

RESEARCH ARTICLE

Medicinal Plants Used by the Indigenous People of the Philippines: A Systematic Review of Ethnobotanical Surveys and Bioactive compounds

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ABSTRACT

Cancer is one of the leading public health concerns worldwide. In the Philippines, 189 out of 100,000 Filipinos are adversely affected by cancer, with a mortality of 96 Filipinos every day. Influenced by their cultural beliefs, practices, and socio-demographic factors, Filipinos, especially the indigenous peoples, tend to lean more towards alternative and complementary medicine when treating illnesses and diseases such as cancer. Efforts have been made to record plants utilized by these people. However, there is still no existing comprehensive review of anticancer medicinal plants used by the Philippines' indigenous peoples, thus the motivation for this research. This study also aims to record reported compounds responsible for the identified plants' anticancer activity in the light of bioprospecting. Various published and unpublished ethnobotanical studies from three databases and university repositories were screened and subjected to a set of defined inclusion and exclusion criteria. This resulted in a corpus of 227 articles, which was narrowed down to 58 after the intervention, from which 152 anticancer plants were identified. Amongst these, medicinal plants that lack research to prove anticancer efficacy were determined, thus meriting further studies. The study also recorded the alarming percentage of medicinal plants that are yet evaluated per conservation status, urging appraisal amidst the threat of climate crisis. Interestingly, novel compounds for cancer therapeutics have been isolated from some of the plants identified, reiterating the importance of indigenous knowledge in pharmaceutical bioprospecting. The current study allows the description of a large number of anticancer medicinal plants used by the indigenous people of the Philippines with discussions of their anticancer compounds and activity.

KEYWORDS:

cancer; philippiness
lifestyle; criteria

ARTICLE HISTORY:

Received April 16, 2021
Accepted May 17, 2021
Published June 20, 2021

DOI:

10.5455/jcmr.2021.12.02.15

VOLUME: 12

ISSUE: 2

ISSN: 2146-8397

INTRODUCTION

Cancer is a genetic disease caused by DNA damage due to specific environmental exposures or errors that occur as cells divide 1. These errors and damage are attributed to an individual's genetic factors and physical, chemical, and biological external agents 2. Cancer can be localized and categorized depending on the body parts affected. The most common types of cancer are the lung and bronchus, prostate, colon and rectum, pancreas, liver, breast, skin, and stomach

2,3. In 2018, 9.6 million deaths were caused by the disease, making it one of the leading public health concerns worldwide 2. In the Philippines, cancer is also a significant public health concern. The country has recorded the highest incidence of breast cancer in Asia, with 11 new cancer cases every day 4. Furthermore, 189 of every 100,000 Filipinos are adversely affected by cancer, with a mortality of 96 Filipinos every day 5. Categorized as a developing country, people from the Philippines often have low access to expensive therapeutic regimens compared to other countries 6. Thus, people often

resort to alternative medicine for prevention and medication of a broad category of diseases.

Medicinal plant species, a significant source of natural products, are used as alternative medicines to deter infectious diseases and various disorders such as cancers and tumors 7. These plant species are widely used in the Philippines, especially by poor communities in rural areas 8,9. The use of medicinal plants for therapeutics is also heavily influenced by cultural beliefs and practices evident in various ethnomedicinal studies conducted in different parts of the country 8-11. With one hundred and ten (110) ethnolinguistic groups 12, the Philippines offers a rich and diversified culture and tradition. Unfortunately, due to the swift pace of modernization, both socially and economically, indigenous knowledge (e.g., language, folk medicine) is disappearing at an astonishing rate 13, affecting the passage of indigenous knowledge from one generation to another. Thus, laws (e.g., IPRA 1997), research, and community efforts have been made to preserve indigenous knowledge, such as the continuous documentation of ethnobotanical knowledge in different areas 14-19, development of databases, and compilation of medicinal plants in the Philippines 20,21. However, there is no existing comprehensive list of anticancer medicinal plants used by the Philippines' indigenous people, thus the motivation for this study. This study also aims to record reported compounds responsible for the identified plants' anticancer activity in the light of pharmaceutical bioprospecting.

MATERIALS AND METHODS

Search Methods

Data Collection. Information about medicinal plants used in the Philippines for cancer therapeutics was obtained from published ethnobotanical and ethnopharmacological studies, in which the place of use or collection was conducted in the Philippines. In addition, theses from the repository of the Department of Biological Sciences of Mindanao State University-Iligan Institute of Technology were also screened for data collection. The data collection started from August 2018 until March 2019, giving the researchers ample time to collect all the necessary data.

Types of Studies. Inclusion criteria include published literature from three (3) known electronic databases: ScienceDirect 22, Google Scholar 23, and PubMed 24. In addition, literature from the Department of Biological Sciences (DBS) of Mindanao State University-Iligan Institute of Technology (MSU-IIT) was also included.

Types of Participants. Inclusion criteria include published literature that corresponds to the following different search query terms; Philippine medicinal plants for cancer, Philippine traditional medicinal plants for cancer, Philippine herbal plants for cancer, treatment of cancer with Philippine medicinal plants, treatment of cancer with Philippine medicinal herbs, Philippine medicinal herbs for cancer. Exclusion criteria include duplicated researches and other off-topic researches.

Types of Outcome Measurements. The polished corpus only includes one copy of each cancer- and Philippine-related article.

Data Coding and Verification

Compiled data from each study was encoded in Excel spreadsheets and was grouped accordingly depending on the category. Different graphical representations, i.e., tables, pie charts, were used to visualize and compare data. Scientific names, plant families, genera, and synonyms of plant species were confirmed using Co's Digital Flora of the Philippines 20 and The Plant List 25. The habit of growth of the identified medicinal plants was confirmed using Flora Fauna Web 26 and Useful Tropical Plants 27.

RESULTS

The extraction of articles from the databases and other resources resulted in the corpus of 227 shown in Table I. The articles were then subjected to the inclusion and exclusion criteria, resulting in the removal of duplicated research and irrelevant or off-topic articles. After the intervention, the corpus was narrowed down to 58 articles.

The final data corpus resulted in the compilation of 152 anticancer plants in the Philippines. Most of them belong to the flowering plant group or angiosperms and are distributed into 70 Families, as shown in Table II. Among the families enumerated, Leguminosae (13 species) has the most medicinal plant species, followed by Compositae (9 species) and Zingiberaceae (9 species). Moreover, Figure 1 shows that most of the identified medicinal plants are trees (36.8%), followed by herbs (33.6%), Shrubs (19.1%), Vines (7.2%), and epiphyte (2%).

Ethnobotanical research dominated the final data corpus. Table III summarizes the ethnomedicinal plants for cancer; the plant part used, method of preparation, application mode, and the indigenous group that utilizes these plants. This data identified the most frequently used medicinal plants for cancer utilized by the Philippines' indigenous people (Figure 2). It is important to note that articles where tribes are not specified and did not mention the mode of preparation or application of the anticancer medicinal plants, were excluded in Table III but are reflected, however, in the overall compilation shown in Table IV.

Since variation on anticancer medicinal plants' usage has been observed within the same group and across the identified groups of indigenous people from Table III, a seriation analysis was done to compare and contrast the plant species utilized, as shown in Figure 3. Moreover, to provide the scientific basis for the claims that the identified plants have anticancer properties, the literature was searched again to record reported compounds of the identified folk plants. The results are summarized in Table IV with the plant's conservation status.

