

# Herbal Drugs Discoveries in the Different Time Frames



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## Abstract

Human's life is completely dependent upon nature. Plants are important natural resource that is used as food to medicines, plant based traditional medicines are widely accepted in many civilizations from past. Plants are important source of oils, food, grains, fruits and as medicine too, as having phytochemical. Due to the existence of active chemicals, medicinal plants were a significant source of medications. Many popular medications are produced from plants, either directly or indirectly. Despite modern medication discovery and production using synthetic chemistry as a vehicle, plants continue to make a significant contribution to disease treatment and prevention. Even at the arrival of the twenty-first century, we are still depending upon plant based drugs. Indian medicinal system Ayurveda, Siddha, folk and traditional medicinal system are totally plant based medicinal system. Although lots of pharmaceutical research is going on in diverse field but there are still many avenues that need to be explored. In the present article we are trying to explore different disease outbreaks and few important medicines that are successfully accepted and adopted by FDA and are used for treatment of different disease which are completely plant based.

## Introduction

Plants were used as drugs for over 5000 years as analgesics, antibiotics and cardioprotective agents [1]. Throughout history, the identity, isolation of biologically energetic compounds and molecules from herbal merchandise have resulted with inside the discovery of the latest healing drugs, thereby selling the fitness and pharmaceutical industries. The earliest information of herbal merchandise had been depicted on clay capsules in cuneiform from Mesopotamia (2600 B.C.) that documented oils from *Cupressus sempervirens* (Cypress) and *Commiphora species* (myrrh) which might be nonetheless used these days to deal with coughs, colds, and irritation [2]. Prior to the arrival of excessive throughput screening and the post-genomic era, greater than 80% of drug materials had been absolutely herbal or had been stimulated via way of means of molecules derived from herbal origin. An analysis of recent pills from 1981 to 2007 famous that herbal merchandise had been utilized in almost 1/2 of the medication accepted given that 1994 [3]. The identity of New Chemical Entities (NCEs) with the specified drug ability and medicinal chemistry functions is a part of the brand new drug discovery process [3]. Although there are a few new processes to drug discovery, along with combinatorial chemistry and computer-primarily based totally molecular modelling design, and lots of pills are made through artificial chemistry, none of them can absolutely update herbal

merchandise in drug discovery and improvement due to the fact maximum artificial chemicals' centre systems are primarily based totally on herbal merchandise. Friedrich Wilhelm Adam Serturmer (1783–1841) reported the alkaloid morphine from poppy in 1806 [4].

## Plants: An important source in drug discovery

Plants have a crucial role in the field of drugs as they provide a fantastic source of naturally occurring substances that have been used widely all over the world in the development of medicine for a very long time (as pharmacological, non-pharmacological and synthetic). Phytochemicals revolve across the studies and improvement (R&D) sectors as a brand new supply of molecules main to the improvement of diverse new tablets for the pharmaceutical industries [5]. The effectiveness and efficiency of these medicines is now an acknowledged fact as the purpose for that is due to their higher cultural acceptability, higher compatibility and adaptableness with the human frame and feature lesser facet outcomes in comparison to different drugs and have an immense role in the improvement of human health worldwide. Various phytochemicals with potential biological activity have been found to be present in plants over a period of time that have the capacity to be used as drugs and the content material and pharmacological

interest of those materials is the idea for their use in present day medication through scientists for studies purposes. The most powerful compounds of plants are secondary metabolites which are generally known as phytochemicals, on which humans depend as they have the ability to cure a wide variety of diseases. Notably, herbal merchandise and their derivatives make contributions to extra than 1/2 of the Food and Drug Administration (FAD) accepted drugs [6]. The phytochemicals synthesized as a part of secondary metabolites in plants are of therapeutic importance due to the presence of various chemical groups like alkaloids, steroids, tannins, glycosides, volatile oils, fixed oils, resins, phenols, and flavonoids. Secondary metabolites or chemicals such as alkaloids, flavonoids, terpenoids and tannins determine the therapeutic strength of plants, particularly antibacterial activity [7].

These are synthesized and occur in different plant parts like leaves, roots, flowers, bark, seeds, and others. Several flora had been determined to own vital antibacterial, antifungal, antidiarrheal, anti-inflammatory, anti-analgesics, antipyretic, antioxidant, anti-tumour, anti-diabetic properties, and many others. Starting with morphine, which was removed withinside the early nineteenth century, now lively chemicals also are removed from medicinal plants [8,9]. Codeine, cocaine, quinine,

morphine and digitoxin were among the first drugs discovered and a number of them are nevertheless used for mankind today [8,10]. Skin illnesses, diabetes, TB, mental illness, jaundice, hypertension, and cancer have all been treated with plant-derived medications. Even if no new chemical structures are discovered during the development of medicinal plant medications, existing chemicals with new biological activities can offer valuable therapeutic leads. Thousands of additional molecular targets had been found as relevant in numerous diseases since the human genome was sequenced [11].

### How drugs are made from plants

Medicinal plants undergo separation or preparation for direct utilization as herbal or customary medication. Herbal medications in therapeutic arrangements include dynamic fixings of the different parts of plant. The item can be produced using the entire plant body or any plant part. Arrangements obtained from herbal plants like oils, gums and different emissions all likewise considered as natural medication. In every movement of the connection, the mass/density of materials are lessened by a movement of bundle measures until the last prescription thing is obtained. Figure 1 showing detail steps and process of large scale drug production from medicinal plants.



figure 1: Steps of drug discovery from medicinal Plants.

## Selection of plant species

For drug manufacturing, the selection of plant species is a primitive step. Selecting some specific plants for specific drug discovery is an ideal step and works accordingly from the ancient knowledge of the selected plants. After this, collection of the plant for a particular drug should be done on time and with proper guidelines. The collection of plants should be carefully done as there are some toxic plants but at the same time, they are medicinally important. During collection, there should be no harm to the plant.

## Identification of bioactive components

A few techniques were utilized in the identification of active constituents from therapeutic plant extricates. Phytochemical screenings tests are done for distinguish the presence of primary and secondary metabolites in a concentrate. Phytochemical screenings are used for the identification of alkaloids, flavonoids, tannins, saponins, flavones, sterols, terpenes, glycosides, protein, sugars and fats, along with this it also helps for functional group, multiple bonds/rings, hydrogen and carbon arrangement identifications. Complete molecular structure detection techniques like mass spectroscopy (MS), ultraviolet spectroscopy (UV), nuclear magnetic resonance spectroscopy (NMR) and infrared spectroscopy (IR) are few other methods. After identification, drying and grinding take place with the help of some advanced machinery system or conventional methods of grinding and chopping.

## Selection of suitable solvent

In the process of extraction, the solvent utilized for the therapeutic plants is known as the menstruum. Selection of solvent relies upon which plant is being used, a piece of plant extricated, bioactive mixtures nature determines, add on to this, the accessibility of dissolvable.

## Extraction

The process extraction of therapeutic plants for isolation of secondary metabolites like alkaloids, flavonoids, terpenes, saponins, steroids and glycosides from inactive material utilizing a suitable solvent and standard extraction method. A few techniques were utilized during extraction of therapeutic plants like maceration, mixture, decoction, permeation, processing and Soxhlet extraction, shallow extraction, ultrasound-helped and microwave-helped extraction. After extraction, drying and filtration of the extracted compounds are considered.

