

Analytical Studies of Anticancer Medicinal Plant of North East India

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Abstract—Cancer is a deadly disease which affects the human cell or tissue and effects to human population. There is emergency need to treat the cancer using new therapies which can prevent this life threatening diseases. Number of researcher and scientist is interested towards compound extraction from natural sources, natural derived compounds extracted from plant having less side effects as compared to the chemotherapy which remains the mostly used practice for anticancer treatment. In this review article we are discussing some North-East regional plants which is having medicinal properties and used against cancer as an anticancer drug. The plant source at north-eastern India, Nagaland, Tripura, Meghalaya, Assam, Arunachal Pradesh, Manipur, and Mizoram are provided effective anticancer agents. There are some herbal plants having a promising bioactive compounds which are *Taxus baccata* extract alkaloids which is known to use as calcium channel blocker drug and also aim in cardiac therapy, from *Terminalia arjuna* extracted compounds Luteolin, Ethyl gallate and Gallic acid inhibit the proliferation of HepG2 cells which is widely used in Ayurvedic medicine for the treatment of cancer, *Oroxylum indicum* Vent extract ethanolic compound have anti-proliferative effect on cancer cell. Now a day's people are scared of the side effects of using chemical drugs, hence aftermath of drugs is the reason people give more preference to the natural plant source for cancer treatment. The plant kingdom specially, medicinal plant are having unlimited source of Phytotherapeutics in the anticancer drug discovery.

Introduction

India is the important country which is one of the biodiversity center countries in plant abundance because it consist of wide range of biological diversities, geographical and ecological [1]. In India there is tropical to typical temperate ecological zones, apart from cold desert there are warm humid to dry hot arid areas also [2]. In India there are number of valuable biotic organizations which is having a number of plants called as treasure house[3]. In India cosmetic industry mostly use plant raw materials as well as in medicinal products [4]. India has different medicinal plants with high genetic resource, called "Emporium of Medicinal Plants"[5]. Indian sub-continent contains more than 2000 medicinal plant species and medicines reported in charaksamhita used in Ayurveda which is oldest medicine system in India [6]. Nature has been huge amount of source of medicinal agents from "Vedas" as early as 6000BC. In India number of plants used for medicinal as a medical plant specifically as traditional drugs, now a day it

established and acknowledged as viable profession [7]. Herbal Plant which is having medicinal properties are relatively simple, and they are quite distinct from conventional medicinal and herbal medicines [8, 9]. Plant belongs to herbal family have a source of medicinal compounds, which play very important role in a health care of human beings [10]. World Health Organization (WHO) said that among total world population, near about 80% of population are using traditional drug for primary health treatment or health care need [11].

There are some alternative therapies for the treatment of cancer such as Radiotherapy, Surgery and Chemotherapy are main therapies for different cancer [12]. Some study shows that micro-chemicals properties in diet, combination of natural and synthetic compounds are used as a controlling a cancer is chemo preventive intervention, other than this, several herbal plants parts are the most desirable class are used for the prevention of different kind of cancer, due to presence of polyphenolic compounds in medicinal plant have been reported the antioxidants and anticancer activity effect [13]. Herbal plant contains Flavonoids and Alkaloids which inhibit the proliferation and growth of the different cancer [14]. In this review we discussing about herbal plant belong to north-east region which is having anticancer activity. Cancer is the abnormal growth of normal cell that leads to death, in which infected cancer cell invade and destroy normal cell. Huge study has been done on different cancers but still scientist has not understood the exact specific reason of cancer and what cancer is?



Figure 1: North-East state part of India

North-East India has consist of seven state these are one of the 25 global biodiversity hotspot, these seven state are- Tripura, Assam, Meghalaya, Arunachal Pradesh, Mizoram, Nagaland, Manipur. North-East region has different climatic condition on which having high rainfall high humidity and moderate temperature as well as swamps, marshes; abound with dense forests with their diversified and characteristic species [15-17].

