

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

3 **Abstract**

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

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

13 **Results:** A total of 25 medicinal plants cited were identified as belonging to 13 families and 23 genera.  
14 The most represented families were Asteraceae (28%), Lamiaceae (16%), Fabaceae (12%) and  
15 Acanthaceae (8%). Out of the seven categories of cancer diseases reported, the highest number of  
16 plants species were reported to treat stomach, pancreas, liver, skin and breast cancers, with informant  
17 consensus factor (ICF) ranging from 0.79 to 0.82. Leaves (60%) and bark (20%) were the major plant  
18 parts used mostly in form of decoction (45.45%) and concoction (38.18%). The result of Relative  
19 frequency citations (RFCs) revealed that 9 of the 25 plants species cited were the most frequently  
20 used with fidelity levels ranging from 92% (*Geniosporum rotundifolium* and *Ocimum tenuiflorum*  
21 *Aframomum melegueta* and *Entada abyssinica*) to 100% (*Coleus blumei*, *Ocimum gratissimum*,  
22 *Eremomastax speciosa*, and *Dichrocephala integrifolia*). Six species were assessed as vulnerable ( $V_i$   
23  $\geq 2$ ), while two species were rated as highly vulnerable namely *G. rotundifolium* ( $V_i = 2.71$ ) and *E.*  
24 *abyssinica* ( $V_i = 2.85$ ).

25 **Conclusion:** New traditionally effective anticancer plants were identified in the present study, some of  
26 which were already vulnerable for exploitation in their actual habitat. Plants with high ICF, RFCs and  
27 FL values should be subjected to further phytochemical and pharmacological investigations for

28 scientific validation while those with high Vulnerability index should be recommended for participatory  
29 domestication by the main users.

30 **Keywords:** anticancer medicinal plants, ethnobotany, human cancer categories, medicinal uses,  
31 vulnerability assessment.

## 32 Introduction

33 According to the World Health Organization, cancer was the second leading causes of death  
34 globally responsible for an estimated 9.6 million of death in 2018, 70% of which occurring in low and  
35 middle-income countries [1]. There are over 200 different types of cancer but four cancers: lung  
36 cancer, breast cancer, prostate cancer and large bowel cancer account for more than half of all cases  
37 [2]. Of the 12.4 million new cancer cases in 2008, the most common cancers in terms of incidence  
38 were lung (1.52 million), breast (1.29 million) and colorectal (1.15 million) [3]. The International Agency  
39 for Research on Cancer estimates of the incidence of mortality and prevalence from major types of  
40 cancer, at national level, for 184 countries of the world revealed that there were 14.1 million new  
41 cancer cases, 8.2 million cancer deaths, and 32.6 million people living with cancer (within 5 years of  
42 diagnosis) in 2012 worldwide [4]. By 2030, it is projected that there will be 26 million new cancer cases  
43 and 17 million cancer deaths per year [5]. The types of cancer vary around the world and there is  
44 significant variation in the risk of different cancers by geographic area. Most of this global variation is  
45 due to exposure to known or suspected risk factors related to lifestyle or environment and provides a  
46 clear challenge to prevention [5]. In developed countries, many cancer cases are attributable to an  
47 unhealthy diet and inactive lifestyle such as smoking and obesity. Although a third of all cancer deaths  
48 are linked to cigarette smoking, obesity is associated with colon, breast, uterine, oesophageal and  
49 kidney cancer [3, 6]. However, some cancers are caused by biological carcinogens such as infections  
50 by viruses (hepatitis B/C and liver cancer and human *Papillomavirus* (HPV) and cervical cancer),  
51 bacteria (*Helicobacter pylori* and gastric cancer) and parasites (*Schistosomiasis* and bladder cancer). A  
52 large number of chemopreventive agents are used to cure various cancers, but they produce side  
53 effects that prevent their extensive usage. Although more than 1500 anticancer drugs are in active  
54 development with over 500 of the drugs under clinical trials, there is an urgent need to develop much  
55 effective and less toxic drugs, for which the plant kingdom could play an important role [7]. In recent  
56 years, the use of traditional medicine information on plant research has received considerable interest.

