



Journal of Integral Sciences (JIS)

(An International Open Access Journal)

Available at www.jisciences.com

ISSN: 2581-5679

A review on role of medicinal plants in HIV/aids therapy

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Received: 06 Aug 2022 Revised: 19 Aug 2022 Accepted: 18 Sept 2022

Abstract

Human immune deficiency virus causes a potentially life threatening chronic disease called acquired immune deficiency syndrome by specifically suppressing immune system. More than 78 million people had been effected by since the pandemic and 39 million people died globally and 36.5 million people. If HIV is not treated it can leads to AIDS. There is no cure but it is treatable with medicine. The effective treatment with HIV medicine called antiretroviral therapy or ART is available. The antiretroviral drugs introduced in 1996 have been shown to increase oxidative stress among other drugs related complications. There is currently no effective cure. Once people get HIV they have if for life. People with AIDS have badly damaged immune system. The majority of the people living with HIV/AIDS are susceptible to bacterial and fungal opportunistic infections that results from immune suppression. Research throughout the world are trying to explore and develop more reliable and safe drugs from natural resources to manage HIV infections. A wide range of medicinal plants have been studied and have reported significant potential against HIV. Plants like vernoniaamygdalina, rheu species, hypoxis hemerocallidea have high efficacy to cure HIV. The extraction of various phytoconstituents isolated from medicinal plants such as Alkaloids, flavanoids etc... have potential to interrupt the HIV.

Keywords: HIV, AIDS, traditional medicinal plants, anti HIV activity, CD4+Tcells, anti retroviral therapy, kisii country.

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Produced and Published by

[South Asian Academic Publications](#)

Introduction

Acquired Immune Deficiency Syndrome (AIDS) is caused due to infection of Caused by human immune deficiency virus. This infection Causes immuno suppression in the body. This is a serious and life-threatening. A condition that affects many people. The World Health Organisation estimates that over 75 million people globally have been infected with the human immunodeficiency virus (HIV), of which approximately 37 million are still alive and living with

the infection. While HIV is a significant cause of morbidity and mortality worldwide, the sub-Sahara region of Africa is burdened with the largest number of HIV cases [2]. Of the 37 million cases of HIV, the sub-Saharan Africa is home to ~70%, although it has only 21% of the world's population [1]. In fact, African men and women worldwide are more affected by this disease than any other race [2,3]. Only ten countries in southern and eastern Africa, including South Africa (25%), Nigeria (13%), Mozambique (6%), Uganda (6%), Tanzania (6%), Zambia (4%), Zimbabwe (6%), Kenya (6%), Malawi (4%) and Ethiopia (3%), account for approximately 80% of HIV patients [2,3]; In most countries, the prevalence of HIV is the highest in specific groups including men who have sex with men, intravenous drug users, people in prisons and other confined settings, sex workers and transgender

individuals. Transition reduced to 9-11 years, depending on subtype. The main targets of infections are vital immunity T helper cells (specifically CD4+ T cells), dendritic and MAC-like cells rophages cells.

According to the WHO report [1], 1.5 million people in Kenya live with HIV/AIDS. Out of this number, 75% of all adults and 63% of all the children living with HIV were receiving ART. This implies that Kenya is also far off the UNAIDS's target of 90-90-90. This will consequently lead to loss and depletion of wild-harvested medicinal plant species, which in turn will threaten the health care not only in Njeru- Uganda but also worldwide.^{20,21} This is due to lack of a proper strategy of conservation and organizing the commercial trade of the plants and integrating the development from production to consumption.[2] The information on plants used in the management of HIV/AIDS opportunistic infections in Uganda is to some extent still scattered and under the custodianship of few individuals who have the knowledge on medicinal plants and are of advanced aged. The treatment of is possible with the use of herbs, while some believe that herbs also improve energy level. However, a The study conducted in the US reported a commonly treated condition anxiety, depression, fear, pain and Nervousness.[3]

