

Review article

A review on treatment of Human Immunodeficiency Virus (HIV) by Naturopathy

Ansari Vikhar Danish Ahmad¹, Nikhil S. Sakle¹, Swaroop R. Lahoti², Sarfaraz Khan³, Syed Ayaz Ali*¹

¹Department of Pharmacology, Y. B. Chavan College of Pharmacy, Dr. Rafiq Zakaria Campus, Aurangabad-431001(M.S.) India.

²Department of Pharmaceutics, Y. B. Chavan College of Pharmacy, Dr. Rafiq Zakaria Campus, Aurangabad-431001(M.S.) India.

³Department of Quality Assurance, Y. B. Chavan College of Pharmacy, Dr. Rafiq Zakaria Campus, Aurangabad-431003, (M.S.) India.

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***Corresponding Author: Dr. Syed Ayaz Ali,** M. Pharm; Ph.D. (Pharmacology), Associate Professor, Department of Pharmacology, Y. B. Chavan College of Pharmacy, Dr. Rafiq Zakaria Campus, Rauza Baugh, Aurangabad-431001, (M.S) India.
E-mail: ayazpharm@gmail.com
Mobile No.: +919960883737

Abstract

Acquired immunodeficiency syndrome is a clinical syndrome that is the result of infection with human immune deficiency virus which causes profound immunosuppression. Current therapies are available for symptomatic treatment of AIDS is quite expensive. Herbal medicines can be developed as a safe, effective and economical alternative. Herbal medications provide sensible means for the treatment of AIDS. The herbal medicines which are used for the treatment of AIDS are kalmegh, asparagus, Indian gooseberry, Ashoka, etc. Many compounds of plants origin inhibit HIV during the various stage of the HIV life cycle, these include several alkaloids carbohydrates, coumarin, lignin, and proteins. These candidates have the potential to come up as the drug for treatment for HIV infection. So, the purpose of this article is to identify herbs and there active constituents having activity against human immune-deficiency virus with an objective of providing an effective method for preventing the transmission and the treatment of this disease.

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Introduction

Acquired immune-deficiency syndrome (AIDS) is a scientific condition that is the result of infection with human immunodeficiency virus (HIV), which causes superficial immune clamp down. It is a serious, life aggressive health problem since the first case was recognized in 1981 and is the most quickly increasing disease of the era. Since the widespread began, more than 60 million people have been infected with the virus and HIV/AIDS is now leading to the death. According to the recent report of WHO and "UNAIDS" at the end of 2004, a predictable 40 million people (37.2 million adults and 2.2 million children) were living with HIV worldwide out of which about 22 million had died [1]. The most pretentious is sub-Saharan Africa, where 3.1 million expired in 2004. By the end of 2004, the total figure of people living with HIV/AIDS in the region has reached 25.4 million. Further 540000 people are predictable to have died of AIDS in 2004. The range of HIV in India has been miscellaneous, with much of India having a low rate of infection and the widespread being most extreme in the southern states. The disease usually occurs in stages from a latent stage with initial symptoms such by means of temperature, wooziness, paleness, also joint pain, rashes and widespread lymphadenopathy tailed by way of the asymptomatic latency period. In the middle stage symptoms such as fever, weight loss, night sweats,

diarrhea, thrust, skin lesion and depression are common. Herbal drugs offer balanced means for the action of many illnesses. In Europe, herbal treatment has been considered as the most popular complementary medicine used by HIV infected individuals [2]. HIV goes to a distinct class of viruses called retrovirus. The normal Human immunodeficiency virus (HIV), the virus actual responsible for AIDS, is around 0.000031 inches (120Å) long and has an RNA core. The ribonucleotide particle is encapsulated by a capsid made up of a capsid protein (CA), p24. The capsid environment also contains other viral proteins such as intergrase and reverse transcriptase. It also covers a wide variety of additional macromolecules derived from the cell including tRNAlys3, which serves as a primer for reverse transcription [3]. The major HIV protein associated with envelope is gp120/41, these functions as the viral attachment proteins.

Types of HIV

Two major types of HIV have been identified as follows [4]:

HIV-1: It is the basis of the international wide spread and is most usually mentioned to as HIV. It is an extremely adaptable virus, which transforms readily. There are many dissimilar straining of HIV-1, which can be categorized according to groups and subtypes; M and O.

Within group M, there are currently known to be at least ten hereditarily dissimilar subtypes which are A to J.

HIV-2: In addition, group O holds another distinct group of mixed viruses. HIV-2 is fewer pathogenic and occurs infrequently; it is found mostly in West Africa.

