/I, concoction of leaves powder/I	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	63.33
<i>Geniosporum rotundifolium</i> <b>Lamiaceae</b>	Feungui	Herb	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and brain cancer	Leaves	Decoction/I, concoction of leaves powder with palm oil /I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	83.33

197 *E: External; I: Internal; C: Cultivated; W: Wild; RFCs: Relative frequency citations*

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200 **Table 2: Human anticancer medicinal plants characteristics, parts used and preparations by traditional healers in Boyo Division (continued)**

Scientific name/ Family	Local name	Habit	Plant status	Medicinal uses	Parts used	Preparation & administration	Dosage	RFCs (%)
<i>Kigelia Africana</i> <b>Bignoniaceae</b>	Atem	Tree	C	Breast cancer, skin cancer, liver cancer, stomach and pancreas cancer	Leaves, fruits	Decoction/I, concoction of leaves powder with palm oil /I, Crush/I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug and crushed extract are taken orally and crushed extract rubbed on areas where pain felt	10
<i>Lannea kerstingii</i> <b>Anacardiaceae</b>	Feuga'ah	Tree	W	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and lung cancer	Barks	Decoction/I concoction of leaves powder with palm oil /I Crush/I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug and crushed extract are taken orally and crushed extract rubbed on areas where pain felt	6.66
<i>Ocimum gratissimum</i> <b>Lamiaceae</b>	Afato'oh	Herb	C	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and brain cancer	Leaves	Decoction/I concoction of leaves powder/I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	93.33
<i>Ocimum sp.</i> <b>Lamiaceae</b>	Tongloan	Herb	C	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas and brain cancer	Leaves	Decoction/I concoction of leaves powder/I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	73.33

201 *E: External; I: Internal; C: Cultivated; W: Wild; RFCs: Relative frequency citations*

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205 **Table 2: Human anticancer medicinal plants characteristics, parts used and preparations by traditional healers in Boyo Division (continued)**

Scientific name/ Family	Local name	Habit	Plant status	Medicinal uses	Parts used	Preparation & administration	Dosage	RFCs (%)
<i>Prunus africana</i> <b>Rosaceae</b>	Prunus	Tree	C	Breast cancer, skin and lung cancer	Barks	Decoction/ concoction of leaves powder with palm oil /I Crush/I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug and crushed extract are taken orally and crushed extract rubbed on areas where pain felt	3.33
<i>Sesbania</i> sp. <b>Fabaceae</b>	Y-yes	Shrub	W	Breast cancer, skin cancer, liver cancer, stomach and pancreas cancer	Leaves	Decoction/ concoction of leaves powder with palm oil /I Crush/I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug and crushed extract are taken orally and rubbed on areas where pain felt	6.66
<i>Setaria barbata</i> <b>Poaceae</b>	Fedjan fegué	Herb	W	Breast cancer, skin cancer, liver cancer, stomach and pancreas cancer	Leaves	Decoction/ concoction of leaves powder/I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	16.66

206 *E: External; I: Internal; C: Cultivated; W: Wild; RFCs: Relative frequency citations*

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214 Table 2: Human anticancer medicinal plants characteristics, parts used and preparations by traditional healers in Boyo Division (end)

Scientific name/ Family	Local name	Habit	Plant status	Medicinal uses	Parts used	Preparation & administration	Dosage	RFCs (%)
<i>Solanum aculeastrum</i> <b>Solanaceae</b>	Fugnah	Shrub	W	Breast cancer, skin cancer, liver cancer, stomach and pancreas cancer	Leaves, fruits, barks	Decoction/I concoction of leaves powder with palm oil /I & E	2 - 3 cups a day of decocted or 2 - 3 spoons of concocted drug are taken orally and concoction mixture is rubbed on areas where pain felt	16.66
<i>Vernonia calvoana</i> <b>Asteraceae</b>	A tong tong	Herb	W	Breast cancer, skin and lung cancer	Leaves	Decoction/I Crush/I & E	2 - 3 cups a day of decocted or crushed extract are taken orally and rubbed on areas where pain felt	6.66
<i>Vernonia</i> sp. <b>Asteraceae</b>	Afessan	Herb	W	Breast cancer, skin and lung cancer	Leaves	Decoction/I Crush/I & E	2 - 3 cups a day of decocted or crushed extract are taken orally and rubbed on areas where pain felt	3.33
<i>Vitex</i> sp. <b>Verbenaceae</b>	Afeuh	Tree	W	Breast cancer, skin and lung cancer	Barks	Decoction/I Crush/I & E	2 - 3 cups a day of decocted or crushed extract are taken orally and rubbed on areas where pain felt	3.33