## Proportioning and packaging

Medication substances are changed in terms of measurement structure before they are commercially available to people or creatures. A lot of methods available to use final filtrated products as drugs. Many substances like dynamic medication are blended in with drug, like covers, fillers, enhancing and building specialists, additives, and cancer prevention agents. The fixings used here

are dried, processed, mixed, packed and granulated to execute the ideal properties prior to the product introduce commercially. Tablets and containers comes under normal oral measurement frames; the other way is sterile fluids taken as infusion and ophthalmic application. In some cases, the filtered powder is consumed and sold as an effective drug. In this case, direct cleaning and packaging of filtered products take place (Figure 1).

## Medicinal plants in the prevention and treatment of several disease

Eucalyptus oil inhalation is very effective on pain and inflammatory response [12] There are many other related studies like eucalyptus oil effect in few surgeries in response to pain and inflammation [13]. Skimmin is one of the most pharmacologically important living molecules found in *Hydrangea paniculata*, studied extensively for its renoprotective properties. Traditional Chinese medicine TangLuoNing ameliorated sciatic nerve injury in streptozotocin carried in diabetic rats [14]. TangLuoNing (TLN), a potent traditional Chinese medicine, was described as having beneficial effects in the treatment of diabetic peripheral neuropathy (DPN). Neuroprotection mechanisms underlying TLN, the effect of TLN on electrophysiology and morphology of the sciatic nerve in a streptozotocin-treated DPN was studied [15]. Grapeseed procyanidins is widely used in pre-and mild hypertension.

According to the scientists, grape seed procyanidin's impact on blood pressure is a useful consequence for the cardiovascular ailment phenotype related with membrane lipid oxidation (endothelial dysfunction, formation of oxidised LDL, and activation of phagocytic cells). Nelumbo nucifera petal extract on lipase, adipogenesis, adipolysis and number one weight problems receptors by [16] confirmed that every methanol and subsequent aqueous extract of Nelumbo nucifera petals inhibited lipid garage in adipocytes and prolonged lipolysis. Green select Phytosome, a proprietary lecithin formulation derived from a caffeine-free green tea catechin extract, was highly effective for weight/life changes in a registry controlled study of subjects without borderline symptoms for metabolic syndrome factors and with increased plasma oxidative fatigue, according to [15] Green select Phytosome for Borderline Metabolic Syndrome. A number of significant in vitro and in vivo research on the bioactivity of mulberry leaf extract and its fractions were described [17]. Metabolic Effects of Mulberry Leaf that is showing remarkable benefits in Type 2 Diabetes and Hyperuricemia. Table 1 summarise detail data from different medicinal plants, its part used, and drug or phytochemical identifies from it along with its effects.

## Smallpox in Former Yugoslavia

Variola is a notably contagious and deadly sickness because of a plague called variola. The maximum substantial signs had been particular rashes that modified in look because the sickness progressed. Prior to the eradication programme, the global loss of life toll changed into over three hundred million. Smallpox

changed into declared eliminated global with inside the 1980s at some point of the Smallpox Eradication Program, despite the fact that the variola virus which reasons smallpox, nonetheless lives. There is a no symptomatic incubation segment as soon as someone is inflamed with the variola virus earlier than the virus replicates symptomatically. After rashes, the signs commonly encompass an excessive fever, physical pain, headache, such as backaches, and vomiting that begins off evolved with small, flat purple patches at the tongue and with inside the mouth and spreads for the duration of the body. Nausea, cold, weariness, diarrhoea and heavy bleeding are a number of the opposite signs. The smallpox vaccination changed into the primary contagious contamination vaccine to be developed. Edward Jenner, a British doctor produced the world's first vaccine for the remedy in 1798. Later in July 2018, the United States Food and Drug Administration authorized tecovirimat dose (TPOXX), an antiviral for the remedy of smallpox contamination (FDA). Plants used to deal with smallpox include Smallpox may be dealt with *Sarracenia purpurea* [18].

### AIDS (Acquired Immune Deficiency Syndrome)

Acquired immunodeficiency syndrome (AIDS) is a deadly pandemic ailment that turned into first diagnosed with inside the early 1980s. Its brief onset and epidemic unfold have inflamed at the least 60 million human beings worldwide, killing over 25 million individuals (occurrence rate: 0. seventy nine percent) (the pandemic shape of HIV-1). Human immunodeficiency virus kind 1 (HIV-1) is a retrovirus was among one of the dangerous virus with maximum adverse infectious sicknesses in history, with many social stigmas related to it (a frequently sexually transmitted ailment, predominantly gay and bisexual men). Intravenous drug addicts, blood transfusion patients, haemophiliacs and everybody who mated with an AIDS victim have been quickly found to be at risk. Antiretroviral drug treatments are given to an uninfected man or woman earlier than they are uncovered to HIV so that you can decrease the threat of infection and are persisted even if they are at risk. Emtricitabine is a reversible transcriptase inhibitor. Contraceptives, along with male and woman condoms and dental dams, are a few preventive strategies. *Andrographis paniculata*/*Avicennia marina* are widely used for the treatment of AIDS.

### Tuberculosis

In 1985, there has been a rapid growth in tuberculosis cases. The revival turned into often visible amongst ethnic minorities and in particular amongst HIV-effective people. This turned into because of HIV's gradual deterioration of the immune system. Men are much more likely than ladies to be affected. It is a continual disorder that has wreaked havoc on humanity and is one of the maximum infectious reasons of human ache and dying across the planet. *Mycobacterium tuberculosis* is the microorganism that reasons it. The chance of tuberculosis in an AIDS affected person is one hundred seventy instances better than in a healthful individual. The signs and symptoms of tuberculosis range relying on wherein the germs are growing with inside the body. It particularly impacts

the lungs, however it could additionally have an effect on different physical additives just like the brain, spine, intestines and kidneys. Directly determined therapy (DOTS) changed into implemented and it changed into hailed as a "breakthrough" in tuberculosis treatment. It commenced in Bangladesh in 1993, and over the last 15 years, it has dealt with almost 35 million humans and avoided about eight million fatalities. Preventive co-trimoxazole remedy need to be commenced as quickly as a person's contamination is observed and endured all through TB treatment. Patients are given a 6-month regimen (more often than not isoniazid and rifampin) and pyrazinamide for 2 months, observed via way of means of isoniazid and rifampin for 4 months. In the case of youngsters, ethambutol or streptomycin need to be protected with inside the preliminary regimen. Plants used to deal with TB includes *Allium sativum* is a former medication with extensive variety of medicinal properties [19].

