

Ethnopharmacology, bioactivities and chemical constituents of some anti-cancer plants in Malaysia

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ABSTRACT

Many plant species are used in Malaysia in folk medicine for the treatment of cancer. This paper presents some of these species with details on other ethnopharmacological uses, the known bioactivities and some chemical constituents of each of the species given. It is normal practice in traditional medicine that one species of plant is used to treat various ailments. Thus the plant species listed are all used to treat cancer but have various other ethnopharmacological uses as well, some with few other uses and rest with many other uses. Information on bioactivities of each species resulting from tests on human and experimental animals are also given. Proven bioactivities give strength to ethnopharmacological claims on the efficacies of plant resources in the treatment of cancer and various other ailments but will but will not necessarily lead to the production of new pharmaceutical drugs. Many of the known chemical constituents of each species are given. This shows the richness and variety of chemicals contained in each of the species listed. The chemicals listed may or may not prove to be important in the pharmaceutical sciences but is an indication of what each species contains in terms of plant chemicals. It is a well known fact that many of the pharmaceutical prescriptions in present day use are of plant origin and semi-synthetic or fully synthetic chemicals produced using knowledge gained from studies of phytochemicals. Thus the paper presented will give useful information and also shows the richness of plant species that have high potentials for the development of anti-cancer resources from plants in Malaysia.

Key words : chemical constituents, anti-cancer, cancer, ethnopharmacological, bioactivities

INTRODUCTION

Many local people make use of wild and cultivated plants as sources of medicine for the treatment of various ailments. More than half the population in underdeveloped and developing countries are dependent on some form of traditional medicines for their health

care, while in remote areas there may be total dependence. Changing cultural trends and wider availability of modern medicines may lead to the loss of useful traditional practices and tribal lore. It is important to pursue ethnobotanical studies as it has been shown that screening for drugs in plants is more fruitful via ethnobotanical approach compared to random sampling. For very advanced countries it is now

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possible to screen large numbers of plant samples using new biotechnological techniques but the importance of ethnobotanical research remains.

Tropical plants contain a wide range of secondary metabolites partly due to the vigorous and demanding conditions under which they grow, having to produce various chemicals to keep away or minimise the harmful effects of attacks by insects and many other organisms. There exist a living treasure of medicinal plants and bioactive compounds in the tropical rain forest. The South-East Asian tropical rain forests are widely acknowledge as among the most species-rich terrestrial ecosystems in the world. Biodiversity in this region is as diverse of more diverse than those in Africa and South America.

In the Malesian region stretching from peninsular Thailand eastward to Papua New Guinea and the adjacent islands with a total land area of about 2.1 million sq. km., between 25,000 to 30,000 sepecies of flowering plants(angiosperms) have been recorded.

Although many novel compounds isolated from plants have no immediate use as drugs, many have become useful tools in pharamacological and biochemical investigations. Natural products provide laed compounds for the production of many drugs. Plants have given useful compounds such as digoxin, morphine, oxycodone, quinine, reserpine, toxol and vincristine. There is considerable potential to find new natural compounds from plants for the development of new drugs and as lead compounds for designing new drug prototypes. The old malady of cancer and the new scourge of AIDS have increased the urgency in the search for new drugs.

Global deaths from cancer total 6.2 million persons per year. Lung cancer is the leader with 1.1 million deaths per year; colon and rectum cancer accounts for 765.000 deaths per year; colon and rectum cancer accounts for 525,000 deaths per year; liver cancer accounts ofr 505,000 dealths per year; breast cancer

accounts for 385,000 deaths per year and all other types of cancer accounts for 2.92million deaths per year. In Malaysia, figures for the incidence of cancer among the male population are 20% lung cancer, 15% genital cancer, 14% colorectal cancer, 10% other digestive organs, 9% urinary system, 5% oral cancer, 8% skin cancer and 19% for all other types of cancer. The figrues for the incidence of cancer of cancer among the female populaton are 31% breast cancer, 15% colorectal cancer, 14% genital cancer, 9% other digestive organs, 6% lung cancer, 2% oral cancer, 1% skin cancer and 22% for all other types of cancer.

Cancer is a popular topic to most people whenever a possible cure is mentioned or a potential carcinogen is exposed. Dioxin contamination in food from Belgium recently caught the attention of the world. Dioxin is one of the most toxic chemicals known to be a cancer-causing agent. Many countries took steps to ban food products from Belgium or from the European Union. But then again, the amount of dioxin contamination in food products from Belgium in 1999 surely cannot compare with the amount of dioxin in agent orange used as a defoliant during the Vietnam war resulting in severe dioxin contamination in the Vietnamese environment and severe exposure to dioxin for both the soldiers of USA and Vietnam and the Vietnamese civilians. Dioxin gets into our body not only throuth the food we eat but also the air we breathe and the water we drink. Incinerators burning huge amounts of garbage in Japan daily potentially releases large amounts of dioxin into the air, causing concern that it may cause cancer, birth defects and other health problems. Malaysians also face the potential hazards of dioxin in the air. All developed countries face the danger of dioxin pollution in the air as dioxin is released into the air not only from incinerators and other sources of burning but also various factories such as pulp mills, chemical manufacturing, copper smelting, ferrous metal smelting, lead smelting and others. But again, dioxin is only one

of the many potentially cancer-causing agents that we are exposed to daily. The danger of contracting cancer is very real.