215 E: External; I: Internal; C: Cultivated; W: Wild; RFCs: Relative frequency citations

## 216 Preparation, dosage and mode of treatment

217 The most common mode of preparation were decoction (45.45%) and concoction (38.18%).  
 218 All the treatments were prepared from a mixture of four to ten dry or fresh plants. Treatments were  
 219 mainly taken orally and topically twice or three times in a day until recovery. The dosages were  
 220 measured using a cup of about 50 – 100 ml. Solvent were water, raphia wine, palm oil and castor oil.  
 221 Some additive substances such as salt and honey were mixed during preparations and  
 222 administrations.

## 223 Informant's consensus factor for each cancer category and fidelity value of recorded 224 medicinal plants

225 Cancer affliction were divided into seven categories, namely: Breast cancer, skin cancer, liver  
 226 cancer, stomach cancer, pancreas cancer, lung cancer and brain cancer. From the informant  
 227 consensus factor analysis computed for each cancer category, it was shown that stomach cancer  
 228 scored the highest ICF value (0.82) followed by skin, pancreas and liver cancer (0.81 each). The least  
 229 values of ICF were found in lung cancer (0.16) and brain cancer (0.54) (Table 3).

230 **Table 3: informant consensus factor (ICF) value of cancer category for anticancer plants in**  
 231 **Boyo division, Cameroon**

Use category	Plant species	Number of use citation	% of all citations	ICF value
Breast cancer	<i>Coleus</i> sp. (13), <i>Ocimum gratissimum</i> (12), <i>Geniosporum rotundifolium</i> (14), <i>Ocimum</i> sp. (11), <i>Eremomastax speciosa</i> (13), <i>Dichrocephala integrifolia</i> (9), <i>Aframomum</i> sp (7), <i>Entada abyssinica</i> (7), <i>Setaria barbata</i> (3), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia</i> sp. (2), <i>Bidens pilosa</i> (3), <i>Vernonia calvoana</i> (2), <i>Sesbania</i> sp. (1), <i>Lannea kerstingii</i> (2), <i>Vitex</i> sp. (1), <i>Prunus africana</i> (1), <i>Aegeratum conyzoides</i> (1), <i>Cleome</i> sp. (1), <i>Chromoleana odorata</i> (1), <i>Aspilia africana</i> (1), <i>Aloe vera</i> (1), <i>Vernonia</i> sp. (1)	111	18.65	0.79
Skin cancer	<i>Coleus</i> sp. (15), <i>Ocimum gratissimum</i> (13), <i>Geniosporum rotundifolium</i> (15), <i>Ocimum</i> sp. (13), <i>Eremomastax speciosa</i> (16), <i>Dichrocephala integrifolia</i> (11), <i>Aframomum</i> spp (7), <i>Entada abyssinica</i> (8), <i>Setaria barbata</i> (5), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia</i> sp. (3), <i>Bidens pilosa</i> (3), <i>Vernonia calvoana</i> (2), <i>Sesbania</i> spp (1), <i>Lannea kerstingii</i> (2), <i>Vitex</i> sp. (1), <i>Prunus</i>	127	21.34	0.81