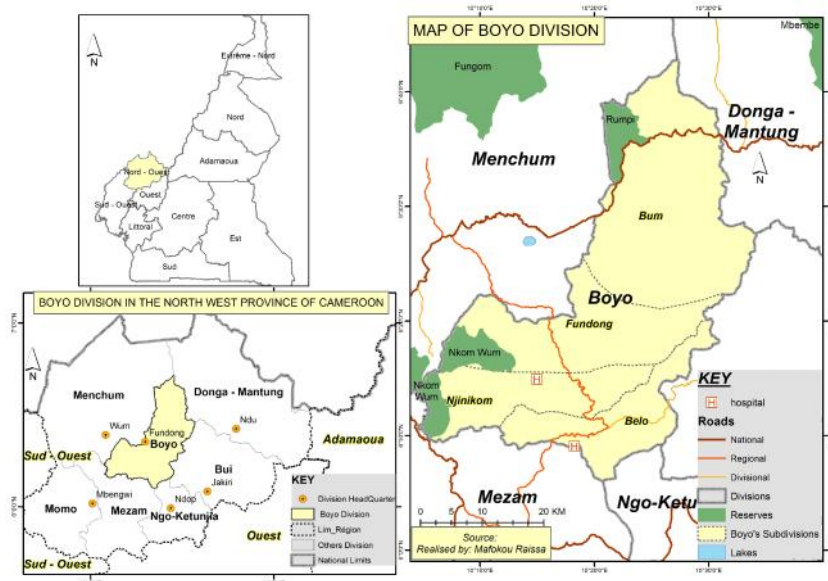
57 According to the world Health Organization (WHO) in 2008, about three quarters of the world's  
58 population currently use herbs and other forms of traditional medicines to treat diseases [8, 9]. It has  
59 been reported that 60% of the commercially available anticancer drugs are from natural sources[9].  
60 Treatment by herbal medicines may have some advantages over treatment by single purified  
61 chemicals [10]; as herbal medicine are a cocktail of metabolites with therapeutic or preventive  
62 properties, and so might be more active than single products alone. Moreover, plant products for  
63 cancer treatment could be available, affordable, and relatively cheap with little or no side effects [11,  
64 12, 13, 14]. In spite of pharmacological progress, urban and rural populations of Cameroon still  
65 depend on medicinal plants for their primary health and many plants species had already been  
66 reported for the treatment of various ailments including cancer [15, 16]. The country is known to be  
67 rich for its plant diversity, culture, language and tradition which contribute to the multiplicity of  
68 practices. However, these practices remain poorly documented and less accessible for modern  
69 research. Hence, the search for alternative anticancer drugs of plant origin in the country requires a  
70 basic ethnobotanical survey in different localities to document diverse knowledge owned by different  
71 ethnic groups. Only few workers [17, 18], have conducted ethnobotanical survey in some parts of  
72 North-West Cameroon. Therefore, very limited ethnobotanical literature is available in the region.  
73 Although various ethnobotanical surveys have been conducted in different parts of Cameroon [15, 19,  
74 20, 21, 22, 23], scientific documentation on plant used to treat human cancer is scarce at the country  
75 level. The overuse of plants' organs such as barks, roots, leaves and fruits for medicinal purpose are  
76 known to differently affect the species sustainability depending on a set of factors among which are  
77 the species morphotype, the part of plant being used, the pharmaceutical form being administered, the  
78 harvest frequency and intensity, the characteristics of the species' habitat among others [24, 25, 26,  
79 27]. These factors have been compiled to elaborate a vulnerability index currently applied to raise  
80 awareness on species sustainability to harvest [24, 28]. Therefore, present survey aimed to provide,  
81 the first inventory and sustainability of medicinal plants used by traditional healers and the associated  
82 indigenous knowledge for the treatment of cancer affliction in the western highland of Cameroon.

### 83 **Materials and Methods**

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

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

96



97

98 **Figure 1: Map showing the Boyo Division in the North-West region of Republic of Cameroon**

### 99 **Ethnobotanical survey and data collection**

100 The primary goal of this survey was to collect ethnobotanical information about medicinal  
 101 herbs for cancer treatment. The informants were selected among traditional healers members of the  
 102 Mixed Farmer common Initiative groups (MIFACIGs), a community based organization collaborating  
 103 with the World Agroforestry Centre (ICRAF) in the framework of the project on participatory