DISCUSSIONS

From the data corpus of two hundred twenty-seven articles (227) that responded to the query term search on Google Scholar, PubMed, and ScienceDirect and the manual search for related literature in the repository of the Department of Biological Sciences of MSU-IIT, the final data corpus was narrowed down to fifty-eight (58) articles, which were dominated mainly by ethnobotanical investigations. Interestingly, anticancer medicinal plants vary across and within the same tribes. From the seriation analysis shown in Figure 4, it can be observed that particular plants are unique to a specific tribe, e.i., *Hydrocotyle vulgaris*. This plant is used mainly by the Ilongot-Egongot Community of Bayanihan of Aurora 28. The particular use of this medicinal plant by this tribe might be attributed to their conservativeness and resistance to external cultural pressures 28. Thus, allowing their own culture to flourish, including their unique use of folk medicines and traditional practices. Aside from identifying the anticancer plants unique to a particular group, the frequently used anticancer medicinal plants are also visible in the seriation analysis. On the trend, it can be observed that most of the plant species used by the Iliganon are also utilized by the Maranao of Iligan and Higaonon of Rogongon. The similarity observed might be due to the groups' geographical setting, since these three groups will most likely interact as they live alongside each other. Nevertheless, the variations observed in the seriation analysis are greatly affected by factors such as beliefs and practices, geographical settings, and plant species availability 9.

There are 152 anticancer medicinal plants identified in this study, shown in Table IV. The table provided an apparent scientific basis for indigenous peoples' claims and a comprehensive compilation of other primary studies indicating that the majority of these plants have anticancer potential. These data identified research gaps that need to be addressed, such as the lack of studies of some identified medicinal plants, i.e., *Osmoxylon luzoniense*, *Marsdenia tinctorial*, *Jacquemontia paniculata*, *Trema amboinensis*, *Shorea almon*, *Tetracera akara*, *Psoralea arborea*, *Pyrrosia adnascens*, *Mazus pumilus*, *Embelia philippinensis*, *Terminalia copelandii*, and *Phragmites vulgaris*. Further investigations and laboratory analyses of these plants should be done to identify their anticancer potential. The results also showed that the leaves decoction of *Annona muricata*, a plant utilized by the Subanen tribe of Sindangan of Zamboanga del Norte, has no significant anticancer effects 29. However, according to the same study, the plant's ethanolic extract has selective cytotoxicity in vitro against tumor cell lines. Another study conducted by 30 successfully extracted the compound indicine-N-oxide from the plant *Heliotropium indicum*. This compound showed anticancer activity; however, extreme side effects also manifested. Thus, it is not recommended for internal consumption. These findings are essential for a more profound understanding of the nature of the plant's anticancer activity, which should be further investigated and communicated to the tribes utilizing these plants.

In the treatment of cancer, some compounds are tagged as novel compounds. These novel compounds have manifested anticancer activity and play a significant role in cancer treatment. A few plant species in Table IV were identified to have some of these novel anticancer compounds. These include *Persea americana*, which is commonly known as the Alligator Pear. This plant is utilized by the Subanen tribe of Sindangan, Zamboanga del Norte, Iliganon of Iligan City, Maranao of Iligan City, and the Higaonon tribe of Rogongon. *P. americana* was reported to contain alkene lactone, a novel anticancer compound, which showed a stimulatory effect on non-tumorigenic MCF-12A cells with respect to cell adhesion while tumorigenic MCF-7 cells detached continuously 31. On the other hand, Cajanol, also a novel anticancer agent, was isolated from *Cajanus cajan* 32. It has shown anticancer activity by the growth inhibition of MCF-7 cells in a dose-dependent manner, cycle arrest at the G2/M phase, and apoptotic cell death 32. On the contrary, Some medicinal plants used by the indigenous people were found to have no anticancer effects. Water and methanolic extract of *Tinospora crispa*, locally known as Makabuhay have shown no significant cytotoxicity to three cancer cells, namely, HL-6-, HepG2, and MCF-7 33. This information should be further investigated to consolidate the report.

As humanity faces different biological struggles, the need to conserve medicinally essential plant species is crucial. Thus, the Philippines' anticancer medicinal plants' conservation status is also shown in the last section of Table IV. It can be observed that most of the identified plants have yet to be evaluated by both the IUCN and the Philippine Government through the Department of Environment and Natural Resources (DENR). These are some of the problems that need to be addressed immediately. The lack of information in this area might lead to the abusive or uncontrolled collection of plant species, which might decrease their number and threaten their existence.

CONCLUSIONS

In light of the fact that cancer morbidity and mortality have been increasing in poor and developing countries like the Philippines, the present study was directed towards compiling the country's indigenous people's anticancer medicinal plants while bioprospecting for a novel source of anticancer compounds and identifying potential research areas. Furthermore, since western therapeutics for cancer are very expensive, discoveries of active compounds from medicinal plants might generate more effective, affordable, and readily available drugs for these indigenous people, who are most at risk of the disease.

ACKNOWLEDGMENT

The authors would like to acknowledge the Department of Biological Sciences for providing some of the literature included in this study. Acknowledgment is also given to the Premier Institute of Science and Mathematics (PRISM) of MSU-Iligan Institute of Technology and the Department of Science

and Technology (DOST) for the assistance and funding provided in the conduct of the study.

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Table 1. Data collection process.

Corpus	Google Scholar	PUBMED	ScienceDirect	Department of Biological Sciences, MSU-IIT	TOTAL
Article Extracted	128	53	23	23	227
Included to the corpus	45	7	2	4	58

Table 2: Families of the identified plants used for cancer therapeutics.

FAMILY	NO. OF SPECIES	FAMILY	NO. OF SPECIES
Annonaceae	3	Lamiaceae	5
Acanthaceae	1	Lauraceae	2
Amaryllidaceae	1	Lycopodiaceae	1
Araceae	1	Lythraceae	1
Apocynaceae	6	Lecythidaceae	1
Amaranthaceae	2	Malvaceae	4
Araliaceae	3	Meliaceae	4
Arecaceae	3	Moraceae	6
Apiaceae	2	Molluginaceae	1
Anacardiaceae	2	Myrtaceae	2
Basellaceae	1	Muntingiaceae	1
Burseraceae	1	Moringaceae	1
Betulaceae	1	Menispermaceae	2
Bignoniaceae	1	Musaceae	1
Boaraginaceae	1	Myristicaceae	1
Compositae	9	Oxalidaceae	2
Combretaceae	2	Polypodiaceae	3
Cucurbitaceae	4	Plantaginaceae	1
Costaceae	1	Phyllanthaceae	3
Chloranthaceae	1	Papaveraceae	1
Cannaceae	1	Phrymaceae	1
Cannabaceae	2	Piperacea	2
Convolvulaceae	2	Poaceae	3
Cyperaceae	2	Pittosporaceae	1
Caricaceae	1	Primulaceae	1
Clusiaceae	2	Rhizophoraceae	1
Casuarinaceae	1	Rutaceae	1
Crassulaceae	1	Rubiaceae	1
Commelinaceae	1	Selaginellaceae	1
Dipterocarpaceae	2	Solanaceae	3
Dilleniaceae	1	Sapindaceae	1
Dichapetalaceae	1	Urticaceae	1
Euphorbiaceae	4	Vitaceae	1
Ericaceae	1	Xanthorrhoeaceae	1
Leguminosae	13	Zingiberaceae	9

Table 3: Preparation and mode of application of anticancer medicinal plants from various ethnic groups in the Philippines.

