ACTA
BOTANICA *PLANTAE*

Acta Botanica *Plantae* : 31–42 (2022)
http://www.actabotanica.org/

REVIEW ARTICLE

Medicinal Plants: Magical Bullet for Countless Disorders

Pushpa C. Tomar, Lokesh Verma, Anoop, Komal Arora*

**Department of Biotechnology, Faculty of Engineering & Technology, Manav Rachna International Institute of Research and Studies, Faridabad, Haryana, -121004 India*

Corresponding Author : Pushpa C. Tomar (dr.tomarpushpa@gmail.com)

Received 10 April 2022 | Revised 26 June 2022 | Accepted 06 July 2022 | Available Online July 15 2022

Citation: Pushpa C. Tomar, Lokesh Verma, Anoop, Komal Arora (2022). Medicinal Plants: Magical Bullet for Countless Disorders. *Acta Botanica Plantae.* V01i01, 31-42. DOI: http://dx.doi.org/10.5281/zenodo.7099226

ABSTRACT

From the dawn of time, plants have been utilized for medical purposes and people have been using them to treat a variety of ailments. Natural products made from various plants used in disease treatment have gone on to reaffirm that nature has always and shall continue to construct a golden mark to demonstrate the interdependence of man and his surroundings. Ayurveda has been an integral part of Indian healing practices since time immemorial and has now been adopted by countries throughout the world. Medicinal plants have provided humanity with a wide diversification of powerful drugs to ease or, in some cases, eradicate infections, that too with the least side effects, low cost, and a good pharmacokinetic profile. Further, the products from herbal extracts are not just good for treating diseases but also prevent them too. At present medicinal plants are excellent sources of vitamins, minerals, and plant-based medicines. These medicinal plants contain several diverse groups of phytochemicals which are important sources of new and biologically active molecules. This paper aims to review the commonest diseases that can be cured, managed, and controlled by a variety of medicinal plants.

Keywords: *Ayurveda, COVID, Medicinal plant, Phytochemicals, Traditional medicine.*

INTRODUCTION

The prevention of disease, management of chronic conditions, and health advancement are proactive healthcare techniques that emphasize prevention at various stages along the healthcare continuum. The purpose of health promotion and disease control approaches is to keep people healthy and keep them from becoming ill. Primary prevention activities are the name given to these techniques. Preventive treatments are divided into three categories [1].

1. **Primary preventive Treatment:** - try to limit the number of new cases of a disease. At this level of prevention, we have health promotion/education as well as specialized preventative interventions (for example -immunization)
2. **Secondary preventive Treatment:** - aims in reducing the number of people who have already been diagnosed with a condition or sickness (prevalence). This category largely includes tools for early diagnosis (for example -screening) and speedy treatment.
3. **Tertiary preventive Treatment:** - Efforts to minimize the amount of disability induced by a pre-existing illness. This level entails disability restrictions and healing. The secondary and tertiary prevention efforts are aimed at keeping people with chronic illnesses well, slowing the advancement of illnesses, and preventing difficulties.

Disease prevention should concentrate on the strategies that reduce disease risk, identify the risk factors or detect sickness in its early, most curable

phases. Disease preventive treatments involve regular well-baby checkups, vaccines, calcium (Ca), and vitamin D supplements to reduce the risk of osteoporosis, hypertension, and cholesterol screening during yearly health tests. screening for breast cancer, cervical, colorectal, and prostate cancer [2].

Understanding the links between Nutrition, food production, and the environment all have an impact on public health. is crucial for achieving a more sustainable future. As a result, the distinction between therapy and the prevention of certain diseases might be blurry at times. Treatment of moderate hypertension, for example, can prevent many chronic renal illnesses. Noncommunicable illnesses include obesity, cancer, coronary heart disease (CHD), and diabetes and its consequences.

The concept of deriving any kind of medicinal benefits from flora is nothing new. The entire history of mankind is peppered with humans using a wide variety of plants for treating various kinds of ailments and diseases. Natural items made from various plants used in disease treatment have gone on to reaffirm that nature has always and shall continue to construct a golden mark to demonstrate the interdependence of man and his surroundings. The study and application of herbal medicine in the treatment of illnesses are becoming increasingly popular [3]. Ayurveda has been an integral part of Indian healing practices since time immemorial and has now been adopted by countries throughout the world [4]. The highly diversified instruments in Ayurveda's arsenal range from the consumption of mango for the treatment of herpes to the digestion-boosting effects of Tulsi. The use of plants is not only limited to medicine but also extends to a lot of aesthetic and environmental benefits as well Lobster Claws serve as effective ornamentation in homes; Ashoka is very effective for creating a noise-free ambiance whenever required [5]. .

The fear of the majority in the usefulness of synthetic drugs or revolutionary drug always go along with its single or numerous adverse impact on health. Medicinal plants have provided humanity with a wide diversification of powerful drugs to ease or, in some cases, eradicate infections. Though many advances have been made in modern (synthetic) medicine, there still remain a huge number of afflictions and infections which are yet to be reasonably sedate synthesized. As a result, plants can be reported as major medicine sources, not only as confined active remedies to be dispensed in the form of consistency but also as effective drugs for the citizens.

In spite of the rapid advancement of modern synthetic drugs in this era, many plant-derived drugs have retained and shall continue to retain their significance and relevance. The use of plant-based drugs all over the world is escalating [6].. According to a recent report published by WHO, approximately 80% of the world's population relies on herbal medicine for their essential health care needs. WHO also states that 21000 plant species around the world can be used for medicine production. Approximately 30% of the whole species of plants or their extracts at a time or others were used for therapeutic objectives. It has been evaluated that in advanced nations such as the U.S., plant medications add up to as much as 25% of the total number of medications, while in quick-creating nations such as India; the aggregate is as much as 80%. Treatment via medical plants is considered to be the safest as it has minimal chances of side effects. Herbal treatment can apply to any individual irrespective of his age or gender.

Introduction to Medicinal plants

Ethnobotany, ethnopharmacology refer to "medicinal plant" it is a species used in traditional medicine that has therapeutic components used to treat human or animal elements. The purpose of ethnopharmacology was to create a drug that can be used to cure patients and, in the future, to verify traditional medicinal plant use. Throughout human history, the isolation and identification of physiologically active chemicals or compounds from nature has resulted in the creation of new therapeutics, culminating in breakthroughs in the areas of health and pharmaceuticals [7]. Phytochemicals are employed as a source of novel molecules in the pharmaceutical industry's research and development (R&D), which leads to the creation of new medications [8].