HIV infection mechanism

HIV begins its infection by voluntarily to the CD4 receptor on the host cell. CD4 is present on the surface of several lymphocytes, which are a serious part of the body's immune system. It is now known that a co-receptor is needed for HIV to enter the cell. Following combination of the virus with the host cell, HIV enters the cell. The genetic material of the virus, which is RNA, is free and undergo reverse transcription into DNA. An enzyme in HIV called reverse transcriptase is necessary to catalyze this change of viral RNA into DNA. Once the genetic material of HIV has been altered into DNA, this viral DNA enters the host cell nucleus where it can be combined into the genetic material of the cell. The enzyme integrase catalyzes this process. Once the viral DNA is incorporated into the genetic material of the host, it is promising that HIV may persist in certain latently infected cells is the chief barrier to eradication or cure of HIV [5].

Modes of transmission

Infected Blood: HIV spread through contact with infected blood. HIV is transmitted through transfusion of contaminated blood or blood components.

Contaminated Needles: HIV is frequently spreading amongst operators by the distribution of needles or syringes contaminated with very minor amounts of blood from someone infected with the virus.

Mother to child: Women can transmit HIV to their offspring throughout gestation or birth. HIV can also be spread to offspring through the breast milk. If the mother takes certain drugs in pregnancy, she can significantly diminish the risks that her baby will get infected with the virus.

Sexually transmitted infection: If the person is infected with syphilis, genital herpes, Chlamydia infection, gonorrhea, or bacterial vaginosis formerly he/she may be extravulnerable to get HIV infection during sex with infected partners.

Stages of HIV infection

Healthy carrier states: A carrier is somebody who is infected with a disease and displays no clinical symptoms, but who is capable of infecting other people with the disease. At this time, the lone harmless practice

is to assume that anybody carrying the virus is accomplished by spreading it to others.

Lymphadenopathy Syndrome (LAS): Lymphadenopathy means "disease of the lymphatic system." one of the important signs of lymphadenopathy is swollen lymph glands. Of course, any contamination, such as flu, causes the lymph nodes to swell; but nodal swelling due to normal infections passes quickly. With HIV infection, this nodal swelling may continue for months, with no other signs of a short-term infective illness. So, lymphadenopathy is occasionally called Persistent Generalized Lymphadenopathy (PGL)

AIDS - related complex (ARC): It is an extra progressive level of HIV infection; Symptoms generally include the symptoms of lymphadenopathy, irregular body situations revealed by laboratory tests, and/or the presence of one or more than one opportunistic infections. His or her everyday activity may be limited and he or she is possibly establishing sessions of disease that require short-term or long-term medical treatment in and out of the hospital.

Acquired Immune Deficiency Syndrome (AIDS): AIDS is the "full-blown" syndrome, also called "frank" AIDS. Patients suffering from AIDS often have many numbers of the opportunistic diseases. These diseases develop because of the extensive disappointment of the immune system. Drug actions are obtainable for many of these infections; but, without the support of the immune system, the drugs fail to cure the disease completely or are incapable to keep the disease from recurring. These unscrupulous infections reason death of most AIDS patients [6].

Symptoms of AIDS

There are no clearly defined symptoms in HIV infected person in the initial stage, however, have a flu-like illness within a month or two after exposure to the virus.

This ailment may include:

- rash fever,
- headache, tiredness
- and enlarged lymph nodes

More persistent or severe symptoms may not appear even for 10 years or more after HIV enters the body in adults, or within 2 years in children born with HIV infection. This period of "asymptomatic" infection differs significantly in each individual. Even through the asymptomatic period, the virus is actively growing, infecting, and killing cells of the immune system.

Other symptoms often experienced from months to years before the onset of AIDS includes: Lack of energy, anorexia, fatigue, frequent fevers and sweats, yeast

infections (oral or vaginal), skin rashes or flaky skin, a pelvic inflammatory infection in women that does not respond to treatment, short-term memory loss and weight loss.

Herbal medicine

Preparations resulting from plants are mutual to many beliefs and a number of progressive medicinal drugs were derived from plants. There are herbs that can heal unsafe

disease such as the cancer. Rarely is it said that where allopathic fails, herbal medicines work. Herbal medicines are said to work to such an amount that they can even do away with the need for the operation. In India the medicine of herbs came to be known as Ayurveda this form of medicine has used herbs to treat all forms of disease [7].

A Number of medicinal herbs have been reported to have anti-HIV properties which are shown in table 1 [8-15].