Species	Plants part used	PREPARATION AND MODE OF APPLICATION	Ethnic group
<i>Annona muricata</i> L.	a	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
<i>Catharanthus roseus</i> L.	d	Drink decoction	Iliganon of Iligan City 35
	d	Drink infusion	Maranao of Iligan City 17
<i>Hydrocotyle vulgaris</i> L.	a	Eaten raw	Ilongot-Egongot Community of Bayanihan, Aurora 28
<i>Andrographis paniculata</i> (Burm. f.) Wall. ex Nees	a	Drink decoction	Locals of San Jose, Dinagat Island 36
	a	Drink decoction	Iliganon of Iligan City 35
	a	Drink decoction	Maranao of Iligan City 17
<i>Colocasia esculenta</i> L.	a, c	Drink decoction	Higaonon of Claveria, Misamis Oriental 37
	a, c	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	a, c	Drink decoction	Iliganon of Iligan City 35
<i>Friesodielsia latifolia</i> (Hook.f. & Thomson) Steenis	c	Drink decoction	Subanen of Lapuyan, Zamboanga del Sur 11
<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe	b	Drink decoction	Locals of Tagmamarkay, Agusan del Norte 38
<i>Basella rubra</i> L. (syn: <i>Basella alba</i> L.)	a	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	a	Drink decoction	Iliganon of Iligan City 35
	a	Drink decoction	Maranao of Iligan City 17
	a	Drink decoction	Higaonon of Rogongon 16
<i>Canna indica</i> L.	a, c	Apply directly, maceration, poultice decoction, poultice	Maranao of Bubong, Lanao del Sur 39
	a, c	Apply directly, maceration, poultice, drink decoction,	T'boli of South Cotabato 40
<i>Carica papaya</i> L.	f	Eaten raw	Maranao of Bubong, Lanao del Sur 39
	f	Eaten raw	Iliganon of Iligan City 23
<i>Terminalia catappa</i> L.	a, b, c	Leaves mixed with oil are rubbed onto body parts. Drink decoction of bark and roots	Subanen of Sindangan, Zamboanga del Norte 34
<i>Rhoeo discolor</i> (L'Hér.) Hance (syn: <i>Tradescantia spathacea</i> Sw.)	a	Drink decoction	Maranao of Bubong, Lanao del Sur 39
	a	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
	a	Drink decoction	Locals of San Jose, Dinagat Island 36
	a	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	a	Drink decoction	Iliganon of Iligan City 35
	a	Drink decoction	Maranao of Iligan City 17
	a	Drink decoction	Higaonon of Rogongon 16
	a	Drink decoction	Maranao of kapai, Lanao del Sur 42
	d	Drink infusion	T'boli of South Cotabato 40
	d	Drink infusion	Higaonon of Rogongon 16
	d	Drink infusion	Iliganon of Iligan City 35
	d	Drink infusion	Maranao of Iligan City 17
<i>Tridax procumbens</i> L.	a	Drink decoction and infusion	Mamanwa of Malimono, Surigao del Norte 41
	a	Drink decoction and infusion	Locals of San Jose, Dinagat Island 36
	a	Drink decoction and infusion	Iliganon of Iligan City 35
<i>Jacquemontia paniculata</i> (Burm. F.) Hallier f.	b	Drink decoction	Higaonon of Esperanza, Agusan del Sur 43

<i>Calophyllum blancoi</i> Planch. & Triana	b	Moistened a piece of cloth with the sap of the bark and applied to the affected area	Locals of San Jose, Dinagat Island 36
	b	Moistened a piece of cloth with the sap of the bark and applied to the affected area	Iliganon of Iligan City 35
<i>Bryophyllum pinnatum</i> Lam. Oken	a	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
	a	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
<i>Cucumis sativus</i> L.	a, f	Eaten steamed or raw. Drink Decoction	Maranao of Bubong, Lanao del Sur 39
	a, f	Eaten steamed or raw. Drink Decoction	Iliganon of Iligan City 35
<i>Momordica chinensis</i> L. (syn.: <i>Momordica charantia</i> L.)	f	Eaten raw	Locals of San Jose, Dinagat Island 36
	f	Eaten raw	T'boli of South Cotabato 40
	f	Eaten raw	Higaonon of Claveria, Misamis Oriental 37
	f	Eaten raw	Iliganon of Iligan City 35
	f	Eaten raw	Maranao of Iligan City 17
<i>Cyperus rotundus</i> L.	e	Wash and sun-dry dried materials are boiled to concentration (Decoction)	Subanen of Sindangan, Zamboanga del Norte 34
	e	Wash and sun-dry dried materials are boiled to concentration (Decoction)	Iliganon of Iligan City 35
	e	Wash and sun-dry dried materials are boiled to concentration (Decoction)	Maranao of Iligan City 17
<i>Ricinus communis</i> L.	b	Apply directly	Iliganon of Iligan City 35
<i>Plectranthus amboinicus</i> (Lour.) Spreng.	a	Heat at least 20 leaves with fire and drink the extract.	Iliganon of Iligan City 35
	a	Heat at least 20 leaves with fire and drink the extract.	Maranao of Iligan City 17
<i>Vitex negundo</i> L.	a	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
<i>Persea americana</i> Mill.	a	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	a	Drink decoction	Iliganon of Iligan City 35
	a	Drink decoction	Maranao of Iligan City 17
	a	Drink decoction	Higaonon of Rogongon 16
<i>Barringtonia racemosa</i> (L.) Spreng.	a	Drink decoction	Iliganon of Iligan City 35
<i>Caesalpinia sappan</i> L.	a	Drink decoction	Maranao of Bubong, Lanao del Sur 39
<i>Cajanus cajan</i> (L.) Millsp.	a, c	Drink decoction or infusion of leaves. Roots and leaves are washed and then chewed.	Higaonon of Sitio Man-ibay, Misamis Oriental 44
<i>Erythrina variegata</i> L.	b, c	Scrape the roots, partly roast them and then apply to the affected part	Maranao of Bubong, Lanao del Sur 39
	b, c	Scrape the roots and stem, partly roast them and then apply to the affected part	Subanen of Sindangan, Zamboanga del Norte 34
	b, c	Scrape the roots and stem, partly roast them and then apply to the affected part	Higaonon of Rogongon 16
<i>Sesbania grandiflora</i> (L.) Pers.	a, b, c, g	Flowers are eaten raw or steamed. Drink Decoction of roots and bark	Maranao of Bubong, Lanao del Sur 39
	a, b, c, g	Flowers are eaten raw or steamed. Drink Decoction of roots and bark	Iliganon of Iligan City 35
	a, b, c, g	Flowers are eaten raw or steamed. Drink Decoction of roots and bark	Maranao of Iligan City 17
<i>Abelmoschus esculentus</i> (L.) Moench	f	Drink infusion	Maranao of Bubong, Lanao del Sur 39
	f	Drink infusion	Mamanwa of Malimono, Surigao del Norte 41