Some of the medicinal plants with their potent activities include *Mangifera indica* which helps control helps controlacute cases of herpes, and liver damage and is also an effective anticancer agent [6]. Chandni *(Tabernaemontana divaricata)* serves various medical purposes. Its flower with oil is applied to sore eyes. The extract from roots is used for the treatment of headaches, scabies, and hypertension. Teak (*Tectona Grandis*) is used extensively in India for furniture and home manufacturing. It has the unique quality of termites' resistance [9]. Apart from being scented,

DOI: http://dx.doi.org/10.5281/zenodo.7099226

sandalwood and cinnamon are excellent astringents. *Sandalwood* is very useful in the ejection of blood, mucus, and other bodily fluids. Certain therapeutic plants include antimicrobial characteristics that kill disease-causing bacteria. Mild tonics are made from fragrant herbs such as Aloe, *Goldenseal, the seal of approval skin, Barberry, and Chirayata.* Toxins in the blood are reduced by the bitter taste perception of such plants. They are also beneficial in the destruction of pathogenic microorganisms [3]. The seed of Jamun (*Syzygium Cumini*) is utilized in the wine, vinegar, and Ayurveda. It is a good source of vitamins A and C. A new cut and wound can be properly treated with liquorice, turmeric, honey, and marshmallow. Medicinal plants such as *Turmeric*, *Ginger*, *Aloe Vera, Tulsi,* and *Neem*, cure several common ailments and are used commonly in various parts of the country. Herbs are utilized in a variety of applications, including food, perfume, tea, natural coloring, pest management, and so on. In several countries, many medicinal plants/herbs are employed as insect repellents [4].

Currently, the world is facing the pandemic of coronavirus (Covid-19). In the absence of a vaccine, the treatment was purely based on herbal remedies. Even today, when vaccines have been made, doctors suggest covid patients quarantine themselves and take ayurvedic recipes to suppress the virus. According to research by the Institute of China, areas where herbal treatment was administered, reported a smaller number of deaths as compared to the areas where herbs were not administered. Herbal plants have also proved to be useful in attenuating infectious viruses like rabies, influenza, chandipura virus, Japanese Encephalitis and other influenza viruses in the past.

New Application to the Use of Herbal Drugs: *in silico* Drug Discovery

Plants produce a large number of substances (secondary metabolites) throughout their lifetime as a result of physiological activities. Most of the supplies for alternative and complementary medicine was accessible through detailed clinical texts of the past century. India's Ayurvedic monograph [10] is one of them. These guidelines do not detail reports that are appropriate for in silico assessment. Analysts have created different datasets to gather all of the data needed to speed up the evolution of new herbal medications. Without a doubt, database technology has paved the way for a variety of advanced and different ways to gain access to more complicated data. There are a variety of environmental goods collections developed by synthetic chemistry to deliver to deliver adequate resources for natural product selection and identification [11]. Fortunately, multiple databases for in silico screening of ethnopharmacology information have been created [12, 13]. Chemoinformatics [14] takes access to a wider spectrum of phytochemicals, leading to a faster pathway for pharmaceutical pathways [15].. This link (https://www.drugbank.ca/databases) will expose us to different databases for the creation of pharmaceuticals. In silico High-throughput Screening (HTS), which employs molecular docking, is widely used to decrease the count of medications for in vitro and in vivo testing. In conclusion, HTS is an appropriate solution for the assessment of a large variety of natural chemicals in a short period to identify new medications.

Herbal treatments are used to treat common diseases

Cancer

Cancer has emerged as one of the most serious issues and diseases of the twenty-first century., characterized by uncontrolled growth and division of cells, and have caused predominant death. Many novel medicines have appeared in the last 20 years, with some of them received from plants that are effective and safe. In addition, it has been established that a variety of plants, herbs, and vegetables can prevent or diminish the occurrence of cancer in a variety of human body parts. The phytochemicals, Alexin B and Emodin present in aloe vera have been reported to suppress/cure leukemia, and neuroectodermal tumors [16]. Allium sativum has been documented for its ability to cure bladder carcinoma and colon cancer due to the presence of bioactive compounds *Allylmer Captocysteine* and *Allicin* [17]. The presence of biologically active component *Amooranin* in *Amoora rohituka* showed effective results against cervical, pancreatic, and breast cancer [18]. Further, *Andrographolide* (an important phytoconstituent of *Andrographis paniculata*) has been recorded for its ability to have an effect against cancers of the stomach, kidney, breast, prostate, ovary, leukemia, and nasopharynx malignant melanoma [19]. Moreover, Yadav et al disclosed the role of *Ashwagandha Bolide*, the bioactive compound of Withania somnifera in suppressing stomach, lung, breast, colon, and brain (CNS) cancer [20]. The plant *Psoralea Corylifolia* is responsible for treating malignant ascites, lung cancer, leukemia, osteosarcoma, liver cancer, and fibrosarcoma that is attributable because of

phytoactive compounds *Bavachanin, corylifolia, psoralen* [21]. The biological potency of *Berberis vulgaris* is due to *Berberine*, *Cannabisin-G* in the context of cancer treatment (prostate cancer, leukemia, breast and liver cancer) [22]. Melanomas have been reported to be cured by phyto-active biochemical Betulinic acid present in Betula utilize [23]. *Curcumin*, the biological asset of *Curcuma longa* rehabilitates cancers of the lung, liver, stomach, skin, breast, esophagus, prostate, and colon [24].

Diabetic retinopathy

It is one of the common complications of insulin-dependent diabetes (diabetes mellitus), caused due to the disruption/damage of the blood vessels of the retina, thus affecting the eyes of an individual [25]. Various therapies like anti-angiogenic therapy, anti-inflammatory therapy, laser treatment, etc have been approved for their treatment but either due to their high cost or more side effects, the success rate of treatment is very low. The herbal therapy in the cure for diabetic retinopathy is a good option as many bio-actives of plants have the potential to prevent diabetes and it's complications. Gupta & associates found the role of curcumin in controlling diabetic retinopathy. The rats treated with curcumin from the plant curcuma longa reduced the levels of glucose when compared to the control [26].

Also, levels of retinal glutathione were accounted for to be diminished by 1.5 folds. The decreased concentration of superoxide dismutase, antioxidant enzymes, and catalase activity was documented. This is because *curcumin* regulates the antioxidant system very well. Supplementation of *curcumin* helps patients with diabetes to improve the complications related to blood vessels and prevent diabetic retinopathy. Curcumin supplementation may help diabetic individuals by reducing microvascular problems and avoiding retinal degeneration [26]. The major constituent, Eugenol, of *Ocimum sanctum* prevents retinopathy by acting as an antioxidant. *Camellia sinensis* contains epigallocatechin as a bioactive component that has antioxidative, anti-inflammatory, and anticarcinogenic mechanisms by which retinopathy can be prevented [27].. The extracts of *Ginkgo biloba* constituents flavonol glycosides (quercetin, catechin), flavones, proanthocyanidins, terpene trilactones (ginkgolides A, B, C, J, P and Q, and bilobalide) and possess neuroprotective, enhanced blood flow and antioxidant properties that control diabetic retinopathy. Also, worthy results were noticed of gingko in the retina during increased blood glucose levels [28].