Table 1. Medicinal herbs have been reported to have anti-HIV properties.

Species (Family)	Active constituents	Mechanism of action
<i>Galanthusnivalis Hippeastrum</i> hybrids (Amaryllidaceae)	Plant lectins: <i>G. nivalis</i> agglutinin (GNA), <i>Hippeastrum</i> hybrid agglutinin (HHA), and monocot mannose-binding lectins (MBLs)	Potent inhibitors that stop the spread of HIV among lymphocytes by targeting gp120 envelope glycoprotein; most prominent anti-HIV activity is found among MBLs; GNA has specificity for terminal -(1-3)-linked mannose residues; HHA recognizes both terminal -(1-3)- and -(1-6)-linked mannose residues.
<i>Anacardiaceae Rhus</i> (Succedanea)	Biflavonoids, robustaflavone, and hinokiflavone	Strong inhibition of the polymerase of HIV-1 reverse transcriptase
<i>Ancistrocladuskorupensis</i> (Ancistrocladaceae)	Michellamines A and B	Anti-HIV -1 and anti-HIV-2 activities. Act at an early stage of the HIV life cycle by inhibiting reverse transcriptase and at later stages by inhibiting cellular fusion and syncytium transformation.
<i>Rauwolfiaserpentina</i> (Apocynaceae)	Papaverine	Inhibition of HIV reverse transcriptase and HIV cell growth
<i>Achyroclinesatureioides Arctiumlappa</i> (Asteraceae)	Two dicaffeoylquinic acids: 3,5-dicaffeoylquinic acid, and 1-methoxyoxalyl-3,5-dicaffeoylquinic acid Wedelolactone (a coumarin derivative); orobol	Potent and irreversible inhibition of HIV-1 integrase. Inhibit HIV-1 replication, block cell-to-cell transmission of HIV.
<i>Arnebiaeuchroma Jonst</i> (Royle) (Boraginaceae)	Monosodium and monopotassium salts of isomeric caffeic acid tetramer	Inhibitory activity against HIV replication in an acutely infected H9 cell.
<i>Terminaliaarjuna</i> (Combretaceae)	Extract of stem bark	HIV protease inhibition
<i>Humuluslupulus</i> (Cannabaceae)	Xanthohumol	HIV-1 inhibitory activity as well as HIV-1-induced cytopathic effects, production of viral p24 antigen and reverse transcriptase in C8166 lympho
<i>Callophyllumcordatooblongu, Marilalaxiflora Symphoniaglobulifera, Hypericumperforatum L</i> (Clusiaceae)	Cordatolide A and B (+)-calanolide A LaxofloranoneGuttiferone A Hypericin, 3-hydroxy lauric acid	Inhibitory activity against HIV-1 replication Inhibit cytopathic effects of HIV-1 in T-cell lines, including both CEM-SS cells and MT-2 cells Novel non-nucleoside reverse transcriptase inhibitor with potent anti-HIV-1 activity Inhibition of the cytopathic effects of in vitro HIV infection Cytoprotection of CEM- SS cells from HIV-1 infection; inhibition of HIV-1 replication; anti-HIV activity with little or no Cytotoxicity
<i>Monotesafricanus, Vaticaastrotricha</i> (Dipterocarpaceae)	Prenylated flavonoids, 6,8-diprenylaromadendrin and 6,8-diprenylkaempferol Prostratin, a 12-deoxyphorbol	Blocks HIV-1 replication at the entry step.

<i>Homalanthusnutan</i> (Euphorbiaceae)	Prostratin, a 12- deoxyphorbol	Putative mechanisms are down-regulation of CD4 expression in CEM and MT-2 cells, interference in protein kinase C enzyme pathway. Prostratin is a potent activator of HIV replication and expression in latently infected T-cells; hence it is used to flush out latent HIV from lymph nodes during Antiretroviral Therapy.
<i>Peltophorumafricanum</i> (Fabaceae)	Gallotannin	Inhibits RNA-dependent-DNA polymerase activity of HIV-1 reverse transcriptase; inhibits ribonuclease H activity of reverse transcriptase.
<i>Swertiafranchetiana</i> (Gentianaceae)	Flavonone-xanthoneglucoside	Inhibits HIV-1 reverse transcriptase
<i>Hypericumperforatum</i> (Hypericeae)	Hypericin and pseudohypericin	Interference with the assembly of virions and secondary spread, interaction with proviral DNA integration, interference with a viral infection, prevention of virus spreading and budding.
<i>Melissa officinalis</i> (Lamiaceae)	Rosmarinic acid	Inhibit HIV-1 virions carrying different X4 and R5 HIV-1. Inhibit fusion of HIV-1 particles with cells.
<i>G. glabra Linn. Liquorice C</i> (Leguminosae)	Glycyrrhizin, licochalcone A, glycocoumarin, licopyranocoumarin	Inhibition of giant cell formation of HIV-infected cells.
<i>S. indica Linn</i> (Leguminosae)	Extract of bark	HIV protease inhibition
<i>Magnolia</i> (Magnoliaceae)	Neolignans e.g. magnolol 1 and honokiol 2	Antioxidant, antidepressant, induces apoptosis in tumor cells, weak anti-HIV-1 activity.