104 domestication of indigenous fruit trees and medicinal plants in the African Humid Tropics region.  
105 Therefore, their willingness to participate to the study was very high. The data were collected between  
106 the months of May to September 2006 Traditional healers were chosen because they are likely to  
107 encounter a wide range of cancer patients. Indeed a total of 30 traditional healers were chosen using  
108 snowball sampling method [32]. Individual ethnobotanical semi-structured interviewing techniques  
109 were used for data collection [33, 34]. The questionnaire were constructed in English. However, for  
110 ease in communicating with the traditional healers during interviews, *Piging-english* was used. Among  
111 the questions asked during the interviews were age, sex, years of experience. Data were also focused  
112 on the uses of each cited medicinal plant which incorporated local names, cancer type treated, parts  
113 used, preparation methods, administration route, dosage, habits and habitats, and the medicinal plant  
114 conservation practices. Guided field walks were conducted with interviewed traditional healers to  
115 collect medicinal plant voucher specimens. Further identification and authentication was done by a  
116 taxonomist in the Cameroon National Herbarium Yaoundé. Voucher specimens were prepared,  
117 labeled and deposited in the Herbarium of Forestry Department, University of Dschang Cameroon.

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

- 127 -  $1 < V_i \leq 2$ , meaning that the plant is not vulnerable and the natural potential is still quite  
128 appropriate for exploitation.
- 129 -  $2 < V_i \leq 2.5$  indicates that the plant is becoming vulnerable in the given environment.
- 130 -  $V_i \geq 2.5$  shows that the plant is highly vulnerable and need sustainable management  
131 strategies.

132 **Data analysis**

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

145 **Table 1: Parameters used for the assessment of the vulnerability index (Vi) of the common**  
 146 **anticancer plant's 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	Fruits and 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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148 The informant consensus factor (ICF) was calculated to determine the agreements of the informants  
 149 on each remedy using the formula:  $ICF = Nur - nt / Nur - 1$ , where number of use citations in each  
 150 category (**Nur**) minus the number of species used (**nt**), divided by the number of use citations in each  
 151 category minus one, where **Nur** is the number of use citations and **nt** is the number of species used  
 152 [40]. IFC values range between 0 and 1, "1" indicates the highest level of consensus. Thus, high IFC  
 153 can be used to identify important plant species for search of novel bioactive compounds [41].

## 154 Results

### 155 Informant's characteristics

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

### 164 Plants reported as anticancer and Relative Frequency citation

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

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183 Table 2: 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 melegueta</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 gummifera</i> <b>Fabaceae</b>	Fwoom	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

185 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>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 viscosa</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 blumei</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

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

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188 **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>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

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

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192 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>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 tenuiflorum</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

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

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197 **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>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 grandiflora</i> <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

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

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206 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>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 amygdalina</i> <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 agnus-castus</i> <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

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

## 208 Preparation, dosage and mode of treatment

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

## 215 Informant's consensus factor for each cancer category and fidelity value of recorded medicinal 216 plants

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

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

Use category	Plant species	Number of use citation	% of all citations	ICF value
Breast cancer	<i>Coleus blumei</i> (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 melegueta</i> (7), <i>Entada abyssinica</i> (7), <i>Setaria barbata</i> (3), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia gummifera</i> . (2), <i>Bidens pilosa</i> (3), <i>Vernonia calvoana</i> (2), <i>Sesbania grandiflora</i> (1), <i>Lannea kerstingii</i> (2), <i>Vitex</i> sp. (1), <i>Prunus africana</i> (1), <i>Aegeratum conyzoides</i> (1), <i>Cleome viscosa</i> . (1), <i>Chromoleana odorata</i> (1), <i>Aspilia africana</i> (1), <i>Aloe vera</i> (1), <i>Vernonia amygdalina</i> (1)	111	18.65	0.79
Skin cancer	<i>Coleus blumea</i> . (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 melegueta</i> (7), <i>Entada abyssinica</i> (8), <i>Setaria barbata</i> (5), <i>Solanum</i>	127	21.34	0.81

