

NATURALLY AVAILABLE ANTIVIRAL MEDICINAL PLANTS A REVIEW

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ABSTRACT

Nature is one of the best sources of medicines since ages. In the present article, we have grouped some of the most important natural products which are of great value in possessing the antiviral properties.

KEYWORDS: Nature, antiviral products, antiviral plants, medicinal plants.

INTRODUCTION

Medicinal plants have been used in treating human diseases throughout history. They have been widely used to treat a variety of infectious and non infectious ailments. Medicinal plants are rich resources of ingredients which can be used in drug development and synthesis.

According to WHO (World Health Organisation) 80% of population living in developing countries use herbal medicines for their primary health care. The use of medicinal plants is much affordable than the modern pharmaceuticals. The demand of medicinal herb in market is high because many of its active ingredients cannot be prepared synthetically.^[1]



Medicinal plants play a major role in traditional medical system and constitute its backbone. Medicinal plants include wide variety of plants which are of great importance to the mankind.

Each and every part of such plants plays a very important role in the treatment of many diseases. The few most known an important medicinal plant products which have a great antiviral potential include Turmeric, Garlic, Echinacea, Olives, Green tea, Elderberries, Cranberries, Lemon balm, Liquorice, Oregano, Lemon, Astragalus.

Virus Introduction and Its Outbreak

Viruses are small infectious agents that replicate inside the living cell. They infect all type of life form i.e. from animals to plants and from bacteria to archaea. They are found in every ecosystem on earth and are the most abundant type of biological entity. Their shape range from simple helical forms to more complex structures.^[2] A virus is about one hundredth the size of average bacterium.

Viruses spread in various ways, viruses in plants are transmitted from plant to plant by insects that feed on plant sap and in animals viruses are transmitted by blood sucking insects.^[3,4]

A 2 year old boy Emile Oumouno who died in December 2013 in a village of Meliandou, Guinea was the index case of current Ebola virus disease epidemic. His sister, mother and grandmother had also died and were suspected with similar symptoms. On 25th march 2014, the world health organization (WHO) reported that guinea's ministry of health had reported the outbreak of Ebola virus disease in south-eastern districts with suspected cases in the neighbouring countries of Liberia and Sierra Leone. There had been 86 suspected cases including 59 deaths as of 14th march 2014 in guinea. By May 2014 the outbreak had spread to guinea's capital Conakry a city of about two million inhabitants. On 28th may 2014 the total number of cases had reached 281 with 186 deaths.^[5,6] The effect of this virus is spreading corner to corner in the places around guinea, causing the death of numerous people.

MATERIALS AND METHODS

Identification of Antiviral Compounds

The following information have been taken from NCBI, Pubmed.

List of Antiviral Compounds

Turmeric^[7,8,9]



Curcuma Longa (Turmeric) belong to the family Zingiberaceae. It is known as the golden spice as well as spice of life. It is also regarded as herb of the son by the people of vedic period. It is used as a spice and food preservative in most of the Asian countries. It performs a wide variety of biological action which includes its Anti-inflammatory, Antioxidant, Anti carcinogenic, Antifungal, Antiulcer and Antiviral activities. The active ingredient of Turmeric i.e. Cur cumin is proved to act against viruses such as Adenovirus, HIV, Influenza virus.

Garlic^[10,11]

Allium Sativum (Garlic) belong to the family Amaryllidaceae have been traditionally used for both culinary and medicinal purpose. It is traditionally used as medicine in most of the parts of the world and is known as a Natural Antibiotic without any side effect. Garlic is an Antiviral plant product which can inhibit many deadly viruses. It has been recently investigated that Garlic has the ability to prevent or treat some kinds of cancer. Cancer is one of the leading causes of death and this research suggests Garlic as a natural product which may help in the prevention of stomach, bladder, breast, colon, and oesophageal cancers.



In addition, Garlic is also found to have properties that actively act against viruses like HIV, Influenza B virus, Human Rhinovirus type 2, Herpes simplex virus type 1 and type 2. It is also known to improve and cure respiratory conditions, digestive disorders, cardiovascular diseases and skin problems.

Echinacea^[12,13]

Echinacea purpurea belong to the family Asteraceae. It is known to have wide medicinal importance and is one of the top selling herbs throughout years. Its ingredients are powerful immune system stimulators. There is considerable evidence which suggest that the Phytochemicals in Echinacea have the ability to reduce tumors and virus infections.



The complex carbohydrate group Arabinogalactans present in Echinacea among other polysaccharides are particularly significant. Several species of Echinacea plant are known to be used in making medicines with their leaves, flowers, and roots. It is used against many infections that include Flu, Urinary tract infections, Gum diseases, Typhoid, Malaria, and Diphtheria. The deadly virus HIV 1 can also be treated with Echinacea.

