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Local understanding of some anticancer plants found in the Ziro Valley of Arunachal Pradesh, India

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Abstract

Cancer is a Death causing disease and its treatment has been a burden to many because of its side effects and costly treatments. This study targets to find alternative source of Synthetic treatment with much lower cost, therefore the study aims to evaluate and document some of the Anticancer plants found in Ziro, Arunachal Pradesh, India with its ethnomedicinal uses. The study reveals 22 diversities of plants species belonging to 21 Genera under 16 Families with Anticancer properties.

Key words: Cancer, Ethnomedicinal, Anticancer, Ziro Valley, Arunachal Pradesh

INTRODUCTION

The word cancer is a subject of pervasive fear and taboos throughout the world. It is also known as malignant tumors and neoplasms. Cancers are large family of diseases that involves abnormal cell growth with the potential to invade or spread to the adjoining parts of the body. It is considered as one of the leading causes of morbidity and mortality. According to the World Health Organization (WHO), cancer is a leading cause of death globally, estimating 9.6 million deaths in 2018. As per the data the most common cancers are, Lung (2.09 million cases), Breast (2.09 million cases), Colorectal (1.80 million cases), Prostate (1.28 million cases), non-melanoma Skin cancer (1.04 million cases) and Stomach (1.03 million cases) (https://www.who.int/health-topics/cancer#tab=tab_1).

In India, slightly more than 1 million new cancer cases were reported out of 14 million cancer diagnosed globally in the year 2012 (Behera & Patro 2018). It records cancer patient of about 1,392,179 for the year 2020, in which leading sites are breast, lung, mouth, cervix-uteri, and tongue. Among Indian states, Northeastern states records the highest cancer patients, compared to the rest of the country; in which Aizawl district (269.4) of Mizoram and Papum Pare district (219.8) of Arunachal Pradesh had the highest occurrence rates among males and females, respectively (Mathur *et al.* 2020).

The new data reveals that the burden of cancer treatment is seen high in low to middle class families. The majority of the patients with cancer were diagnosed at a very late stage and so the occurrence of the death prevails more in Developing and under developed counties. Cancer survival involves quality diagnosis and treatment for the patient. It has been identified that natural products are better choice for cancer treatment with lower side effects as compared to synthetic compounds because of their pharmacokinetic properties. Himalayan plants has been used as a traditional medicine for over 6500 years (Tariq *et al.* 2015). Numerous anticancer drugs have been originally advanced from plants and have been playing vital role in the treatment of cancer (Al-Zahrani 2018). Seca and Pinto (2018) reported novel cytotoxic secondary metabolites, isolated from various medicinal plants, to fight against cancer related diseases. Anticancer agents like vinca alkaloids, epipodophyllotoxins, taxanes, and camptothecins are some of the plant derived compounds which has been playing active role in cancer treatment.

The study was carried out in Ziro, a small valley, located in the Eastern Himalayas of Indian state Arunachal Pradesh. The ethnic people of Ziro are known for Biodiversity conservation and unique land and water management system (Dollo *et al.* 2009). The area is also well known for its agricultural practice and was proposed as a world heritage site tentatively by UNESCO in 2014. Tribal dwellers of Ziro, sustain their lives depending on natural resources since time immemorial and they have enormous knowledge of ethnomedicinal plants which is being used in day to day life for curing certain ailments at local level. Therefore, the present study was designed to assess the anticancer plants found locally in Ziro, Arunachal Pradesh with a hope to find a natural therapeutic replacement for a synthetic treatment of cancers.

MATERIALS AND METHODS

Study area:

Ziro is a small valley in Arunachal Pradesh India, inhabited by a group of tribe known as the Apatani and is the headquarter of Lower Subansiri district. Ziro stands tall at an elevation of 1688 m to 2438 m above the mean sea level and is located at 27.63° N and 93.83° E (Ziro Wikipedia). The valley is endowed with richness of flora and fauna with much potential to be called as a hub of biodiversity. The Apatanis are one of the major ethnic Tribes of the Eastern Himalaya and are known for their activities on natural resource conservation and management. The area exhibits a humid subtropical to temperate climate with 108.1 cm average annual rainfall and a temperature ranging from a of 30.6°c or more to of 1.1°c or less (Dollo *et al.* 2009; Yakang *et al.* 2013).

