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Review Article

A REVIEW ON ANTI-HIV AND ANTAGONIST THERAPEUTICS OF SELECTED INDIAN MEDICINAL PLANT FLORA

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ABSTRACT

AIDS- a pandemic situation remains globally. The non-inheritable disorder Syndrome (AIDS) could also be a result of human Immuno virus (HIV) infection that later finishes up in vital suppression of immune functions. Hence, the plant-derived natural product still functions as a reservoir intended for the invention of the latest therapeutic medicines, alongside anti-HIV agents. The present medical care comes across its boundaries within the emergence of MDR (multidrug resistance) and as a result finding new therapeutics and novel targets. Furthermore, the necessity of the hour to treat the person with infection, attack Human Immunodeficiency virus reservoirs inside the body like the brain, lymphnodes towards understanding the vital word goal of complete obliteration of HIV and AIDS. The plant compounds and the extracts possess anti-HIV and neuroprotective activity. The current review aims to explore the medical care treatment and also the information on seasoning medicines as a standard medical aid for anti-HIV therapy.

Keywords: Anti-HIV activity, Herbal medicine, HIV, Phytochemical Constituents.

1. INTRODUCTION

AIDS (Acquired Immuno Deficiency Syndrome), caused by HIV (Human Immunodeficiency Virus); a family of the retrovirus, results in serious life-threatening opportunistic infections and is also an economic burden to society. The virus is built of RNA rather than more typical DNA in its molecular process. It attacks the cells of the immune system that ought to be protecting the body against it-T lymphocytes and other white blood cells with CD4 receptors on their surfaces [1]. There are 2 major types sorts of HIV are identified, HIV-1which is an infective agent that has led to the planet-wide AIDS epidemic. HIV-2 which is far less common and fewer virulent eventually produces clinical symptoms almost like HIV-1. Around 37 million people are still alive and living with the infection and illness [2]. The African traditional religion surmises that HIV/AIDS partly results from punishment by the Supreme Being [3]. Recently it is estimated that approximately 26 million HIV patients reside in Africa, 3.3 million within America, 3.5 million in Southeast Asia, 2.4 million in Europe, 360,000 within the eastern Mediterranean, and 1.5 million within the Western Pacific [3].

Medicinal plants are nature's gift to human mankind by a disease-free healthy life. They have always provided a source of drugs for various elements including anti-HIV properties [4]. The recent pharmacological studies showed that medicinal plants exerted a good range of antimicrobial activities [5]. As of August 2012, the Food and Drug Administration of the USA has approved 23 drugs of a single parent compound for HIV [6]. Moreover, the rapid emergencies of viruses are resistant to these drugs [7]. So, continuous life-long treatment is necessary for providing antiretroviral therapy [8]. Consequently, there is a necessity for the invention of novel remedial therapeutic strategies. Traditional medicine has served as a source of alternative medicine, new pharmaceutical products, and health care products

[9]. Phytochemicals extracted from the several medicinal plants found to possess alkaloids, flavonoids, phenolics, steroids, saponins, glycosides, coumarins, etc. characterized with a broad antiviral spectrum against the infection [10].

2. PATHOLOGY Of HIV

The Human Immuno Deficiency viruses 1 and 2 (HIV-1, HIV-2) originated from the simian immunodeficiency viruses (SIV) belongs to the family of Retroviruses, in the genus of Lentiviruses. HIV is commonly transmitted through unprotected sexual activity, blood transfusions, infected needles, and syringes. Non-sexual transmission can occur from an infected mother to her infant during pregnancy, during childbirth when exposed to her vaginal fluid or blood, and through breast milk [11]. Retroviruses can use their RNA and host DNA to make viral DNA for their long incubation period. When HIV infects a host cell, it must use its reverse transcriptase enzyme to transcribe its RNA to the host cell's proviral DNA. The activated T lymphocytes are preferred targets, macrophages, dendritic cells, and monocytes are activated [12]. Human Immunodeficiency virus-induced immune commencement results in an augmented turnover of T-cells production and destruction, elevated death of T-cells, a drop in the size of the CD4+ T- cell pool, and a condition of activation-induced immunodeficiency [13]. The penetration of HIV into the host cell is a complicated process that proceeds in 3 stages: (1) An attachment stride that needs CD4 receptor binding, (2) Co-receptor binding and, (3) Fusion process HIV entry. The low number of CD4 + T cells loses cell-mediated immunity, increases opportunistic infections, resulting in the event of AIDS [13].