Hepatitis B virus

Hepatitis B virus (HBV) infection is major health of general public concern as a number of 250 million individuals are infected chronically with HBV. It is a viral disorder where the use of herbal plants is highly recommended for the cure because of their potential activities and limited supply and various side effects of effective chemical/ synthetic drugs. Recent Studies have shown the worthy results of *Camellia sinensis* in the elimination of HBV because of phytochemical Epigallocathechin-3-gallate [29]. *Cyperus rotundus* proved to be a milestone in curing HBV since cyperene-3, 8-dione, 14-hydroxy cyperotundone, 14-acetoxy cyperotundone, 3β-hydroxycyperenoic acid, and sugetriol-3, 9-diacetate are present as biological active compound [30]. Due to the presence of phytochemical Highly oxygenated *norbisabolane* sesquiterpenoids, *phyllanthacidoid* acid methyl ester, *Phyllanthus acidus* is capable to eradicate Hepatitis B virus [31]. Another most successful research work of Lv JJ et al., has certified the presence of Sesquiterpenoid glycoside dimers and thus the role of *Phyllanthus emblica* in knocking out the HB virus [32]. The phytochemicals 2β-hydroxy-3, 4-seco-friedel lactone-27-oic acid, 2β, 28β-dihydroxy-3,4-seco-friedel lactone-27-oic acid, 2β, 30β-dihydroxy-3,4-seco-friedelolactone-27-lactone and *stigmastane, stigmast-25-ene-3β,5α,6β-triol of plant Viola diffusa* have the potential to suppress *HBV [33].*

Headache

The most common disease of the nervous system, headache, is accelerating at a rate of 48.9% in the general population. Some headaches are extremely weak but have a profound effect on a person's quality of life. Herbal plants have shown promising results in managing the pain that occurs in different regions of the head. Guo T et al. reported the presence of *agrimoniin* as a bioactive compound in the plant *Agrimonia Pilosa* to reduce headaches [34]. *Lonicerae japonicae* has been documented to regulate Headaches due to the presence of the promising compound Chlorogenic acid [35]. Other effective bioactive components that control headaches include *Taurine* in *Lycium barbarum*; Ursolic acid and Oleanolic acid in *Origanum majorana [36, 37].* (Chiang S.T. et al., 2014; Sun Y et al., 2015). Also, positive results have been investigated for

DOI: http://dx.doi.org/10.5281/zenodo.7099226

the plant *Prunella vulgaris* against headache [38].

Coronavirus

Coronaviruses are RNA (plus strand) viruses that have a genomic size 27-32 kb with an outer covering or envelop, belonging to the family *Coronaviridae* and the order *Nidovirales* A major outbreak of COVID-19, affecting several countries of the world, has altered everyone's outlook. The strain responsible for causing this infection has been identified as SARS- COV 2 and is found to be a major problem for public health globally [39]. This SARS-COV 2 hijacks the host machinery and weakens the immune system. Extensive research is being conducted to produce a powerful vaccination that will entirely defeat the coronavirus. Unfortunately, no standard medicine or vaccine is available to treat the disease. Due to the different activities of Medicinal plants, they can be employed as active reagents for its elimination. Green tea has been reported to suppress sars-cov due to the presence of *Epigallocatechin gallate*, *epicatechin gallate,* and *gallocatechin-3-gallate* [40]. The bioactive component Polyphenols present in *Broussonetia papyrifera have* been documented for its suppression [41]. Q*uercus infectoria* G. Olivier has been documented for its potential to arrest coronavirus by blocking the ACE 2 site. The inhibitory activity of the plant is due to the high content of phenols and antioxidant activity [42]. Ocimum sanctum contains Apigenin and Ursolic acid which are significant antiviral compounds. One docking study showed the binding affinities of seven different ingredients of *Tulsi (Tulsinol A, B, C, D, E, F, G, dihydroeugenol)* with the receptors of coronavirus which revealed the potential of *Tulsi* in fighting COVID-19 as it inhibits the virus' replication and blocks the site of Ace II [40-43].

Rheumatoid arthritis

Rheumatoid arthritis, an autoimmune disorder affects the synovial joints by disrupting its lining, leading to the progression of the disease and even precocious (premature) death. NF-κB is transcription factor that regulate inflammatory activity and thus has a prominent role in the development of Rheumatoid arthritis [44].

Many traditional and modern biological drugs are available and doing a good job, however, a considerable number of individuals are not able to respond as productively as they should [45]. Thus, it's an urgent requirement for such potent drugs that can be fulfilled in the form of herbal therapies. *Withania somnifera,* is a plant used significantly in the treatment of rheumatoid arthritis. It possesses withanolide (a bioactive component) that inhibits the activation of NF-κB [46-48]. Also, another bio-potent compound, Withaferin A prevents the spontaneous and LPS-activated NF-κB at 10 μg/ml concentrations [49]. *Thunder God Vine*, scientifically known as *Tripterygium wilfordii Hook F (TWHF),* inhibits several factors required for transcription such as NF-κB, NF-AT, and AP-1 [50]. The signaling of NF-κB can also be prevented by the anti-inflammatory property of the bioactive compound called *guggulsterone* that is present in the plant Commiphora Mukul [51-53]. *Camellia sinensis* have *Epigallocatechin-3-gallate* which has a role in inhibiting the expression of Mcl-1 in patients with rheumatoid arthritis. Also, studies reported its role in inhibiting TNF-α-induced nuclear translocation of NF-κB-p65, TNF-α-induced NF-κB-p65 capacity to bind with DNA by more than 50% in comparison to only TNF-α treated samples [54]. Furthermore, Epigallocatechin-3-gallate decreases the concentration of NF-κB translocating to the nucleus, thereby downregulating the signaling of NF-κB and finally inhibits the binding of DNA in RA patients [55]. *Curcuma longa*, a known anti-arthritic plant, is well recognized because of its biological ingredient curcumin. the studies evaluated and documented the contribution of *curcumin* in the hindrance of NF-κB pathway [56-58].