	<i>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 africana</i> (1), <i>Aegeratum conyzoides</i> (1), <i>Cleome viscosa</i> (1), <i>Chromoleana odorata</i> (1), <i>Aspilia africana</i> (1), <i>Aloe vera</i> (1), <i>Vernonia amygdalina</i> (1), <i>Acanthus montanus</i> (1)			
Liver cancer	<i>Coleus blumea</i> (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 melegueta</i> (6), <i>Entada abyssinica</i> (7), <i>Setaria barbata</i> (6), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia gummifera</i> . (2), <i>Bidens pilosa</i> (3), <i>Sesbania</i> spp (1), <i>Lannea kerstingii</i> (1), <i>Aegeratum conyzoides</i> (1), <i>Cleome viscosa</i> . (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
Gastrointestinal cancer	<i>Coleus blumea</i> (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 melegueta</i> (7), <i>Entada abyssinica</i> (7), <i>Setaria barbata</i> (6), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia gummifera</i> .(2), <i>Bidens pilosa</i> (3), <i>Sesbania</i> sp. (1), <i>Lannea kerstingii</i> (1), <i>Ageratum conyzoides</i> (1), <i>Cleome viscosa</i> . (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

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

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

Use category	Plant species	Number of use citation	% of all citations	ICF value
Pancreas cancer	<i>Coleus blumea</i> . (12), <i>Ocimum gratissimum</i> (14), <i>Geniosporum rotundifolium</i> (12), <i>Ocimum tenuiflorum</i> (11), <i>Eremomastax speciosa</i> (12), <i>Dichrocephala integrifolia</i> (10), <i>Aframomum melegueta</i> (6), <i>Entada abyssinica</i> (7), <i>Setaria barbata</i> (5), <i>Solanum aculeastrum</i> (2), <i>Kigelia africana</i> (2), <i>Albizia gummifera</i> (2), <i>Bidens pilosa</i> (3), <i>Sesbania</i> sp. (1), <i>Lannea kerstingii</i> (1), <i>Aegeratum conyzoides</i> (1), <i>Cleome viscosa</i> . (1), <i>Chromoleana 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 blumei</i> . (1), <i>Eremomastax speciosa</i> (1), <i>Dichrocephala integrifolia</i> (1), <i>Entada abyssinica</i> (1), <i>Albizia gummifera</i> . (2), <i>Lannea kerstingii</i> (1)	7	1.18	0.16
Brain cancer	<i>Coleus blumei</i> (4), <i>Ocimum gratissimum</i> (3), <i>Geniosporum rotundifolium</i> (2), <i>Ocimum sp.</i> (3), <i>Eremomastax speciosa</i> (4), <i>Dichrocephala integrifolia</i> (2), <i>Aframomum melegueta</i> . (1), <i>Albizia gummifera</i> . (1), <i>Bidens pilosa</i> (1), <i>Aspilia africana</i> (1), <i>Acanthus montanus</i> (1)	23	3.86	0.54

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

230

231 Eight medicinal plants scored highest FL values: These were *Coleus* spp, *Ocimum gratissimum*,  
232 *Eremomastax speciosa*, and *Dichrocephala integrifolia* ranked first with the highest score of FL value  
233 (100% each); followed by *Geniosporum rotundifolium* and *Ocimum sp.* (92% each) ranked second,  
234 *Aframomum melegueta* and *Entada abyssinica* ranked third with FL value (91.67% each) (**Table 4**).

235

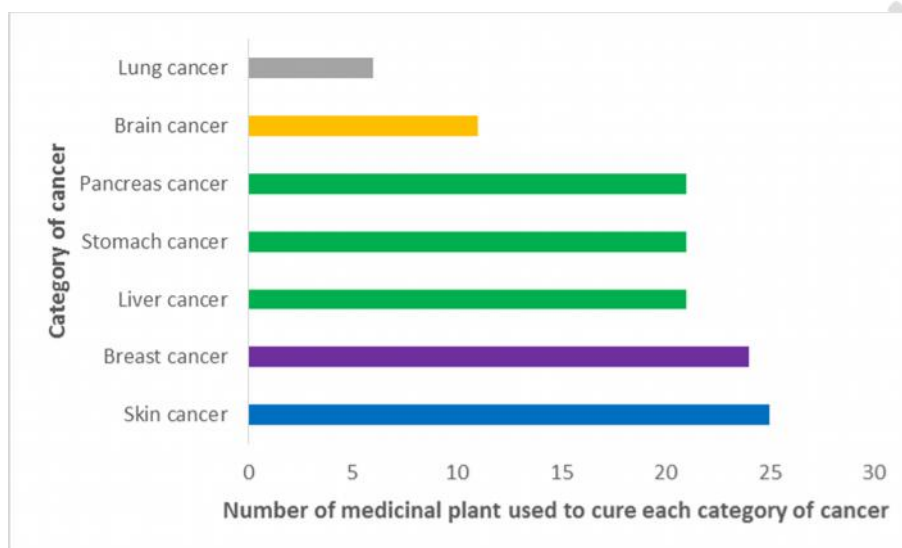
236 **Table 4: Fidelity level (FL) values for common medicinal plants used against some cancer**  
237 **categories in Boyo division by local traditional healers**

