

## Role Of Medicinal Plant in HIV/AIDS: A Review

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### ABSTRACT

Acquired Immunodeficiency Syndrome (AIDS) is a clinical infirmity that is a result of infection with Human immunodeficiency virus (HIV), which causes intense immunosuppression. Many compounds of plant origin that inhibits HIV during various stage of cycle, these include several alkaloids carbohydrates, coumarine, flavonoids, lignin, phenolics, proteins, quinines, xanthene's, phospholipids and tannins. These candidates have the potential to come up as drug for treatment for HIV infection. So, the aim of this review article is to identify plants and their active principles possessing activity against Human immunodeficiency virus with objective of providing an effective approach for prevention of transmission and treatment of these diseases.

**Keywords:** HIV, AIDS, Syndrome, Herbal remedies, Immune system, Medicinal plants, Phytoconstituents, Safety concerns, Specific Anti-HIV activity.

### INTRODUCTION

Human immunodeficiency virus infection / acquired Immunodeficiency syndrome (HIV-AIDS) is a viral Infection that effects the human immune system. The HIV virus comprises of two types, HIV-1 and HIV-2, and is a retrovirus that infects and destroys T-cells, Macrophages and dendritic cells. HIV-2 is predominant In West Africa, whereas the more virulent HIV-1 is the cause of the majority of infections globally. According to the World Health Organization (WHO), Traditional medicines, which include herbal medicines, Acupuncture, manual therapies, spiritual therapies, Exercise, etc., are the most commonly used form of medicines/treatments in many parts of the world. The use of traditional medicine is especially common in developing countries (i.e. Africa, Asia and Latin/South America). In developing countries, an estimated 60 to 90% of the population use traditional medicines which mainly serve their primary healthcare needs. On the other hand, in developed countries (i.e. Australia, Europe and North America) traditional medicine is commonly used in parallel with allopathic medicine (i.e. highly active antiretroviral therapy (HAART)). The use of complementary and 'alternative medicines' is widespread in chronic conditions, including HIV-AIDS infection. Even though herbal medicine is one of the most commonly used traditional medicines, statistics on the utilisation of herbal medicine in the treatment and management of

HIV among the Australian population are largely unavailable. According to a US study, 26% of HIV-infected people use herbal medicine as part of their treatment. A European study showed that herbal Medicines are used by approximately 25% of HIV-infected people. Although a number of reports are available on folkloric uses of Medicinal plants to manage some diseases, knowledge of herbal remedies used to treat HIV/AIDS is limited impressionistic and not well documented. Medicinal plants contain novel anti-HIV compounds. As it has been well Medicinal plants have been reported to contain various phytochemical constituents, including alkaloids, flavonoids, phenolic compounds, glycosides, tannins, and saponins. The medicinal plants could be potential sources of boosting immune responses, as well as halting the replication of HIV. Furthermore, it is important to search for novel antiretroviral compounds that can replace or be added to the present arsenal of drugs against HIV/AIDS. A literature survey of medicinal plants with anti-HIV property is an important prerequisite to search the novel antiviral agents for the treatment of HIV/AIDS worldwide. Therefore, the effort has been made to review the taxonomic families and species of plants with Anti-HIV active compounds and their modes of action. Bioactive Compounds from plants which play effective roles in the management of AIDS are also discussed in this review study.

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**Mode of transmission:**

• **Infected Blood**

HIV spread through contact with infected blood. HIV is transmitted Through transfusions of contaminated blood or blood components.

• **Contaminated Needles**

HIV is frequently spreading among users by the sharing of needles Or syringes contaminated with very small quantities of blood from Someone infected with the virus.

• **Mother to child**

Women can transmit HIV to their babies during pregnancy or birth. HIV can also be spread to babies through the breast milk. If the mother takes certain drugs during pregnancy, she can significantly Reduce the chances that her baby will get infected with HIV.