### Swine flu: - Influenza

In the year 2009, a new pressure of H1N1 induced swine flu. It all began out in Mexico with inside the spring of 2009, earlier than spreading all around the world. It changed into passed down from pigs to people [20]. According to the CDC, it stricken almost 1.4 billion people international in only one 12 months, ensuing with inside the deaths of 151,700 to 575,400 persons. Antigenic glide changed into negligible when evaluating the 2009 H1 protein to the 1918 H1 protein. The A/H1N1pdm09 virus was discovered to have a reduced assault rate in older adults, possibly because of beyond exposure to older A/H1N1 viruses. When contamination progresses, signs can range from moderate respiration irritations to excessive pneumonia connected with ARDS over an extended period of time [21]. It's feasible that it is asymptomatic in a few circumstances, which accounts for about 10% of cases [22]. Loss of life associated with breathing issues in numerous international locations at some point of the world [23]. Hand washing, face masks use, and cough etiquette had been a few of the non-pharmaceutical treatment plans adopted [24]. The 2009 pandemic turned into the primary to appoint vaccinations and antivirals together. Symptomatic sufferers and their contacts had been separated from normal/unaffected humans and given antiviral remedy as a prophylactic measure. Plants mainly used in the treatment of Swine flu are as follows, Holy Basil (*Ocimum sanctum*), Ginger (*Zingiber Officinalis*), Elderberry (*Sambucus nigra*), Gooseberry (*Emblica Officinalis*), Japanese Wasabi (*Wasabia japonica*), Garlic (*Allium sativum*), Aloe Vera, Camphor and Eucalyptus Oil, Neem (*Azadirachta indica*), Turmeric (*Curcuma longa*), Ajwain (*Trachyspermum Ammi*).

### Cancer

In each industrialized and growing countries, mostly cancer is a high-profile disease and according to a report by WHO 2007, about 7.6 million people died from most cancers-associated issues in 2005, among them bulk of the population lived in low-profits nations [25]. In the United States, most cancers is

answerable for 1,444 fatalities, while greater than 1.5 million new times of most cancers had been recognized in the year 2010 [26]. According to Cancer Research UK, about 14.1 million people had been recognized with most cancers in 2012, and 8.2 million human beings had been killed with the aid of using most cancers worldwide [27]. As a result, chemical-derived medicinal drugs had been produced, in addition to the diverse most cancers treatments [28]. Modern-day techniques like as chemotherapy have challenges because of their poisonous outcome on non-target tissues, which are at the root of human fitness concerns [29]. As a result, there may be a demand for potential anticancer therapies using natural beginning with flora marketers, as the preferred supply demand for most cancers therapy and prevention could be quite substantial. Polyphenols, flavonoids and brassinosteroids are secondary metabolites observed in vegetation which have been studied for their capability as anticancer drugs. Anticancer action has been demonstrated, such as antioxidant activity, tumour cell increase suppression, apoptosis induction, target selectivity and most cancers cell cytotoxicity [30-33]. Plant-derived medicines were produced and are progressing via medical trials with beneficial results. Vinca, an alkaloid-derived medication, become one of the first to be utilized and its miles presently being examined in Phase II medical trials along Paclitaxel and different anticancer treatments. This chemical is plentiful with inside the herbal global and is enormously non-poisonous to wholesome human cells. Furthermore, drugs generated from alkaloids Vinca were among the first chemical substances to be employed, and they may be presently being examined in Phase III scientific trials along Paclitaxel and different anticancer drugs. This chemical is ample with inside the natural world and especially non-poisonous to wholesome human cells. Furthermore, novel technology like as nanoparticles are being evolved for utility in drug transport and anticancer therapy improvement may be used to modulate medicinal drug launch over the years and resource with inside the improvement of tissue-unique healing procedures. Demand for natural drug treatments is increasing, placing pressure on high-value medicinal plants and jeopardising their biodiversity [34]. Endangered species in rising nations gain from population increase, urbanisation, and deforestation. Conservation, cryopreservation, tissue culture and plant element alternative strategies should all be implemented with a view to resource with inside the conservation of germplasm species [35]. The use of uncooked by-products with inside the industry and mass cultivation of medicinal plant species can each resource in conservation. Plant-primarily based totally anticancer drugs are powerful inhibitors of tumour cell lines [36,37] making them very popular. To meet demand and stay sustainable, those agents' exploitation should be regulated.

### Coronaviruses

Covid is home to the coronaviridae family and includes four generations of Covid [38]. The genome is composed of non-subgroup proteins and four basic proteins including layer, spike, envelope and nucleocapsid proteins. Human Covids (HCoVs) cause

occasional respiratory infections, and gradually gastroenteritis.

### SARS-CoV

SARS-CoV started in Guangdong (China) in 2003. Sensitive bats are the common thought of SARS-CoV [39] and palm civets may be classified as previously distributed to humans [40]. During the period 2002-2003, SARS-CoV contamination was reported in 29 countries in North America, South America, Europe and Asia. In particular, about 8,437 cases were associated with 813 SARS-related deaths [41]. Contamination by SARS-CoV often causes disruptions such as the flu through severity, weakness and the common cold. Many common symptoms include constipation and diarrhea. In 20-30% of contaminated patients, the disease progresses to a rare, pneumonic and non-invasive air trade in the alveoli with patients requiring ICU board or mechanical ventilation. A large number of these patients have also developed loose bowel disease. Important subjects for SARS-CoV transmission were droplets, vapor sprays and fomites [42].

### MERS-CoV

Ten years after the major rise of MERS-CoV, SARS-CoV was listed in Jeddah in Saudi Arabia. The possible repositories of MERS-CoV species are bats and dromedary camels, have been suggested as a mediator host [43]. Elsewhere in the period 2012 and 2020, 2,519 study centers confirmed the incidence of MERS-CoV and 866 deaths in 27 countries [44]. About half of MERS-CoV cases were due to nosocomial transmission in patients, medical staff and visitors [45]. Transfers between relatives recently occurred in 13-21% of cases [46]. People with MERS-CoV offer a wide range of clinical offers from mild to severe lung infections [47]. A non-symptomatic to mild to moderate degree of contamination of 25-50 is calculated. Contamination with MERS-CoV causes very serious, extremely dangerous pneumonia and kidney failure with various side effects including fever, chills, illness, migraine, cough, sore throat, arthralgia and myalgia. Various manifestations include illness, vomiting, diarrhea and stomach upset. There is currently no approved vaccine or treatment available against MERS-CoV contamination. Clinical management of patients with MERS-CoV includes basically ongoing consideration for pain and flu relief, support for vital organ functions and treatment of orthopedic infections [47]. The spike protein MERS-CoV is an important target for developing vaccines [48]. These antibodies are based on DNA, viral vectors, viral proteins, particles such as infection, particles such as bacteria and nanoparticles.