High contents of natural antioxidants in plants used medicinally provides defence against infections, cancer, heart diseases and other illnesses. The noni plant, *Morinda citrifolia* contains high levels of antioxidants. The Tahitian noni is exported to about 20 countries. Now there is the Hawaiian noni on the market and there is also a Malaysian noni. Cancer patients, however, need to be cautious about consuming too much of one substance for too long as there may be adverse effects. Cancer patients are in a very vulnerable position, grasping at any straws of hope but there is no miracle fruit or panacea to cure all even though some cancer patients claim to have complete remission through ethnophytotherapy using only a single species of plant. In alternative, herbal or complimentary medicine, a combination of various medicinal plants and healthy nutrition would seem to effect a better alternative. An academic in a Malaysian university has put together more than 50 types of herbal formulations, with over 10 for specific cancers and the rest to treat toxification, pain, coughs, constipation, phlegm, fluid retention, urination problems and to boost resistance but at the same time stressed the need for practicing healthy nutrition. Among other advances in cancer treatment is to make the "slash, poison and burn" approach - surgery, chemotherapy and radiotherapy - more precise and effective; finding and developing drugs to block new cancer in high-risk individuals; and improved treatments to eliminate cancer growth after early detection. Genetic engineering is another tool that can potentially be used to fight cancer.

Diagnostic tools and methods used to detect cancer and people who are more susceptible to cancer also improve continuously with new ideas and inventions. A team of Australian scientists recently reported that a single pubic hair is all that is required to detect women

who are at risk for breast cancer and also those who have breast cancer. Thus early detection of breast cancer at a very early stage is possible using this method.

This paper lists some of the diverse plant species available in Malaysia that are used in ethnophytotherapy to treat cancer. All known ethnopharmacological uses of each species are also listed although many of these uses do not relate to cancer and other complaints associated with cancer. This will show the richness or otherwise of ethnopharmacological uses of each of the species listed. The bioactivities of each species are also given where available. The chemical constituents of each species are also given and this shows the richness or otherwise of chemical contents of each of the species listed. Some of the chemical constituents given in this paper may be useful for treating cancer while others may be useful for treating other diseases. The remaining may be of no potential usage for pharmaceutical purposes but listing these chemical constituents shows the rich diversity of chemicals produced by plants and these chemicals may be potentially important for other purposes.

METHODS AND MATERIALS

The basis for the plants to be listed in this paper are from:

1. Ethnopharmacological data and information obtained by the author from ethnobotanical studies showing these plants are used to treat cancer among Malaysian communities. (Ong, 1986, 1998)
2. Ethnobotanical results obtained by students doing research projects supervised by the author showing these plants are used to treat cancer among Malaysian communities. (Ong & Norzalina, 1999; Ong & Nordiana, 1999)
3. Ethnopharmacological records in publications

showing these plants are used to treat cancer among Malaysian communities.(Burkill, 1993; Goh et al, 1994; Perry, 1980; Zhari et al, 1999)

The other ethnopharmacological uses listed are from:

1. Ethnopharmacological data and information obtained by the author from ethnobotanical studies among Malaysian communities.(Ong, 1986, 1998)
2. Ethnobotanical results obtained by students doing research projects among Malaysian communities supervised by the author.(Ong & Norzalina, 1999; Ong & Nordiana, 1999)
3. Ethnopharmacological records in publications. (Burkill, 1993; Goh et al, 1994; Perry, 1980; Zhari et al, 1999)

Bioactivities and chemical constituents listed in this paper are obtained from various publications on these subjects. They are Burkill, 1993; Goh et al, 1994; Li, 1985; Morton, 1981; Petty, 1980; Zhari et al, 1999

The plants used

Abrus precatorius L.(Leguminosae)

Dried leaves of this plant are used to make herbal tea taken to treat cancer. Other ethnopharmacological uses are anthelmintic, emetic, expectorant, purgative, refrigerant and sudorific; used to treat abdominal pains, bronchitis, conjunctivitis, coughs, headache, hepatitis, high blood pressure, malaria, scurvy, sore throat, sprue and trachoma. The bioactivities are emetic, hypotensive, are emetic, hypotensive, purgative and toxic. Among the chemical constituents are abrectorin, abricin, abridin, abrin, abrine, abric acid, abrusogenic acid methyl ester, abrusogenin, abrusoside A, B, C, and D, amyrrin, choline, delphinidin, glycyrrhizin, haemagglutinin, hypaphorine, precatorine, squalene, stigmasterol, trigonelline, triterpenes, xyloglucosylephininid and xylose. The extremely toxic abrin is in the seeds.