Figure 1. Location map of Ziro valley in Lower Subansiri District of Arunachal Pradesh, India (not to the scale). [*source*: Google image]

Field Survey & Sample size

In order to complete the aforesaid study, various ethnobotanical tools and methods were applied. First ethnobotanical survey was made in 7 villages in Ziro circles of Lower Subansiri District during the years 2018 – 2019. Villages like Hari, Bula, Hija, Duta, Mudang Tage, Bamin Michi and Hong were surveyed following the field method following Martin (2008).

The survey was carried out with a sample size of 63 households in the 7 villages i.e. 9 households in each village in order to acquire ethnobotanical information as much as possible from each village. At the beginning, Prior Informed Consents (PIC) were obtained from the Head Gao Buras and concerned person of the respective villages. During the process of data collected from both male and female informants, with age ranging from 25 to 60 years. The plant samples were collected with the help of informants mostly from the natural habitat. Specimens were identified using standard literatures including Flora of Arunachal (Hajra *et al.* 1996; Giri *et al.* 2008; Chowdhery *et al.* 2009), Hooker 1875 – 1897 and Kanjilal *et al.* 1934 – 1940 at the Plant Systematics and Ethnobotanical Research Laboratory of the Department of Botany, Rajiv Gandhi University and verified at the HAU and ARUN herbaria. For updated nomenclature and family delimitation www.plantsoftheworldonline.org has been largely followed. The voucher specimens were deposited in the HAU herbarium at the Department of Botany, Rajiv Gandhi University, Arunachal Pradesh for future reference.

RESULT AND DISCUSSION

Taxonomic Diversity of Species and Habits:

The present investigation discloses 22 plant species belonging to 21 genera under 16 families (Table 1; Figure 2) with anticancer potential. Apiaceae with 13.3% (3 spp.) was recorded to be the dominant plant family followed by Amaryllidaceae, Asteraceae, Solanaceae and Zingiberaceae (each with 2 spp. or 9.09%), and rest of the families are represented by single species (i.e. 4.5%) only (Figure 3). Considering the habit diversities, herbs were the most dominant with 77.3% (17 spp.), followed by shrubs with 13.6% (3 spp.) and trees with 9.09% (2 spp.) (Figure 4).

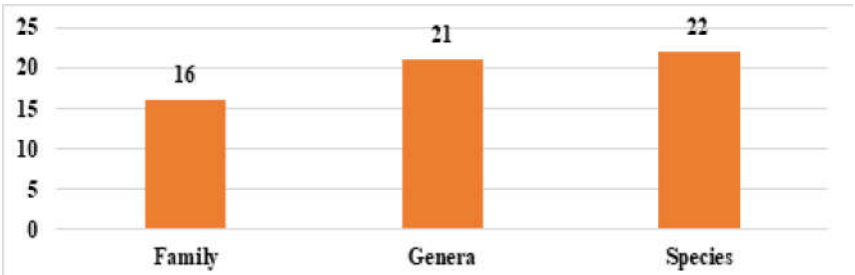

Figure 2. Taxonomic diversity of anticancer plant found in Ziro, Arunachal Pradesh, India

Ethnobotanical and Ethnomedicinal uses:

The study reveals that shortlisted anticancer plants were ethnobotanically used as a food quality enhancer, hair care therapy; treatment of itching and rashes on skin, cuts and wounds; as traditional medicine for cold and cough, sore throat, fever, gastritis, stomach disorder, blood purification, appetizer, eye sight improver, stress reducer, immunity booster, malaria, lung ailment, high blood pressure, depression, diabetes, scurvy, bleeding gums, liver tonic and arthritis.