### SARS-CoV-2

In early December 2019, the common pneumonia was reported in a crowd of patients in Wuhan (China) and was shown to be introduced by a new Covid called SARS-CoV-2 [49]. The infection known as COVID-19, in COVID animal dams may be bats [50]. It was suggested that pangolin could be a carrier transmitting the virus to humans [51] yet the host, it is thought, by any means, has not been definitively isolated. SARS-CoV-2 infections may be undetectable (up to 40% of cases) or cause a variety of diseases

ranging from mild manifestations to serious infections [52]. People infected with the virus often have fever, dry cough and shortness of breath, fatigue, myalgia, sickness, vomiting, diarrhea, migraine, weakness, rhinorrhea, anosmia and ageusia. Common complications among hospitalized patients include pneumonia, severe liver damage, ARDS, heart damage, prothrombotic coagulopathy, severe kidney damage and neurologic symptoms. Basically, sick patients can also have cytokine storm and macrophage initiation disease. Diseases such as high blood pressure, diabetes, heart disease, frequent pneumonic infections, chronic kidney disease, the threat and chronic liver disease have been detected in 60-90% of hospitalized patients [53]. Mild adverse effects occurred in 80% of certified laboratory cases. Coronavirus has been spread worldwide over the past few months causing more than 74 million cases and more than 1.6 million deaths worldwide since December 18, 2020 [44]. In less than a year (as December 11, 2020), vaccine involving mRNA encoding spike protein infection (created by Pfizer / BioNTech) has been

approved by the US FDA. Antiviral remdesivir (a reconstructed drug created to treat Ebola infection) received US FDA Emergency Use Authorization to treat in patients with COVID-19 in need of extra oxygen. The drug that reduces dexamethasone was recommended in sick patients with COVID-19 by WHO [54]. Herbal remedies for the treatment of coronavirus: - *Vitex trifolia*, *Indigofera Tinctoria*, *Abutilon indicum*, *Cassia alata*, *Amaranthus Phaphil*, *Mygaris*, *Sphaeranthus indicus*, *Leucas aspera*, *Hyptis atrorubens* Poit, *Evolvulus alsinoides*, *Ally*, *Alla*, *Alluxericicllaum*, *Glycyrrhizae radix*, *Glycyrrhiza uralensis*, *Clitoria ternatea*, *Lycoris radiata*, *Camellia sinensis*, *Phyllanthus emblica*, *Citri Reticulatae Pericarpium*, *Phaphalas*, *Mygarica*, *Gymnema sylvestre*, *Erigeron breviscapus*, *Fraxinus sieboldiana* [55-72]. So medicinal plants are very strong support for human life since ancient years and world many civilizations still dependent upon the medicinal plants. Tribal, Folk medicinal system are completely plant based (Table 1) [73-118].

**Table 1:** Showing different medicinal plants and their important phytochemical/ drug produced from specific part of plant along with their effects.

S.NO	Drug/Chemical	Plant parts	Action	Plant Source	References
1	Andrographolide	Whole plant	Treatment for baccillary dysentery	<i>Andrographis paniculata</i>	-55
2	Allyl isothiocyanate	Seed	Rubefacient	<i>Brassica nigra</i> (black mustard)	-56
3	Anisodine	Root	Anticholinergic	<i>Anisodus tanguticus</i>	-57
4	Anisodamine	Root	Anticholinergic	<i>Anisodus tanguticus</i>	-56
5	Asiaticoside	Whole plant	Vulnerary	<i>Centella asiatica</i> (gotu cola)	-58
6	Arecoline	Nu (Fruit)	Anthelmintic	<i>Areca catechu</i>	-56
7	Berberine	Fruit, bark, root,	Treatment for bacillary dysentery	<i>Berberis vulgaris</i> (common barberry)	-59
8	Bergenin	Root, stem, leaves	Antitussive	<i>Ardisia japonica</i> (marlberry)	-60
9	Caffine	Leaves	CNS stimulant	<i>Camellia sinensis</i>	-61
10	Camptothecin	Bark	Anticancerous	<i>Camptotheca acuminata</i>	-62
11	Camphor	Wood	Rubefacient	<i>Cinnamomum camphora</i> (camphor tree)	-63
12	Chymopapain	Fruit, bark, root, stem	Proteolytic, mucolytic	<i>Carica papaya</i> (papaya)	-64
13	(+)-Catechin	Underground parts	Hemostatic	<i>Potentilla fragarioides</i>	-65
14	Cocaine	Leaves	Local anaesthetic	<i>Erythroxylum coca</i> (coca plant)	-66
15	Cissampeline	Root, barks	Skeletal muscle relaxant	<i>Cissampelos pareira</i> (velvet leaf)	-56
16	Colchicesine amide	Root, seeds	Antitumor agent	<i>Colchicum autumnale</i> (autumn crocus)	-67
17	Codeine	Seeds	Analgesic, antitussive	<i>Papaver somniferum</i> (poppy)	-68
18	Colchicine	Root, seeds	Antitumor, antigout	<i>Colchicum autumnale</i> (autumn crocus)	-67
19	Curcumin	Rhizomes	Choleretic	<i>Curcuma longa</i> (turmeric)	-69

20	Demecolcine	Root, seeds	Antitumor agent	<i>Colchicum autumnale</i> (autumn crocus)	-67
21	Deserpidine	Root	Antihypertensive, tranquilizer	<i>Rauwolfia canescens</i>	-70
22	L-Dopa	Seeds	Anti-parkinsonism	<i>Mucuna species</i> (nescafe, cowage, velvet-bean)	-71
23	Deslanoside	Part grow above the ground	Cardiotonic	<i>Digitalis lanata</i> (Grecian foxglove, woolly foxglove)	-72
24	Digoxin	Leaves	Cardiotonic	<i>Digitalis purpurea</i> (purple or common foxglove)	-72
25	Ephedrine	Branches, leaves	Sympathomimetic, antihistamine	<i>Ephedra sinica</i> (ephedra, ma huang)	-73
26	Galanthamine	Bulbs	Cholinesterase inhibitor	<i>Lycoris squamigera</i> (magic lily, resurrection lily, naked lady)	-74
27	Etoposide	Roots, rhizome	Antitumor agent	<i>Podophyllum peltatum</i> (mayapple)	-75
28	Glycyrrhizin	Root, rhizome	Sweetener, treatment for Addison's disease	<i>Glycyrrhiza glabra</i> (licorice)	-76
29	Irinotecan	Bark, seeds, leaves, fruits	Anticancer, antitumor agent	<i>Camptotheca acuminata</i>	-77
30	Khellin	Seeds	Bronchodilator	<i>Ammi visnaga</i>	-78
31	Kawain	Root	Tranquilizer	<i>Piper methysticum</i> (kava kava)	-79
32	Lapachol	Bark	Anticancer, antitumor	<i>Tabebuia species</i> (trumpet tree)	-80
33	Lanatosides A, B, C	Leaves	Cardiotonic	<i>Digitalis lanata</i> (Grecian foxglove, woolly foxglove)	-72
34	Menthol	Leaves	Rubefacient	<i>Mentha species</i> (mint)	-81
35	Methyl salicylate	Leaves and bark	Rubefacient	<i>Gaultheria procumbens</i> (wintergreen)	-82
36	Neoandrographolide	Aerial parts, roots	Treatment of dysentery	<i>Andrographis paniculata</i>	-83
37	Morphine	Unripe seed capsule	Analgesic	<i>Papaver somniferum</i> (poppy)	-84
38	Anamirta cocculus (fish berry)	Leaves	Antioxidant	<i>Nordihydroguaiaretic acid</i>	-85
39	Nicotine	Leaves	Insecticide	<i>Nicotiana tabacum</i>	-86
40	Noscapine	Green capsule	Antitussive	<i>Artemisia maritima</i> (wormwood)	-74
41	Palmatine	Stems	Antipyretic, detoxicant	<i>Carica papaya</i> (papaya)	-87
42	Pachycarpine	dried flowers	Oxytocic	<i>Cannabis sativa</i> (marijuana)	-84
43	Papavarine	Latex	Smooth muscle relaxant	<i>Catharanthus roseus</i> (Madagascar periwinkle)	-88
44	Physostigmine	Seeds	Cholinesterase inhibitor	<i>Chondodendron tomentosum</i> (curare vine)	-89
45	Phyllodulcin	Leaves	Sweetener	<i>Catharanthus roseus</i> (Madagascar periwinkle)	-90
46	Pilocarpine	Leaves	Parasympathomimetic	<i>Cinchona ledgeriana</i> (quinine tree)	-91
47	Picrotoxin	Fruit	Analeptic	<i>Cinchona ledgeriana</i> (quinine tree)	-92
48	Podophyllotoxin	Roots, stems, fruits, leaves, and seeds	Antitumor, anticancer agent	<i>Coptis japonica</i> (Chinese goldthread, goldthread, Huang-Lia)	-75
49	Pinitol	Leaves	Expectorant	<i>Citrus species</i> (e.g., orange, grapefruit)	-93