Acanthus ilicifolius L.(Acanthaceae)

The bitter seeds are eaten raw to treat cancer. A decoction of the dried roots is also drunk to treat cancer. Other ethnopharmacological uses are anthelmintic, diuretic, emollient, purgative, resolvent; used for treating asthma, boils, chronic fever, colic, coughs, flatulence, gastric pains, hepatitis, hepatosplenomegaly, lymphadenopathy, neuralgia, paralysis, rheumatism, shingles, snake bite, swellings, wounds caused by poisoned arrows or darts. Bioactivities of this plant are antiphlogistic, expectorant.

Allium sativum L.(Amaryllidaceae)

Among its many uses, garlic is taken raw or cooked in dishes for its anti-cancer properties. Among the other ethnopharmacological uses are antiarthritic, anticoagulant, antihelminthic, antihypertensive, antioxidant, antiseptic, carminative, detoxifying, diaphoretic, expectorant, febrifuge, hypolipidaemic, sedative; used for treating diphtheria, headache, insect bites, pneumonia, of arteriosclerosis, stroke and thrombosis. It has proven bioactivity in the treatment of colorectal and oesophageal cancer in mice through the chemoprotective activities of diallyl sulphide and S-allylcysteine. Other bioactivities of garlic are anthelmintic, anti-arteriosclerotic, antiarthritic, antibacterial, anticandidal, antifungal, antihypertensive, antimutagenic, antithrombotic, diuretic, hypocholesterolaemic, hypoglycaemic and vasodilator. Some of the chemical constituents are ajoene, allacim, allicin, alliin, alliin lyase, allyl methyl sulphides, allyl sulphides, diallyl disulphides, mono-, di-, tri-, tetra-, penta- and hexa-sulphides, thiosulfinates and vinylidithiols.

Aloe vera(L.) Burm. f.(Liliaceae)

In ethnopharmacology, this plant is used to treat leukemia and lung cancer, Juice made from the leaves is also drunk for treating other types of cancer. Other ethnopharmacological uses for this plant are antiviral,

antipetic, cathartic, emmenagogue, purgative, vermifuge, treatment of burns, constipation, eczema, edema, pain, pertussis, piles, swellings, toothaches, wounds, wrinkles and other skin problems.

Bioactivities of this plant are antibacterial, immunomodulation and insecticidal. Among the chemical constituents are aloemodin, aloesin, aloin, anthranol, anthraquinones, arachidonic acid, barbaloin, chrysophanic acid, coumarins and glucogalactomannan.

Alpinia galanga(L.) Willd.(Zingiberaceae)

The young rhizome is used as spice for cooking dishes and the young shoots boiled and eaten as salad to treat cancer. Other ethnopharmacological uses are antiseptic, rubefacient, stimulant, vesicant; used for treating colic, convulsions, diarrhoea, dysentery, earache, fever, flatulence, food poisoning, headache, herpes, indigestion, pityriasis versicolor, puerperal, rheumatism, ringworm, skin eruptions, spleen ailments and vomiting. The bioactivities are antibacterial. Among the chemical constituents are acetoxycinnamic acid, bergamotene, bisabolene, borneol, borneol acetate, butanol, acetate, citronellol acetate, copaene, curcumene, cymene, cymenol, eugenol, hydroxybenzaldehyde, hydroxycinnamic acid, humulene, isorhamnetin, kaempferide, limonene, linalool, methyl sabinene, myrcene, nerol acetate, pentadecane, quercetin, terpinolene, trans-coniferyl diacetate, trans-p-coumaroyl diacetate and tridecane.

Alstonia scholaris(L.) R.Br.(Apocynaceae)

A decoction of the bark and roots mixed with many other plants is taken regularly to treat various types of cancer. Other ethnopharmacological uses are anthelmintic, antimalarial, anticonvulsant, antidiabetic, antiepileptic, antimalarial, antiperiodic, antipyretic, antispasmodic, antitussive, astringent, boric, emmenagogue, febrifuge; used for the treatment of

asthma, beri-beri, boils, constipation, diarrhoea, dysentery, hypertension, liver problems, neuralgia, rheumatic pains, skin ulcers, stomatitis and toothache. The bioactivities of this plant are hypoglycemic and hypotensive. Among the chemical constituents are acetylcholine, akuammicine, alstonine, angustilobine B acids, chitin, dihydrocondylocarpine, ditamine, echinacanthine, echicerine, echitamine, echitidine, echitine, echitenine, echiretine, hydroxyechitamine, lagunamine, losbanine, monoterpenoids, nareline, picraide, picralinal, picrinine, rhazamine, scholaricine, scholarine, tubotaiwine, tubotaiwine oxide and venoterpene glucoside.