	<i>africana</i> (1), <i>Aegeratum conyzoides</i> (1), <i>Cleome</i> sp. (1), <i>Chromolaena odorata</i> (1), <i>Aspilia africana</i> (1), <i>Aloe vera</i> (1), <i>Vernonia</i> sp. (1), <i>Acanthus montanus</i> (1)			
Liver cancer	<i>Coleus</i> spp (12), <i>Ocimum gratissimum</i> (14), <i>Geniosporum rotundifolium</i> (13), <i>Ocimum</i> sp. (11), <i>Eremomastax speciosa</i> (12), <i>Dichrocephala integrifolia</i> (10), <i>Aframomum</i> spp (6), <i>Entada abyssinica</i> (7), <i>Setaria barbata</i> (6), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia</i> sp. (2), <i>Bidens pilosa</i> (3), <i>Sesbania</i> spp (1), <i>Lannea kerstingii</i> (1), <i>Aegeratum conyzoides</i> (1), <i>Cleome</i> sp. (1), <i>Chromolaena odorata</i> (1), <i>Aspilia africana</i> (1), <i>Aloe vera</i> (1), <i>Acanthus montanus</i> (1)	108	18.15	0.81
<b>Stomach cancer</b>	<i>Coleus</i> spp (13), <i>Ocimum gratissimum</i> (15), <i>Geniosporum rotundifolium</i> (12), <i>Ocimum</i> sp. (12), <i>Eremomastax speciosa</i> (13), <i>Dichrocephala integrifolia</i> (11), <i>Aframomum</i> spp (7), <i>Entada abyssinica</i> (7), <i>Setaria barbata</i> (6), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia</i> sp.(2), <i>Bidens pilosa</i> (3), <i>Sesbania</i> sp. (1), <i>Lannea kerstingii</i> (1), <i>Ageratum conyzoides</i> (1), <i>Cleome</i> sp. (1), <i>Chromolaena odorata</i> (1), <i>Aspilia africana</i> (1), <i>Aloe vera</i> (1), <i>Acanthus montanus</i> (1)	113	18.99	0.82
232	<i>Numbers in parenthesis indicate the number of citation of that plant by traditional healers against a</i>			
233	<i>particular ailment category, ICF: Informant Consensus Factor</i>			
234	<b>Table 3: informant consensus factor (ICF) value of cancer category for anticancer plants in</b>			
235	<b>Boyo division, Cameroon (end)</b>			
Use category	Plant species	Number of use citation	% of all citations	ICF value
Pancreas cancer	<i>Coleus</i> sp. (12), <i>Ocimum gratissimum</i> (14), <i>Geniosporum rotundifolium</i> (12), <i>Ocimum</i> sp. (11), <i>Eremomastax speciosa</i> (12), <i>Dichrocephala integrifolia</i> (10), <i>Aframomum</i> sp. (6), <i>Entada abyssinica</i> (7), <i>Setaria barbata</i> (5), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia</i> sp. (2), <i>Bidens pilosa</i> (3), <i>Sesbania</i> sp. (1), <i>Lannea kerstingii</i> (1), <i>Aegeratum conyzoides</i> (1), <i>Cleome</i> sp. (1), <i>Chromolaena odorata</i> (1), <i>Aspilia africana</i> (1), <i>Aloe vera</i> (1), <i>Acanthus montanus</i> (1)	106	17.81	0.81
Lung cancer	<i>Coleus</i> sp. (1), <i>Eremomastax speciosa</i> (1), <i>Dichrocephala integrifolia</i> (1), <i>Entada abyssinica</i> (1), <i>Albizia</i> sp. (2), <i>Lannea kerstingii</i> (1)	7	1.18	0.16
Brain cancer	<i>Coleus</i> sp. (4), <i>Ocimum gratissimum</i> (3), <i>Geniosporum rotundifolium</i> (2), <i>Ocimum</i> sp.(3), <i>Eremomastax speciosa</i> (4), <i>Dichrocephala integrifolia</i> (2), <i>Aframomum</i> sp. (1), <i>Albizia</i> sp. (1), <i>Bidens pilosa</i> (1), <i>Aspilia africana</i> (1), <i>Acanthus</i>	23	3.86	0.54

*montanus* (1)

236 Numbers in parenthesis indicate the number of citations of that plant species by traditional healers  
237 against a particular ailment category, ICF: Informant Consensus Factor

238

239 Eight medicinal plants scored highest FL values: These were *Coleus* spp, *Ocimum*  
240 *gratissimum*, *Eremomastax speciosa*, and *Dichrocephala integrifolia* ranked first with the  
241 highest score of FL value (100% each); followed by *Geniosporum rotundifolium* and *Ocimum*  
242 sp. (92% each) ranked second, *Aframomum* sp. and *Entada abyssinica* ranked third with FL  
243 value (91.67% each) (**Table 4**).