Fever

Fever is the major and significant pervasive burden on mankind [59]. It develops as a symptom in many infectious disorders and it usually originates after a microbial attack. This is due to the release of pyrogens by the microorganism that reacts quickly on the *organum vasculosum laminae terminals* of the anterior hypothalamus that elevating the temperature of the body [60]. Several plants alleviates fever due to the presence of bioactive and potent compounds. The list includes *Astragalus membranaceus* (Astragaloside IV); *Ligustrum lucidum* (Specnuezhenide); *Lonicerae japonicae* (Chlorogenic acid); *Paenonia lactiflora* (Aminoguanidine); *Platycodon grandiflorum* (Luteolin); *Pueraria lobata* (Puerarin); *Zingiber zerumbet* (Zerumbone) and so on that are potent enough to reduce the feverish effects [61-67].

Hypertension

Hypertension is a heterogeneous disorder,

S. No	Diseases name	*Plant name*	Plant part used	Phytochemical	References
1.	**Cancer**	*Alovera*	leaves	Alexin B and emodin	[16]
		Allium sativum	Bulb	allylmercaptocysteine and allicin	[17]
		Amoora rohituka	Leaves extract	Amooranin	[18]
		Andrographis paniculata	Leaves Extract	Andrographolide	[19]
		Withania somnifera	Root and Leaves extract	Ashwagandhanolide	[20]
		Psoralea corylifolia	Root, Leaves and Fruit	Bavachanin, corylfolinin, psoralen	[21]
		Berbes vulgars	Fruit	Berberine, Cannabisin-G.	[22]
		Betula utilis	Bark	Betulinic acid	[23]
		Curcuma longa	Rhizome	Curcumin	[24]
		Glycine max	Seed and oil	Daidzein and genistein .	[38]
		Panax ginseg	Root and Rhizome	Panaxadiol, panaxatriol.	[81]
2.	**Diabetic retinopathy**	*Aegle marmelos*	Leaves Extract	Cinnamic acid	[82] Sankeshi et al., 2013.
		Agrimonia pilosa ledeb	Leaves and Flower extract	Agrimoniin	[34]
		Alpinia zerumbet	Boiled Leaves	Labdadiene	[83] Chompoo et al., 2011
		Andrographis paniculata	Leaves extract	Andrographolide	[84] Yu et al., 2015
		Aster Koraiensis	Young Leaves extract	Chlorogenic acid with 3,5,di-caffeoylquinic acid.	[85] Kim et al., 2016..
		Carpobrotus edulis	Leaf Juice and leaf pulp	Ellagic acid	[86] Raghu et al., 2017.
		Cnidium officinale	Dried Rhizomes	Butylidenephthalide.	[85] Kim et al., 2016.
3.	**Hepatitis B virus**	*Camellia sinensis*	Leaves	Epigallocathechin-3-gallate.	[87] Maregesi et al., 2008.
		Cyperus rotundus	Tuber	Cyperene-3, 8-dione, 14-hydroxy cyperotundone, 14-acetoxy cyperotundone, 3β-hydroxycyperenoic acid and sugetriol-3, 9-diacetate	[30]
		Phyllanthus acidus	leaves, stems, and root	Sesquiterpenoid	[31]
		Phyllanthus emblica	leaves, stems, and root	Sesquiterpenoid glycoside dimers	[32]
		Viola diffusa	Leaves	2β-hydroxy-3, 4-seco-friedelolactone-27-oic acid, 2β, 28β-dihydroxy-3,4-seco-friedelolactone-27-oic acid, 2β, 30β-dihydroxy-3,4-seco-friedelolactone-27-lactone and stigmastane, stigmast-25-ene-3β,5α,6β-triol	[33]
4.	**Headache**	*Agrimonia ilosa ledeb*	Leave and Flower	Agrimoniin	[34]
		Lonicerae japonicae	Flowers,seeds and leaves	Chlorogenic acid	[35]
		Lycium barbarum	Dried berries	Taurine	[36]
		Origanum majorana L.	Marjoram oil	Ursolic acid , Oleanolic acid	[37]

DOI: http://dx.doi.org/10.5281/zenodo.7099226

5.	**Coronavirus**	*Green tea*	Leaves	Epigallocatechin gallate, epicatechingallate and gallocatechin-3-gallate.	[40]
		Broussonetia papyrifera		Polyphenols	[41]
		Sambucus Formosana	Stem ethanol extract	Phenolic acids: caffeic acid, chlorogenic acid with gallic acid.	[88] Weng et al., 2019.
		Sambucus Formosana	Stem ethanol extract	Flavonoids: herbacetin, isobavachalcone, quercetin 3-β-d-glucoside with helichrysetin .	[89] Jo et al., 2019.
6.	**Fever**	*Astragalus membranaceous*	Root	Astragaloside IV	[61]
		Ligustrum lucidum	Ripe fruit	Specnuezhenide	[62]
		Lonicerae japonicae	Flower and Flower bud	Chlorogenic acid	[63]
		Paenonia lactiflora	Dried root	Aminoguanidine	[64]
		Platycodon grandiflorum	Root	Luteolin	[65]
		Pueraria lobata	Root	Puerarin	[66]
		Zingiber zerumbet	Rhizome	Zerumbone	[67]

characterized by level of systolic and diastolic blood pressure of more than 140/mm Hg and 90 mm Hg respectively [68].. Several drugs like *captopril, amiloride, losartan, verapamil, atenolol* are used to treat high blood pressure [69, ,70]. However, these drugs are very costly and they can manage elevated blood levels in only 34% of the hypertensive population [71,72]. The wide range of supported clinical and preclinical proofs for the pharmacological potential of medicinal plants that too with low toxicity make them therapeutically perfect. *Allium sativum* has been reported for hypotensive activity because of allicin, diallyl disulfides, and S- allyl cysteine as its bioactive constituents [73, 74]. *Andrographolide*, 14-deoxyandrographolide and 14-deoxy-11,12-didehydro *andrographolide in Andrographis paniculata* extracts have been reported to decrease blood pressure by decreasing ROS levels in hypertensive rats [75]. The presence of *Apegenin* as a bioactive component in *Apium graveolens* blocked the contractions in the aortic ring [76].

Alzheimer disease

Alzheimer's disease (AD) is a neurodegenerative, inevitable, progressive disorder that affects memory, thinking behavior & other potential activities [77]. Accumulation of deposits of beta-amyloid plaques and neurofibrillary tangles are the main hallmarks of Alzheimer [78]. Drugs such as acetylcholinesterase inhibitors, M-drugs, and amyloid degrading enzymes failed to clear beta-amyloid completely from the brain. Medicinal plants such as *Curcuma longa, Withania somnifera, Bacopa monnieri, Centella asiatica, Convolvulus pluricaulis* have been reviewed, researched, and documented that shows the potent response in Alzheimer cure. These plants consist of active compounds like tannins, lignans, triterpenes, alkaloids, flavonoids, sterols, and polyphenols and work by inhibiting fibrillation, relaxing CNS, promoting memory [79, 80].