50	Pseudoephedrine	Branches	Sympathomimetic	<i>Cytisus scoparius</i> (scotch broom)	-94
51	Quinidine	Bark	Antiarrhythmic	<i>Daphne genkwa</i> (lilac)	-95
52	nor-pseudoephedrine)	Branches	Sympathomimetic	<i>Daphne genkwa</i> (lilac)	-94
53	Quinine	Bark	Antimalarial, antipyretic	<i>Datura species</i> (e.g., Jimsonweed)	-96
54	Reserpine	Roots	Antihypertensive, tranquilizer	<i>Hydrangea macrophylla</i> (big leaf hydrangea, French hydrangea)	-97
55	Rescinnamine	Leaves	Antihypertensive, tranquilizer	<i>Ephedra sinica</i> (ephedra, ma huang)	-98
56	Rorifone	Whole plant part	Antitussive	<i>Lonchocarpus nicou</i>	-99
57	Rhomitoxin	Leaves	Antihypertensive, tranquilizer	<i>Larrea divaricata</i> (creosote bush)	-100
58	Rutin	Fruits	Treatment for capillary fragility	<i>Pausinystalia yohimbe</i> (yohimbe)	-101
59	Rotenone	Roots	Piscicide, Insecticide	<i>Papaver somniferum</i> (opium poppy, common poppy)	-102
60	Santonin	flower	Ascaricide	<i>Podophyllum peltatum</i> (mayapple or mandrake)	-103
61	Salicin	Barks	Analgesic	<i>Physostigma venenosum</i> (Calabar bean)	-104
62	Scopolamine	Roots	Sedative	<i>Quisqualis indica</i> (Rangoon creeper, drunken sailor)	-105
63	Sanguinarine	Rhizomes	Dental plaque inhibitor	<i>Pilocarpus jaborandi</i> (jaborandi, Indian hemp)	-106
64	Scillarin A	Bulbs	Cardiotonic	<i>Podophyllum peltatum</i> (mayapple)	-107
65	Silymarin	Fruits	Antihepatotoxic	<i>Rauvolfia serpentina</i>	-108
66	Sennosides A, B	Leaves	Laxative	<i>Rauvolfia serpentina</i>	-109
67	Strychnine	Seed, stem, root	CNS stimulant	<i>Salix alba</i> (white willow)	-110
68	Sparteine	Flowers	Oxytocic	<i>Rhododendron molle</i> (rhododendron)	-111
69	Teniposide	Roots and rhizomes	Antitumor agent	<i>Several plants</i> (e.g., bougainvillea)	-112
70	Tetrahydropalmatine	Roots	Analgesic, sedative, tranquilizer	<i>Sophora pschycarpa</i>	-113
71	Tetrandrine	Roots	Antihypertensive	<i>Stephania sinica</i>	-114
72	Thymol	Leaves	Topical antifungal	<i>Strophanthus gratus</i> (ouabain tree)	-115
73	Trichosanthin	Fruits and leaves	Abortifacient	<i>Taxus brevifolia</i> (Pacific yew)	-116
74	Vinblastine	Part above the ground and root	Antitumor, Antileukemic agent	<i>Trichosanthes kirilowii</i> (snake gourd)	-117
75	Vasicine	Part above the ground and root	Cerebral stimulant	<i>Thymus vulgaris</i> (thyme)	-118

## Conclusion

Plants produce a wide variety of amazingly diverse natural products. Phytochemicals are non-nutritive synthetics and are responsible for the medicinal properties of plants. On the bases of their energy it plays on plant metabolism, phytochemical are

divided into two groups for example secondary and primary metabolites. From ancient times the people have tried to find medicines to relieve pain and to correct various ailments through various structures produced by various natural products. Natural remedies are now known to play a key role in the development of



antidepressant therapies, which has prompted specialists to look at natural remedies for solutions, reducing their effectiveness and increasing the risk of synthetic drugs, which in itself is a disturbing issue. The discovery of medicinal plants continues to provide new and important clues against a variety of drug goals including HIV / AIDS, Alzheimer's, cancer, pain, and malaria. Medicinal plants may be less valuable as they are certified, or they may have more repair facilities than are known locals. As a result, there is a need for scientific research to better understand the specific therapeutic potential of these nearby plants.