244

245

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247

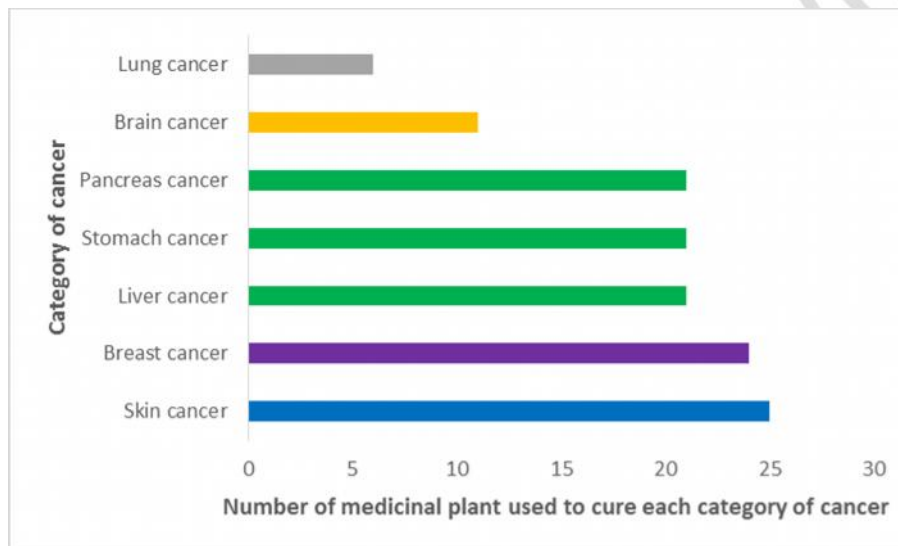
248 **Table 4: Fidelity level (FL) values for common medicinal plants used against some cancer**  
249 **categories in Boyo division by local traditional healers**

Plant species	Disease category	Ip	Iu	FL%
<i>Coleus</i> sp.	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung cancer & brain cancer	29	29	100
<i>Ocimum gratissimum</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer & brain cancer	28	28	100
<i>Geniosporum rotundifolium</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer & brain cancer	23	25	92
<i>Ocimum</i> sp.	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer & brain cancer	23	22	92
<i>Eremomastax speciosa</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung cancer & brain cancer	19	19	100
<i>Dichrocephala integrifolia</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung	19	19	100

	cancer & brain cancer			
<i>Aframomum</i> sp.	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung cancer & brain cancer	11	12	91.67
<i>Entada abyssinica</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer & lung cancer	11	12	91.67

250

251 Moreover, the highest number of plant species (more than 20 species) were cited for the treatment of  
 252 five out of the seven cancer categories recorded, namely skin cancer, liver cancer, stomach cancer,  
 253 pancreas cancer and breast cancer (**Figure 2**)



254

255 **Figure 2: Distribution of medicinal plants recorded for each cancer category in Boyo Division,**  
 256 **Northwest region Cameroon**

257

### 258 **Threats and vulnerability assessment of medicinal plants used as anticancer in the** 259 **study area**

260 Most of the plant species were collected in the wild (76%), while 24% were cultivated. Some of  
 261 these wild medicinal plants are considered as threatened due to expansion of agriculture and  
 262 overgrazing.

263

264

265  
266**Table 4: Fidelity level for common anticancer medicinal plants used by local traditional healers in Boyo division**

Plant species	Disease category	Ip	Iu	FL%
<i>Coleus</i> sp.	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung cancer & brain cancer	29	29	100
<i>Ocimum gratissimum</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer & brain cancer	28	28	100
<i>Geniosporum rotundifolium</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer & brain cancer	23	25	92
<i>Ocimum</i> sp.	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer & brain cancer	23	22	92
<i>Eremomastax speciosa</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung cancer & brain cancer	19	19	100
<i>Dichrocephala integrifolia</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung cancer & brain cancer	19	19	100
<i>Aframomum</i> sp.	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung cancer & brain cancer	11	12	91.67
<i>Entada abyssinica</i>	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer & lung cancer	11	12	91.67

267 *I<sub>p</sub>*: number of informants who independently indicated the use of the species for the same  
 268 major ailment; *I<sub>u</sub>*: the total number of informants who mentioned the plant for any major  
 269 ailment

270 Furthermore, according to reports of informants and field observation, two of the anticancer  
 271 plants, *E. abyssinica* and *G. rotundifolium* are becoming rare in the nearby areas and as a  
 272 result traditional healers needed to travel longer distances to harvest them. The assessment of  
 273 the vulnerability to harvest indicated that out of the eight common medicinal plants used in  
 274 the treatment of cancer, six were found vulnerable with vulnerability index (*V<sub>i</sub>*) varying from  
 275 2 (*D. integrifolia* and *Aframomum* sp.) to 2.42 (*E. speciosa* and *Ocimum* sp.). Two of them,

276 namely *G. rotundifolium* and *E. abyssica* were assessed as highly vulnerable with Vi value of  
 277 2.71 and 2.82 respectively (**Table 5**).