We are discussing properties of selected three plants as well as taxonomical classification, Botanical description, and anticancer activity. The north-east region of Himalaya state having eight major states harbor and around 180 tribal communities of the total 427 tribal communities belong in India [18-20]. The north-east region of Himalaya state having 57 Ethno medicinal plants from 52 genera and 36 families. Maximum Ethno medicinal plants were found from Zingiberaceae and Euphorbiaceae, after that Dilleniaceae, Rosaceae, Taxaceae, Fabaceae, Combretaceae, Bignoniaceae, Compositae, Asteraceae and Acanthaceae [21].

Table 1: Medicinal plants from north-east India shows anticancer properties.

Local Name	Botanical Name	Family	Part use
Vailenhlo (Mz)	Ageratum conizoids Linn.	Asteraceae	Root
Buarze (Mz)	Blumea Lanceolaria Linn.	Asteraceae	Leaves
	Blumea balsamifera Linn.	Asteraceae	Leaves
Kaihzawl (Mz)	Dillenia pentagyna Roxb	Dilleniaceae	Stem Bark
Kawrthindeng (Mz)	Dillenia indica Linn.	Dilleniaceae	Stem Bark
Langniang (Kh)	Potentilla fulgens Wall.	Rosaceae	Root
Soh blei (Kh)	Taxus baccata Linn.	Taxaceae	Leaves
Godhuli gopal (As)	Mirabilis jalapa L.	Nyctaginaceae	Leaves
Ban agara (As)	Xanthium strumarium L.	Asteraceae	Root
Buarzo (Mz)	Gynura conyza sp.	Compositae	Leaves
Mao(As)	Oroxylum indicum Vent	Bignoniaceae	Bark
Arjun(As)	Terminalia arjuna (Roxberg)	Combretaceae	Stem bark

Mz = Mizo, Kh = Khasi, Mn = Manipur, As = Assam.

❖ Taxus baccata Linn.

➤ Properties of Taxus baccata Linn.

• TAXONOMICAL CLASSIFICATION

Binomial Name	Taxus baccata Linn.
Kingdom	Plantae
SubKingdom	Pinophyta
Class	Pinopsida
Order	Pinales
Family	Taxaceae
Genus	Taxus
Species	T.Baccata



Figure 1: Taxus baccata Linn. Seed and Fruit

• BOTANICAL DESCRIPTION

Taxus baccata L. (Taxaceae), English yew, yew is slow growing plant, and regeneration is very poor, this plant are found in meghalya at a 1800 to 3000m elevation and at Manipur it's found at altitude of 1500m [22, 23]. Taxus baccata L. is 30m tall evergreen plant with spreading crown. Branches of plant are arranged in ascending to drooping order with twigs irregularly alternate, and at young it was yellow-green or green color and changes the color to reddish brown with age. Bark of plant is reddish brown and reddish grey, with smooth, thin, peeling off in longitudinal narrow shreds. Leaves are curved, acuminate and needle like with 1.5-2.8 by 0.2-0.25cm. Flower is yellowish and inconspicuous with female blooms on small flaky handles. Seed are 7mm in diameter, hard and surrounded by red fleshy aril [24].

Taxus baccata L. is found in various part of Arunachal Pradesh, which is having anti-cancer properties and having pharmaceutical demand.

• ANTICANCER ACTIVITY

Avicenna shows the medicinal use of Taxus baccata L. (Taxaceae) for phytotherapy in 1021. That time this herbal plant is called as herbal drug "Zarnab" and used as a cardiac remedy. This herbal drug is firstly used as a calcium channel blocking drug, but this drug is not used in western world until 1960s [25]. At sixties National cancer institute, USA in 1967, taxol were isolated from leaves and bark of pacific yew plant by chemists scientist Wall, wani and their colleague which came in to prominence view of its anticancer activity. Bristol-Myers Squibb company (BMSC) registered Taxol, which is named Paclitaxel. Taxotere is a registered trademark of Rhone-Poulenc (RP) also; its generic name is docetaxel. The paclitaxel is isolated from Pacific yew bark, which is used for cancer chemotherapy [26]. This plant part is toxic in nature