	f	Drink infusion	Locals of San Jose, Dinagat Island 36
	f	Drink infusion	T'boli of South Cotabato 40
	f	Drink infusion	Higaonon of Claveria, Misamis oriental 37
	f	Drink infusion	Subanen of Sindangan, Zamboanga del Norte 34
	f	Drink infusion	Iliganon of Iligan City 35
	f	Drink infusion	Maranao of Iligan City 17
	f	Drink infusion	Higaonon of Rogongon 16
<i>Theobroma cacao</i> L.	f	Scrape the peeling of the fruit and apply around the boils or wound as poultice	Maranao of Bubong, Lanao del Sur 39
	f	Scrape the peeling of the fruit and apply around the boils or wound as poultice	Locals of San Jose, Dinagat Island 36
	f	Scrape the peeling of the fruit and apply around the boils or wound as poultice	T'boli of South Cotabato 40
<i>Swietenia macrophylla</i> King	b	Drink decoction	Iliganon of Iligan City 35
<i>Swietenia mahogani</i> L.	f	Drink decoction	Locals of San Jose, Dinagat Islands 36
<i>Lansium parasiticum</i> (Osbeck) K.C.Sahni & Bennet	a, b	Drink decoction	Maranao of Bubong, Lanao del Sur 39
<i>Melia azedarach</i> L.	a	Pound the leaves, extract the juice, mix with little kerosene and apply to the affected area.	Maranao of Bubong, Lanao del Sur 39
	a	Pound the leaves, extract the juice, mix with little kerosene and apply to the affected area.	Subanen of Sindangan, Zamboanga del Norte 34
	a	Pound the leaves, extract the juice, mix with little kerosene and apply to the affected area.	Iliganon of Iligan City 35
	a	Pound the leaves, extract the juice, mix with little kerosene and apply to the affected area.	Maranao of Iligan City 17
<i>Artocarpus heterophyllus</i> Lam.	a	Drink decoction	Maranao of Bubong, Lanao del Sur 39
	a	Drink decoction	Locals of San Jose, Dinagat Island 36
	a	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	a	Drink decoction	Iliganon of Iligan City 35
	a	Drink decoction	Maranao of Iligan City 17
<i>Ficus septica</i> Burm.f.	a, b	Drink decoction	Maranao of Bubong, Lanao del Sur 39
	a, b	Drink decoction	Locals of San Jose, Dinagat Island 36
	a, b	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	a, b	Drink decoction	Iliganon of Iligan City 35
	a, b	Drink decoction	Maranao of Iligan 17
	a, b	Drink decoction	Higaonon of Rogongon 16
<i>Moringa oleifera</i> Lam.	a, c, f	Drink decoction of roots. Pound the leaves and rub it to the affected area	Locals of San Jose, Dinagat 36
	a, c, f	Drink decoction of roots. Pound the leaves and rub it to the affected area	Subanen of Sindangan, Zamboanga del Norte 34
	a, c, f	Drink decoction of roots. Pound the leaves and rub it to the affected area	Iliganon of Iligan City 35
	a, c, f	Drink decoction of roots. Pound the leaves and rub it to the affected area	Maranao of Iligan 17
<i>Mollugo pentaphylla</i> L.	d	Drink decoction	Maranao of Bubong, Lanao del Norte 39
	d	Drink decoction	Locals of San Jose, Dinagat 36
	d	Drink decoction	Higaonon of Claveria 37

	d	Drink decoction	Higaanon of Sitio Man-ibay 44
	d	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	d	Drink decoction	Iliganon of Iligan City 35
	d	Drink decoction	Maranao of Iligan 17
	d	Drink decoction	Higaanon of Rogongon 16
<i>Syzygium malaccense</i> (L.) Merr. & L.M.Perry	a	Drink decoction	Maranao of Bubong, Lanao del Sur 39
	a	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
	a	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
	a	Drink decoction	Locals of San Jose, Dinagat Island 36
	a	Drink decoction	T'boli of South Cotabato 40
	a	Drink decoction	Higaanon of Sitio Man-ibay 44
	a	Drink decoction	Higaanon of Claveria 37
	a	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	a	Drink decoction	Iliganon of Iligan City 35
	a	Drink decoction	Maranao of Iligan 17
	a	Drink decoction	Higaanon of Rogongon 16
<i>Muntingia calabura</i> L.	a, g	Drink decoction	Iliganon of Iligan City 35
	a, g	Drink decoction	Maranao of Iligan 17
	a, g	Drink decoction	Higaanon of Rogongon 16
<i>Artocarpus heterophyllus</i> Lam.	b, c	Drink decoction	Talaandig tribe of Bukidnon 45
<i>Oxalis corniculata</i> L.	d	Drink decoction	Maranao of Bubong, Lanao del Norte 39
	d	Drink decoction	Iliganon of Iligan City 35
<i>Drynaria quercifolia</i> (L.) J. Sm.	e	Drink infusion	Talaandig tribe of Bukidnon 45
<i>Pyrosia adnascens</i> (Sw.) Ching	e	Drink infusion	Talaandig tribe of Bukidnon 45
<i>Microsorium punctatum</i> (L.) (syn: <i>Neochiropteris sarawakense</i> (Baker) Parris)	e	Drink infusion	Talaandig tribe of Bukidnon 45
<i>Piper betle</i> L.	a	Apply the leaves upside down to the breast and back overnight	Maranao of Bubong, Lanao del Sur 39
	a	Apply the leaves upside down to the breast and back overnight	Iliganon of Iligan City 35
	a	Apply the leaves upside down to the breast and back overnight	Maranao of Iligan 17
<i>Peperomia pellucida</i> L.	d	Drink decoction	Maranao of Bubong, Lanao del Sur 39
	d	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
	d	Drink decoction	Locals of San Jose Dinagat 36
	d	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	d	Drink decoction	Iliganon of Iligan City 35
	d	Drink decoction	Maranao of Iligan City 17
<i>Phyllanthus niruri</i> L.	a	Partly roast the leaves and then rub it all over the body (usually mixed with other herbal plants like guava leaves)	Maranao of Bubong, Lanao del Sur 39
	a	Partly roast the leaves and then rub it all over the body (usually mixed with other herbal plants like guava leaves)	Higaanon of Sitio Man-ibay, Misamis Oriental 44
	a	Partly roast the leaves and then rub it all over the body (usually mixed with other herbal plants like guava leaves)	Iliganon of Iligan City 35i
	a	Partly roast the leaves and then	Maranao of Iligan City 17