278 **Table 5. Vulnerability indices for common anticancer medicinal plants used by traditional**  
 279 **healers in Boyo Division, Cameroon**

Parameters	LF	HCS	Pop	Oh	Dst	GM	PhF	Total	Vi
Species									
<i>Coleus sp</i>	1	2	3	1	2	3	3	15	2,14
<i>Ocimum gratissimum</i>	1	2	3	1	2	3	3	15	2,14
<i>Geniosporum rotundifolium</i>	2	2	3	3	3	3	3	19	2,71
<i>Ocimum sp.</i>	1	2	3	3	2	3	3	17	2,42
<i>Eremomastax speciosa</i>	1	2	3	3	2	3	3	17	2,42
<i>Dichrocephala integrifolia</i>	1	1	3	1	2	3	3	14	2
<i>Aframomum sp</i>	1	2	2	1	2	3	3	14	2
<i>Entada abyssinica</i>	3	3	2	3	3	3	3	20	2,85

280 LF: Life Form; HCS: Habitat and conservation status; Pop: popularity; Oh: organs harvested; Dst:  
 281 development stage at harvesting; GM: gathering method; PhF: Pharmaceutical form, Vi: Vulnerability  
 282 Index.

283

## 284 Discussion

285 Indigenous people of different localities have their own specific knowledge on plant use,  
 286 management and conservation [44]. Various anticancer plant species have been assessed for their  
 287 efficacy and tolerability. Some of these plant species including *Taxus baccata*, *Podophyllum peltatum*,  
 288 *Camptotheca acuminata* and *Vinca rosea*, *Curcuma zedoaria*, *Typhonium flagelliforme*, *Phaleria*  
 289 *macrocarpa*, *Catharanthus roseus*, *Selaginella corymbosa*, *Taraxacum mongolicum*, *Brucca javanica*,  
 290 *Allium sativum*, *Smilax china*, *Helianthus annus*, *Solanum nigrum*, *Coix lachryma-Jobi*, *Asparagus*  
 291 *cochinchinensis*, and others are used to manufacture anticancer drugs.

292 The fact that all informants claimed they had acquired their knowledge from their family  
 293 members secretly and sometime by dream, is in agreement with those of Eyssartier et al. (2008) in  
 294 Northwestern Patagonia, [45] in Western Region of Ghana, [23] in Bamboutos Division West

295 Cameroon. It was pointed out that in China, traditional medicinal knowledge and practices are passed  
296 orally from generation to generation [46]. This pattern of knowledge transfer and the tendency of  
297 secrecy are also reported in similar studies elsewhere [47, 48, 49]. The high illiteracy level (83.33%)  
298 may explain why knowledge of medicinal properties and uses of plants are still oral and yet not written  
299 down [45].