CONCLUSION

We are moving away from nature as our lifestyle becomes more technologically advanced. We can't get away from nature since we are part of it . Ayurvedic Medicines are natural items with no adverse effects, are relatively safe, eco-friendly, and readily available. Herbs have long been used to treat illnesses associated with the seasons. They must be promoted to preserve human lives. Many diseases and disorders can benefit from the use of medicinal plants. They are inexpensive, and they may be purchased without a prescription in health food stores, pharmacies, and online. The World Health Organization has claimed that 80 percent of the world's population relies on herbal medication. Many developing nations have increased their efforts to collect ethnomedical data and conduct a scientific studies on therapeutic plants.

REFERENCES

[1] Kisling, Lisa A., and Joe M. Das. "Prevention strategies." In StatPearls [Internet]. StatPearls Publishing, 2021.

[2] Meuser, J., Bean, T., Goldman, J., & Reeves, S. (2006). Family health teams: a new Canadian interprofessional initiative. *Journal of interprofessional care*, *20*(4), 436-438.

[3] Sofowora, A., Ogunbodede, E., & Onayade, A. (2013). The role and place of medicinal plants in the strategies for disease prevention. *African journal of traditional, complementary and alternative medicines*, *10*(5), 210-229.

[4] Sen, S., Chakraborty, R., & De, B. (2011). Challenges and opportunities in the advancement of herbal medicine: India's position and role in a global context. *Journal of Herbal medicine*, *1*(3-4), 67-75

[5] Odeyemi S, Bradley G. Medicinal Plants Used for the Traditional Management of Diabetes in the Eastern Cape, South Africa: Pharmacology and Toxicology. *Molecules*. 2018;23(11):2759. Published 2018 Oct 25. doi:10.3390/molecules23112759

[6] Parvez, G. M. (2016). Pharmacological activities of mango (Mangifera Indica): A review. *Journal of Pharmacognosy and phytochemistry*, *5*(3), 1.

[7] Pye C.R., Bertin M.J., Lokey R.S., Gerwick W.H., Linington R.G. Retrospective analysis of natural products provides insights for future discovery trends. Proc. Natl. Acad. Sci. USA. 2017;114:5601–5606. DOI: 10.1073/pnas.1614680114.

[8] Newman D.J., Cragg G.M. Natural Products as Sources of New Drugs from 1981 to 2014. J. Nat. Prod. 2016;79:629–661. doi: 10.1021/acs.jnatprod.5b01055.

[9] Chanchal, R., Balasubramaniam, A., Navin, R., & Nadeem, S. (2015). Tabernaemontana divaricata leaves extract exacerbate burying behavior in mice. *Avicenna journal of Phytomedicine*, *5*(4), 282.

[10] Owen J.G., Reddy B.V., Ternei M.A., Charlop-Powers Z., Calle P.Y., Kim J.H., Brady S.F. Mapping gene clusters within arrayed metagenomic libraries to expand the structural diversity of biomedically relevant natural products. Proc. Natl. Acad. Sci. USA. 2013;110:11797–11802. doi: 10.1073/pnas.1222159110.

[11] Medina-Franco J.L. Evidence-Based Validation of Herbal Medicine. Elsevier; Amsterdam, The Netherlands: 2015. Discovery and development of lead compounds from natural sources using computational approaches; pp. 455–475.

[12] Baxevanis A.D., Bateman A. The importance of biological databases in biological discovery. Curr. Protoc. Bioinform. 2015;50:1.1.1–1.1.8. DOI: 10.1002/0471250953.bi0101s50.

[13] Prachayasittikul V., Worachartcheewan A., Shoombuatong W., Songtawee N., Simeon S., Prachayasittikul V., Nantasenamat C. Computer-aided drug design of bioactive natural products. Curr. Top. Med. Chem. 2015;15:1780–1800. doi: 10.2174/1568026615666150506151101.

[14] Lagunin A.A., Goel R.K., Gawande D.Y., Pahwa P., Gloriozova T.A., Dmitriev A.V., Ivanov S.M., Rudik A.V., Konova V.I., Pogodin P.V., et al. Chemo-and bioinformatics resources for in silico drug discovery from medicinal plants beyond their traditional use: A critical review. Nat. Prod. Rep. 2014;31:1585–1611. doi: 10.1039/C4NP00068D.

[15] Xin-Zhuan S., Miller L.H. The discovery of artemisinin and the Nobel Prize in Physiology or Medicine. Sci. China Life Sci. 2015;58:1175–1179.

[16] Elshamy H. A., Aboul-Soud M. A., Nassr-Allah A. A., Aboul-Enein K. M., Kabash A., Yagi A. (2010). Antitumor properties and modulation of antioxidant enzymes by Aloe vera leaf active principles isolated via supercritical carbon dioxide extraction. Curr. Med. Chem. 17, 129–138. 10.2174/092986710790112620

[17] Ranjani R., Ayya R. M. (2012). Anticancer properties of Allium sativum- a review. Asian J. Biochem. Pharm. Res. 3, 190–196.

[18] Chan L. L., George S., Ahmad I., Gonsangari S. L., Abbasi A., Cunningham B. T., et al. . (2011). Cytotoxicity effects of Amoora rohituka and chittagonga on breast and pancreatic cancer cells. Evid. Based Complement. Alternat. Med. 2011:860605 10.1155/2011/860605.

[19] Geethangili M., Rao Y. K., Fang S. H., Tzeng Y. M. (2008). Cytotoxic constituents from Andrographis paniculata induce cell cycle arrest in jurkat cells. Phytother. Res. 22, 1336–1341. 10.1002/ptr.2493

[20] Yadav B., Bajaj A., Saxena A. K. (2010). In vitro anticancer activity of the root, stem and leaves of Withania somnifera against various human cancer cell lines. Indian J. Pharm. Sci. 72, 659–663. 10.4103/0250-474X.78543

DOI: http://dx.doi.org/10.5281/zenodo.7099226

[21] Wang Y., Hong C., Qu H. (2011). Screening of antitumor compounds psoralen and isopsoralen from Psoralea corylifolia L seeds. Evid. Based Complement. Alternat. Med. 2011, 363052. 10.1093/ecam/nen087

[22] Elisa P., Elisa D., Fiorenza O., Guendalina L., Beatrice B., Paolo L., et al. . (2015). Antiangiogenic and antitumor activities of berberine derivative NAX014 compound in a transgenic murine model of HER2/neu-positive mammary carcinoma. Carcinogenesis 36, 1169–1179. 10.1093/carcin/bgv103

[23] Król S. K., Kiełbus M., Rivero-Müller A. R., Stepulak A. (2015). Comprehensive review on betulin as a potential anticancer agent. Biomed Res. Int. 2015:584189. 10.1155/2015/584189

[24] Perrone D., Ardito F., Giannatempo G., Dioguardi M., Troiano G., Russo L. L., et al. . (2015). Biological and therapeutic activities and anticancer properties of curcumin. Exp. Ther. Med. 10, 1615–1623. 10.3892/etm.2015.2749

[25] Wei Wang and Amy C. Y. Lo. Diabetic Retinopathy: Pathophysiology and Treatments. Int J Mol Sci. 2018 Jun; 19(6): 1816.