because it contains alkaloids, exception the aril's part in which seeds enveloped [27]. Extract from European yew synthesized the precursors of chemotherapy drug paclitaxel (taxol) [28]. In central Himalayas this plant part used for treatment of ovarian and breast cancer [29]. Taxol is used as an anticancer agents, this Taxol is derivatives of Taxus and used for anticancer agent in breast, ovarian, and lungs cancer. Taxol is harvested and dried inner bark (phloem cambial tissues), only 0.01 to 0.03% dry phloem weights is taxol, and near about 2gram of taxol is required for a full regimen of anti-cancer treatment [30]. Taxus baccata used for treatment of different cancer like ovarian, breast, lungs kaposi's sarcoma (AIDS related cancer). The ethanolic extract of the heartwood of T. baccata afforded taxoids and lignans [31-34]. Ploy phenol compound found in plant such as 'Lignans' has different activities, such as, antibacterial, antiviral, antifungal, anticancer, anti-inflammatory, and anti-oxidant effects [35, 36].

❖ Terminalia arjuna (Roxberg)

- Properties of Terminalia arjuna (Roxberg)
- TAXONOMICAL CLASSIFICATION

Binomial name	Terminalia arjuna
Kingdom	Plantae
Subkingdom	Magnoliophyta
Class	Magnoliopsida
Order	Myrtales
Family	Combretaceae
Genus	Terminalia
Species	Arjuna



Figure 2: Terminalia arjuna (Bark, Fruit, Flower)

• BOTANICAL DESCRIPTION

Terminalia arjuna is widely distributed in all over the world specially in tropical area, this terminalia plant genus comprising of 250 species [37], among all of these seven species were used for treatment of cancer [38]. Roxberg belong to the Combretaceae family, Terminalia arjuna's bark is a form of decoction with milk and water which is found in a stimulant of heart and this plant grown at medium in size around 60-80 feet height and also called Arjun in Hindi [39]. There a number of use of Terminalia arjuna as traditional medicine such as bark past is used for applied on wounds, ulcer as well as promoting the union of fractures [40]. This plant has radially along stream blank spreading; root system is shallow and superficial. Tree branches are spreading like crown, plant bark is a thick, smooth with pinkish green and

grey color as well as exfoliating in thin irregular sheets. Leaves are simple, 5-25×4-9cm oblong or elliptic oblong, margin often crenulated, apex obtuse. The petiole has 2-4cm long, with 2 prominent two glands at petiole apex. Fruits are 2.5-6× 1.8-2.8cm long, dark brown to reddish brown, and bovid-oblong. Flowers are cup shapes small, regular, polygamous, and creamy or greenish white with strongly honey scented. In February to April at hot season new leaves appearing before leaf fall, Terminalia arjuna plant tree usually evergreen tree. Fruits are developed after 6-7 year of planting, flower are grown in April and extends to May with the fruit ripening the following February-May, nearly a year after the appearance of the flower [24].

• ANTICANCER ACTIVITY

Terminalia arjuna plant has used for treatment of cancer in Ayurveic medicine, as well as urinary disorder, gynaecological complaints, dermatological and heart diseases. The cancer cell growth inhibited by constituents isolated from bark, leaves and stem such as- Luteolin. In some study shows that high blood pressure and ulcers can be treated by plant bark acid, tonic and an astringent. Compounds extracted from bark and treated the HepG2 cancer cell which inhibited the proliferation at different concentration of drug [41]. Compound extracted from Terminalia arjuna plant such as Ethyl gallate, Gallic acid, Luteolin are shows the growth inhibition of OVCAR-3, KM20L2, P388, NCI-H460, SF-295, SK-Mel-5, and A498 cancer cells [42]. Luteoline is widely used flavone which shows growth inhibitory effect against MCF-7 cancer cell line at in-vitro experiment [43].