Andrographis paniculata(Burm. f.) Nees
(Acanthaceae)

A decoction of the leaves is taken regularly to cool the body of a cancer patient undergoing chemotherapy and to cleanse the body of toxins.

Other ethnobotanical uses are analgesic, antipyretic; for treating burns, coughs, scalds, snake bites. The bioactivities are antibacterial, antidiarrheal (caused by *E. coli* enterotoxin), antimicrobial febrifuge, hepatoprotective, hypotensive.

Among the chemical constituents are andrographanin, andrographidines, andrographoside, andrographolide, andrographolide sodium bisulfite, andropanoside, chologenic acid, deoxyandrographoside, dicaffeoylquinic acids, diterpene glycoside, diterpenoids, eugenol, gamma-bisabolene, hentriacontane, myristic acid, neoandrographolide, ninandrographolide, paniculide A, B and C, polyphenol caffeic acids and tritriacontane.

Apium graveolens L.(Umbelliferae)

The plant is grown and used as a vegetable and for flavouring food. Eating this plant is considered beneficial in helping the body to fight against cancer.

Other ethnopharmacological uses are abortifacient, alterative, antispasmodic, carminative, digestive, diuretic, emmenagic, excitant, hypotensive, stomachic; used for the treatment of anasarca, asthma, bronchitis, chest pains, colic, indigestion, itch, liver diseases, rheumatic complaints, spleen problems. The bioactivity is antioxidant. The chemical constituents are apigenin, apigravin, apiin, apiumetin, apiumiside, asparagine, gergapten, celereoside, choline, dhrysoeriol apiosylglucoside, inosite, isopimpinellin, isoquercitrin, linamarose, linoleic acid, luteolin 7-apiosylglucoside, mannite, oleic acid, osthonol, palmitic acid, petroselinic acid, sesilin.

Blumea balsamigera(L.) A. dc.(Compositae)

The roots of this plant are boiled in a compound mixture with other plants and the decoction regularly taken internally to treat various kinds of cancer. Other ethnopharmacological uses are anthelmintic, anti_clotting, antipyretic, astringent, carminative, extectorant, stomachic, vermifuge; used for treating bone aches, diarrhoea, gravel, heatiness, hematuria, menstrual pains and sore throat. The bioactivities are antihistamine, antispasmodic, antitumour(leukemia), diuretic, hypotensive, symphatholytic, traquillizing, vasodilator. Among the chemical constituents are blumealactones A, B and C, borneol, camphor, cryptomeridiol, dihydroquercetindimethylether, dihydrpquercetin-methylether, dimethoxytrihydroxyflavanone, germacranolides, sesquiterpenes and triterpenes.

Brucea javanica(L.) Merr.(simaroubaceae)

A decoction of the seeds is used to treat cancer. Other ethnopharmacological users are hemostatic, insecticide, laxative;

the leaves, bark and seeds are used to treat boils, centipede bites, colic, diarrhoea, dysentery, enlarged spleen, fever, hemorrhoids, malaria, pains, rheumatism,

ringworm, scurf and stomach complaints. The bioactivities are abortifacient, antibiotic, cholagogue, emetocathartic, protozoidal, toxic. Among the chemical constituents are brucamarine, brucealin, kosamin, yatanine and yatanoside.

Carica papaya L.(caricaceae)

Various parts of this plant are used as remedy for cancer. Among the many other ethnopharmacological used are abortifacient, amoebicidal, anodyne, antibiotic, antidyspepsia, antihypertensive, antimalarial, antiphlogistic, cardiotoxic, carminative, cholagogue, digestive, discutient, diuretic, ecboic, emmenagogue, exgectorant, febrifuge, fungicidal, insecticidal, laxative, pectoral, pediculicide, suppurative, tonic, used in the treatment of asthma, catarrh, corns, freckles and other skin problems, piles, rheumatism, warts and yaws. The bioactivities are cardiac depressant, CNS depressant, hypotensive and proteolytic. Among the many chemical constituents are aryl glucosides, carposide, carpasemine, chymopapain M, cryptoxanthin, cysteine proteinases, systine, dehydrocarprmine, epoxylinalool, invertase, lycoene, papain, phenyllacetonitrile, phosphatidycholine, pseudocarpaine, rutin, sinigrin, and valine.