Among all, *Centella asiatica* and *Sonchus oleaceous* is known to use against stomach cancer traditionally.

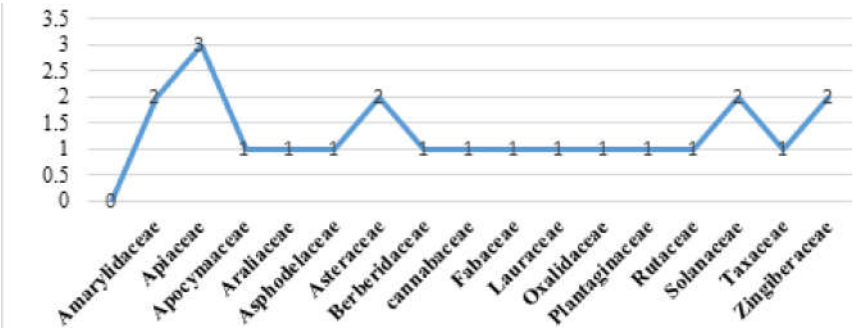

Figure 3. Frequency of the most frequently used plant families for the treatment of cancer in Ziro valley, Arunachal Pradesh, India

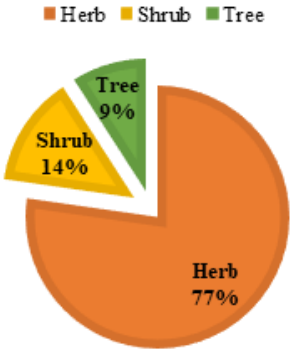

Figure 4. Diversity of habit groups of recorded anticancer plants recorded from the Ziro valley

Useful Plant parts:

Considering the utilisation pattern of the plants parts, it has been found that leaves were used most frequently and for 7 species (i.e. 31.8%), followed by fruits and whole plant (5 spp. Or 22.7% for each) and flowers (3 spp. or 13.8%), roots and seeds (2 spp. or 9.09% each), 1 species (4.5%) each for bark, bulb, and rhizome.

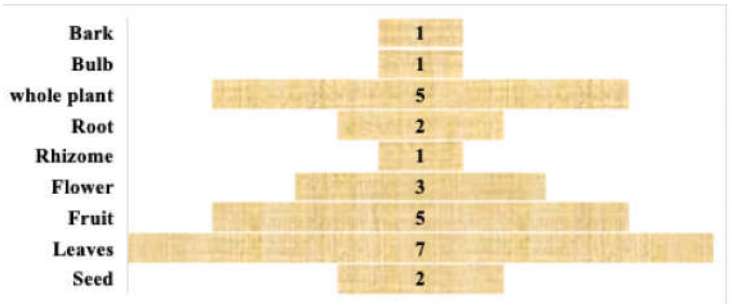

Figure 5: Frequency of plant parts used for anticancer plants found in Ziro valley

The present study revealed that cancer was not known by the early generations of the Apatanis. The disease was known only in very recent decades through the emerging medical technologies. With the adaptation to new lifestyle, the Apatanis have developed their understanding of utilizing their long used medicinal plants for various purposes including cancer treatment in recent days. It has been observed that numerous plants with anticancer potential are available in