3. CURRENT TREATMENTS FOR HIV

The current treatment process for HIV is Antiretroviral Therapy. Treatment options for persons living with HIV have improved over the past decade. HIV/AIDS used to be a much deadlier disease prior to the development of drugs that help slow the progression of the disease. HIV can be controlled and prevented by certain medications. Those medications are called antiretroviral therapy (ART). This therapy involves the combination of drugs from several classes not to cure HIV but to suppress the virus and slow its progression in the body. If an Antiretroviral drug is successful, it can add many healthy, productive years to a person's life and reduce the risk of transmission to others [14].

4. ANTI-HIV DRUGS-CLASSES

Non-nucleoside reverse transcriptase inhibitors (NNRTIs) turn off a protein needed by HIV to make copies of itself. Examples include Efavrienz (Sustiva), Rilpivirine (Edurant), and Doravirine (Pifeltro). Nucleoside or nucleotide reverse transcriptase inhibitors (NRTIs) block the reverse transcriptase enzymes that involve in the reverse transcription process by blocking HIV to make copies of itself. Examples include Lamivudine (Epivir), Emtricitabine (Emtriva), Abacavir (Ziagen), Tenofovir (Viread), and Zidovudine (Retrovir). These can be processed by combined drugs such as Emmtricitabine / Tenofovir (Truvada) and Emtricitabine/Tenofoviralafenamide (Descovy). Protease inhibitors (PIs) inactive HIV needs to make copies of itself. Examples include Darunavir (Prezista), Atazanavir (Reyataz), and Lopinavir/Ritonavir (Kaletra). Integrase inhibitors block HIV infection by disabling a protein called integrase, which helps the virus to insert its genetic material into CD4 T cells. Examples encompass Raltegravir (Isentress) and Dolutegravir (Tivicay). The entry of fusion inhibitors blocks HIV's entry into CD4 T cells. Examples include Enfuvirtide (Fuzeon), Ibalizumab-uiyk (Trogarzo), and Maraviroc (Selzentry). The agents of Antiretrovirus endure the milestone of the prevention and treatment of HIV. Nonetheless of the CD4 cell count, ART is highly advocated for all HIV-infected patients to avert disease development and to diminish transmission. The HIV-infected individuals treated with preliminary regimens consist of Integrase Strand Transfer Inhibitors (InSTI) and two Nucleoside Reverse Transcriptase Inhibitors (NRTIs) that inhibit HIV infection and transmission. This regimen treatment increases the survival rate of HIV-infected adults and prevents new HIV infections [15].

4.1. Ongoing treatment

HIV RNA level must be pragmatic every 4 to 6 weeks following the treatment is initiated or changed as far as it is insensible, in general beneath 20 to 50 copies/ml. The suppression of the viral particles occurs within the period of 24 weeks of ART commencement still while initiated in acute infection [16]. After the suppression, the presence of the RNA in the HIV would be monitored every 3 months as far as restraint has been constant for 1 year and at a minimum of every 6 months afterward for adherent patients who endure clinically protected. The monitoring of therapeutics is not recommended except for the precise situation [17].

CD4 cell count up is used to ascertain the necessitate intended for OI prophylaxis. If pre-treatment CD4 cell counts up is beneath 200/microliter, re-examination is optional every 3 to 4 months till HIV RNA is consistently suppressed and CD4 cell count up is over 350/microliter for 1 year. Subsequently, CD4 cell counts up would be assessed at 6-month intermission till the virus has been buried for as a minimum 2 years and the CD4 cell counts up is constantly steady 500/ microliter. Consequently, go over the track is not compulsory if the virologic collapse or inter-current immune-suppressive circumstances happen or immune-suppressive therapies are initiated [18].