Plant species	Disease category	Ip	Iu	FL%
<i>Coleus blumei</i> .	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 tenuiflorum</i>	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 melegueta</i> .	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung	11	12	91.67

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

238

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



242

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

245

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

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

250

251

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

Plant species	Disease category	Ip	Iu	FL%
<i>Coleus blumei</i> .	Breast cancer, skin cancer, liver cancer, stomach cancer, pancreas cancer, lung	29	29	100

	cancer & brain cancer			
<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 tenuiflorum</i>	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 melegueta.</i>	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

254  $I_p$ : number of informants who independently indicated the use of the species for the same major  
255 ailment;  $I_u$ : the total number of informants who mentioned the plant for any major ailment

256 Furthermore, according to reports of informants and field observation, two of the anticancer plants, *E.*  
257 *abyssinica* and *G. rotundifolium* are becoming rare in the nearby areas and as a result traditional  
258 healers needed to travel longer distances to harvest them. The assessment of the vulnerability to  
259 harvest indicated that out of the eight common medicinal plants used in the treatment of cancer, six  
260 were found vulnerable with vulnerability index ( $V_i$ ) varying from 2 (*D. integrifolia* and *Aframomum*  
261 *melegueta.*) to 2.42 (*E. speciosa* and *Ocimum gratissimum*). Two of them, namely *G. rotundifolium*  
262 and *E. abyssinica* were assessed as highly vulnerable with  $V_i$  value of 2.71 and 2.82 respectively  
263 (Table 5).

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

Parameters	LF	HCs	Pop	Oh	Dst	GM	PhF	Total	$V_i$
<b>Species</b>									
<i>Coleus blumei</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 tenuiflorum</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 melegueta</i>	1	2	2	1	2	3	3	14	2
<i>Entada abyssinica</i>	3	3	2	3	3	3	3	20	2,85

266 LF: Life Form; HCs: Habitat and conservation status; Pop: popularity; Oh: organs harvested; Dst:  
 267 development stage at harvesting; GM: gathering method; PhF: Pharmaceutical form, Vi: Vulnerability  
 268 Index.

269

## 270 Discussion

271 Indigenous people of different localities have their own specific knowledge on plant use,  
 272 management and conservation [44]. Various anticancer plant species have been assessed for their  
 273 efficacy and tolerability. Some of these plant species including *Taxus baccata*, *Podophyllum peltatum*,  
 274 *Camptotheca acuminata* and *Vinca rosea*, *Curcuma zedoaria*, *Typhonium flagelliforme*, *Phaleria*  
 275 *macrocarpa*, *Catharanthus roseus*, *Selaginella corymbosa*, *Taraxacum mongolicum*, *Brucca javanica*,  
 276 *Allium sativum*, *Smilax china*, *Helianthus annuus*, *Solanum nigrum*, *Coix lachryma-Jobi*, *Asparagus*  
 277 *cochinchinensis*, and others are used to manufacture anticancer drugs. [9;45].

278 The fact that all informants claimed they had acquired their knowledge from their family  
 279 members secretly and sometime by dream, is in agreement with those of Eyssartier et al. (2008) in  
 280 Northwestern Patagonia, [46] in Western Region of Ghana, [23] in Bamboutos Division West  
 281 Cameroon. It was pointed out that in China, traditional medicinal knowledge and practices are passed  
 282 orally from generation to generation [47]. This pattern of knowledge transfer and the tendency of  
 283 secrecy are also reported in similar studies elsewhere [48, 49, 50]. The high illiteracy level (83.33%)  
 284 may explain why knowledge of medicinal properties and uses of plants are still oral and yet not written  
 285 down [47].