Cassia fistula L. (leguminosae)

In ethnopharmacological uses this plant is used as anticancer, antidiabetic, antirheumatic, astringent and laxative; used in the treatment of constipation, gastric problems, hypertension, leprosy, piles and skin diseases. The bioactivities are antivacterial, anticancer, antifertility, antiviral and hypoglycemic. The chemical constituents are aurantiamide acetate, clitorin, dihydrokaempferol, fistucacidin, galactomannan, kaempferol, kaempferol glucoside, kaempferol neohesperidoside, physcion, proanthocyanidin, rhein, sennosides A and B, sitosterol, stigmasterol, triflavonoids, and xanthone glycoside.

Crescentia cujete L.(Bignoniaceae)

The fruit pulp is boiled and the decoction drunk to treat cancer.

The pulp is poulticed on malignant tumors. Other ethnopharmacological uses are antihemorrhagic, astringent, emetic, emollient, pectoral, purgative; used to treat asthma, chest congestion, colds, coughs, cuts, dermatitis, diabetes, diarrhea, dysentery, genital irritations, headache, hemorrhoids, pulmonary complaints, spider bites, sprains, sunburn, tuberculosis and wounds. It is used to aid delivery and expel the placenta. Bioactivities are emetic, purgative, toxic to birds small mammals, inducing abortion in cattle, caused 25% of mice to develop leukemia-lymphoma type neoplasm. Among the chemical constituents are chlorogenic acid, citric acid, crescentic acid, hydrogen cyanide, linoleic, linolenic acid, oleic acid, tannin and tartaric acid.

Curculigo orchioides Gaertn.(Hypoxidaceae)

The roots, stem and leaf stalks are used to make a compound mixture and the decoction drunk regularly to treat cancer. Other ethnopharmacological uses are aphrodisiac, diuretic, pectoral, rejuvenator, tonic; used to treat asthma, colic, cuts, diarrhoea, gonorrhoea, jaundice, piles and wounds. Among the chemical constituents are acetyl hydroxy carbamic acid methylester, acetyl carbomethoxy tetrahydro oxatetrazine, acetyl methoxy methyltriacontane, aliphatic hydroxyketones, corchioside A, curculigenins B & C, curculigine A, B & C, curculigol, curculigosaponins G, H, I & J, curculigosides A & B, 2, 6 - dimethoxybenzoate, lycorine, 4-methylheptadecanoic acid, orcinol glucoside, phenolic curculigosides and yuccagenin.

Curcuma domestica Val.(Zingiberaceae)

The rhizome is used to cook food taken for good health and treat cancer. Other ethnopharmacological

used are anthelmintic, anticoagulant, antiedemic, antihypertensive, anti-inflammatory, antimalarial, bactericide, carminative, cholagogue, emmenagogue, fungicide and stimulant; for treating bruises, neuralgia, rheumatism, ringworm, scabies and sprains. Among the chemical constituents are antioxidant Fr-12, antioxidant Fr-14A, bisabola-3, 10-dien-2-one, bisacumol, bisacurone, bisdemethoxycurcumin, borneol, camphene, camphor, caryophyllene, chloroform, cineole, curcumene, curcumenol, curcumenone, curcumin, curcuminoids, curdione, curlone, curzerenone, dehydrocurdione, dicinnamoylmethane, didemethoxycurcumin, dihydrocurcumin, epiprocume-nol, eugenol, isonoenol, isoprocurcumenol, limonene, lenalool, monodemethoxycurcumin, oleoresin, sesquiterpenes, terpinene, turmeronol A and B and zedoarondial.

Cycas revoluta Thunb.(Cycadaceae)

The leaves are used in traditional medicine to treat cancer.

Other ethnopharmacological uses are analgesic, anti-inflammatory, antirheumatic, astringent, diuretic, emmenagogue, expectorant, hemostatic, hypotensive, tonic; used to treat amenorrhea, dysmenorrhea, epigastric pain, hemorrhagic problems, hepatoma, leucorrhoea, lunggago, lung tumours, neuralgia, peptic ulcer, pulmonary tuberculosis, rheumatic arthritis, toothache, traumatic injury. The bioactivities are carcinogenic, mutagenic, toxic. Among the chemical constituents are amentoflaveone, azoxyglucoside, cellobiosyloxyazoxymethane, cycasin, 2, 3-dihydrohinokiflavone, laminaribiosyloxy-azozymethane, macrozamin, neocycasins A, B, C and E, neomycin C, phycoerythrin, podocarpusflavone A, primeverose, proanthocyanodin, tyramine and xylose.

Cyclea barbata Miers(Menispermaceae)

The leaves are used in traditional medicine to treat cancer. Other ethnopharmacological uses are for

treating abdominal diseases, fevers and as an expectorant. The bioactivities are antimalarial, antitumour, cytotoxic, muscle relaxant, neuromuscular blocker, Among the chemical constituents are aporphine alkaloids, berbamine, bisbenzylisoquinoline alkaloids, cycleacurine, cycleadrine, cycleahomine chloride, cycleanine, cycleanorine, cycleapeltone, cycleine, fangchinoline, galactose, homoaromoline, isochondrodendrine, isotetrandriene, limacine, maguoflorine, protoquercitol and tetrandrine.