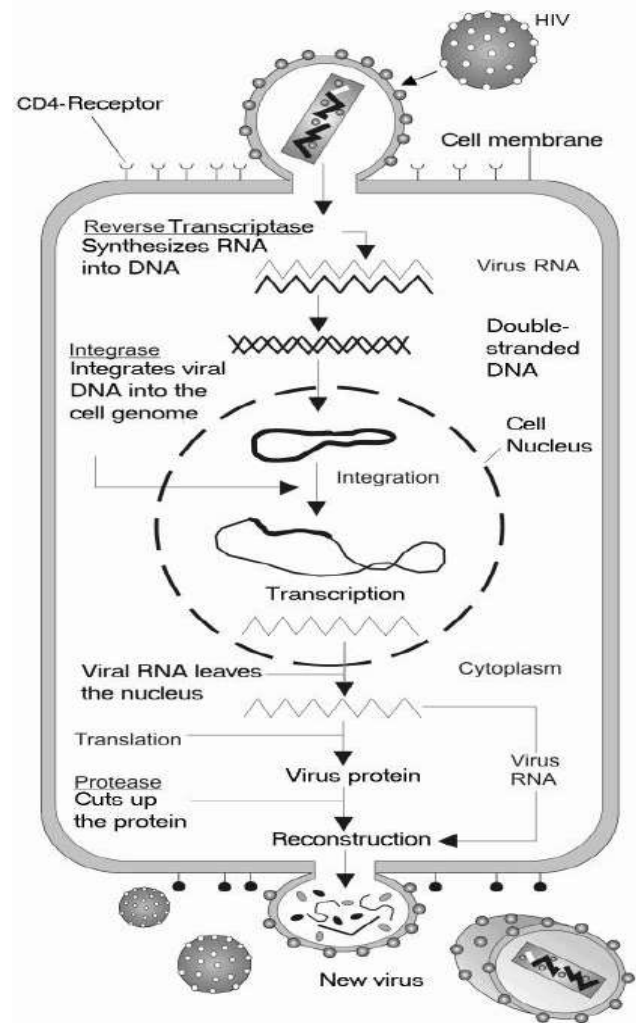
• **Sexually Transmitted Infections**

If the person is infected with syphilis, genital herpes, chlamydia Infection, gonorrhoea, or bacterial vaginosis then he/she may be more Susceptible to get HIV infection during sex with infected partners.

**PATHOGENESIS:**

HIV infects the CD4+ cells and chemokine receptor, which is CCR5 or CXCR4. Infection to CD4+ cells indicates that the patient is immune compromised. In 1996, a cohort study reported that HIV infection course could be predicted within 6–12 months based on the viral load in the plasma, and at this stage, CD4+ count confirmed the disease severity. More than half of the CD4+ cells decreased during the early stage of infection. When this cell count decreases, the disease progresses from acute to chronic phase. During HIV infection, CD4+ T cells are depleted from the gut and the helper cells produce interleukins maintaining the integrity of the mucosal barrier. During acute infections, the loss of CD4+ cells shows two effects on the immune system: it depletes memory CD4 T cells, which constitute a major portion of the immune system, and allows microbial translocation.

**Life Cycle of HIV:**



**Treatment:**

Drugs from natural resources like medicinal plants remain a popular choice to treat various infectious as well as non-infectious diseases. It has been well reported that medicinal plants with minimal or no side effects are being used for the treatment of HIV/AIDS. Medicinal herbs not only affect the replication of viral particles but also act as immunomodulators and immune stimulants due to the potential source of antioxidants and nutraceutical compounds. A number of herbs having anti-HIV activity have been reported in the literature.

Only a few clinical trials are available on the use of herbal medicine in HIV-AIDS. They are often administered due to their low cost and wide availability in third-world and developing nations where anti-retroviral drugs are not easily accessed. One issue is the misguided healthcare provided by uneducated and unqualified herbalists' misuse of herbal therapy in treating HIV-AIDS in third-world and developing nations, although this may represent traditional use of herbal medicines for infection and

inflammatory conditions. In the developed world, CAM treatment appears to be widely used in conjunction with conventional HIV treatment, such as anti-retroviral drugs. Herbal medicines are used with anti-retroviral drugs to reduce adverse effects like nausea and depression and for immune support/modulation. In third-world and developing nations, herbal medicines are more widely used, mainly due to the cost of anti-retroviral drugs, especially in managing associated conditions like immune suppression and opportunistic infections.

### 1. *Artemisia annua* L

*Artemisia annua* L., a native Asian annual herb belonging to the Asteraceae family, has been found to exhibit anti-HIV properties. The plant's tea infusion demonstrated significant anti-HIV activity, with IC<sub>50</sub> values reaching as low as 2.0 µg/mL. Interestingly, artemisinin, which was initially considered inactive at concentrations of 25 µg/mL, also displayed notable anti-HIV activities.