[26] Gupta SK, Kumar B, Nag TC, Agrawal SS, Agrawal R, Agrawal P, Saxena R, Srivastava S. Curcumin prevents experimental diabetic retinopathy in rats through its hypoglycemic, antioxidant, and anti-inflammatory mechanisms. J Ocul Pharmacol Ther. 2011 Apr;27(2):123-30. doi: 10.1089/jop.2010.0123. Epub 2011 Feb 12. PMID: 21314438.

[27] Behl, T., & Kotwani, A. (2017). Chinese herbal drugs for the treatment of diabetic retinopathy. Journal of Pharmacy and Pharmacology, 69(3), 223-235.

[28] Brondino, N., De Silvestri, A., Re, S., Lanati, N., Thiemann, P., Verna, A., ... & Politi, P. (2013). A systematic review and meta-analysis of Ginkgo biloba in neuropsychiatric disorders: from ancient tradition to modern-day medicine. Evidence-Based Complementary and Alternative Medicine, 2013.

[29] Maregesi SM, Pieters L, Ngassapa OD, Apers S, Vingerhoets R, Cos P, Berghe DA, Vlietinck AJ. Screening of some Tanzanian medicinal plants from Bunda district for antibacterial, antifungal and antiviral activities. J Ethnopharmacol. 2008;119(1):58–66. doi: 10.1016/j.jep.2008.05.033.

[30] Xu HB, Ma YB, Huang XY, Geng CA, Wang H, Zhao Y, Yang TH, Chen XL, Yang CY, Zhang XM, Chen JJ. Bioactivity-guided isolation of anti-hepatitis B virus active sesquiterpenoids from the traditional Chinese medicine: rhizomes of Cyperus rotundus. J Ethnopharmacol. 2015;171:131–140. doi: 10.1016/j.jep.2015.05.040

[31] Lv JJ, Wang YF, Zhang JM, Yu S, Wang D, Zhu HT, Cheng RR, Yang CR, Xu M, Zhang YJ. Anti-hepatitis B virus activities and absolute configurations of sesquiterpenoid glycosides from Phyllanthus emblica. Org Biomol Chem. 2014;12(43):8764–8774. doi: 10.1039/c4ob01196a.

[32] Lv JJ, Yu S, Wang YF, Wang D, Zhu HT, Cheng RR, Yang CR, Xu M, Zhang YJ. Anti-hepatitis B virus norbisabolane sesquiterpenoids from Phyllanthus acidus and the establishment of their absolute configurations using theoretical calculations. J Org Chem. 2014;79(12):5432–5447. doi: 10.1021/jo5004604.

[33] Dai JJ, Tao HM, Min QX, Zhu QH. Anti-hepatitis B virus activities of friedelolactones from Viola diffusa Ging. Phytomedicine. 2015;22(7-8):724–729. DOI: 10.1016/j.phymed.2015.05.001.

[34] Guo T., Zhu L., Tan J., Zhou X., Xiao L., Liu X., Wang B. Promoting effect of triterpenoid compound from Agrimonia pilosa Ledeb on preadipocytes differentiation via up-regulation of PPARγ expression. Pharmacogn. Mag. 2015;11:219–225.

[35] Mei X., Zhou L., Zhang T., Lu B., Sheng Y., Ji L. Chlorogenic acid attenuates diabetic retinopathy by reducing VEGF expression and inhibiting VEGF-mediated retinal neoangiogenesis. Vasc. Pharmacol. 2017;101:29–37. doi: 10.1016/j.vph.2017.11.002.

[36] Chiang S.T.-H., Yeh S.-M., Chen Y.-C., Lin S.-L., Tseng J.-K. Investigation of the protective effects of taurine against alloxan-induced diabetic retinal changes via electroretinogram and retinal histology with New Zealand white rabbits. Int. J. Endocrinol. 2014;2014:631549. doi:10.1155/2014/63154

[37] Sun Y., Sun X., Wang F., Liu S. Inhibitory effects of ursolic acid on diabetic retinopathy in mice. Zhonghua Yi Xue Za Zhi. 2015;95:2589–2593.

[38] Li Q. S., Li C. Y., Li Z. L., Zhu H. L. (2012). Genistein and its synthetic analogs as anticancer agents. Anticancer Agents Med. Chem. 12, 271–281. 10.2174/187152012800228788

[39] Arora, Komal, Pooja Khurana, Deepak Kumar, and Bhanu Sharma. "Mathematical Insight of COVID-19 Infection—A Modeling Approach." Enabling Healthcare 4.0 for Pandemics: A Roadmap Using AI, Machine Learning, IoT and Cognitive Technologies (2021): 275-297.

[40] Ghosh R, A. Chakraborty, A. Biswas, S. ChowdhuriEvaluation of green tea polyphenols as novel coronavirus (SARS CoV-2) main protease (Mpro) inhibitors – An in silico docking and molecular dynamics simulation study Journal of Biomolecular Structure & Dynamics (2020), pp. 1-13, 10.1080/07391102.2020.1779818

[41] Park JY, H.J. Yuk, H.W. Ryu, S.H. Lim, K.S. Kim, K.H. Park, ..., W.S. LeeEvaluation of polyphenols from Broussonetia papyrifera as coronavirus protease inhibitors .Journal of Enzyme Inhibition and Medicinal Chemistry, 32 (1) (2017), pp. 504-512, 10.1080/14756366.2016.1265519

[42] [42] Bachir Benarba and Atanasio Pandiella. Medicinal Plants as Sources of Active Molecules Against COVID-19. Front Pharmacol. 2020; 11: 1189. DOI: 10.3389/fphar.2020.01189

[43] [43] Khaerunnisa S, Kurniawan H, Awaluddin R, Suhartati S, Soetjipto S. Potential Inhibitor of COVID-19 Main Protease (Mpro) from Several Medicinal Plant Compounds by Molecular Docking Study. 2020

[44] Makarov, Sergei S. "NF-κB in rheumatoid arthritis: a pivotal regulator of inflammation, hyperplasia, and tissue destruction." Arthritis Research & Therapy 3, no. 4 (2001): 1-7.