		rub it all over the body (usually mixed with other herbal plants like guava leaves)	
	a	Partly roast the leaves and then rub it all over the body (usually mixed with other herbal plants like guava leaves)	Higaonon of Rogongon 16
<i>Phyllanthus virgatus</i> G.Forst.	a, f, g	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
	a, f, g	Drink decoction	Maranao of Iligan City 17
<i>Morinda citrifolia</i> L.	a	Apply directly overnight usually mixed with leaves of guava and wild tea	Maranao of Bubong, Lanao del Sur 39
	a	Apply directly overnight usually mixed with leaves of guava and wild tea	Iliganon of Iligan City 39
	a	Apply directly overnight usually mixed with leaves of guava and wild tea	Maranao of Iligan City 17
<i>Solanum americanum</i> Mill. (syn: <i>Solanum nigrum</i> L.)	a	Eat young leaves after boiling	Maranao of Bubong, Lanao del Sur 39
	a	Eat young leaves after boiling	Locals of San Jose, Dinagat Island 36
	a	Eat young leaves after boiling	Higaonon of Claveria, Misamis Oriental 37
	a	Eat young leaves after boiling	Subanen of Sindangan, Zamboanga del Norte 34
	a	Eat young leaves after boiling	Iliganon of Iligan City 35
	a	Eat young leaves after boiling	Maranao of Iligan City 17
<i>Leea indica</i> (Burm. f.) Merr.	a, b, c	Drink decoction	Iliganon of Iligan City 35
<i>Aloe vera</i> (L.) Burm.f.	a	Extract the juice and then apply it to the affected area	Locals of San Jose, Dinagat Island 36
	a	Extract the juice and then apply it to the affected area	Iliganon of Iligan City 35
	a	Extract the juice and then apply it to the affected area	Maranao of Iligan City 17
<i>Curcuma longa</i> L.	e	Drink decoction	Maranao of Bubong, Lanao del Sur 39
	e	Drink decoction	Mamanwa of Malimono, Surigao del Norte 41
	e	Drink decoction	Locals of San Jose, Dinagat Island 36
	e	Drink decoction	T'boli of South Cotabato 40
	e	Drink decoction	Higaonon of Claveria, Misamis Oriental 37
	e	Drink decoction	Subanen of Sindangan, Zamboanga del Norte 34
	e	Drink decoction	Iliganon of Iligan City 35
	e	Drink decoction	Maranao of Iligan City 17
	e	Drink decoction	Higaonon of Rogongon 16
	e	Directly apply poultice to affected area	Maranaos of Pualas, Lanao del Sur 46
<i>Kaempferia galanga</i> L.	e	Directly apply poultice to affected area	Mamanwa of Malimono, Surigao del Norte 41
<i>Zingiber officinale</i> Roscoe	e	Eaten raw/ Pound it then rub to the affected part	Maranao of Bubong, Lanao del Sur 39
	e	Eaten raw/ Pound it then rub to the affected part	Mamanwa of Malimono, Surigao del Norte 41
	e	Eaten raw. Pound it then rub to the affected part	Locals of San Jose, Dinagat 36
	e	Eaten raw. Pound it then rub to the affected part	T'boli of South Cotabato 40
	e	Eaten raw. Pound it then rub to the affected part	Higaonon of Claveria, Misamis oriental 37
	e	Eaten raw. Pound it then rub to the affected part	Higaonon of Sitio Man-ibay 44
	e	Eaten raw. Pound it then rub to	Subanen of Sindangan, Zamboanga del

		the affected part	Norte 34
	e	Eaten raw. Pound it then rub to the affected part	Iliganon of Iligan City 35
	e	Eaten raw. Pound it then rub to the affected part	Maranao of Iligan City 17
	e	Eaten raw. Pound it then rub to the affected part	Higaonon of Rogongon 16
a- leaves; b- bark; c- roots; d- whole plant; e- rhizome; f- fruit; g- flowers			

Table 4: Anticancer plants used by the Indigenous people of the Philippines

SPECIES SCIENTIFIC NAME	FAMILY	ANTICANCER COMPOUNDS	CONSERVATION STATUS
<i>Annona muricata</i> L.	Annonaceae	Acetogenins and annonacin 47,48. The ethanolic leaves extract are found to be selectively cytotoxic in vitro to tumor cell lines, but data also showed that water leaves extract of <i>A. muricata</i> had no anticancer effect 29	Least concern 49
<i>Andrographis paniculata</i> (Burm. f.) Wall. ex Nees	Acanthaceae	Andrographolide 50,51	
<i>Allium sativum</i> L.	Amaryllidaceae	S-allylcysteine and S-allylmercapto-L-cysteine 52	
<i>Annona squamosa</i> L.	Annonaceae	Annonaceous and acetogenin [43], 12, 15-cis-squamostatin-A and bullatacin 53	
<i>Colocasia esculenta</i> L.	Araceae	12, 15-cis-squamostatin-A and bullatacin 54	Least concern 55
<i>Catharanthus roseus</i> L.	Apocynaceae	Catharantamine 56	
<i>Allamanda cathartica</i> L.	Apocynaceae	Phytol, oleic acid, squalene 57,58	
<i>Amaranthus tricolor</i> L.	Amaranthaceae	Galactosyl glycerols 59	
<i>Rauvolfia serpentina</i> L.	Apocynaceae	Reserpine 60	
<i>Hydrocotyle vulgaris</i> L.	Araliaceae	Saponin, flavonoid, steroid, d-Ledol, Alpha- Caryophyllene 61,62	Least concern
<i>Plumeria acuminata</i> W.T.Aiton (syn.: <i>Plumeria rubra</i> L.)	Apocynaceae	Saponins 63	
<i>Fissistigma latifolium</i> (Dunal) Merr.	Annonaceae	4,6-di-methoxy-2,5-quinodihydrochalcone 64	
<i>Alstonia scholaris</i> (L.)	Apocynaceae	Echitamine 65	Least concern 66
<i>Areca catechu</i> L.	Arecaceae	Alkaloid, tannin, flavonoid, catechin and quercetin 67	Least concern 68
<i>Osmoxylon luzoniense</i> (Merr.)	Araliaceae	No study evaluating anticancer compounds and anticancer activity	
<i>Panax ginseng</i> C.A.Mey.	Araliaceae	Ginsenosides 69	
<i>Glehnia littoralis</i> F.Schmidt ex Miq.	Apiaceae	Furano coumarines and polyacetylenic alcohols 70	
<i>Cyathula geniculata</i> Lour. (syn: <i>Cyathula prostrata</i> (L.) Blume)	Amaranthaceae	Showed anticancer potential 71,72 but compounds were not evaluated.	
<i>Marsdenia tinctoria</i> R. Br.	Apocynaceae	No study evaluating anticancer compounds and anticancer activity	
<i>Corypha utan</i> Lam.	Arecaceae	Alkaloids and terpenes 73,74.	Least concern 75
<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe	Anacardiaceae	Anthraquinones, Flavonoids, and n-Hexadecanoic acid 38,76-78	Vulnerable 79
<i>Mangifera indica</i> L.	Anacardiaceae	Saponins, steroids, tannins, alkaloids, and flavonoids 80-83	
<i>Petroselinum crispum</i> (Mill.) Fuss	Apiaceae	Myristicin 84	