Eurycoma longifolia Jack.(Simaroubaceae)

Roots of the plant are taken in the form of infusion or decoction by itself or in compound mixtures for treating cancer and many other uses. Among the other ethnopharmacological uses are antidote to poisoning, antihypertensive, antimalarial, antipyretic, antituberculosis, antivinous, aphrodisiac, febrifuge, tonic, vermifuge; used to treat cachexia, diarrhoea, dropsy, dysentery, fever, indigestion, itches, jaundice, lumbago, and pains. The bioactivities are antihistamine, antimalarial, antitumour, antiulcer, antiviral and cytotoxic. Among the chemical constituents are dehydroeurycomalactone, dihydroeurycomanol, dihydroklaineaneone, dihydroniloticin, dihydroxyeurycomanone, dihydroxyklaineaneone, episapelin, eurycomalactone, eurycomaol, eurycomanol glycopyranoside, eurycomanone, eurylactone, eurylene, hispidone, laurycolactone A and B, longilactone, longilene peroxide, melianone, niloticin, pasakbumin A, B, C and D, piscidionol A, quassinoids and scopoletin.

Hyptis suaveolens Poit.(Labiatae)

Leaves are rubbed together with chalk and the juice extracted is applied externally to treat breast cancer and swollen glands, Leaf poultices are also taken to cure cancer. Other ethnopharmacological uses are antirheumatic, antispasmodic, aperatif, diaphoretic, emmenagogue, excitant, febrifuge, galactagogue,

stimulant; used to treat acne, catarrh, centipede bites, colds, constipation, dermatitis, dysentery, eczema, fever, gallbladder troubles, gastro-intestinal distention headache, influenza, menstrual difficulties, nausea, palsy, paralysis, skin complaints, snake bites, stomachache, trauma, ulcers and wounds.

It is regarded as useful to stimulate secretion of milk. The bioactivities are analgesic, hemostatic, stimulant and sudorific. Among the chemical constituents are hydrocyanic acid, menthol, sesquiterpenes, sesquiterpene alcohols.

Imperata cylindrica Beauf.(Gramineae)

Dried stems of this plant in a compound mixture is taken as a decoction for treating cancer and various other ailments. The other ethnopharmacological uses are antihypertensive, antiinflammatory, antipyretic, astringent, diuretic, hemostatic, restorative, sedative, tonic, vulnerary; used to treat arthritis, asthma, dropsy, dysentery, fever, indigestion, jaundice, nose bleed and urinary tract infections. The bioactivities are anticancer, antiviral, insecticidal and phytotoxicity. Among the chemical constituents are arborinone, arborinol acid, coumaric acid, cyclindrin, fernenol, friedelin, gentistic acid, hydrobenzaldehyde, hydrobenzoic acid, hydroxytryptamine, isochlorogenic acid, isoarborinol, iso-orientin, neochlorogenic acid, scopolin, scopoletin, serotonin, simiarenol, vanilic acid and vanillin.

Momordica charantia L.(Cucurbitaceae)

The bitter-gourd is one of a number of vegetables eaten by some cancer patients to fight against cancer. Other ethnopharmacological uses of this plant are abortifacient, antimicrobial, astringent, emetic, purgative, vermifuge, vulnerary; for the treatment of burns, diarrhoea, skin diseases and stomachache. The bioactivities are antimicrobial, antitumour, antiviral, hypoglycaemic and immunosuppressive. Among the chemical constituents are elaeostearic acid, elasterol,

momorcharins, momordicines, momordicosides and triterpenoids.

Morinda citrifolia L.(Rubiaceae)

Juice of the fruits of this plant is taken for the treatment of many health problems, including for the treatment of cancer. Other ethnopharmacological uses are anthelmintic, antibilious, antibiotic, antiemetic, antihypertensive, antinauseant, antipyretic, antiseptic, antitussive, astringent, cathartic, decongestant, emmenagogue, emmolient, expectorant, febrifuge, laxative, tonic, vermifuge; used for the treatment of arteriosclerosis asthma, boils, diabetes, dysentery, eruptions, hepatitis, itches, lumbago, psoriasis, rheumatism, scabies, sores, ulcers and wounds. The bioactivities are analgesic, antimicrobial, antioxidant, hypotensive, insecticidal and uterine muscle relaxant. Among the chemical constituents are acacetin glycopyranoside, ajmalicine isomers, alizarin, aseruloside, asperulosidic acid, caproic acid, caprylic acid, chrysophanol, damnocanthol, digoxin, dihydroxylucidin, dihydroxylucidin primeveroside, hydroxymorindone, hydroxymorindone primeveroside, indole, lucidin, lucidin primeveroside, methoxylizarin, monoethoxyrubiadin, morindadiol, morindin, morindone, morindone primeveroside, nordamcanthal, quinoline, rubiadin, rugiadin methyl ether, purine, sitosterol, soranjidiol and ursolic acid.