[45] Qiang Guo, Yuxiang Wang, Dan Xu, Johannes Nossent, Nathan J. Pavlos, and Jiake Xu. Rheumatoid arthritis: pathological mechanisms and modern pharmacologic therapies. Bone Res. 2018; 6: 15. DOI: 10.1038/s41413-018-0016-9

[46] Grover, A., Shandilya, A., Punetha, A., Bisaria, V. S., & Sundar, D. (2010, December). Inhibition of the NEMO/IKKβ association complex formation, a novel mechanism associated with the NF-κB activation suppression by Withania somnifera's key metabolite withaferin A. In BMC genomics (Vol. 11, No. 4, pp. 1-11). BioMed Central.

[47] SoRelle, J. A., Itoh, T., Peng, H., Kanak, M. A., Sugimoto, K., Matsumoto, S., ... & Naziruddin, B. (2013). Withaferin A inhibits pro-inflammatory cytokine-induced damage to islets in culture and following transplantation. Diabetologia, 56(4), 814-824.

[48] Heyninck, K., Lahtela-Kakkonen, M., Van der Veken, P., Haegeman, G., & Berghe, W. V. (2014). Withaferin A inhibits NF-kappaB activation by targeting cysteine 179 in IKKβ. Biochemical pharmacology, 91(4), 501-509.

[49] Singh, D., Aggarwal, A., Maurya, R., & Naik, S. (2007). Withania somnifera inhibits NF-κB and AP-1 transcription factors in human peripheral blood and synovial fluid mononuclear cells. Phytotherapy Research, 21(10), 905-913.

[50] Matta, R., Wang, X., Ge, H., Ray, W., Nelin, L. D., & Liu, Y. (2009). Triptolide induces anti-inflammatory cellular responses. American journal of translational research, 1(3), 267.

[51] Xiao, D., & Singh, S. V. (2008). z-Guggulsterone, a constituent of Ayurvedic medicinal plant Commiphora mukul, inhibits angiogenesis in vitro and in vivo. Molecular Cancer Therapeutics, 7(1), 171-180.

[52] Patel, S. S., & Shah, P. V. (2013). Evaluation of anti-inflammatory potential of the multidrug herbomineral formulation in male Wistar rats against rheumatoid arthritis. Journal of ayurveda and integrative medicine, 4(2), 86.

[53] Shishodia, S., & Aggarwal, B. B. (2004). Guggulsterone inhibits NF-κB and IκBα kinase activation, suppresses the expression of anti-apoptotic gene products, and enhances apoptosis. Journal of Biological Chemistry, 279(45), 47148-47158.

[54] Ahmed, S., Stepp, J. R., Orians, C., Griffin, T., Matyas, C., Robbat, A., ... & Kennelly, E. (2014). Effects of extreme climate events on tea (Camellia sinensis) functional quality validate indigenous farmer knowledge and sensory preferences in tropical China. PloS one, 9(10), e109126.

[55] Wu, P. H., Lin, S. K., Lee, B. S., Kok, S. H., Wang, J. H., Hou, K. L., ... & Hong, C. Y. (2012). Epigallocatechin-3-gallate diminishes cytokine-stimulated Cyr61 expression in human osteoblastic cells: a therapeutic potential for arthritis. Rheumatology, 51(11), 1953-1965.

[56] Basnet, P., & Skalko-Basnet, N. (2011). Curcumin: an anti-inflammatory molecule from a curry spice on the path to cancer treatment. Molecules, 16(6), 4567-4598.

[57] Sharma, R. A., Gescher, A. J., & Steward, W. P. (2005). Curcumin: the story so far. European journal of cancer, 41(13), 1955-1968.

[58] Jurenka, J. S. (2009). Anti-inflammatory properties of curcumin, a major constituent of Curcuma longa: a review of preclinical and clinical research. Alternative medicine review, 14(2).

[59] Bryan C.S. Fever, Famine, and War: William

 DOI: http://dx.doi.org/10.5281/zenodo.7099226

Osler as an infectious disease specialist. Clin. Infect. Dis. 1996;23:1139–1149. doi: 10.1093/clinids/23.5.1139.

[60] Walter E.J., Henna-Jumma S., Carraretto M., Forni L. The pathophysiological basis and consequences of fever. Crit. Care. 2016;20:200. doi: 10.1186/s13054-016-1375-5.

[61] Ding Y., Yuan S., Liu X., Mao P., Zhao C., Huang Q., Zhang R., Fang Y., Song Q., Yuan D., et al. Protective effects of astragaloside IV on db/db mice with diabetic retinopathy. PLoS ONE. 2014;9:e112207. doi: 10.1371/journal.pone.0112207.

[62] Wu J., Ke X., Fu W., Gao X., Zhang H., Wang W., Ma N., Zhao M., Hao X., Zhang Z. Inhibition of Hypoxia-Induced Retinal Angiogenesis by Specnuezhenide, an Effective Constituent of Ligustrum lucidum Ait., through Suppression of the HIF-1α/VEGF Signaling Pathway. Molecules. 2016;21:1756. doi: 10.3390/molecules21121756.

[63] Mei X., Zhou L., Zhang T., Lu B., Sheng Y., Ji L. Chlorogenic acid attenuates diabetic retinopathy by reducing VEGF expression and inhibiting VEGF-mediated retinal neoangiogenesis. Vasc. Pharmacol. 2017;101:29–37. doi: 10.1016/j.vph.2017.11.002.

[64] Zhu S.H., Liu B.Q., Hao M.J., Fan Y.X., Qian C., Teng P., Zhou X.W., Hu L., Liu W.T., Yuan Z.L., et al. Paeoniflorin Suppressed High Glucose-Induced Retinal Microglia MMP-9 Expression and Inflammatory Response via Inhibition of TLR4/NF-κB Pathway through Upregulation of SOCS3 in Diabetic Retinopathy. Inflammation. 2017;40:1475–1486. DOI: 10.1007/s10753-017-0571-z.

[65] Ojha S., Balaji V., Sadek B., Rajesh M. Beneficial effects of phytochemicals in diabetic retinopathy: Experimental and clinical evidence. Eur. Rev. Med. Pharmacol. Sci. 2017;21:2769–2783.

[66] Kim J., Kim K.M., Kim C.S., Sohn E., Lee Y.M., Jo K., Kim J.S. Puerarin inhibits the retinal pericyte apoptosis induced by advanced glycation end products in vitro and in vivo by inhibiting NADPH oxidase-related oxidative stress. Free Radic. Biol. Med. 2012;53:357–365. doi: 10.1016/j.freeradbiomed.2012.04.030.