Herbal drugs

The following are some of the herbs, which are commonly used for the treatment of HIV/AIDS.

Ashwagandha (*Withaniasomnifera*):

Synonyms: Withania root, Asgandh, Winter cherry

Biological source: It consists of a dried root and stem bases of *Withaniasomnifera* Linn,

Family: Solanaceae.

Chemical constituent: The main constituents are alkaloids and steroidal lactones. Withanine is the main constituent. The other alkaloids are somniferine, somnine, somniferinine, withananine, pseudowithanine. The leaves contain lactone called as "withanolides".

Use: Ashwagandha has sedative and hypnotic effects. Ashwagandha or Indian ginseng, or Winter cherry has been traditionally used in Ayurveda, as the herb, which works to increase health and longevity. It is also considered to be a nontoxic herb that is said to normalize physiological function. Today, it is one of the most important components in HIV treatment [16].

Tulsi (*Ocimum sanctum*):

Synonyms: Sacred basil, Holy basil

Biological source: Tulsi consists of dried as well as fresh leaves of *Ocimum sanctum* Linn,

Family- Lamiaceae, and not less than 0.40% eugenol on the dried basis.

Chemical constituent: volatile oil, 70% eugenol, 20% eugenol methyl ester, and it also contains glycosides, tannins, citric, tartaric acid and Vit. C.

Use: The oil is antibacterial and insecticidal. Tulsi extract has traditionally been used in Ayurveda, as a remedy for a number of ailments like common colds, headaches, stomach disorders, inflammation, heart disease, various forms of poisoning, and malaria. The drug is a good immunomodulatory agent [17].

Black Seed:

Synonym: Black cumin, kalonji

Biological source: *Nigella Sativa*

Chemical constituent: *N. sativa* seeds contain 36 to 28% fixed oil, proteins, alkaloid, saponin and 0.4 to 2.5% essential oil. The fixed oil is mainly composed of unsaturated fatty acid that includes arachidonic, eicosadienoic, linoleic and linolenic acid. The saturated fatty acid present in the oil are palmitic, stearic and myristic acid the pharmacologically active constituent of volatile oil are thymoquinone, dithymoquinone, thymol and thymohydroquinone.

Uses: anti-oxidant, hepatoprotective, anti-nephrotic, anti-cancer, anti-diabetic, anti-microbial, anti-parasitic, anti-malarial, anti-histaminic, HIV [18-19].

Topvein:

There is a new herbal remedy available in the Zimbabwean market called Topvein, and it claims to cure with a 99 percent success rate against HIV/AIDS. In addition, the drug also claims to cause no side effects on the blood chemistry, lung and kidney functions, based on their official report. Topvein curing claims against HIV Topvien herbal medicine could cure AIDS within a year of use by boosting and improving the CD4 and CD8

immune cell counts on the patient. He too said that Topvein is rather which be able to be used for HIV/AIDS treatment along with antiretroviral drugs, but patients may know-how some drowsiness and yellowish stool and urine.

Agreeing to the Topvein here are the official clinical effects of using the drug:

1. Increase in body weight.
2. Increase in appetite.
3. No opportunistic infections such as meningitis, tuberculosis, sexually transmitted infection and diarrhea. Increase in CD4 cell count by 99 percent [18].

Shatavari:

Synonyms: *Shatmuli*

Biological source: Shatavari consists of dried roots and leaves of the plant known as *Asparagus racemosus* Wild, family Liliaceae.

Chemical constituent: Shatavari roots contain 4 steroid saponins: shatavarin 1. Shatavarin 1 major glycoside with 3 glucose and rhamnose moieties attached to sarsapogenin, whereas Shatavari 4 two glucose and one rhamnose moieties are attached. Leaves contain diosgenin and quercetin.