4.2. Safety Monitoring

The safety process consists of renal and hepatic tasks and fasting lipids, which should be individualized depending on age, comorbid circumstances, and simultaneous medications. Seclude for sexually transmitted infections would be presided over reliable with guidelines, local prevalence, and patient threat.

4.3. Noveltherapeutics for HIV

In a modern review in HIV therapeutics, phase 2 clinical attempts have been narrated on therapeutic drugs to block HIV entry through novel modes of deed as well as histone deacetylase (HDAC) inhibitors, gene therapies to facilitate deeply neutralizing anti-HIV antibodies [19]. The US Food and Drug Administration (FDA) has approved two new oral treatments for adults with HIV-1 infection, Pifeltro and Delstrigo, both from Merk and co., according to a company news release. Dovato, the first complete two-drug HIV treatment regimen is in recent times accepted by the United States Food and Drug Administration (USFDA) for people who previously have not been on ART.

This drug helps the infected individuals to eliminate additional toxicity and potential drug interactions from a third drug in a single tablet. Drug-resistant HIV can be initially infecting a person or the resistant nature can be developing after starting HIV medicines. Furthermore, this drug-resistant HIV can spread from person to person. The screening of drug-resistance strain in an individual helps to determine which HIV medicines to incorporate in an HIV treatment regimen. Taking HIV medication every day, exactly as prescribed helps prevent drug resistance and to maintain the viral load with no risk of sexually transmitting HIV to their HIV-negative partners [20].

5. HERBAL MEDICINES FROM NATURAL PRODUCTS FOR HIV

The patients who are moderate and highly infected with HIV commonly use traditional herbal treatment. This conventional herbal medicine is used in Africa to treat HIV infected persons during their initial stage of infections and other HIV- related problems together with nausea, dermatological disorders, depression, weakness, and insomnia traditionally. In addition to its applications, this therapy ends in a limitation due to the emergence of multidrug resistance developed by the virus. This creates the need of the hour to discover a new drug in the treatment of the infected persons and supplementary to assault HIV reservoirs in the human body like the lymph nodes, brain to attain the vital ambition of absolute purge of HIV and AIDS [21]. Also, antiretroviral therapy recipients have been reported to use herbs to alleviate some of the negative side effects of antiretroviral drugs such as nausea and diarrhea. The common reason for the patients to use herbs is relaxation, spiritualism, pain, stress, and healing. It was recorded to 9% of outpatients supposedto facilitate it was probable to treat HIV only with the use of herbs, while others use it to progress energy level, to complement dietary intake, and to enhance response. A study in the US records of herbal medicine is used in the treatment of pain, fear/anxiety, neuropathy, and depression. The natural blend calanolides (coumarins) [22] ursolic and betulinic acids [23] baicalin (flavonoid) [24] polyciton an (alkaloid) [25] lithospermic acid (phenolic compound) [26] have been anticipated as a promising candidate for anti-HIV agents [27].

5.1. The traditional familiarity of plants combat HIV

The Plantae is undoubtedly a successful source of drug leads. This has resulted in the use of an outsized number of medicinal plants to treat various diseases, and many other drugs in western medicine are supported the normal use of such drugs, documented ideal are artemisinin by-product (artemether and artesunate) as antimalarial agents and, taxol (paclitaxe) and camptothecin by-product (topotecan and irinotecan) as antitumor agents [28]. Compared to the synthetic chemicals, the drugs made with natural products and their derivatives commercially hit a higher rate roughly estimated to be one-third of the worldwide sale. A prevailing impression is that the Plantae has already been thoroughly examined for biologically active molecules [29]. However, this is often not the case,