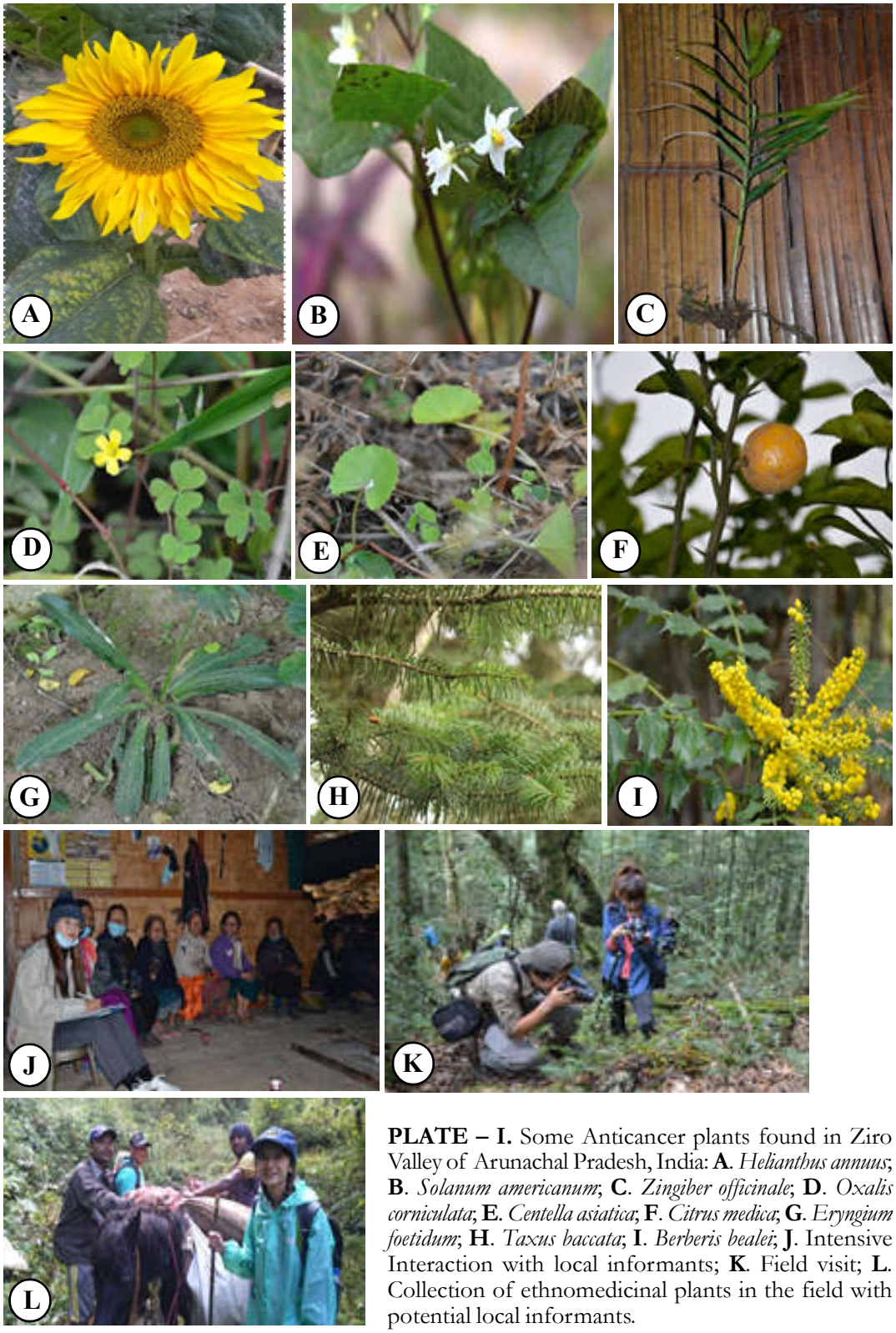

PLATE – I. Some Anticancer plants found in Ziro Valley of Arunachal Pradesh, India: **A**. *Helianthus annuus*; **B**. *Solanum americanum*; **C**. *Zingiber officinale*; **D**. *Oxalis corniculata*; **E**. *Centella asiatica*; **F**. *Citrus medica*; **G**. *Eryngium foetidum*; **H**. *Taxus baccata*; **I**. *Berberis bealei*; **J**. Intensive Interaction with local informants; **K**. Field visit; **L**. Collection of ethnomedicinal plants in the field with potential local informants.