Cocos nucifera L.	Arecaceae	Flavonoid and Steroid 83,84	
Basella rubra L. (syn: Basella alba L.)	Basellaceae	Both aqueous methanol and water extracts show high antioxidant & anticancer activity. Shown to have contained betacyanins 85	
Canarium ovatum Engl.	Burseraceae	Kaempferol, flavonoids, triterpenes, Epi- β -amyrin, epi-lupeol, - β -carotene 86-88	Other Threatened 79
Alnus japonica (Thunb.) Steud	Betulaceae	Diarylheptanoids 89	Least Concern 90
Radermachera sinica (Hance) Hemsl.	Bignoniaceae	Lapachol 91,92	
Heliotropium indicum L.	Boaraginaceae	Indicine-N-oxide showed anticancer activity but is said to have severe side 93	
Pluchea odorata (L.)	Compositae	Taxol 30	
Terminalia copelandi Elmer	Combretaceae	Showed anticancer potential but specific compounds are not enumerated 94.	
Momordica chinensis L. (syn.: Momordica charantia L.)	Cucurbitaceae	Kuguacin J and momorcharins 95,96	
Eupatorium triplinerve Vahl (syn: Ayapana triplinervis (Vahl) R.M.King & H.Rob.	Compositae	Tetradecanoic acid 97	
Costus igneus N.E.Br. (syn: Chamaecostus cuspidatus (Nees & Mart.) C.D.Specht & D.W.Stev.)	Costaceae	Terpenes and flavonoid 98,99	
Chloranthus glaber (Thunb.) Makino (syn: Sarcandra glabra (Thunb.) Nakai	Chloranthaceae	Flavonoids and rosmarinic acid 100,101.	
Canna indica L.	Cannaceae	Stigmasterol and 6- β -hydroxy stigmasta-4, 22-diene-3 102.	
Cannabis sativa L.	Cannabaceae	Cannabinoid and rimonabant 103.	
Emilia sonchifolia L.	Compositae	Steroids and terpenes 104	
Tridax procumbens L.	Compositae	Lupeol 105	
Terminalia catappa L.	Combretaceae	Punicalagin 106	
Chrysanthemum sinense Sabine (syn: Chrysanthemum morifolium Ramat.)	Compositae	Luteolin, diosmetin 107	
Ipomoea batatas L.	Convolvulaceae	Anthocyanins 108	
Jacquemontia paniculata (Burm. f.) Hallier f.	Convolvulaceae	No study evaluating anticancer compounds and anticancer activity	
Chromolaena odorata L.	Compositae	Kaempferide 109	
Cyperus kyllingia Endl. (syn: Rhynchospora colorata (L.) H.Pfeiff.)	Cyperaceae	α -cadinol, α -humulene and β -caryophyllene 110	
Carica papaya L.	Caricaceae	Saponins, papain, and isothiocyanate 80,111	
Calophyllum blancoi Planch. & Triana	Clusiaceae	Apetalic acid methyl ester, apetalic acid 5-O-acetate, isopetalic methyl ester, isorecedensolide, and recedesolide 112,113	
Trema amboinensis (Willd.) Blume	Cannabaceae	No study evaluating anticancer compounds and anticancer activity	
Conyza cinerea L. (syn: Cyanthillium cinereum (L.) H.Rob.	Compositae	δ -cadinene, δ -humulene, terpinen-4-ol 114,115	
Cucurbita maxima Duchesne	Cucurbitaceae	Flavonoids 116,117	
Garcinia mangostana L.	Clusiaceae	a-mangostin and B-mangostin, 3-isomangostin, garcinone D, and 9-hydroxycalabaxanthone, and Mangostanol 118,119	
Sechium edule (Jacq.) Sw.	Cucurbitaceae	Cucurbitacin D and flavonoid 120	

Casuarina equisetifolia L.	Casuarinaceae	kaempferol, quercetin taraxerol, lupenone, lupeol, sitosterol, catechin and galocatechin 121-124	
Bryophyllum pinnatum Lam. Oken	Crassulaceae	Bufadienolides, Flavonoids, Bersaldegenin- 1, and 3, 5-orthoacetate 125	
Blumea balsamifera L.	Compositae	Luteolin-7-methyl ether 126	
Tagetes erecta L.	Compositae	Alkaloids, flavonoids, Hexadecanoic acid, methyl ester, and ethyl stearate 127-130	
Rhoeo discolor (L'Hér.) Hance (syn: Tradescantia spathacea Sw.)	Commelinaceae	Steroids, Saponins, Flavonoids, Caryophyllene and phytol 83,131,132.	
Cucumis sativus L.	Cucurbitaceae	Cucurbitacins, lignans, and flavonoids 133	
Cyperus rotundus L.	Cyperaceae	Sterols, terpenoids and phenolics 134	
Shorea contorta S.Vidal	Dipterocarpaceae	Betulone, lutein, B-sitosterol 135-138	Vulnerable in the Philippines 79
Shorea almon Foxw.	Dipterocarpaceae	No study evaluating anticancer compounds and anticancer activity	Vulnerable 79
Tetracera akara Merr.	Dilleniaceae	No study evaluating anticancer compounds and anticancer activity	
Dichapetalum gelonioides (Roxb.) Engl.	Dichapetalaceae	Dichapetalins 139	
Ricinus communis L.	Euphorbiaceae	Terpenoids, Ricin A, B and C, ricinine, and glycoside 140,141	
Croton tiglium L.	Euphorbiaceae	Isoguanosine 142	
Vaccinium myrtoides Miq.	Ericaceae	Flavonoids, phytosterol, tannins 99,143-145	
Euphorbia hirta L.	Euphorbiaceae	kaempferol, quercetin 122,146	
Manihot esculenta Crantz	Euphorbiaceae	Linamarin and B-carotene 147	
Cynometra ramiflora L.	Leguminosae	Tannins and saponins 148-150	Least concern 151
Plectranthus amboinicus (Lour.) Spreng.	Lamiaceae	Tetra decanoic acid, phytol, squalene, and oleic acid 152	
Vitex negundo L.	Lamiaceae	Flavonoids, alkaloids, and terpenoids 153,154	
Psoralea arborea Sims	Leguminosae	No study evaluating anticancer compounds and anticancer activity	
Persea americana Mill.	Lauraceae	alkene lactone, oleic acid, and sterol 31,155.	
Cinnamomum mercadoi S. Vid.	Lauraceae	Methyl eugenol, eugenol safrole 156,157.	Other Threatened Species 79
Lycopodium clavatum L.	Lycopodiaceae	Lycopodine 158	Least concern
Lagerstroemia speciosa L.	Lythraceae	Corosolic acid (CA) or 28-hydroxyursolic acid 159	
Barringtonia racemosa (L.) Spreng.	Lecythidaceae	phenolic and flavonoid 160	
Cajanus cajan (L.) Millsp.	Leguminosae	Cajanol- a novel anticancer agent 161	
Erythrina variegata L.	Leguminosae	Diacetyl lycorine lactam- a novel anticancer agent 32,162	Least concern
Sesbania grandiflora (L.) Pers.	Leguminosae	Showed anticancer activity but corresponding compounds are not stated 163,164	
Flemingia strobilifera (L.)	Leguminosae	The plant showed anticancer potential 165 but very few literature are currently available. According to 166 the plant contains Genistein which is an anticancer agent 167	
Mimosa pudica L.	Leguminosae	L-Mimosine 168	Least concern 169
Mentha arvensis L.	Lamiaceae	Flavonoids and tannins 170-172	Least concern 173
Pongamia pinnata L.	Leguminosae	Oleic acid, beta-sitosterol acetate and stearic acid 174-177.	Least concern 178
Abrus precatorius L.	Leguminosae	Glycyrrhizin and Abrus Lectins 179-181	
Premna Odorata Blanco	Lamiaceae	Diosmetin and acacetin 182	