300 Some of the anticancer plants reported during the current study were found to be also used in  
301 other countries for the treatment of cancer ailments. These included *Aloe vera* [6], *Entada abyssinica*,  
302 *Ocimum gratissimum*, *Prunus africana*, *Albizia gummifera* [50]. Some of the listed species in this work  
303 have also been earlier reported in the same study area to be useful in curing of other ailments [18].  
304 Furthermore, *Coleus* sp., *Ocimum gratissimum*, *Geniosporum rotundifolium*, *Ocimum* sp.,  
305 *Eremomastax speciosa*, *Dichrocephala integrifolia*, *Aframomum* sp., *Entada abyssinica* and *Setaria*  
306 *barbata* were the most frequently cited plants in the study area and thus, may indicate their  
307 effectiveness. Some genus or plant species listed in this work have also been clinically verified and  
308 were found to be quite effective. This is the case for *Entada abyssinica*, *Ocimum gratissimum*, *Prunus*  
309 *africana*, *Albizia gummifera*, *Vernonia lapiosus* and *Aloe volkensii* [50]. In addition, phytochemical  
310 analysis of these plant extracts did by [51], revealed the presence of alkaloids, anthraquinones,  
311 xanthines, valepotriates, cardioactive glycosides, flavonoids, essential oils, coumarins, lignans,  
312 saponins and arbutin compounds. These bioactive compounds are known to possess important  
313 pharmacological actions [50]. For instance, Phenolic compounds such as flavonoids have been  
314 previously shown to have anti-apoptosis, anti-aging, anti-carcinogenic, anti-inflammatory, anti-  
315 atherosclerotic, and cardiovascular protective activities [51]. Flavonoids in plants comprise a vast array  
316 of biologically active compounds which have been used in traditional medicine for many years and  
317 have majorly antioxidant and antiproliferative effects especially against chronic inflammatory and  
318 allergic diseases, breast cancer and coronary artery disease [52]. [53] has reported evidence of  
319 flavonoids having antimutagenic activity of quercetin that was shown to inhibit the mutagenic activity of  
320 benzo( $\alpha$ )pyrene, a polyaromatic hydrocarbon carcinogen. Besides they have shown effectiveness as  
321 antioxidants and strong anticancer activities [54]. Thus, the use of our plant species for the treatment  
322 of various cancer categories in the study area might be due to their richness in bioactive constituents.  
323 From this study, it is shown that more than three plant species are used in the treatment of each  
324 cancer category for example skin cancer is treat by 25 plant species and breast cancer by 24 plant

325 species. Multiple plant species used to treat ailments have been confirmed by [15, 22, 23] in  
326 Cameroon and [55] in Thailand. The utilization of medicinal plant species belonging to Asteraceae,  
327 Lamiaceae, Fabaceae and Acanthaceae families was in line with ethnomedicinal flora reported from  
328 other parts of Cameroon [15, 17, 22, 23] and in other areas of the world [44, 56]. This may be due to  
329 the wide distribution of plant belonging to Asteraceae, Lamiaceae, Fabaceae and Acanthaceae  
330 families and their traditional uses known by the indigenous communities living in different parts of the  
331 world. Moreover, the wide utilization of species from these families might be relate to the presence of  
332 effective bioactive secondary metabolites that work against reproductive health-related infections [57,  
333 58, 59, 60, 61]. For example, studies have reported that the Asteraceae family is rich in  
334 monoterpenes, sesquiterpenes, sesquiterpene lac-tones, diterpenes, triterpenes, polyacetylenes,  
335 benzofuranes, and phenyl-propanes that help to treat various diseases [62]. Most medicinal plants  
336 used in the area were herbs. This finding is in line with results from other studies in Cameroon [15, 17,  
337 20, 23]. This could be relate to the fact that herbs are usually more readily available than shrubs and  
338 trees that are often harvested from forest patches always distant from residential areas. It could also  
339 be due to the fact that our informants live in shrubby savannas and grass-lands where herbs abound  
340 [17]. Our observation agrees with the general pattern of dominance of herbaceous species seen in  
341 most medicinal plant inventories in Cameroon [18, 20], and in other African countries like Ethiopia [63,  
342 64] and Uganda [59]. Moreover, the frequent use of herbs by traditional healers may be due to their  
343 accessibility and high efficacy in the treatment of cancer compared to other life forms [65, 66, 67]. Leaf  
344 was the most commonly used plant part in the area, the harvest of which does not normally causes  
345 significant harm to survival of individuals as compared to other parts such as the stem, bark and root.  
346 This could be explained by the fact that leaves are sites where more phytochemicals are produced via  
347 photosynthesis [68, 69]. This finding is in agreement with those of certain others [15, 17, 18].  
348 Furthermore, plants were reported to be used in various forms such as dry and fresh; however,  
349 preference was given to those that were freshly collected. This could be an indication that medicinal  
350 activities of plants are readily available when the plants are freshly collected as some of their  
351 metabolites may be volatile and could be lost through evapotranspiration. This corroborates the  
352 findings of [22, 23, 69, 70] who reported that fresh plant material was used to prepare remedies as  
353 mixtures of multiple ingredients from different plants. The number of plants in mixture ranged from four  
354 to ten. The informants in the study area perceived that use of multiple plants in preparation of