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### References

- MM Robinson, X Zhang (2011) The World Medicine Situation (Traditional Medicines: Global Situation, Issues and Challenges). Geneva. World Health Organization.
- GM Cragg, DJ Newman (2005) Biodiversity: A continuing source of novel drug leads. *Pure and applied chemistry* 77(1): 7-24.
- C Katiyar, A Gupta, S Kanjilal, S Katiyar (2012) Drug discovery from plant sources: An integrated approach *Ayu* 33(1): 10-19.
- JB Calixto (2019) The role of natural products in modern drug discovery. *Anais da Academia Brasileira de Ciências* 91(3).
- DJ Newman, GM Cragg (2016) Natural products as sources of new drugs from 1981 to 2014. *Journal of natural products* 79(3): 629-661.
- SS Chavan, MG Damale, B Devanand (2018) Antibacterial and Antifungal Drugs from Natural Source: A Review of Clinical Development; Natural Products in Clinical Trials: Sharjah, UAE. 1: 114.
- WC Evans (2002) Trease and Evans pharmacognosy. Nottingham: University of Nottingham 21.
- G Samuelsson (2004) Drugs of natural origin: a textbook of pharmacognosy, 5<sup>th</sup> Swedish Pharmaceutical Press. Stockholm, Sweden.
- AD Kinghorn (2001) Pharmacognosy in the 21<sup>st</sup> century. *Journal of pharmacy and pharmacology* 53(2): 135-148.
- MS Butler (2004) The role of natural product chemistry in drug discovery. *Journal of natural products* 67(12): 2141-2153.
- R Kramer, D Cohen (2004) Functional genomics to new drug targets. *Nature Reviews Drug Discovery* 3(11): 965-972.
- YS Jun, P Kang, SS Min, JM Lee, HK Kim, et al. (2013) Effect of eucalyptus oil inhalation on pain and inflammatory responses after total knee replacement: a randomized clinical trial. *Evidence-Based Complementary and Alternative Medicine*.
- SZhang, HXin, YLi, DZhang, JShi, et al. (2013) Skimmin, a coumarin from *Hydrangea paniculata*, slows down the progression of membranous glomerulonephritis by anti-inflammatory effects and inhibiting immune complex deposition. *Evidence-Based Complementary and Alternative Medicine*.
- DW Zou, YB Gao, ZY Zhu, H Zhou, TJ Zhang, et al. (2013) Traditional chinese medicine tang-luo-ning ameliorates sciatic nerve injuries in streptozotocin-induced diabetic rats. *Evidence-Based Complementary and Alternative Medicine*.
- G Belcaro, A Ledda, S Hu, MR Cesarone, B Feragalli, et al. (2013) Grape seed procyanidins in pre-and mild hypertension: a registry study. *Evidence-Based Complementary and Alternative Medicine*.
- CC Velusami, A Agarwal, V Mookambeswaran (2013) Effect of *Nelumbo nucifera* petal extracts on lipase, adipogenesis, adipolysis, and central receptors of obesity. *Evid Based Complement Alternat Med* 2013: 145925.
- A Hunyadi, E Liktör-Busa, Á Márki, A Martins, N Jedlinszki, et al. (2013) Metabolic effects of mulberry leaves: exploring potential benefits in type 2 diabetes and hyperuricemia. *Evidence-Based Complementary and Alternative Medicine*.
- F Lawrence Mackey (2019) Medical Appropriation in the Red Atlantic: Translating a Mi'kmaq smallpox cure in the mid-nineteenth century (Doctoral dissertation, UCL (University College London)).
- C Dini, A Fabbri, A Geraci (2011) Direzione Generale per la Cooperazione allo Sviluppo, Ministero degli Affari Esteri. Dipartimento del Farmaco, Istituto Superiore di Sanità 47(4): 465-473.
- JD Easterbrook, JCKash, ZM Sheng, L Qi, J Gao, et al. (2011) Immunization with 1976 swine H1N1- or 2009 pandemic H1N1-inactivated vaccines protects mice from a lethal 1918 influenza infection. *Influenza Other Respir Viruses* 5: 198-205.
- G Chowell, SM Bertozzi, MA Colchero, H Lopez-Gatell, C Alpuche-Aranda, et al. (2009) Severe respiratory disease concurrent with the circulation of H1N1 influenza. *N Engl J Med* 361: 674-679.
- J Papenburg, M Baz, ME Hamelin, C Rheaume, J Carbonneau, et al. (2010) Household transmission of the 2009 pandemic A/H1N1 influenza virus: elevated laboratory-confirmed secondary attack rates and evidence of asymptomatic infections. *Clin Infect Dis* 51(9): 1033-1041.
- L Simonsen, P Spreeuwenberg, R Lustig, RJ Taylor, DM Fleming, et al. (2013) Global mortality estimates for the 2009 Influenza Pandemic from the GLaMOR project: a modeling study. *PLoS Med* 10(11): e1001558.
- PT Cantey, MG Chuk, KS Kohl, J Herrmann, P Weiss, et al. (2013) Public health emergency preparedness: lessons learned about monitoring of interventions from the National Association of County and City Health Official's survey of nonpharmaceutical interventions for pandemic H1N1. *J Public Health Manag Pract* 19: 70-76.
- World Health Organisation (2007) The World Health Organisation's Fight Against Cancer: Strategies that prevent, cure and care. WHO Press; Geneva.
- A Jemal, R Siegel, J Xu, E Ward (2010) Cancer Statistics, CA: A Cancer Journal for Clinicians 60: 277-300.
- Cancer Research UK (2014). (Accessed 23 January 2015) World cancer statistics.
- C Seidel, C Florean, M Schnekenburger, M Dicato, M Diederich (2012) Chromatin-modifying agents in anti-cancer therapy. *Biochimie* 94: 2264-2279.
- DO Ochwang I, CN Kimwele, JA Oduma, PK Gathumbi, JM Mbaria, et al. (2014) Medicinal plants used in treatment and management of cancer in Kakamega County Kenya. *J Ethnopharmacol* 151: 1040-1055.
- SC Gupta, AK Tyagi, P Deshmukh Taskar, M Hinojosa, S Prasad, et al. (2014) Downregulation of tumor necrosis factor and other proinflammatory biomarkers by polyphenols. *Arch Biochem Biophys*. 559: 91-99.