PATHOPHYSIOLOGY

Viruses cannot survive or replicate without a host and can only do so inside a living cell. Viral structure is simple. Viruses lack the complex components present in bacterial or human cells. HIV is commonly transmitted via transfusions, hypodermic needles and from mother to child. HIV targets and infects a particular type of T-cell called CD4 helper cells. These are so called because they do not kill or neutralise foreign antigens but instead signal to and recruit other immune cells to do so.[3] After entering a host's body HIV rapidly seeks out the CD4 cells and infects them. HIV DNA is transcribed to viral mRNA and exported to the cytoplasm where it is translated to viral Gag, Gag-Pol, and Net polyproteins, which are then cleaved later during virion assembly and maturation at the cell surface or after release of the new viral particles. In this process, such as entry inhibitors, reverse transcriptase inhibitors, integrase strand transfer inhibitors and protease inhibitors. The RNA present in a virus is protected by a protein coat called capsid. Outside the capsid are enzymes the virus uses to infect its host and replicate. These structures are surrounded by an envelope

comprising glycoproteins, which help the virus identify and bind to its target [4].

Diagnosis

HIV can be diagnosed through blood or saliva testing. Available tests include:

- ❖ Antigen tests: These tests usually involve drawing blood from vein. Antigens are substances on the HIV virus itself and are usually detectable a positive test in the blood within a few weeks after exposure to HIV.
- ❖ Antibody tests : These tests look for antibodies to HIV in blood or saliva. Most rapidly HIV tests done at home or antibody tests .Antibody tests can take 3 to 12.
- ❖ Nucleic acid test: In these test can tell if a person has HIV or how much virus is present in the blood. A NAT can detect HIV sooner than other types of tests.
- ❖ ELISA test: The most common HIV test use blood to detect HIV infection. Oral fluid collected from the cheeks and gums may also be used to perform an ELISA [5].

Treatment

- There is no cure for HIV/AIDS. Ones infected cannot get rid of it.
- HIV treatment does not prevent transmission of other sexually transmitted diseases.
- There are many medications that can control HIV and prevent complications these medications are called antiretroviral therapy [6].
- The treatment of HIV/AIDS with medicines is called antiretroviral therapy.
- Each of the new drugs may potentially fill a void in current antiretroviral therapy which will ultimately lead to improved out comes in HIV infected individuals [7].

Medicinal Plants in HIV Therapy

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 [8]. Anti HIV activity of HIV protease Curcuma Longa Curcumin E coli integrase assay, HeLA H12 Inhibition of HIV integrase, Tat mediat. transactivation Ceriops decandra Aqueous Extract MT-4 cell Assay Inhibit Virus adsorption Cinnamomun aromiticum Bark Extract MT-4 cell Assay Inhibit virus induced cytopathogenecity Eugenia jambolona Bark Extract - medicinal plants has

been reviewed from the published literature by searching reference materials through various databases/search engines and is listed below [9].

Vernoniaamygdalina

Vernoniaamygdalina is a shrub used as a traditional herbal medicine long to family Asteraceae and common name of the plant is bitter leaf due to its bitter taste. The study results showed that CD4 count was increased in patients who used the leaf extractor supplements. Those clients who used both supplements and leaf extract had an increase in CD4 count [10]. When compared with the control group, CD4 cell count was found to have increased. amygdalina have an immunological effect on HIV-infected patients and are used in HIV management. CD4 count depends on the white blood cell count. Leaves of fresh bitter leaf are effective for the treatment of persistent fever, headache and joint pain in AIDS patients. Vernoniaamygdalina also act as a nutritional supplement [11].



Sutherlandia Frutescens

The flowering shrub of Sutherlandia frutescens also called insiswa, belongs to family Fabaceae. It is effective to stimulate the immune system in infective persons [12].



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. 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 [13].



Hypericum Perforatum L

It is also known as St. John's Wort, Hypericum perforatum belongs to the plant family Hypericaceae.. 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 [14].



RHEUM SPECIES: It has been reported that extracts from Rheum species including Rheumpalmatum L. and

Rheumofficinale Baill contain phytochemical constituents which specifically inhibit the replication of HIV. When Sennoside it was studied more, it was noted that there are two RT binding sites for its antiviral activity. Viral transcription process is the major target for Sennoside a reported at the time of Viral DNA production [15].



Pelargonium Sidoides

Pelargonium sidoides (PS) is herb which belongs to family Geraniaceae. Its common name is African geranium. The antiviral effect of P. sidoides extract is mediated by polyphenols, and the polyphenol mixture obtained from the extract of P. sidoides attacks HIV-1 and their action is different from all anti-HIV-1 drugs which were clinically used. The extract of this plant targets initial and final binding of HIV To stop its activity and also prevent the attachment of virus particle to the host, hence prevent the entry of HIV [16].