Olives^[14,15,16]

Olea europaea (Olives) belonging to the family Oleaceae is evergreen tree. Olives have a very strong cultural and religious symbolism in several civilizations. The Holy Bible refers to the Olive tree as the 'Tree of Life' and is also one of the first plants mentioned in Hebrew Bible. Similarly the olive tree and olive oil is mentioned seven times in the Holy Quran and The Prophet Muhammad referred olive tree as 'Blessed Tree'. It is a powerful defender against sickness and promotes healthy blood pressure supporting cardiovascular system and immune system. Recently a Dutch researcher identified that Oleuropein (active ingredient) of Oleo europaea inhibits the growth of Viruses, Bacteria, Fungi, and Parasites. Even the European research determined this compound to have strong antiviral and antibacterial capabilities.



Olive leaf blocks entire virus - specific system in the infected host which serve to offer healing effects that are not addressed by pharmaceutical antibiotics. Olive leaf also acts as an antioxidant that protects the blood vessels from damage and has proved to be effective in protecting the heart from coronary occlusion. In addition Olive leaf is beneficial for the treatment of conditions caused by virus, reterovirus, bacterium or protozoan. Among treatable conditions are influenza, the common cold, candida infections, meningitis, Epstein barr virus (EBV), ARC/ Aids, Chronic Patigue, Human Herpes Virus 6 and 7, Hepatitis B, Pneumonia, Tuberculosis, Gonorrhea, Malaria, Dengue, Severe Diarrhea and Dental, Ear, Urinary tract and Surgical infections.

Green Tea^[17,18,19]

Green tea is obtained from the plant (*Amellia sinensis*) is beneficial for a wide variety of ailments that includes Cancer, Heart diseases and Liver diseases. In general green tea has been proved superior to black tea in terms of health benefits. Flavanoids are the major polyphenols in green tea. The four major flavanoids in green tea are the catechins, Epicatechin (EC). Epigallocatechin (ECG) epicatechin gallate (ECG) and epigallocatechin gallate (EGCG). Epigallocatechin gallate is the most significant active component. EGCG is a powerful antioxidant it kills the cancer cells without harming a healthy tissues. EGCG and ECG are the inhibitors of influenza virus replication in cell culture.



Recent studies presented in the Journal of Allergy and Clinical Immunology states that EGCG found in green tea can help to boost one's immune system, helping to prevent HIV.

The binding of HIV to human T-cells, the first step of HIV infection is prevented by EGCG research. Professor Milke Williamson of University of Sheffield stated that drinking of green tea can reduce the risk of getting infected by HIV. Regarding this he also said that it is neither a perfect cure nor a safe way to avoid infection; however his suggestion says that green tea should be used in combination with particular medicines to improve the quality of life for those who are infected or being diagnosed in early stages.

Elderberries^[20,21,22]

Sambucus nigra commonly known as Elderberry belonging to the family *Andonaceae* is a deciduous shrub or small tree growing to 6m tall and wide. It is traditionally used as a medicinal plant by many people and herbalist.



It is of great antiviral importance and is advised for porphyries and for the treatment of influenza infections. Mumcloglu was the first person to discover the constituents of elderberry that neutralize the activity of hemagglutinin that is found on the surfaces of many viruses. Viruses will no longer have the ability to enter or pierce and replicate in the cell when hemagglutinin spikes are deactivated. The flowers of Elderberry can be used to make tea or non-alcoholic cordial. In recent studies, Fink et al (2009) reported that the flavanoids and A-type proanthocyanidins present in Elderberry extracts also blocks HIV entry and infection in the ghost cells.

Cranberries^[23,24]



Vaccinium oxycoccos belonging to the family Ericaceae is a group of evergreen dwarf creeping shrubs or vines upto 2 meters (7 fts) long and 5 to 20 centimetres (2 to 8) in height. Cranberries are very high in vitamin C and have significant amounts of antioxidants that act against heart diseases and certain types of cancers caused by viruses. They have been studied for having a wide capability in treating Urinary tract infections and certain viral infections. Their active ingredient Proanthocyanidin is found to act against Feline calcivirus F9 strain (FCV/F9). It is also been proved that the constituents of cranberries act against influenza virus adhesion and infectivity.

Lemonbalm^[25,26,27]



Melissa officinalis commonly known as lemon balm or balm mint belonging to the family Lamiaceae is used for both culinary and medicinal purpose. Several studies say that lemon balm when combined with other herbs (such as Valerion, Hops and Chamomile) helps to reduce anxiety and promote sleep. It is an effective antiviral that inhibits most of the viral infections. Lemon balm is known to heal cold sores caused by herpes simplex virus (HSV). It also exhibits a high concentration dependant activity against HIV infection. In addition it also helps in treating indigestion. It is also reported to have antibacterial, antimicrobial activities.