since the amount of various plant species is estimated at over 1/4 of 1,000,000, and only 10% are tested for a couple of kind of biological activity. Additionally to the various structural compounds of the natural herbs that are not rivaled by the creativeness or artificial ingenuity of medicinal chemists. No matter this positive angle, substantial pharmaceutical companies have stopped exploring natural resources collections for several reasons. Firstly, due to concerns about the 'intellectual property' status of leads from natural resources. Secondly, because natural compounds don't fit well into modern high throughput screening (HTS) strategies [30]. It's a too complex and time-consuming process to assay the extracts of the herbal products whose structures and therefore the chemical compositions are frequently 're-discovered'. Structural complexity medicinal chemists are often reluctant to derive optimized drugs. Therefore the characterizations of biologically active compounds by screening the extracts and are passed on to smaller companies or academia and involves a multidisciplinary team consisting of a minimum of a pharmacognosist and a virologist. Furthermore, as estimated by the International Union for the Conservation of Nature, we are steadily losing a variety of plant species every day. Recognizing that also little or no is understood about the biodiversity on Earth, high priority must therefore tend to preservation and inventorization of species, supported by ethnomedical and ethnobotanical information [31].

6. PLANTS AND PLANT SUBSTANCES USED AGAINST HIV AND OTHER VIRUSES

6.1. *Vitex negundo*

Vitex negundo is a commonly cited medicinal plant, five-leaved chaste tree or horseshoe vitex, or nishinda is additionally an outsized aromatic shrub. It's widely utilized for medicinal purposes within the Ayurvedic and Unani systems of medication where most of the parts are employed for drug preparation. It's found throughout, mainly at warmer zones and at an altitude of 1500 m within the outer Western. Himalayans, India. It's also found in Bangladesh, Sri Lanka, Burma, China, Pakistan, Tropical Africa, Philippines [32]. In the Indian traditional medicine system, *Vitex negundo* Linn is referred to as 'sarvaloganivarani'- the remedy for all diseases [33]. The anti- HIV action of ethanolic leaf extract of *V. negundo* Linn was studied against HIV-1 polymerase. Employing a non-radioactive HIV-RT colorimetric ELISA kit and with recombinant HIV-1 enzyme, it had been evaluated *in vitro*. The study concluded that the ethanolic extract exhibits more anti-HIV activity than the flavonoids as antiviral agents [34].

6.2. *Hybanthus enneaspermus*

Hybanthus enneaspermus commonly stated as a spade flower, pink ladies slipper. This can be often a perennial herb or small shrub to 60 cm high, smooth or hairy and roots are spindle-shaped. It's one of the important medicinal herbs used from the past. The plant is native to Himalayan regions and warmer parts of India. Moreover, it is distributed in Sri Lanka, tropical Asia, Africa, and Australia. *H. Enneaspermus* commonly found in river banks, open grasslands, sandy regions, and wastelands. This plant is utilized in Ayurveda, Siddha, and other traditional medicines for treating ailments [35]. The phytochemicals present within the *H. enneaspermus* include alkaloids, depeptide, isoarborinol, sitosterol, flavonoids, sugars, tannins, etc. Recent research work proved that the plant possesses medical activities against some dreadful diseases [36, 37].

The cured extracts of the leaves of *H. enneaspermus* were discovered to powerfully inhibit the functions of the HIV- RT inhibition assay [38].

6.3. *Phyllanthus emblica*

Commonly remarked as Indian gooseberry or Amla might be a deciduous tree of the family Phyllanthaceae. It's known for its production of constant names. It's considered together of the foremost important medicinal plant in Indian traditional systems of medication (Ayurveda, Unani, and Siddha) including folklore Ayurveda. *Phyllanthus emblica* is extremely nutrients and reported as a significant dietary supply of minerals, vitamin C, and amino acids. All the plant parts are used for therapeutic purposes, particularly the fruit [39]. All the parts of *Phyllanthus emblica* are useful in the treatment of assorted diseases (Fruits, leaves, roots, leaves, and stem). The phytochemicals are present within the plant *P. emblica* include flavonoids, sterols, terpenoids, saponins, tannins show in acetone extract, and thus the phenols, sterols, terpenoids, tannins, and proteins are shown in ethanol extract. The presence of these phytochemicals signifies the possession of medicinal properties within the plant [40].