<i>Coleus blumei</i> Benth. (syn: <i>Plectranthus scutellarioides</i> (L.) R.Br.)	Lamiaceae	Alkaloids, Saponin, Flavonoids, tannins, and quercetin 99,144,183-185	
<i>Cassia sophera</i> L. (syn: <i>Senna sophera</i> L.)	Leguminosae	1,6-Dihydroxy-3-methyl-9,10-anthraquinone 186	
<i>Gliricidia sepium</i> Jacq	Leguminosae	Flavonoid, steroids, tannins, and Neophytadiene 187,188	
<i>Caesalpinia sappan</i> L.	Leguminosae	Alkaloids, Flavonoids, steroids, 3-tetradecene, copaene and hexadecane 189-192	
<i>Clitoria ternatea</i> L.	Leguminosae	Flavonoid 193	
<i>Theobroma cacao</i> L.	Malvaceae	Polymer, Procyanidin B2, Epicatechin and Catechin 194-200	
<i>Abelmoschus esculentus</i> (L.) Moench	Malvaceae	Quercetin and flavonoids 201	
<i>Swietenia macrophylla</i> King	Meliaceae	Limonoids 202,203	Vulnerable 204
<i>Lansium parasiticum</i> (Osbeck) K.C.Sahni & Bennet (syn: <i>Lansium domesticum</i> Corrêa)	Meliaceae	Triterpenoids, hexadecenoic and α -cubebene 191,205-207	
<i>Melia azedarach</i> L.	Meliaceae	Limonoid and Methyl kulonate 208-210	Least concern 211
<i>Ficus septica</i> Burm.f.	Moraceae	Phenanthroindolizidine and Actinomycin D 212-215	
<i>Ficus nota</i> (Blanco) Merr.	Moraceae	beta-sitosterol 136,137	
<i>Mollugo pentaphylla</i> L.	Molluginaceae	Stigmasterol 216	
<i>Syzygium malaccense</i> (L.) Merr. & L.M.Perry	Myrtaceae	Catechins, Quercetin, and carotenoids 217-219	Least concern 220
<i>Muntingia calabura</i> L.	Muntingiaceae	chalcone: 2',4'-dihydroxychalcone, 5-hydroxy-3,7-dimethoxyflavone 221	
<i>Moringa oleifera</i> Lam.	Moringaceae	Niazimicin, Quercetin and kaempferol 222,223	
<i>Tinospora crispa</i> L.	Menispermaceae	No anticancer potential. Water and methanolic extract of <i>T. cripa</i> L. had no significant cytotoxicity to three (3) cancer cells namely; HL-6-, HepG2, and MCF-7 224	
<i>Strebilus asper</i> Lour.	Moraceae	Strebloside and mansonin 33	
<i>Corchorus olitorius</i> L.	Malvaceae	Phytol and monogalactosyldiacylglycerol 225	
<i>Ficus botryocarpa</i> Miq.	Moraceae	Ficuseptine 226	
<i>Ceiba pentandra</i> (L.) Gaertn.	Malvaceae	Flavonoid 171,227	
<i>Musa sapientum</i> L. (syn: <i>Musa × paradisiaca</i> L.)	Musaceae	Flavonoids 171,228	
<i>Tinospora rumphii</i> Boerl	Menispermaceae	Tannins, Saponins, Flavonoids, Alkaloids, and phenols 144,184,229-232	
<i>Ficus odorata</i> (Blco.) Merr.	Moraceae	Phenols, flavonoids, terpenoids, alkaloids, tannins, Bcyanins and coumarins α - amyryn 233	
<i>Eucalyptus globulus</i> Labill.	Myrtaceae	eucalyptals D, eucalyptals E, and euglobal-In-3 234	
<i>Swietenia mahogani</i> L.	Meliaceae	Catechin and quercetin-3-O-glucoside 235	Exotic and endangered 68
<i>Artocarpus heterophyllus</i> Lam.	Moraceae	Artocarpin, cudraflavone C, 6-prenylapigenin, kuwanon C, norartocarpin, albanin A, cudraflavone B, brosimone I and artocarpanone 236	
<i>Myristica simiarum</i> A. DC.	Myristicaceae	Alkaloids, anthraquinones, D-Limonene, phenol, 2-methoxy-4-(2-propenyl)-(CAS) Eugenol, Cyclopentaneacetic acid, 3-oxo-2-pentyl-methyl ester and Isopropyl Myristate 237-241	
<i>Averrhoa bilimbi</i> L.	Oxalidaceae	Flavonoids, steroids, tannins, and teradecanoic acid 207,242-245	
<i>Oxalis corniculata</i> L.	Oxalidaceae	Flavanoids, tannins, phytosterols, and phenol 246	
<i>Drynaria quercifolia</i> (L.) J. Sm.	Polypodiaceae	Friedelin, epifriedelinol, 8-sitosterol, and naringin 247-250	Vulnerable
<i>Pyrrosia adnascens</i> (Sw.) Ching	Polypodiaceae	No study evaluating anticancer compounds and anticancer activity	Least Concern 79

Microsorium punctatum (L.) (syn: Neochleopteris sarawakense (Baker) Parris	Polypodiaceae	Alkaloids, anthraquinones, phenolics, saponins, tannins and terpenoids 251-255	Vulnerable
Plantago major L.	Plantaginaceae	Ursolic acid and oleanolic acid 256-259	Least concern 260
Antidesma bunius L.	Phyllanthaceae	Anthocyanin 261,262	
Papaver somniferum L.	Papaveraceae	Noscapine 263	
Mazus pumilus (Burm.f.)	Phrymaceae	No studies evaluating specific anticancer compounds but have showed anticancer activity to A549 and Hep G2 cancerous cell lines 264	
Piper betle L.	Piperaceae	Chlorogenic acid 265	
Eleusine indica (L.) Gaertn.	Poaceae	Alkaloids, Steroids, Tannin and quinones 266	Least concern 267
Phyllanthus niruri L.	Phyllanthaceae	Flavonoids and gallic acid 171,268 and Tannins, lignans: phyllanthin and hypophyllanthin 269	
Phyllanthus virgatus G.Forst.	Phyllanthaceae	9,12-octadecadienoic acid, asarone, 11-octadecenoic acid, and acrylic acid 270	
Pittosporum pentandrum (Blanco) Merr.	Pittosporaceae	alkaloids, triterpenoids, flavonoids and tannin 271	
Peperomia pellucida L.	Piperaceae	Phytol, 2-Naphthalenol, hexadecenoic acid 129,272	
Embelia philippinensis A.DC.	Primulaceae	No study evaluating anticancer compounds and anticancer activity	
Cymbopogon citratus L.	Poaceae	Nerolidol, Beta-Elementene, Beta- Eudesmol, Myrtenal and L-calamenene 273-278	
Phragmites vulgaris Lam. (syn: Phragmites australis (Cav.) Trin. ex Steud.	Poaceae	No study evaluating anticancer compounds and anticancer activity	Least concern 279au
Ceriops tagal (Perr.) C.B.Rob.	Rhizophoraceae	3-(E)-feruloyllupeol 280	Common 79
Citrus microcarpa Bunge	Rutaceae	Polyphenols, flavonoids and flavonols 281,282	
Morinda citrifolia L.	Rubiaceae	Damnacanthal 283	
Selaginella delicatula (Desv. Ex. Poir.)	Selaginellaceae	Rubustaflavone derivatives, anthraquinone and glycosides 284	
Solanum americanum Mill. (syn: Solanum nigrum L.)	Solanaceae	Saponin and degalactotigonin 285,286	
Solanum lycopersicum L.	Solanaceae	Lycopene and beta-carotene 287-290	
Solanum betaceum Cav.	Solanaceae	Anthocyanin 291,292	
Litchi chinensis Sonn.	Sapindaceae	Epicatechin, luteolin, and rutin 293-296	Vulnerable 79
Laportea interrupta (L.) Chew	Urticaceae	Showed anticancer potential but no studies stating what chemical compounds responsible for anticancer activity 297	
Leea indica (Burm. f.) Merr.	Vitaceae	Alkaloids, flavonoids saponins, sterols, tannins, anthraquinone and phenols 149,171,298-300	
Aloe vera (L.) Burm.f.	Xanthorrhoeaceae	Barbaloin, Aloesin, and aloe-emodin 301-303	
Zingiber zerumbet L.	Zingiberaceae	Kaempferol, polyphenol, flavonoid 304-308	
Hedychium coronarium J.Koenig	Zingiberaceae	Zerumbene, coronarin D 309,310	
Kaempferia galanga L.	Zingiberaceae	Ethyl-p-methoxycinnamate 311	
Curcuma longa L.	Zingiberaceae	Curcumin 312	
Zingiber cassumunar Roxb. (syn: Zingiber montanum (J.Koenig) Link ex A.Dietr.)	Zingiberaceae	Zerumbene and terpinen-4-ol 309,313	
Zingiber officinale Roscoe	Zingiberaceae	Zerumbene and 6-gingerol 309,314	