31. J Cao, X Xia, X Chen, J Xiao, Q Wang (2013) Characterization of flavonoids from *Dryopteris erythrosora* and evaluation of their antioxidant, anticancer and acetylcholinesterase inhibition activities. *Food Chem Toxicol* 51: 242-250.
32. J Malíková, J Swaczynová, Z Kolář, M Strnad (2008) Anticancer and antiproliferative activity of natural brasinosteroids. *Phytochemistry*. 69(2): 418-426.
33. SR Kumar, S Priyatharshni, VN Babu, D Mangalaraj, C Viswanathan, et al. (2014) Quercetin conjugated superparamagnetic magnetite nanoparticles for in-vitro analysis of breast cancer cell line for chemotherapy applications *J Colloid Interface Sci* 436: 234-242.
34. S Zschocke, T Rabe, JLS Taylor, AK Jäger, J van Staden (2000) Plant part substitution – a way to conserve endangered medicinal plants? *J Ethnopharmacol* 71: 281-292.
35. VN Kasagana, SS Karumuri (2011). Conservation of Medicinal Plants (Past, Present & Future Trends). *Journal of Pharmaceutical Sciences and Research*. 3(8):1378-1386.
36. D Sahpazidou, GD Geromichalos, D Stagos, A Apostolou, SA Haroutouian, et al. (2014) Anticarcinogenic activity of polyphenolic extracts from grape stems against breast, colon, renal and thyroid cancer cells. *Toxicol Lett* 230: 218-224.
37. R Sivaraj, PK Rahman, P Rajiv, S Narendhran, R Venckatesh (2014) Biosynthesis and characterization of *Acalypha indica* mediated copper oxide nanoparticles and evaluation of its antimicrobial and anticancer activity. *Spectrochim Acta A Mol Biomol Spectrosc* 129: 255-258.
38. PS Masters, S Perlman, DM Knipe, PM Howley (2013) (Eds.) (sixth ed.), *Fields Virology*, vol 1, Lippincott Williams & Wilkins, Philadelphia, PA. 825-858.
39. W Li, C Zhang, F Michael, Jianhua Sui, Jens H Kuhn, et al. (2005) Receptor and viral determinants of SARS-coronavirus adaptation to human ACE2. *EMBO J* 24(8): 1634-1643.
40. Y Guan, BJ Zheng, YQ He, XL Liu, ZX Zhuang, et al. (2003) Isolation and characterization of viruses related to the SARS coronavirus from animals in southern China. *Science* 302(5643): 276-278.
41. JS Mackenzie, P Drury, A Ellis, et al. (2004) *The WHO Response to SARS and preparations for the future*. National Academies Press (US).
42. WH Seto, D Tsang, RWH Yung, TY Ching, TY Ching, et al. (2003) Effectiveness of precautions against droplets and contact in prevention of nosocomial transmission of severe acute respiratory syndrome (SARS). *Lancet* 361(9368): 1519-1520.
43. R Conzade, G Rebecca, MR Malik, A Elkholy, M Elhakim, et al. (2018) Reported Direct and Indirect Contact with Dromedary Camels among Laboratory-Confirmed MERS-CoV Cases. *Viruses* 10(8): 425.
44. HA Mohammad, AB Salman (2021) Determining the correlation between comorbidities and MERS-CoV mortality in Saudi Arabia. *Journal of Taibah University Medical Sciences* 16(4): 591-595.
45. D Hui, EI Azhar, A Zumla, Yae-Jean Kim, Myoung-Don Oh, et al. (2018) Middle East respiratory syndrome coronavirus: risk factors and determinants of primary, household, and nosocomial transmission. *Lancet Infect Dis* 18(8): 217-227.
46. G Chowell, F Abdirizak, S Lee, J Lee, E Jung, (2015) Transmission characteristics of MERS and SARS in the healthcare setting: comparative study. 13: 210.
47. ZA Memish, DS Hui, EI Azhar, A Zumla (2020) Human coronavirus infections—severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and SARS-CoV-2.
48. N Zhang, C Li, Y Hu, K Li, J Liang, et al. (2020) Current development of COVID-19 diagnostics, vaccines and therapeutics. *Microbes and infection* 22(6-7): 231-235.
49. Y Zhu, L Chen, H Ji, M Xi, Y Fang, et al. (2020) The Risk and Prevention of Novel Coronavirus Pneumonia Infections Among Inpatients in Psychiatric Hospitals. *Neurosci Bull* 36(3): 299-302.
50. SY Lau, P Wang, BWY Mok, AJ Zhang, H Chu, et al. (2020) Attenuated SARS-CoV-2 variants with deletions at the S1/S2 junction. *Emerg Microbes Infect* 9(1): 837-842.
51. TTY Lam, N Jia, YW Zhang, Marcus Ho Hin Shum, Jia Fu Jiang, et al. (2020) Identifying SARS-CoV-2-related coronaviruses in Malayan pangolins. *Nature* 583(7815): 282-285.
52. WJ Wiersinga, A Rhodes, AC Cheng, SJ Peacock, HC Prescott (2020) Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review. *JAMA* 324(8): 782-793.
53. S Richardson, JS Hirsch, M Narasimhan, JM Crawford, T McGinn, et al. (2020). COVID-19 Research Consortium. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *Jama* 323(20): 2052-2059.
54. Lamontagne, François, Arnav Agarwal, Bram Rochweg, Lisa Askie, et al. (2020) A living WHO guideline on drugs for covid-19 *BMJ* 370: m3379.
55. MD Hossain, ZUrbi, A Sule, KM Rahman (2014) *Andrographis paniculata* (Burm. f.) Wall. ex Nees: a review of ethnobotany, phytochemistry, and pharmacology. *ScientificWorldJournal* 2014: 274905.
56. Harish K Sharma, Sandeep Ingle, Charanjiv Singh, Bhavesh C Sarkar, Ashutosh Upadhyay (2012) Effect of various process treatment conditions on the allyl isothiocyanate extraction rate from mustard meal. *J Food Sci Technol* 49(3): 368-372.
57. CK Zoltani, GD Thorne, & SI Baskin (2006) Cardiovascular Toxicity of Cholinesterase Inhibitors. In *Toxicology of Organophosphate & Carbamate Compounds*. pp.381-388.
58. KJ Gohil, JA Patel, AK Gajjar (2010) Pharmacological review on *Centella asiatica*: a potential herbal cure-all. *Indian J Pharm Sci* 72(5): 546-556.
59. M Rahimi Madiseh, Z Lorigoini, H Zamani Gharaghoshi, M Rafieian-Kopaei (2017) *Berberis vulgaris*: specifications and traditional uses. *Iran J Basic Med Sci* 20(5): 569-587.
60. JA Duke, ES Ayensu (1985). *Medicinal plants of China*. 2: 705.
61. A Gupta, AK Pandey (2019) Plant secondary metabolites with hepatoprotective efficacy. In *Nutraceuticals and Natural Product Pharmaceuticals* 71-104.
62. SS Yang, GM Cragg, DJ Newman (2001) The Camptothecin Experience: From Chinese Medicinal Plants to Potent Anti-Cancer Drugs. In *Drug Discovery and Traditional Chinese Medicine*. pp. 61-74.
63. E Cronkleton (2018) *What Is Camphor? Health Uses and Precautions*.
64. AA Adeneye (2014) 6 - Subchronic and chronic toxicities of African medicinal plants. In *Toxicological survey of African medicinal plants* 99-133.
65. M Tomczyk, KP Latté (2009) *Potentilla*-A review of its phytochemical and pharmacological profile. *J Ethnopharmacol* 122(2): 184-204.
66. P Trifilieff, D Martinez (2014) Chapter Five - Cocaine: mechanism and effects in the human brain. In *The effects of drug abuse on the human nervous system* 103-133.
67. JK Aronson (Ed) (2015) *Meyler's side effects of drugs: the international encyclopedia of adverse drug reactions and interactions*.
68. E Britannica (2009) *Opium Poppy*. *Encyclopedia Britannica*.
69. D Rakel (2017) *Integrative medicine-E-book*. Elsevier health sciences.