Hypoxis Hemerocallidea

Hypoxis hemerocallidea is also known as the African potato and belongs to the family Hypoxidaceae. African potato is commonly used as an immune booster. Active ingredients of plants which have anti-HIV activity.



Combretum molle

Combretum molle belongs to Combretaceae plant family. It is widely used in traditional medicinal system. C. molle using different solvents including methanol, acetone, chloroform and petroleum ether through Soxhlet apparatus for the assessment of in vitro anti-HIV activity against HIV-1 and HIV-2. [17]



Artemisia Annua

The anti-HIV activity of the tea infusion prepared from the Chinese medicinal plant identified as Artemisia annua L. by using the validated cellular systems were examined. The tea infusion of Artemisia annua was found to be highly active with IC₅₀ values as low as 2.0 µg/mL. In addition, artemisinin was found as inactive at 25 µg/mL and the related species Artemisia afra (not containing artemisinin) has also shown a similar level of activity [18].



Extraction Process

- ❖ Take 100gm of dried leaf powder and add in a 250ml of methanol.
- ❖ It maceration by using magnetic stirrer at 700rpm until get methanol colourless.
- ❖ Evaporation by using rotavapour at 40°C to reduce 100ml and add hexane 50ml mix well.
- ❖ Separate hexane and methanol by using separating funnel.
- ❖ To methanolic extract add 10ml distilled water and add 50ml ethyl acetate.
- ❖ Ethyl acetate and methanol water mixture is separated by using separating funnel.
- ❖ Each extract was evaporated by rotavapour.
- ❖ This methanolic extract containing artemisin [19].

Identification

- To drug add 10ml of alcohol and boil for 15 minutes and filter it.
- To filtrate add sodium hydroxide and heat it.
- Red colour liquid indicate the presence of artemisin.

Analysis

By using UV 1mg sample add 10ml methanol – absorbance at 200 to 400 nm by using thin layer chromatography 1mg sample dissolved in ethyl acetate.

Mobile phase – ethyl acetate: hexane (3:97)

Stationary phase : silica gel

Method of Preparation

Artemisia annua prepared in the form of tea infusions in the traditional Chinese medicine produces artemisin. This plant components change as leaves are processed into tablets for oral consumption. Here we compared leaf tablet of *Artemisia annua*. Dried leaves artemisinin, arteannuin B, Artemisinic acid, chlorogenic acid, scopoletin, chrysosplenetin and quercetin increased

or remained stable with powdering and compressed into tablets.

Treatment by Using *Artemisia Annua*

- ❖ *Artemisia annua* tea infusions are also able to inhibit HIV.
- ❖ It has been used in traditional Chinese medicine for fever.
- ❖ Artemisin is used to treat inflammation.
- ❖ It is used in treatment of malaria.
- ❖ Artemisin it act as anti oxidant, anti tumor, anti bacterial, anti fungal properties [20].

Conclusion

Since the discovery of the causative agent of AIDS in the 1980s, Researchers are trying to develop drugs to manage about this devastating and deadly disease. Medicinal plants can play an important role in this endeavor. Several plant species have shown remarkable anti-HIV activity, especially *Combretum molle*, *Hypoxis hemerocallidea*, *Pelargonium sidoides*, *Rheum* species, *Vernonia amygdalina*, *Sutherlandia frutescens* and *Hypericum perforatum*. These plant species are worthy of further study for the development of new anti-HIV chemotherapeutic options. These medicinal plants are used in the management of HIV/AIDS in Kisii County. Unfortunately, despite the promising data reported on the eight plants in the management of HIV/AIDS and the opportunistic infections, the main parts of the plants used are the roots which pose a danger to the sustainability of the medicinal plants. The most commonly used plant part was leaves for the management of HIV/AIDS opportunistic infections. The plants were used to manage several infections but the most commonly mentioned were skin infections, chronic cough, tuberculosis, stomach infections, diarrhea, warts and herpes zoster. In the future, medicinal plants should be constantly evaluated for their anti-activity. Many plants have recently been revealed to be rich sources of antioxidants.

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