286 Some of the anticancer plants reported during the current study were found to be also used in  
 287 other countries for the treatment of cancer ailments. These included *Aloe vera* [6], *Entada abyssinica*,  
 288 *Ocimum gratissimum*, *Prunus africana*, *Albizia gummifera* [51]. Some of the listed species in this work

289 have also been earlier reported in the same study area to be useful in curing of other ailments [18].  
290 Furthermore, *Coleus blumei*, *Ocimum gratissimum*, *Geniosporum rotundifolium*, *Ocimum tenuiflorum*,  
291 *Eremomastax speciosa*, *Dichrocephala integrifolia*, *Aframomum melegueta*, *Entada abyssinica* and  
292 *Setaria barbata* were the most frequently cited plants in the study area and thus, may indicate their  
293 effectiveness. Some genus or plant species listed in this work have also been clinically verified and  
294 were found to be quite effective. This is the case for *Entada abyssinica*, *Ocimum gratissimum*, *Prunus*  
295 *africana*, *Albizia gummifera*, *Vernonia lapiosus* and *Aloe volkensii* [51]. In addition, phytochemical  
296 analysis of these plant extracts did by [52], revealed the presence of alkaloids, anthraquinones,  
297 xanthines, valepotriates, cardioactive glycosides, flavonoids, essential oils, coumarins, lignans,  
298 saponins and arbutin compounds. These bioactive compounds are known to possess important  
299 pharmacological actions [51]. For instance, Phenolic compounds such as flavonoids have been  
300 previously shown to have anti-apoptosis, anti-aging, anti-carcinogenic, anti-inflammatory, anti-  
301 atherosclerotic, and cardiovascular protective activities [52]. Flavonoids in plants comprise a vast array  
302 of biologically active compounds which have been used in traditional medicine for many years and  
303 have majorly antioxidant and antiproliferative effects especially against chronic inflammatory and  
304 allergic diseases, breast cancer and coronary artery disease [53]. [54] has reported evidence of  
305 flavonoids having antimutagenic activity of quercetin that was shown to inhibit the mutagenic activity of  
306 benzo( $\alpha$ )pyrene, a polyaromatic hydrocarbon carcinogen. Besides they have shown effectiveness as  
307 antioxidants and strong anticancer activities [55]. Thus, the use of our plant species for the treatment  
308 of various cancer categories in the study area might be due to their richness in bioactive constituents.  
309 From this study, it is shown that more than three plant species are used in the treatment of each  
310 cancer category for example skin cancer is treat by 25 plant species and breast cancer by 24 plant  
311 species. Multiple plant species used to treat ailments have been confirmed by [15, 22, 23] in  
312 Cameroon and [56] in Thailand. The utilization of medicinal plant species belonging to Asteraceae,  
313 Lamiaceae, Fabaceae and Acanthaceae families was in line with ethnomedicinal flora reported from  
314 other parts of Cameroon [15, 17, 22, 23] and in other areas of the world [44, 57]. This may be due to  
315 the wide distribution of plant belonging to Asteraceae, Lamiaceae, Fabaceae and Acanthaceae  
316 families and their traditional uses known by the indigenous communities living in different parts of the  
317 world. Moreover, the wide utilization of species from these families might be related to the presence of  
318 effective bioactive secondary metabolites that work against reproductive health-related infections [58,