70. D Lobay (2015) Rauwolfia in the treatment of hypertension. *Integr Med (Encinitas)* 14(3): 40-46.
71. LR Lampariello, A Cortelazzo, R Guerranti, C Sticozzi, G Valacchi (2012) The magic velvet bean of *Mucuna pruriens*. *J Tradit Complement Med* 2(4): 331-339.
72. AE Al Snafi (2017) Phytochemical constituents and medicinal properties of *Digitalis lanata* and *Digitalis purpurea*-A review. *Indo American Journal of Pharmaceutical Sciences* 4(2): 225-234.
73. MR Lee (2011) The history of Ephedra (ma-huang). *JR Coll Physicians Edinb* 41(1): 78-84.
74. M Alliegro (2007) Angiogenesis, (Ed's): SJ Enna, David B Bylund, xPharm: The Comprehensive Pharmacology Reference.
75. H Ardalani, A Avan, M Ghayour Mobarhan (2017) Podophyllotoxin: a novel potential natural anticancer agent. *Avicenna journal of phytomedicine*. 7(4): 285.
76. V Sharma, A Katiyar, RC Agrawal (2018) *Glycyrrhiza glabra*: Chemistry and Pharmacological Activity 87-100.
77. A Lorence, F Medina Bolivar, CL Nessler (2004) Camptothecin and 10-hydroxycamptothecin from *Camptotheca acuminata* hairy roots. *Plant Cell Reports* 22(6): 437-441.
78. AS Bhagavathula, AJM Al Khatib, AA Elnour, NM Al Kalbani, A Shehab (2015) Ammi Visnaga in treatment of urolithiasis and hypertriglyceridemia. *Pharmacognosy Res* 7(4): 397-400.
79. MT Murray, J Nowicki (2020) Piper methysticum (Kava). In *Textbook of Natural Medicine* 791-796.
80. SS El Hawary, MA Taher, E Amin, SF AbouZid, R Mohammed (2021) Genus *Tabebuia*: A comprehensive review journey from past achievements to future perspectives. *Arabian Journal of Chemistry* 14(4): 103046.
81. MP Ferreira, F Gendron, K Kindscher (2012) Bioactive Prairie Plants and Aging Adults: Role in Health and Disease. *Bioactive Food as Dietary Interventions for the Aging Population: Bioactive Foods in Chronic Disease States* 263.
82. A Dasgupta, A Wahed (2021) *Clinical Chemistry, Immunology and Laboratory Quality Control: A Comprehensive Review for Board Preparation, Certification and Clinical Practice*.
83. WW Chao, BF Lin (2010) Isolation and identification of bioactive compounds in *Andrographis paniculata* (Chuanxinlian). *Chin Med* 5: 17.
84. Britannica (2021) The Editors of Encyclopaedia. poppy Encyclopaedia Britannica.
85. G Manda, AI Rojo, E Martínez Klimova, J Pedraza Chaverri, A Cuadrado (2020). Nordihydroguaiaretic acid: From herbal medicine to clinical development for cancer and chronic diseases. *Front Pharmacol* 11: 151.
86. T Dodd-Butera, M Broderick (2005) *Plants, Poisonous* 443-448.
87. H Ali, S Dixit (2013) Extraction optimization of *Tinospora cordifolia* and assessment of the anticancer activity of its alkaloid palmatine. *ScientificWorldJournal* 2013: 376216.
88. X Han, M Lamshöft, N Grobe, X Ren, AJ Fist, et al. (2010) The biosynthesis of papaverine proceeds via (S)-reticuline. *Phytochemistry* 71(11-12): 1305-1312.
89. SF Malamed (2010) *Pharmacology*. 316-354.
90. K Izawa, Y Amino, M Kohmura, Y Ueda, M Kuroda (2010) Human-Environment Interactions - Taste 631-671.
91. P Sidhu (2014) Endangered *Jaborandi*. *Br Dent J* 217: 2-3.
92. JK Aronson (2017) Defining 'nutraceuticals': Neither nutritious nor pharmaceutical. *Br J Clin Pharmacol* 83(1): 8-19.
93. RL Bielecki (1994) Pinitol is a major carbohydrate in leaves of some coastal plants indigenous to New Zealand. *New Zealand Journal of Botany* 32(1): 73-78.
94. VS Vaidya, HM Mehendale (2005) *Ephedra* 223-228.
95. M Absolli (Ed) (2014) *Encyclopedia of toxicology*. Elsevier.
96. FM Kuhlmann, JM Fleckenstein (2017) 157 - Antiparasitic agents. In *Infectious Diseases*. Elsevier 1345-1372.
97. Britannica (2019) The Editors of Encyclopaedia. *reserpine*. Encyclopaedia Britannica.
98. S Verma, SP Singh (2008) Current and future status of herbal medicines. *Veterinary world* 1(11): 347.
99. R Xu, Y Ye, W Zhao (Ed) (2012) *Introduction to natural products chemistry*. Science press 101-118.
100. A Rezk, A Al Hashimi, W John, H Schepker, MS Ullrich, et al. (2015) Assessment of cytotoxicity exerted by leaf extracts from plants of the genus *Rhododendron* towards epidermal keratinocytes and intestine epithelial cells. *BMC Complement Altern Med* 15: 364.
101. K Patel, DK Patel (2019) Chapter 26 - The beneficial role of rutin, a naturally occurring flavonoid in health promotion and disease prevention: a systematic review and update. *Bioactive food as dietary interventions for arthritis and related inflammatory diseases* 457-479.
102. RC Gupta, R C (2014) *Rotenone*. 185-187.
103. HA Stein, RM Stein, MI Freeman, MD Facs, M Rebecca Stein (2018) *The Ophthalmic Assistant E-Book: A Text for Allied and Associated Ophthalmic Personnel*. Elsevier Health Sciences.
104. PK Mukherjee (2019) *Quality control and evaluation of herbal drugs: Evaluating natural products and traditional medicine*. Elsevier.
105. KL Kohnen, S Sezgin, M Spitteller, H Hagels, O Kayser (2018) Localization and Organization of Scopolamine Biosynthesis in *Duboisia myoporoides* R Br *Plant Cell Physiol* 59(1): 107-118.
106. DS Senchina, GN Flinn, DA McCann, ML Kohut, CT Shearn (2009) Bloodroot (*Sanguinaria canadensis* L, Papaveraceae) enhances proliferation and cytokine production by human peripheral blood mononuclear cells in an in vitro model. *J Herbs Spices Med Plants* 15(1): 45-65.
107. F Wälli, PJ Grob, J Müller Schoop (1981) Pseudo-(venocuran-) lupus--a minor episode in the history of medicine. *Schweiz Med Wochenschr* 111(38): 1398-1405.
108. D Wianowska, M Wiśniewski (2015) Simplified procedure of silymarin extraction from *Silybum marianum* L Gaertner. *Journal of chromatographic science* 53(2): 366-372.
109. S Kamble, T Shinge, P Shinde (2020) A Review Extraction and Standardization Techniques of Senna Leaves. *Journal of Drug and Discovery Research* 1(1): 33-35.
110. AA Ferreira, JR Albert-García, JM Calatayud (2007) Chemiluminometric photo-induced determination of Strychnine in a Multicommunitation flow assembly. *Talanta* 72(3): 1223-1229.
111. FS Abtahi, FJ Auletta, D Sadeghi, B Djahanguire, A Scommegna (1978) Effect of sparteine sulfate on uterine prostaglandin F in the rat. *Prostaglandins* 16(3): 473-482.
112. S Albertini, AA Chételat, B Miller, W Muster, E Pujadas, et al. (1995) Genotoxicity of 17 gyrase-and four mammalian topoisomerase II-poisons in prokaryotic and eukaryotic test systems. *Mutagenesis* 10(4): 343-351.

113. JB Wang, JR Mantsch (2012) l-tetrahydropalaminine: A potential new medication for the treatment of cocaine addiction. *Future medicinal chemistry* 4(2): 177-186.
114. T Liu, X Liu, W Li (2016) Tetrandrine, a Chinese plant-derived alkaloid, is a potential candidate for cancer chemotherapy. *Oncotarget* 7(26): 40800.
115. V Kuete (Ed) (2017) Medicinal spices and vegetables from Africa: therapeutic potential against metabolic, inflammatory, infectious and systemic diseases. Academic Press.
116. GJ Peters (2020) Chapter 1 - Drug resistance in colorectal cancer: General aspects. In *Drug Resistance in Colorectal Cancer: Molecular Mechanisms and Therapeutic Strategies* 1-33.
117. IM Chung, A Ahmad, M Ali, OK Lee, MY Kim, et al. (2009) Flavonoid glucosides from the hairy roots of *Catharanthus roseus*. *J Nat Prod* 72(4): 613-620.
118. M Zhu, KT Lew, PL Leung (2002) Protective effect of a plant formula on ethanol-induced gastric lesions in rats. *Phytother Res* 16(3): 276-280.



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