Phyllanthus niruri L.(Euphorbiaceae)

The whole plant is used in a compound mixture and the decoction taken for treating various ailments including cancer. Other ethnopharmacological uses are antidysenteric, antihepatotoxic, antihypertensive, diuretic, emmenagogue, febrifuge, pergative, stomachic; used for the treatment of bruises, cuts, dropsy, jaundice, sores, swellings, ulcers and ruino-genital infections.

The bioactivities are aldose reductase inhibitor, antitumour, antiviral and HIV-1-RT inhibitor. Among

The chemical constituents are allosecurinine, amyryn, astragalinal, grevifolin carboxylic acid, dibenzylbutyrolactone, dihydrosecurinine, ellagic acid, entnorsecurinine, ethyl brevifolin, farnesyl farnesol, geraniin, hydroxysecurinine, hypophyllanthi, isolintetralin, isoquercitrin, linoleic acids, linolenic acids, lintetralin, lupeol, methoxydihydroorsecurinine, methoxynorsecurinine, methoxytetrahydrosecurinine, niranthin, nirphyllin, nirtetralin, phyllanthin, phyllanthusiin, phyllester, phyllnirurin, phyltetralin, quercitrin, repandusinic acid, ricinoleic acids, ssecurinine, securinol A and B, sitosterol, tetrahydrosecurinine, tetrahydroxyflaone, trans-phytol, triacontanal and triacantanol.

Physalis minima L.(Solanaceae)

The whole plant is used in a compound mixture and the decoction taken for treating various ailments including cancer. Other ethnopharmacological uses are abortifacient, antipyretic, diuretic, laxative, tonic, vermifuge; used for the treatment of boils, diabetes, edema, fever, inflammation of the spleen, internal pains, stones in the urinary system, ulcers and wounds. The bioactivities are abortifacient, antiinflammatory, antitumour, antiviral, bradycardia, cytotoxic, hypotensive and uterine stimulant. Among the chemical constituents are cryptoxanthin, dihydro-hydroxydehydrophysalin, epoxyphysalin, ergosta-dien-diol, hydroxydehydrophysalin, methoxy-methylenedioxyflavone, phygrine, physalins, physalindicanols, quercetin-galactoside, secosteroid, trimethoxyflavone, trimethylquercetin, withaminimin and withaphysalins.

Piper nigrum L.(piperaceae)

Pepper seeds are used for flavouring food and the seeds together with the roots are also used as medicine in compound mixtures for treating cancer. Other ethnopharmacological uses are abortifacient, diuretic, emmenagogue, tubefacine, stimulant, stomachic, tonic;

used for treating abdominal swelling, adenitis, ascite, choleaa, colds, colic constipation, cough, ear bleed, ecaema, elephantiasis, diarrhoea, dysentery, flatulence, furuncles, gonorrhoea, gynecological problems, hemorrhoid, hernia, insanity, lumbago, malaria, rheumatism, ringworm, sexual debility, shingles, syphilis and typhoid fever. Among the chemical constituents are astragalins, caffeic acid, coumapherine, coumaric acid, dienamides, dienoylpiperidine, dihydropiperidine, feruloulytyramine, feruperine, guineensine, isoquercitrin, isorhamnetin, kaemferol-arabinosyl-rhamnoside, piperamides, piperidine, piperetone, piperolein B, piperoleine, piperonal, piperonylin, pyrrolidines, quercetingalactoside, quercetin rhamnoside, quercetin rutinoside, rhamnetin-triglucoside, sesquiterpene and trienamides.

Solanum nigrum L.(Solanaceae)

The black nightshade is one of a number of vegetables eaten by some cancer patients to fight against cancer. Other ethnopharmacological uses of this plant are alterative, antihypertensive, antipyretic, antispasmodic, hydrogogue, laxative, narcotic, stimulant, tonic; used for the treatment of abdominal pains, asthma, bronchitis, cancerous growths, coughs, cramps, dysentery, eczema, eye ailments, headache, inflammation of the bladder, itch, menstrual disorders, neuralgia, piles, psoriasis, rheumatism, skin diseases, sores, tumours, ulcers, virility problems and wounds. The bioactivities are antitumour and antiviral. Among the chemical constituents are acetylcholine, campesterol, chaconine, desgalactotigonin, dihydroxy-solsodine, diosgenin, quercetin glycosides, sitosterol, soladulcidine, solamargine, solasodiol, solanidine, solanines, solanocapsine, solanosamine, solasodine, solasonine, steroidal glycosides, stigmasterol, tigogenin, tomatidenol, utronins and utrosidine.