319 59, 60, 61, 62]. For example, studies have reported that the Asteraceae family is rich in  
320 monoterpenes, sesquiterpenes, sesquiterpene lac-tones, diterpenes, triterpenes, polyacetylenes,  
321 benzofuranes, and phenyl-propanes that help to treat various diseases [63]. Most medicinal plants  
322 used in the area were herbs. This finding is in line with results from other studies in Cameroon [15, 17,  
323 20, 23]. This could be relate to the fact that herbs are usually more readily available than shrubs and  
324 trees that are often harvested from forest patches always distant from residential areas. It could also  
325 be due to the fact that our informants live in shrubby savannas and grass-lands where herbs abound  
326 [17]. Our observation agrees with the general pattern of dominance of herbaceous species seen in  
327 most medicinal plant inventories in Cameroon [18, 20], and in other African countries like Ethiopia [64,  
328 65] and Uganda [60]. Moreover, the frequent use of herbs by traditional healers may be due to their  
329 accessibility and high efficacy in the treatment of cancer compared to other life forms [66, 67, 68]. Leaf  
330 was the most commonly used plant part in the area, the harvest of which does not normally causes  
331 significant harm to survival of individuals as compared to other parts such as the stem, bark and root.  
332 This could be explained by the fact that leaves are sites where more phytochemicals are produced via  
333 photosynthesis [69, 70]. This finding is in agreement with those of certain others [15, 17, 18].  
334 Furthermore, plants were reported to be used in various forms such as dry and fresh; however,  
335 preference was given to those that were freshly collected. This could be an indication that medicinal  
336 activities of plants are readily available when the plants are freshly collected as some of their  
337 metabolites may be volatile and could be lost through evapotranspiration. This corroborates the  
338 findings of [22, 23, 69, 71] who reported that fresh plant material was used to prepare remedies as  
339 mixtures of multiple ingredients from different plants. The number of plants in mixture ranged from four  
340 to ten. The informants in the study area perceived that use of multiple plants in preparation of  
341 traditional drugs adds up the curing potential and confer synergetic actions. On the other hand, the  
342 use of multiple plants to cure an ailment could be an indication of the prevalence and severity of that  
343 illness in the locality. This finding is in affinity with the study of [72]. Anticancer drugs in the study area  
344 were prepared in form of decoction and concoction, which is in concordance with results of a study  
345 conducted by [23, 73]. Oral and topical were the only administration route. Oral route was also  
346 reported in many studies in Cameroon [17, 22, 23] and elsewhere [72, 73, 74] and may reflect the low  
347 toxicity of the plant extract for human being. Informants used additive such as honey in order to  
348 improve taste and flavor and therefore facilitate oral administration [23]. The use of water, palm wine,

349 palm oil and castor oil as solvent may be due to their ability to better extract active compounds present  
350 in the plant than other solvents.

351 It was observed in this study that informants assigned local names to all the medicinal plants  
352 species used in the cancer treatment, indicating the existence of a very close interaction between the  
353 traditional healers and their plant resources. According to [75, 76], the importance of plants in local  
354 culture is usually shown by the proportion of plants that can be identified by local people and in  
355 vernacular names. Furthermore, species such as *Coleus blumei*, *Ocimum gratissimum*, *Eremomastax*  
356 *speciosa*, *Dichrocephala integrifolia*, *Geniosporum rotundifolium*, *Ocimum tenuiflorum*, *Aframomum*  
357 *melegueta* and *Entada abyssinica* in the present work scored the highest FL and could be therefore  
358 subjected to phytochemical and pharmacological investigation to prove their efficacy [77]. Moreover,  
359 the ICF results proved that breast, skin, liver, pancreas and stomach cancers had higher informant  
360 consensus factor values, indicating that traditional healers share the knowledge of the most important  
361 medicinal plants species used to treat cancer ailments. Nevertheless, most medicinal plants claimed  
362 by traditional healers for cancer treatment have least relative frequency citations, which could not  
363 necessary mean that they are less effective in the treatment. This could be because the knowledge on  
364 medicinal plants is still very secret [78].

365 The majority of medicinal plants used to treat cancer diseases in the study area was harvested  
366 from the wild. Similar results were obtained by [59] in Uganda, Yineger *et al.* [79] in Ethiopia and [23]  
367 in Cameroon. Moreover, the vulnerability assessment revealed that the most frequently used plant  
368 species were becoming vulnerable in these wild habitats. This could be explained either by the  
369 exploitation pressure on these species, or by the fragility of the savannah grassland extensively  
370 converted to cropping and grazing lands. In order to ensure availability of these species for future  
371 generations and improve their use and pharmaceutical valorization, alternative sources of supply  
372 should be developed in more closely human-managed systems such as homegardens and food crop  
373 farms. Informants have expressed their willingness to participate in the domestication process of these  
374 species and some of them had started planting multiple used species such as *Ocimum tenuiflorum*  
375 These initiatives need to be strengthened through capacity building for medicinal gardens creation and  
376 management as well as nursery techniques.

377

## 378 **Conclusion**

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

384

## 385 **List of abbreviations**

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

## 390 **Declarations**

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

394 **Consent for publication:** Not applicable

## 395 **Availability of data and materials**

396 All data are available from CHS. Herbarium voucher specimens are deposited in the Department of  
397 Forestry of the Faculty of Agronomy and Agricultural Sciences, University of Dschang.

398

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

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