Liquorice^[28,29,30]

Liquorice is the root of *Glycyrrhiza glabra* that belongs to the family Fabaceae is herbaceous perennial that grow to 1m in height with pinnate leaves about 7-5 cms (3-6 inch) long, with 9-17 leaflets. Studies of past 50 years provide information which has prompted new interest in the pharmacological and physiological effect of this plant. *Glycyrrhiza glabra* possesses different pharmacological activities such as Antibacterial, Antioxidant, Antiinflammatory and Antiglycemic properties. It is also known to exhibit Antiulcer, Antiviral and Antifungal activities. Its active ingredient glycyrrhentic acid has shown antiviral activity against vaccinia, virus, herpes, simplex 1 and the vesicular stomatitis virus. Liquorice root saponins

inhibit the development of type A influenza virus in chicken embryos. Liquorice powder extracts are proved to act against Varicella-zoster Virus (VZV) which is an etiologic agent that is responsible for diseases like varicella (Chicken Pox) and Zoster (shingles).



In vitro study evidenced the inhibitory action of glycyrrhizin on HIV cultures other. In Vitro studies have demonstrated glycyrrhizin as effective compound at inhibiting the growth of viruses under culture conditions including pathogenic, flavivirus, Alpha viruses and Herpes simplex virus. In vivid and human studies tend to agree with antiviral efficacy of glycyrrhizin. Spinach mosaic virus is also known to be inhibited by aqueous extract of this root.

Oregano^[31,32]

Oreganum vulgare commonly known as *Origanum* belongin to the family Lamiaceae is a perennial herb growing from 20-80 cm tall, with opposite leaves 1-4 cm long. It is widely used in cooking and as natural medicines. Its actuve ingredient Carvacrol exhibits properties that improves gastrointestinal disorders, reduce blood cholesterol and glucose level.



It is a very active antiviral agent that acts against Flu, Influenza virus, Rotavirus, acyclovir-resistant herpes simplex virus type 1. Oregano oils are cytotoxic and do posses anti influenza virus activities.

Lemon^[33,34,35]

Lemon belongs to the family *Tutaceae*. It is a yellow fruit known worldwide for its culinary and non-culinary uses. The lemon juice is about 5% to 6% citric acid (active ingredient) that is responsible in giving lemons a sour taste.



Citrus flavanoids perform wide variety of biological activity including Antibacterial, Antifungal, Antidiabetic, Anticancer and Antiviral activities. Flavanoids in lemon function as direct antioxidant and free radical scavengers. They play a defensive role against pathogens, including bacteria fungi and viruses.

Among viruses, HIV is found to be inhibited by the action of Citric acid present in Lemon.

Astragalus^[36]

Astragalus belongs to the family *Fabaceae*. It grows about 16-36 inches and it is a large genus having about 3,000 species of herbs and small shrubs. Astragalus supports the immune system preventing colds and upper respiratory infections lowering blood pressure, treating Diabetes and protecting the Liver. It also has Antibacterial and Antiinflammatory properties. It also serves as an effective antiviral and stimulates the immune system.



Researchers of United States have found Astragalus to improve the immune system of those who had been through chemotherapy or radiation. Researchers have been carried out to find

out the Astragalus Antiviral activity on AIDS and it has been concluded that the effect of Astragalus on people with AIDS have proved to be beneficial.

COMPOUND NAME	ACTIVE CHEMICAL	ACTION AGAINST
Turmeric	Curcumin	Adenovirus, HIV, Influenza virus, Coxsackievirus.
Garlic	Allicin	Influenza B, Herpes simplex virus type 1 and 2, Parainfluenza virus type 3, Vaccinia virus, Human rhino virus type 2, Vesicular stomatitis virus.
Echinacea	Caffeic acid	HIV-1, Influenza virus, Para Influenza virus, Herpes Simplex Virus type 1.
Olive leaf	Oleuropein	Viral hemorrhagic Septicemia virus (VHSV), Hepatitis virus, Rota virus, Bovine rhino virus, Canine parvovirus, Parainfluenza type 3 virus, HIV.
Green tea	Catechins	Influenza virus, HIV
Elderberry	Sambucin	Avian flu virus, Influenza, HIV, Herpes Simplex Virus type 1 (HSV 1).
Cranberry	Proanthocyanidins	Feline Calcivirus F9 Strain (FCV/F9)
Lemon balm	Citronella, Citral tannins, Geraniol	Herpes simplex virus 1 and 2, HIV.
Liquorice	Glycyrrhizin acid	Herpes simplex virus, Varicella-zoster Virus i.e. chicken pox and shingles
Oregano	Carvacrol	Rotavirus, Influenza, Flu, acyclovir-resistant herpes simplex virus type 1, acyclovir-sensitive HHV-1
Lemon	Citric acid	HIV
Astragalus	Cycloastragenol	HIV

CONCLUSION

The natural products have been studied to have the antiviral capability and have been practiced since ages. If these products are studied further and joined with other receptors (homo receptors) then their efficacy will be increased.

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