Symphytum officinale L.(Boraginaceae)

A comfrey poultice and a drink containing comfrey leaves using four to six medium sized leaves taken regularly to treat malignant ulcers is said to cause the painful swellings to subside soon after treatment. In some cases improvement was rapid and after a few months of treatment the malignant ulcer had disappeared. Other ethnopharmacological uses of this plant are for healing arthritis, asthma, beauty aid, blood in sputum, blood in urine, blood purifier, boils, broken bones, diarrhoea, external ulcers, gangrene, gastric and duodenal ulcers, gout, haemoptysis, haemorrhoids, intestinal irritations, lung ulcers, neurosis, pulmonary diseases, rheumatic complaints, scurvy, severe burns, skin complaints, sores, sore breasts, tuberculosis, tumors benign and malignant, wounds. Among the bioactivities of this plant, comfrey is reported to cause serious liver damage if taken in large amounts over a long period of time; comfrey breaks down the red blood cells and it is also under suspicion as a carcinogen. Leaves and roots of comfrey contain allantoin, the active ingredient that is valued as a cell proliferant in pharmacy for inducing the edges of wounds to grow together, thus bringing about healing. Allantoin is also astringent and demulcent. Other chemical constituents of this plant are allantoin, choline and vitamin B12.

Typhonium flagelliforme(Araceae)

The whole plant is pounded and consumed fresh regularly with a little honey added to treat all types of cancer. Other ethnopharmacological uses are emetic, expectorant, resolvent, rubbed over bruises, rubefacient, styptic; used to treat boils, coughs, hemangioma, internal injuries, pulmonary disorders, pyoderms and snake bites. Bioactivities are anti-inflammatory, anti-swelling, anti-tumour, anti-viral, hemostatic.

Vernonia cinerea Less.(Asteraceae)

The juice of the finely pounded whole plant is drunk

to treat cancer. Other ethnopharmacological uses are antidiarrheic, febrifuge, emmenagogue, restorative, sedative; used to treat chest complaints, colds, colic, conjunctivitis, coughs, diarrhea, dysentery, fever, furunculosis, headache, hepatitis, hypertension, neurasthenia, rheumatism, ringworm, skin diseases, snake bites, stomacheache and wounds. It is also use to stimulate labor and expedite the expulsion of the placenta. Among the chemicla constituents are luteolin-7-0-glucoside, quercetin-3-0-methyl ether, saponin and triterpinoids.

GENERAL DISCUSSIONS AND CONCLUSIONS

Cancer is one of the most dreaded diseases today. The search for anticancer agents from plants continues. There has been some successes where plant alkaloids are able to arrest cancer. From *Catharanthus roseus*(Apocynaceae) comes the active chemicals used as anti-cancer drugs leurocristine, vinblastine and vincristine used in chemotherapy against Burkitt's lymphoma, gestational choriocarcinoma, Hodgkin's disease, lymphocytic leukemia and Wilm's tumour. Research on *Catharanthus roseus*(periwinkle) started because it is an important plant in ethnopharmacology for treating various ailments, especially diabetes and high blood pressure. From *Podophyllum peltatum* (Berberidaceae) comes the active chemicals alpha peltatin, beta peltatin and podophyllin, alkaloids used as the basis of VM-26, a drug used to treat lymphocytic leukemia. In ethnopharmacology, *Podophyllum peltatum*(mayapple) is used by American Indians as purgative, for treating skin disorders and tumorous growths. From *Colchicum autumnale*(Liliaceae) comes the active chemical colchicine used as a chemotherapeutic agent to prevent the proliferation of cancer cells. Chemicals from plants can become important medicines in their own rights and also serve as

blueprints for synthetic and partially synthetic pharmaceutical drugs. This paper has presented some of the plants used in Malaysia in the field of ethnopharmacology in the treatment of cancer. Some are well known medicinal plants while others are lesser known. There are many chemicals from these plants, some of which are proven to be important medicinally, some may not be of any importance medicinally while others need to be further studied. Some of the chemicals contained in the plants are highly toxic requiring great care in utilisation but the very nature of chemotherapy is controlled poisoning of cancer cells so some of these poisonous substances may prove useful in cancer treatment. Some of the plants listed do not have their efficacy as anti-cancer agents supported by clinical trials or published papers. Some may prove to be ineffective in clinical or other scientific experiments but the inability to explain or prove the process scientifically does not render the healing abilities of these plants invalid. There are many phenomena that science cannot explain but inability to explain the mechanism does not negate the process. The ethnopharmacological uses are varied and many. While the focus here is on the search and development of anti-cancer resources from plants, chemicals contained in the plants listed in this paper may prove to be useful not only in treating cancer but various other ailments as well. Various bioactivities shown for many of these plants indicate the potential of developing new pharmaceutical products.

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