355 traditional drugs adds up the curing potential and confer synergetic actions. On the other hand, the  
356 use of multiple plants to cure an ailment could be an indication of the prevalence and severity of that  
357 illness in the locality. This finding is in affinity with the study of [71]. Anticancer drugs in the study area  
358 were prepared in form of decoction and concoction, which is in concordance with results of a study  
359 conducted by [23, 72]. Oral and topical were the only administration route. Oral route was also  
360 reported in many studies in Cameroon [17, 22, 23] and elsewhere [71, 72, 73] and may reflect the low  
361 toxicity of the plant extract for human being. Informants used additive such as honey in order to  
362 improve taste and flavor and therefore facilitate oral administration [23]. The use of water, palm wine,  
363 palm oil and castor oil as solvent may be due to their ability to better extract active compounds present  
364 in the plant than other solvents.

365 It was observed in this study that informants assigned local names to all the medicinal plants  
366 species used in the cancer treatment, indicating the existence of a very close interaction between the  
367 traditional healers and their plant resources. According to [74, 75], the importance of plants in local  
368 culture is usually shown by the proportion of plants that can be identified by local people and in  
369 vernacular names. Furthermore, species such as *Coleus* sp., *Ocimum gratissimum*, *Eremomastax*  
370 *speciosa*, *Dichrocephala integrifolia*, *Geniosporum rotundifolium*, *Ocimum* spp, *Aframomum* spp and  
371 *Entada abyssinica* in the present work scored the highest FL and could be therefore subjected to  
372 phytochemical and pharmacological investigation to prove their efficacy [76]. Moreover, the ICF results  
373 proved that breast, skin, liver, pancreas and stomach cancers had higher informant consensus factor  
374 values, indicating that traditional healers share the knowledge of the most important medicinal plants  
375 species used to treat cancer ailments. Nevertheless, most medicinal plants claimed by traditional  
376 healers for cancer treatment have least relative frequency citations, which could not necessary mean  
377 that they are less effective in the treatment. This could be because the knowledge on medicinal plants  
378 is still very secret [77].

379 The majority of medicinal plants used to treat cancer diseases in the study area was harvested  
380 from the wild. Similar results were obtained by [59] in Uganda, Yineger *et al.* [78] in Ethiopia and [23]  
381 in Cameroon. Moreover, the vulnerability assessment revealed that the most frequently used plant  
382 species were becoming vulnerable in these wild habitats. This could be explained either by the  
383 exploitation pressure on these species, or by the fragility of the savannah grassland extensively

384 converted to cropping and grazing lands. In order to ensure availability of these species for future  
385 generations and improve their use and pharmaceutical valorization, alternative sources of supply  
386 should be developed in more closely human-managed systems such as homegardens and food crop  
387 farms. Informants have expressed their willingness to participate in the domestication process of these  
388 species and some of them had started planting multiple used species such as *Ocimum* spp. These  
389 initiatives need to be strengthened through capacity building for medicinal gardens creation and  
390 management as well as nursery techniques.

391

## 392 **Conclusion**

393 The present study documented 25 medicinal plants species and their uses, of which many had  
394 already been reported to contain active ingredient against symptoms of various categories of cancer.  
395 Furthermore, reported plant species can serve as a basis for formal analysis of active constituents and  
396 validation of results. However, the threat reported for some of these species need to be urgently  
397 addressed to ensure their long term availability.

398

## 399 **List of abbreviations**

400 Dst: development stage at harvesting; ICF: Informant Consensus Factor; **FL**: Fidelity level; FC:  
401 frequency of citation; GM: gathering method; HCs: Habitat and conservation status; LF: Life Form; Oh:  
402 organs harvested; Pop: popularity; PhF: Pharmaceutical form; RFCs: Relative Frequency of Citations;  
403 Vi: Vulnerability index.

## 404 **Declarations**

405 **Ethics approval and consent to participate:** interviews with traditional healers were done following  
406 mutual contentment as they were participating in the domestication programme led by the World  
407 Agroforestry Centre (ICRAF)

408 **Consent for publication:** Not applicable

409 **Availability of data and materials**

410 All data are available from CHS. Herbarim voucher specimen are deposited in the Department of  
411 Forestry of the Faculty of Agronomy and Agricultural Sciences, University of Dschang.

412

413 **Competing Interests:** the authors declare that they have no competing interests.

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