HIV- RT was inhibited by *P. emblica* plant extract. The n-hexane and aqueous extract of the plants and at 1mg/ml concentration results in the elevated embarrassment of recombinant HIV-RT (89% and 91% respectively). The chloroform extraction shows the maximum inhibition of HIV-RT at 0.5mg/ml

concentration. The demonstration that compared to the standard anti - HIV drug AZT, a chloroform extraction of *P.emblica* shows the maximum inhibition of HIV-RT at 0.5mg/ml and solvent extraction at 0.12mg/ml concentration [41]. These data were in good agreement with the results of 1 previous study on the inhibition of HIV infection by medicinal plant extracts [41].

6.4. *Ocimum basilicum*

Ocimum basilicum might be a herb of medium size, strong scent with a smooth or velvety touch. The colour of the petals is often white, pink, or purplish. Nitrogen fertilization effects several stages of development of the herb on the leaves of *O. bacilicum*. Mass chlorophyll and volatile oil yield significantly increase with nitrogen fertilization. The Ocimum covers over 150 species of herbs additionally shrubs. It's broadly utilized in food, pharmaceutical, cosmetics, aromatherapy, and perfumery industries. Many research workers conducted various laboratory experimental studies for investigating the demeanor of basil for its antiviral activities [42]. *O. bacilicum* majorly contains about 20 compounds like linalool, Estragole, methyl eugenol, 1,8- cineole, etc., Methyl eugenol is that the active compound of *O. bacilicum*. Chichoric acid was found within the fresh basil leaves. Phenolic compounds are rich in the crude extract of various parts of Ocimum. The extract of *Ocimum* shows the strong inhibitory effects on HIV-1 polymerase and platelet aggregation [43]. *In vitro* studies of the *O. bacilicum* plant, parts exhibit considerable inhibitory actions against HIV-1 include MT4 cells of cytopathogenicity. The active factors present within the solvent extracted samples were established to be water-soluble polar substances. Furthermore, apart from aqueous extracts, inhabitation of giant cell development on the co-culture of Molt-4 cells with and without HIV-1 infection also demonstrated inhibitory action against HIV-1 polymerase. A further experimental study proves that the ethanolic and aqueous extracts of aerial parts of *O. bacilicum*e xhibit phytochemical compounds, like apigenin, linalool, and ursolicacid revealed an honest range of antiviral activity. It inhibits the polymerase enzyme of HIV [44].

6.5. *Allium sativum*

Allium sativum is commonly mentioned as Garlic. Garlic could even be a species within the onion genus, Allium. It's close relative to the onion and Chinese onion. It had been known to ancient Egyptians and has been used both as a food flavoring and as typical medicine. It is believed that *A. sutivum* (Liliaceae), a strong aromatic bulb crop originates from Western China and Kazakhstan, Uzbekistan. It grows in temperature and humid regions everywhere on the planet and lots of cultivars are developed to suit different climates. Garlic extract has antimicrobial activity reported against bacteria, fungi, and viruses. *A. sutivum* also consists of an anti-diabetic activity. Garlic controls the blood glucose level by differing kinds of mechanisms. The active compound in garlic is allicin, which is librated when raw garlic is compressed, allowing the enzyme alliinase to perform on the constant precursor allin. It acts as a natural immune booster, with the arrival of frightening against viral diseases like HIV/AIDS, boosting the immunity system is receiving replacement attention [45]. Garlic qualitatively consists of aqueous and ethanol extracts indicated the presence of alkaloid, flavonoids, steroid, phenol, anthraquinones, saponin, tannin, and glycoside. Quantitatively, alkaloid was found to be the abundant consistent making about 7.2%, followed by Tannin and saponin constituting 4.8% and 4.3% respectively [46]. Garlic is a rich source of organosulfur compounds. The antiviral property of garlic was determined by the presence of Organosulfur compounds like allicin, diallyltrisulfide, and ajoene. It's known that allicin can undergo the phospholipid membrane of the cell and further contribute to inhibiting viral multiplication. Organosulfur compounds like quercetin and allicin are related to the inhibition of HIV-1 polymerase [47]. Flavonoids present in onion and garlic have a strong inhibitory effect on virus multiplication [48].