**Figure 1 *Artemisia annua* L**

### 2. *Calendula officinalis* L

*Calendula* species are medicinal herbs that belong to Asteraceae plant family. Among calendula species, *Calendula officinalis* flowers are used in ointments for the treatment of skin damage, ulcers, herpes, wounds and frostbite. The extract of *C. officinalis* flowers prepared in dichloromethane-methanol (1:1) exhibited potential anti-HIV activity in in-vitro tetrazolium-based assay. Anti-HIV activity of this plant was attributed to inhibit HIV1-RT at extract concentration of 1000 µg/mL as well as suppressing the HIV mediated fusion at 500 µg/mL concentration. The ability of both organic and aqueous extracts of *C. officinalis* flowers to inhibit HIV-1 replication were examined and it was found that the organic extract exhibited anti-HIV activity in an in-vitro MTT tetrazolium-based assay. It was also found that the *C. officinalis* flowers organic extract caused a significant

reduction of HIV-1 reverse transcription activity in a dose and time-dependent manner. The study results suggested that the organic extract of *C. officinalis* flowers possess anti-HIV properties which are of therapeutic interest.



**Figure 2 *Calendula officinalis* L**

### 3. *Trigonostemxypophylloides* and *Vatica astrotricha*

To explore the inhibitory effects of medicinal plants on HIV-1, extracts from two traditional Chinese medicinal plants, *Trigonostemxypophylloides* (TXE) and *Vaticastrotricha* (VAD), were investigated. Results revealed that both extracts had few side effects on the multiplication of host immune cells and their survival significantly halted the replication of HIV-1 and syncytia formation in CD4+ Jurk at cells. Further, research revealed that TXE and VAD extract have no HIV-1 RT enzyme inhibitory effects. Treatment with both extracts demonstrated that TXE and VAD extract have anti-HIV potential by inhibiting the HIV multiplication and the entry of this virus into target cells. Molecular studies revealed that Phyto-chemical constituents block the HIV-1 interaction with target cells, i.e., the interaction between gp120 and CD4/CCR5 or gp120 and CD4/CXCR4 and point to the potential of developing these two extracts to be HIV-1 entry inhibitors.



**Figure 3 *Trigonostemxypophylloides* and *Vatica astrotricha***

#### 4. Rheum species

It has been reported that extracts from Rheum species including *Rheum palmatum* L. and *Rheum officinale* Baill contain phytochemical constituents which specifically inhibit the replication of HIV. Esposito et al,<sup>21</sup> isolated and investigated the anti-HIV activity of anthraquinone derivatives on both HIV-1 reverse transcriptase (RT) associated DNA Polymerase (RDDP) and Ribonuclease H (RNase H) activities in biochemical assays. Then HIV-1 mutated RTs, integrase (IN) and viral replication as anti-HIV parameters were also tested to explore the new treatment strategies. Results revealed that HIV-1 RT-associated RNase H function is inhibited by the extracts of both *R. palmatum* L. and *R. officinale* Baill. Further, studies revealed that Sennoside A and B were the Phyto-constituents responsible to inhibit both RDDP and RNase H associated functions. When Sennoside it was studied more, it was noted that there are two RT binding sites for its antiviral activity. Moreover, cell-based analysis revealed that Sennoside A affects the HIV-1 replication as well as in vitro studies revealed the phytochemical effects on HIV-1 IN activity. Viral transcription process is the major target for Sennoside A reported at the time of Viral DNA production.



**Figure 4 Rheum species**

#### 5. Hypericum perforatum L



**Figure 5 Hypericum perforatum L**

Also known as St. John's Wort, *Hypericum perforatum* belongs to the plant family Hypericaceae. It has been used for medicinal purposes in traditional medicinal system particularly for wound healing and also for the treatment of AIDS. The antiretroviral activity of Phyto-constituents like hypericin and pseudo-hypericin isolated from *H. perforatum* in HIV-infected patients have been observed during a clinical trial.

#### CONCLUSION

Acquired immunodeficiency Syndrome spreads rapidly in human beings. Current therapies available for AIDS treatment are expensive. Patients suffering from AIDS seek help from alternative medical systems like Ayurveda, Unani, Homeopathy, etc. Natural drugs have been used for AIDS treatment since long. Medical drugs have a long history of use. Many natural drugs are used in AIDS treatment, e.g., Bittermelon, Echinacea, Cat's Claw, Turmeric, Nuts, Ashoka, Sarpagandha, Cotton Seed, Arjuna, etc. Natural medicines can be expanded as a safe, effective, and inexpensive alternative for AIDS. When it comes to health, 'Prevention is always better than Cure'. Natural remedies need not necessarily be a cure but can be an alternative or, more preferably, a preventive measure in AIDS cases.

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