[67] Liu W.Y., Tzeng T.F., Liu I.M. Zerumbone, a Bioactive Sesquiterpene, Ameliorates Diabetes-Induced Retinal Microvascular Damage through Inhibition of Phospho-p38 Mitogen-Activated Protein Kinase and Nuclear Factor-kappaB Pathways. Molecules. 2016;21:1708. doi: 10.3390/molecules21121708.

[68] Kokubo, Yoshihiro, and Yoshio Iwashima. "Higher blood pressure as a risk factor for diseases other than stroke and ischemic heart disease." Hypertension 66, no. 2 (2015): 254-259.

[69] Archer J. S. (2000). Evaluation and treatment of hypertension. Prim. Care Update Ob Gyns 7, 1–6. 10.1016/S1068-607X(99)00032-3

[70] Susalit E., Agus N., Effendi I., Tjandrawinata R. R., Nofiarny D., Perrinjaquet-Moccetti T., et al. . (2011). Olive (Olea europaea) leaf extract effective in patients with stage-1 hypertension: comparison with Captopril. Phytomedicine 18, 251–258. 10.1016/j.phymed.2010.08.016

[71] August P. (2004). Overview: mechanisms of hypertension: cells, hormones, and the kidney. J. Am. Soc. Nephrol. 15, 1971–1973. 10.1097/01.ASN.0000133197.23478.76

[72] Freedman, Barry I., and Arthur H. Cohen. "Hypertension-attributed nephropathy: what's in a name?." Nature Reviews Nephrology 12, no. 1 (2016): 27.

[73] Shouk R., Abdou A., Shetty K., Sarkar D., Eid A. H. (2014). Mechanisms underlying the antihypertensive effects of garlic bioactive. Nutr. Res. 34, 106–115. 10.1016/j.nutres.2013.12.005

[74] Qidwai W., Ashfaq T. (2013). Role of garlic usage in cardiovascular disease prevention: an evidence-based approach. Evid. Based Complem. Alternat. Med. 2013:125649. 10.1155/2013/125649

[75] Zhang C. Y., Tan B. K. (1996). Hypotensive activity of aqueous extract of Andrographis paniculata in rats. Clin. Exp. Pharmacol. Physiol. 23, 675–678. 10.1111/j.1440-1681.1996.tb01756.x

[76] Ko F. N., Huang T. F., Teng C. M. (1991). Vasodilatory action mechanisms of apigenin isolated from Apium graveolens in rat thoracic aorta. Biochim. Biophys. Acta 1115, 69–74. 10.1016/0304-4165(91)90013-7

[77] Mark W. Bondi, Emily C. Edmonds, and David P. Salmon. Alzheimer's Disease: Past, Present, and Future. J Int Neuropsychol Soc. 2017 Oct; 23(9-10): 818–831. doi: 10.1017/S135561771700100X

[78] Thakur AK, Kamboj P, Goswami K. Pathophysiology and management of Alzheimer's disease: an overview. J Anal Pharm Res. 2018;9(2):226?235. DOI: 10.15406/japlr.2018.07.00230

[79] Chen, Xin, Joshua Drew, Wren Berney, and Wei Lei. "Neuroprotective natural products for Alzheimer's

disease." Cells 10, no. 6 (2021): 1309.

[80] Rammohan V Rao, Olivier Descamps, Varghese John, and Dale E Bredesen. Ayurvedic medicinal plants for Alzheimer's disease: a review. Alzheimers Res Ther. 2012; 4(3): 22. doi: 10.1186/alzrt125.

[81] Du G. J., Wang C. Z., Qi L. W., Zhang Z. Y., Calway T., He T. C., et al. . (2013). The synergistic apoptotic interaction of panaxadiol and epigallocatechin gallate in human colorectal cancer cells. Phytother. Res. 27, 272–277. 10.1002/ptr.4707

[82] Sankeshi V., Kumar P.A., Naik R.R., Sridhar G., Kumar M.P., Gopal V.V., Raju T.N. Inhibition of aldose reductase by Aegle marmelos and its protective role in diabetic cataract. J. Ethnopharmacol. 2013;149:215–221. DOI: 10.1016/j.jep.2013.06.025

[83] Chompoo J., Upadhyay A., Kishimoto W., Makise T., Tawata S. Advanced glycation end products inhibitors from Alpinia zerumbet rhizomes. Food Chem. 2011;129:709–715. doi: 10.1016/j.foodchem.2011.04.034.

[84] Yu Z., Lu B., Sheng Y., Zhou L., Ji L., Wang Z. Andrographolide ameliorates diabetic retinopathy by inhibiting retinal angiogenesis and inflammation. Biochim. Biophys. Acta. 2015;1850:824–831. DOI: 10.1016/j.bbagen.2015.01.014.

[85] Kim J., Jo K., Lee I.-S., Kim C.-S., Kim J.S. The extract of aster koraiensis prevents retinal pericyte apoptosis in diabetic rats and its active compound, chlorogenic acid inhibits AGE formation and AGE/RAGE interaction. Nutrients. 2016;8:585. doi: 10.3390/nu8090585.

[86] Raghu G., Akileshwari C., Reddy V.S., Reddy G.B. Attenuation of diabetic retinopathy in rats by ellagic acid through inhibition of AGE formation. J. Food Sci. Technol. 2017;54:2411–2421. doi: 10.1007/s13197-017-2683-8.

[87] Maregesi SM, Pieters L, Ngassapa OD, Apers S, Vingerhoets R, Cos P, Berghe DA, Vlietinck AJ. Screening of some Tanzanian medicinal plants from Bunda district for antibacterial, antifungal and antiviral activities. J Ethnopharmacol. 2008;119(1):58–66. doi: 10.1016/j.jep.2008.05.033.

[88] Weng JR, C.S. Lin, H.C. Lai, Y.P. Lin, C.Y. Wang, Y.C. Tsai, ..., C.W. LinAntiviral activity of Sambucus FormosanaNakai ethanol extract and related phenolic acid constituents against human coronavirus NL63 Virus Research, 273 (2019), p. 197767, 10.1016/j.virusres.2019.197767

[89] Jo S, H. Kim, S. Kim, D.H. Shin, M.S. KimCharacteristics of flavonoids as potent MERS-CoV 3C-like protease inhibitors Chemical Biology and Drug Design, 94 (6) (2019), pp. 2023-2030, 10.1111/cbdd.13604

 DOI: http://dx.doi.org/10.5281/zenodo.7099226