6.6. *Calendula officinalis*

Among the various species of the genus Calendula, *C. officinalis* is that the sole one, which is extensively used clinically throughout the world. *C.officinalis* is raw sienna with a characteristic, aromatic odor, and slightly bitter taste. On the tilt of every stem, there's a 5-7 cm composite inflorescence, which comprises an apicalyx of various narrow-lanceolate sepals which are compactly covered on all sides through glandular hairs. The internal section of the inflorescence is formed from orange-yellow tubular florets. The alcoholic flower extract of *C.officinalis* carriesanti- HIV potential [49].

So many kinds of phytocompounds studies encompass well reported about the occurrence of some classes of bioactive compounds, the foremost one's life formterpenoids, volatile oil, coumarins, flavonoids, carotenoids, quinines, and aminoacids within the plant.

A variety ofterpenoids are recorded from the petroleum ether flower extract of *C. officinalis*. They comprise diesters of diols, sitosterols, stigmasterols, etc., various flavonoids and coumarins have been secluded from the ethanolic extract of *C. officinalis*. They comprise Quercetin, isohamnetin, rutin, narcissi, etc., and scopoletin, umbelliferone, and esculetin. The extract of leaves contains quinines like phylloquinone, ubiquinone, and plastoquinone. The maximal amount of volatile oil present in the stage of flowers (0.97 %) and nominal during the stage of pre-flower (0.13%). The methanolic extract of pollens, petals, and leaves of *C. Officinalis* flowers showed a kind of carotenoids [50].

C. officinalis Extracts were investigated for the capability to inhibit the replication of HIV-1. Both aqueous and organic extracts were moderately nontoxic to individual lymphocytic Molt-4 cells, but only the organic one Dichloromethane-methanol (1:1) extract of *C. Officinalis* displayed the effective anti-HIV action in an in vitro test. In addition to the occurrence of organic extract, the uninfected Molt-4 cells were wholly secluded for 24h from the co-cultivation with unceasingly infected U-937/HIV-1 cells that form fusion and subsequent death. It had been also originated that the organic flower extract of *C. Officinalis* caused a huge dosage-and time-dependent drop of HIV-1 reverse transcription (RT) action. A chloroform extract also inhibited HIV-1 polymerase activity during a dose-dependent manner [51].

6.7. *Ailanthus altissima*

Ailanthus altissima is a tree of paradise that is a resident of Central and Northeast China also like Taiwan. It's a rapidly growing plant. Tree of paradise was previously utilized in traditional therapeutics in numerous parts of Asia as well as China. The bark and the leaves of this plant had been used as a sourtonic, mordant, vermifuge, antiviral, and antitumoral potential [52].

A bioactive compound derived from *Ailanthus altissima* consists of antioxidant, antimicrobial, and anti-tuberculosis activities that have previously been reported [53]. These biological activities were attributed to a plethora of bioactive components like alkaloids, quassinoids, terpenoids, steroids, flavonoids, and volatile oils, among others [54]. The foremost significant and active quassinoid is ailanthone. Amidst these quassinoids, the dried bark shows 0.01% of ailanthone [55]. The methanol extract of *A. altissima* showed potent anti-HIV activity (applied to a syncytia formation inhibition test, that is predicated on the interfaceamong the envelope glycoprotein (gp120/41) of HIV-1 and thus the CD4 (cellular membrane protein) of T lymphocytes) [56].

6.8. *Canna indica*

Commonly cultivated as a garden ornamental, particularly within the hotter parts of Australia. It's normal in south-eastern Queensland and within the coastal and sub-coastal districts of the latest South Wales. Leaves were used medicinally and massive and much-branched rootstocks are edible. The most constituents normally occur in Canna leaf extract sucrose, amino acids, organic acids, citric, glyceric, succinic, and lactic acids and thus the aspartic, glutamine, and alanine [57].

About 100 g of dry leaf powder of was *Canna indica* L. extracted with ethanol at 60°C to 70°C by continuous hot percolation using soxhlet apparatus. The plant extracts were screened for the presence of biologically active compounds like alkaloids, flavonoids, glycosides, carbohydrates, phytosterols, and fatty acids, proteins, phenolics, tannins, and saponins[58].