Table 1. Checklist of anticancer plants found in Ziro valley area of Lower Subansiri District of Arunachal Pradesh, India [*Abbreviations used*: L = Leaf; Fr = Fruit; WP = Whole Plant; Rh = Rhizome; S = Seed; Bu= Bulb; Br= Bark; FL = Flower; R = Root]

Botanical name [Family]; Voucher specimen	Apatani name	Habit	Parts used	Ethnobotanical & ethnomedicinal use	Ethnomedicinal Formulation	Medicinal Properties revealed in some of the literature	Supporting references for the Medicinal properties
Allium cepa L. [Amaryllidaceae]; HY/HT/HAU/1501/2016	*Piyaji*	Herb	Bu	Food enhancer, hair care	Eaten raw or highly heated in burning firewood or charcoal before consuming	Anticancer, Antimicrobial	Abdelrahman *et al.* 2017
Allium sativum L. [Amaryllidaceae]; HY/HT/HAU/1505/2016	*Lossung*	Herb	WP	Food enhancer, cold and cough	Eaten Raw with salt	Anticancer	Abdelrahman *et al.* 2017
Centella asiatica (L.) Urb. [Apiaceae]; HY/HT/HAU/1544/2017	*Ngilyang Khiko hamang*	Herb	WP	Gastritis, stomach disorder, blood purification and also increases appetite, Stomach Cancer	Fresh Plant is consumed raw or the plant is made into paste mixed and with salt to taste better	Antimicrobial, Anti-inflammatory, Anticancer, Antioxidant	Prakash *et al.* 2017
Eryngium foetidum L. [Apiaceae]; HY/HT/HAU/1632/2019	*Dunia*	Herb	L	Food enhancer, appetizer	Consumed raw or boiled with other vegetable	Anticancer, Antioxidant, Antimicrobial	Nanasombat & Teckchuen 2009
Daucus carota L. [Apiaceae]; HY/HT/HAU/1586/2017	*Gajor*	Herb	R	Improving eye sight	Consumed raw or boiled	Anticancer	Zaini *et al.* 2012
Catharanthus roseus (L.) G.Don [Apocynaceae]; HY/HT/HAU/1533/2016	*Periwinkle*	Herb	WP	-----	-----	Anticancer	Chanchal *et al.* 2018
Panax ginseng C.A.Mey. [Araliaceae];HY/HT/HAU/1581/2017	*Zinseng*	Herb	R	Reduce stress, boost immune system.	Roots are made into paste and consumed raw	Antioxidant, Anti-stress, Antineoplastic, Anticancer.	Shin *et al.* 2000
Aloe vera (L.) Burm.f. [Asphodelaceae]; HY/HT/HAU/1516/2016	*Alo bera*	Herb	WP	Cuts and wounds	Pulp is consumed after several filtration	Antioxidant, anticancer.	Sánchez *et al.* 2020
Helianthus annuus L. [Asteraceae]; HY/HT/HAU/1590/2017	*Danyi apu*	Shrub	L, FL, S	Malaria, lung ailment.	Seeds eaten after it is dried in the sun for several days	Anticancer	Al-jumaily *et al.* 2013
Sonchus oleraceus L. [Asteraceae]; HY/HT/HAU/1602/2018	*Kochi Hamang*	Herb	L	Stomach disorder, High blood pressure, stomach anticancer	Eaten raw with ***Pila*** (exotic Apatani Dip) or simply fresh leaves are chewed	Anticancer	Elnour *et al.* 2017
Berberis bealei Fortune [Berberidaceae]; HY/HT/HAU/1611/2018	*Taming*	Shrub	Fr, FL	Itching and rashes skin	Eaten Raw	Antitumor, Antibacterial, tonic.	Kakar *et al.* 2019