Alpinia galanga L.	Zingiberaceae	Zerumbene and eugenol 309,315,316	
Curcuma zedoaria Roxb.	Zingiberaceae	Curcumin, demothxycurcumin and bisdemothxycurcumin 317-319	
Curcuma aromatica Salisb.	Zingiberaceae	Curcumin, monoterpenoids, sesquiterpenoids 28,309,320,321	

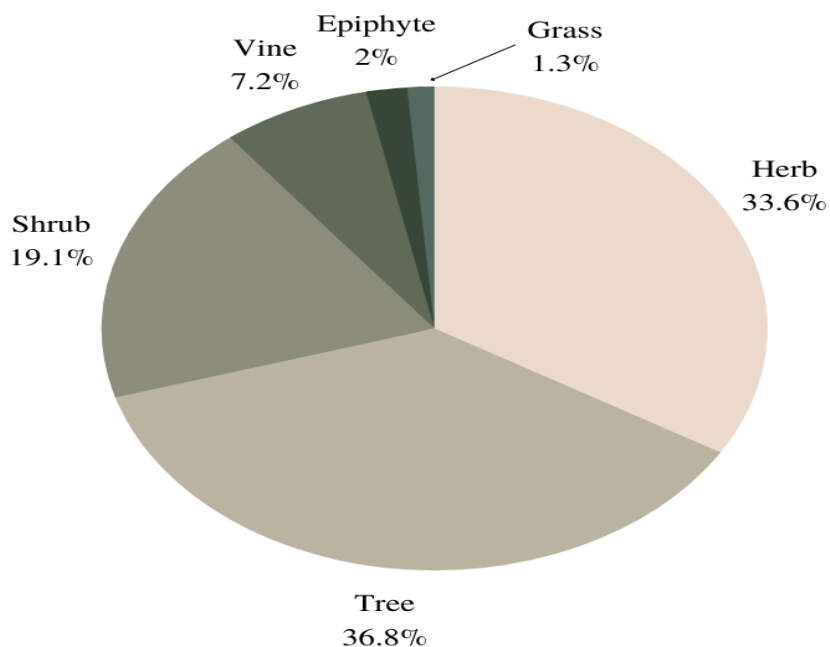


Figure 1: Habit of growth of the identified anticancer medicinal plants

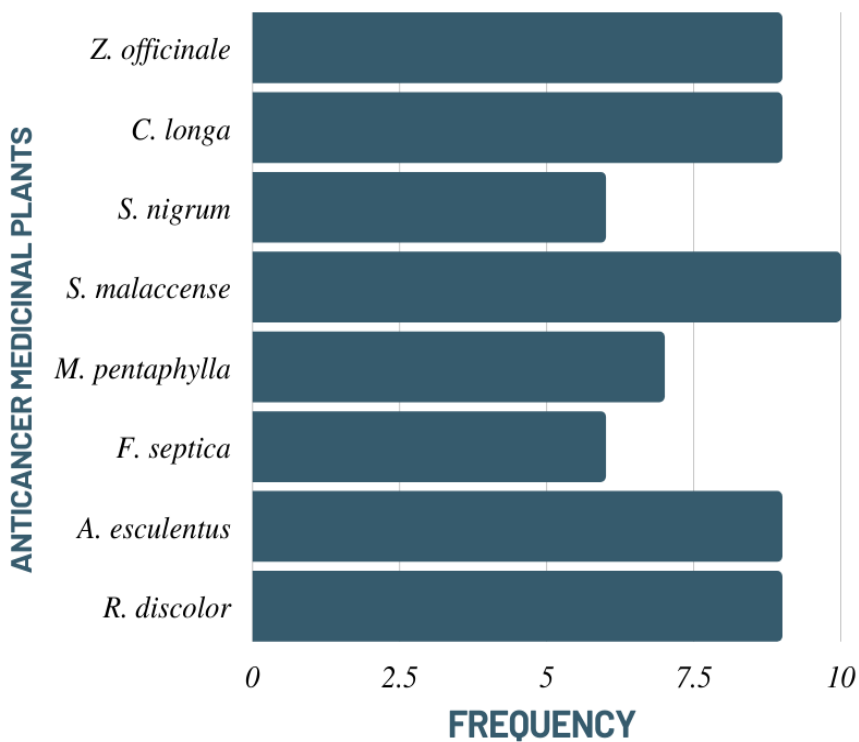
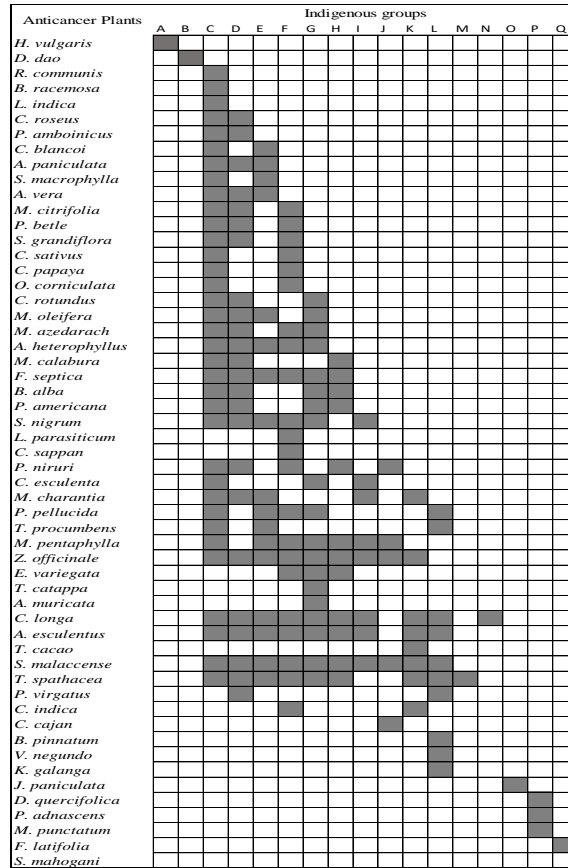


Figure 2: Top anticancer plants used by the indigenous people of the Philippines



- A- Ilongot-Egongot Community of Bayanihan, Aurora,
- B- Locals of Tagmamarkay, Agusan del Norte,
- C- Iliganon of Iligan City,
- D- Maranao of Iligan City,
- E- Locals of San Jose Dinagat,
- F- Maranao of Bubong, Lanao del Sur,
- G- Subanen of Sindangan, Zamboanga del Norte,
- H- Higaonon of Rogongon, Iligan City,
- I- Higaonon of Claveria, Misamis Oriental,
- J- Higaonon of Sitio Man-ibay, Misamis Oriental,
- K- T'boli of South Cotabato,
- L- Mamanwa of Malimono, Surigao del Norte,
- M- Maranao of Kapai, Lanao del Sur,
- N- Maranao of Pualas, Lanao del Sur,
- O- Higaonon of Esperanza, Agusan del Sur,
- P- Talaandig tribe of Bukidnon,
- Q- Subanen of Lapuyan, Zamboanga del Sur

Figure 3: Seriation analysis of the anticancer plants used by the indigenous people of the Philippines.