Canna indica L was one of the remedial plants used to medicate HIV infection (AIDS) tested for type I HIV polymerase inhibitor property. The rhizomes of this plant revealed an HIV-1 inhibition proportion above 90% at 200 ug/ml concentration. Further study of *C. indica* and two proteins isolated showed significant HI-1RT inhibition [59]. A unique 10 kDa protein amid anti-HIV-1 polymerase (RT) inhibitory property was secluded from the leaves of *C. indica* [60].

6.9. *Momordica charantia*

Bitter melon comes in a sort of shapes and sizes. It's been utilized in various Asian and African herbal medicine systems for an extended time. The application of the Balsam pear feature includes the treatment of chronic infections, AIDS and to prevent cancer.The active compounds derived from *Momordica charantia* have been documented within vitro antiviral activity against viruses including herpes and HIV viruses [61].

The following phytochemicals constituents are triterpene, protein, steroid, alkaloid, inorganic, lipid, and phenolic compounds. Alkaloids, saponins, cardiac glycosides, tannins, and flavonoids are reported in previous authors [62].

Momordica charantia consists two proteins like Alpha and beta momarcharin, which are known to inhibit the AIDS virus. Alpha-and beta- momorcharinis revealed to hinder HIV *in vitro* [63]. In the solitary study, infected cells of HIV medicated with alpha- and beta-

momocharin showed an almost absolute thrashing of the viral antigen whilst healthful cells were mostly unaffected. The chemical protein MAP-30 filed a U.S. patent in 1996, stating it had been useful for treating tumors and HIV infections. In treating HIV infection, the protein is run alone or in conjunction with conventional AIDS therapies. Seeds and Fruits extracts from this plant are exposed to own in vivo anti-tumoraction, immune enhancement capability, and resultin HIV [64].

6.10. *Justicia gendarussa*

Commonly mentioned as willow-leaved justicia, it has been described as rare and endemic to India, though those claims are a minimum of confusing, within the context of statements that the plant is widely utilized in various forms for several of its medicinal and insecticidal properties. The plant has shown as a promising source of a compound that inhibits an enzyme crucial to the event of HIV [65].

The phytochemicals are also biologically significant by playing a crucial role within the plants to defend themselves against various pathogenic microbes by showing the antimicrobial activity by inhibition or killing mechanisms. The secretion of these plant compounds varies from plant to plant. The phytochemical studies of the plant extracts show the presence of alcoholic extract carbohydrates, aminoacids, saponins, alkaloids, tannins, flavonoids, and glycosides [66].

J. gendarussa roots and leaves are usually used as typical medicine. This species of plant deserve supplementary study for the event of the latest anti-HIV therapeutic options. The inhibition of MT-4 cells with strains of HIV-1 for 4 days led to quite 95% of cells contains viral antigen. The leaf extract has anti-HIV activity. *J. Gendarussa* leaves extract on MOLT-4 cell cultures infected with HIV showed that inhibit HIV replication by decreasing the number of p24 and inhibiting oh syncytica formation [67].

7. CONCLUSION

This paper reviewed the antiviral effects of important medicinal plants. Some natural products have been used since pilot compounds because of their precise activity and low down toxicity. Several compounds might mask the anti- HIV1 impending of plant extract owing to their cytotoxicity. Numerous of them have the probable to hinder with a meticulous viral target, which can consequence in mechanisms of deed complementary to those of active antiviral drugs. Though there have been chief activities in HIV chemotherapy, there remains a need for new anti-HIV drug detection, and medicinal plants can play a significant role in this endeavor. Thus the present study seems to justify the use of plants for the treatment of infectious diseases of viral origin. The third world countries, who are the major sufferers of this dreaded disease will have to rely on natural products due to lesser side effects, easy accessibility, and low cost. Therefore, the use of herbal remedies represents an alternative route to better health for AIDS patients. Herbs have long been used to cure all kinds of illnesses in the past and it is hoped that our traditional wisdom may be beneficial in the treatment of newly discovered diseases such as AIDS.

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