Use: Shatavari root is used to stimulate the immune system and also used as a diuretic [20].

Indian Gooseberry:

Synonyms: Emblica, Amla

Biological source: This consists of dried, as well as fresh fruits of the plant *Emblica Officinalis* Gareth belonging to family Euphorbiaceae.

Composition: Vitamin C (ascorbic acid), 0.5% fat, phyllembin, 5% tannin also contains iron and calcium.

Use: Amla is one of the natural sources of vitamin C. Indian gooseberry is highly beneficial for the reproductive systems of both men and women. It helps in regulating the menstrual cycle in women.

It helps to treat respiratory disorders. Indian gooseberry is a medicinal tonic, which helps in the treatment of respiratory disorders such as tuberculosis of lungs, bronchitis, and asthma. Amalaki or amla, or Indian gooseberry, is the richest known source of Vitamin C, which plays a very vital role in enhancing the immune system of the body. It has traditionally been used for curing numbers of diseases, such as cancer, age-related renal disease, and diabetes. Nowadays, it is also used for the treatment of HIV [21].

Astragalus:

Common Name(s): Huang Chi, Huang Qi, astragalus

Uses: Astragalus root can have used in the rebuilding of immune function once cancer Chemotherapy and for the treatment of HIV infection. However, there are no clinical trials to support any of these uses [22]. One study provides evidence that Astragalus polysaccharides (APS)

and astragalosides (AS) have strong promoting effects on the phagocytosis of *M. tuberculosis* [22].

Garlic (Lahsun):

Synonym: Allium

Biological source: It consists of bulbs of the plant known as *Allium Sativum* Linn

Family: Liliaceae

Chemical constituent: Garlic bulbs contains 29% carbohydrates, 56% proteins [albumin], 0.1% fat, Volatile oil is the chief active constituent and contains allyl propyl disulfide, diallyl disulfide, alliin & allicin.

Uses: Garlic has been used worldwide for centuries as both a topical and oral antibacterial agent, antifungal& antiviral agent. It reduces serum cholesterol, against the background of the antiretroviral therapy-induced hypercholesterolemia. It has several immune enhancing effects [23].

Liquorice:

Synonym: Glycyrrhiza, liquorice root, glycyrrhizae radix, mulethi.

Biological source: it consists of dried, peeled or unpeeled, root and stolon of *Glycyrrhizaglabra* Linn.

Family: Leguminosae.

Chemical constituent: the chief constituent of liquorice is a triterpenoidsaponin known as glycyrrhizin (glycyrrhizic acid), which is a potassium and calcium salt of the glycyrrhizinic acid.

Uses: it contains the compound glycyrrhizin which has significantly inhibits HIV replication in the peripheral blood mononuclear cells from HIV-seropositive patients. Traditionally it has been used as an expectorant and demulcent. The drug is also an antispasmodic. It is also used as an anti-inflammatory drug [24].

Olive Oil:

Synonym: oleumolivae

Biological source: it is a fixed oil expressed from the ripe fruit of *Olea Europaealinne*.

Family: Oleaceae

Chemical constituent: the olive oil contains the triglycerides mainly in the form of olein, palmitin, and linolein.

Uses: olive leaf extract exhibit anti-HIV activity, internally it is used as a nutrient, demulcent, and also mild laxative [25].

Conclusion

Acquired immunodeficiency syndrome, caused by human immunodeficiency virus is an immunosuppressive disease. Acquired immunodeficiency syndrome is gaining significant importance at present due to a rapid spread of the disease, high cost of treatment, and the increased risk of transmission of other STDs & AIDS. Current therapies available for symptomatic treatment of AIDS are quite

expensive. Many patients of AIDS is seeking help from the alternative system of medicine such as Unani, Chinese, Ayurvedic, and homeopathy. Since a long time a medicinal plant has been used for the treatment of AIDS, research is in progress to identify plants and their active principles possessing activity against sexually transmitted pathogens including human immunodeficiency virus with the objective of providing an effective approach for prevention of transmission and treatment of these diseases. Medicinal plants have a long history of use and their use is widespread in both developing and developed countries. Herbal medicine provides rational means for the treatment of AIDS. Many compounds of plant origin that inhibits HIV during the various stage of the cycle, include alkaloids, carbohydrates, coumarine, flavonoids, lignin, phenolic, proteins, quines, xanthenes, phospholipids, and tannins. Plant-derived microbicide and plant bodies are some of the new approaches for the prevention of HIV, so, herbal medicines can developed as a safe effective and economical alternative for AIDS.

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