❖ Oroxyllum indicum Vent

- Properties of Oroxyllum indicum vent

This plant belongs to the Bignoniaceae family. The taxonomy of plant are given below

(<http://www.ncbi.nlm.nih.gov/Taxonomy/>)

• TAXONOMICAL CLASSIFICATION

Binomial name	Oroxyllum indicum Vent
Kingdom	Plantae
Subkingdom	Magnoliophyta
Class	Magnoliopsida
Order	Lamiales
Family	Bignoniaceae
Genus	Oroxyllum
Species	indicum



Figure 3: Oroxyllum indicum-(a) Tree (b) Leaves (c) Flowers (d) Wood bark

• BOTANICAL DESCRIPTION

Oroxylum indicum Vent has medicinal value found in a villages and rice field, used for a different purposes such as root of this plant are used for anti-inflammatory, astringent, stomachic, anodyne, bitter tonic, and expectorant it stimulates digestion, cough, cures fever and other respiratory disorders and other skin diseases and urinogenital disorders [44]. Leaves are used for treatment of stomachalgia, splenomegaly, ulcers and flatulence. Tender fruit are used for improving the digestion, cure the morbid vata and kapha and destroy piles and worms. Matured fruit used for cardiac disorders, bronchitis, pharyngodynia, helminthiasis, haemorrhoids and gastropathy [45]. This plant has medicinal value on stem bark, fruits, seeds, leaf, root bark [46-48]. This plant is member of a well-known 'Dasamula' group [49].

Oroxylum indicum Vent is a small tree which is around 8-15meter tall, branched at top; with corky lenticles soft with green juice and light brown color bark. Plant leaves are 3-7cm long with 2-3 pinnate with opposite pinnae, leaflets are 2-4 pair around 6-12cm long and 4-10cm broad. Flowers are 0.3-0.5meter long or even more pedicels 6-30mm long. Corolla is 10cm long, with 4cm long fleshy lobes. Calyx is 4cm long, glabrous, leathery and oblong-campanulate. [50]. In India at August to February plants flower are grown depending upon on season. This plant is distributed throughout India and south East Asia, on slopes of the hills and along the riverbanks [51].

• ANTICANCER ACTIVITY

Oroxylum indicum Vent used in India for different purposes. Recently, *Oroxylum indicum* Vent bark is used for the cure of nasopharyngeal cancer man suffered in a Maolearnt from Maram Naga village. Anticancer properties of this plant is checked and evaluated in laboratory and animal experiments for various types of cancer cell line and carcinogens. On Hep2 cancer cell line Ethanolic extract are used, which shows that it has an anti-proliferative effects. This Ethanolic extract shows the cytotoxic activity against Hep2 cancer cell line at concentration of 0.05% [52]. Methanol extracted from plant fruit, this inhibited in-vitro proliferation of HL-60 cells. Mainly flavonoid baicalein is an active compounds extracted from *Oroxylum indicum* Vent. Most use-full flavonoid compound found in leaves, which is isolated and tested for induction of apoptosis and viability in the HL-60 cancer cell. Baicalein shows the 50% inhibition on HL-60 cells at concentration of 25-30 μ M for 24hours. cell is accumulate at S or G2M phase after 36-48 hours when HL-60 cell exposure to 10-20 μ M baicalein show the anticancer effect [53, 54]. *Oroxylum indicum* has been found to have an IC50 value of 19.6 μ g/ml for CEM, 14.2 μ g/ml for HL-60, 17.2 μ Mg/ml for B-16 and 32.5 μ g/ml for HCT-8. On the sea urchin eggs, it also inhibit the progression of cell cycle since the first cleavage (IC50= 13.5 μ g/ml) 91 [55]. This plant extract are used for the anti-proliferative activity on breast tumor cell line of human, which shows the anti-proliferative activity against MDA-MB-231 and MCF7 cell line which is belong to breast cancer. Chrysin, Baicalein, and oroxylin-A are phenolic compounds present in

Oroxylum indicum Vent, which is showing therapeutic potential in anti-viral, anti-inflammatory, anti-cancer. Some studies shows that methanol and aqueous extracts have reported for is cytotoxicity in MDA-MB-435S and Hep3B cell line [52, 54-59].

CONCLUSION

The selected plants from north east region are the source of alkaloids, terpenoids, flavonoids play important role in targeting various diseases. The secondary metabolites extracted from *Taxus baccata* Linn, *Terminalia arjuna*, *Oroxylum indicum* Vent plants known to have anticancer activity. The phytochemical analysis on various cancer cell lines depicts its role in treating cancer and various kind of disease. Thus we hope the properties of medicinal plants will be helpful in treating disease and replacing chemotherapy in nearby future.

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