Botanical name [Family]; Voucher specimen	Apatani name	Habit	Parts used	Ethnobotanical & ethnomedicinal use	Ethnomedicinal Formulation	Medicinal Properties revealed in some of the literature	Supporting references for the Medicinal properties
Cannabis sativa L. [Cannabaceae]; HY/HT/HAU/1522/2016	*Bangw*	Herb	L	Depression appetite suppressant	Few have been consuming its aroma	Anticancer	Ayenigbara 2012
Glycine max (L.) Merr. [Fabaceae]; HY/HT/HAU/1636/2019	*Pottung Perung*	Herb	Fr	Diabetes	Consumed after Boil	Antioxidant, anticancer	Chanchal *et al.* 2018
Cinnamomum verum J.Presl [Lauraceae]; HY/HT/HAU/1518/2016	*Khe Alyo*	Tree	Br, R	Food enhancer	Consumed raw after deep cleaning	Anticancer, Antibacterial	Noudeh *et al.* 2010
Oxalis corniculata L. [Oxalidaceae]; HY/HT/HAU/1538/2016	*O khui Hamang*	Herb	L, Fr	Leaf juice used as eye drop to remove dust or against redness of eye; appetizer	Consumed raw	Anticancer	Salahuddin *et al.* 2016
Plantago asiatica subsp. ***erosa*** (Wall.) Z.Yu Li [Plantaginaceae]; HY/HT/HAU/1511/2016	*Mepi Hamang*	Herb	WP	Cuts and wounds	The plant is made into paste and applied in cuts and wounds, it is also consumed raw	Anticancer, Antioxidant	Tariq *et al.* 2015
Citrus medica L. [Rutaceae]; HY/HT/HAU/1528/2016	*Nimu Tünga*	Tree	Fr	Scurvy, bleeding gums.	Ripened fruits are consumed raw	Anticancer	Jain & Jain 2010
Nicotiana tabacum L. [Solanaceae]; HY/HT/HAU/1615/2018	*Dui Muku*	Herb	L	Cold and fever	The leaves are dried and consumed	Anticancer	Al-Lahham *et al.* 2020
Solanum nigrum L. [Solanaceae]; HY/HT/HAU/1656/2019	*Hiroh Hamang*	Herb	L, Fr	Liver tonic, stomach disorder	Leaves are boiled to consume while ripened fruits are eaten raw	Anticancer	Lai *et al.* 2016
Taxus baccata L. [Taxaceae]; HY/HT/HAU/1595/2017	*Tale Noori*	Tree	FL	Arthritis, fever	Eaten raw	Anticancer	Malik *et al.* 2011
Curcuma longa L. [Zingiberaceae]; HY/HT/HAU/1559/20[17	*Haldi*	Herb	R	Fever	Consumed making it paste	Anti-inflammatory, antioxidant, anticancer.	Chainani-Wu 2003
Zingiber officinale Roscoe [Zingiberaceae]; HY/HT/HAU/1533/2018	*Taki*	Herb	Rh	Fever sore throat, cold and cough.	Consumed raw or made into paste with salt and chillies	Antioxidant, Anti-inflammation, anticancer	Al-Zahrani 2018

Ziro valley of Arunachal Pradesh, India, but only few are used for anticancer treatment at local level. Most of the plants mentioned above are not known to use as an anticancer treatment by the ethnic people of Ziro, except *Centella asiatica* and *Sonchus oleaceous* which has been used in recent decades for stomach cancer traditionally. The study has also revealed that most of the medicinal plant species were consumed raw and very few are cooked or made into paste to apply.

CONCLUSION

Although many Ethnobotanical survey has been carried out in Ziro by different researcher, more intensive ethnomedicinal studies with targeted diseases needed to be done throughout the area in order to preserve the traditional Ethnomedicinal knowledge and document the important medicinal plant diversity and their potential uses. While, all the plants mentioned above has been reported to have Anticancer activity through literature survey, but many of these ethnomedicinal pants has limited pharmacological validation for their traditional therapeutic claim. Therefore, further research needed to be carried out to find the chemical constituents of these highly valued plants by applying different modern biotechnologies. The people of Ziro valley remain quite healthy with the help of their traditional and mostly plant based therapy and with minimum or no side effects, this type of treatment can be encouraged before transferring a patient for the treatment with modern medicines.

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