

Antiviral:-A Natural Herbal Drug

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ABSTRACT

Antiviral is mainly used for kills viruses in human . The emergence of drug resistance and spread of new virus will be the new challenge against viral disease. antiviral allopathic drugs show some side effect where the herbal natural drugs show minimum side effect . herbal plant use as a antiviral like **Echinacea ,ginger, garlic, oregano, turmeric** . they widely action in our body to cure virus infections like **influenza virus , herpes virus , HIV/AIDS virus , respiratory virus** . the herbal remedies consist of portion of plant or plant extracts containing constituents which work synergistically. some drugs used as antiviral synthetic where prolonged drug exposure and ongoing viral replication result in the selection of resistant strains Antiviral drug resistance is a growing concern in immunocompromised patient populations mainly all medications have side effects in allopathy. Unquestionably, in an emergency, this type of therapy works quite well . the herbal medicine gentler on the body. this chapter highlights on antiviral natural herbal components which show minimum side effect and minimum resistance , toxicity and maximum therapeutic effect .

Key words :- virus , antiviral , side effect , herbal plant .

I. INTRODUCTION:-

The prevalence of viral infection and resistance to existing antiviral drugs is concerning, posing a serious public health risk. Medicinal plants can be used for treating viral infections such as herpes simplex virus (HSV), human immunodeficiency virus (HIV), influenza, and others. Plant extract antiviral screening should be highly selective, specific, and sensitive for bioactivity-guided isolation of active compounds from herbal plant extracts[1].Viral illnesses are still the biggest cause of death in people globally, caused by pathogenic viral infections with significant morbidity and mortality rates.

Although effective vaccines have resulted in or may result in the eradication of important viral

pathogens such as smallpox, polio, and mumps, other viral diseases such as HIV and hepatitis C virus (HCV) have proven difficult to combat using the traditional vaccine approach. Furthermore, the growth of viral medication resistance, as well as the major side effects created by antiviral treatments, has caused serious medical concerns, particularly when taken in combination during protracted treatment durations[2]

Natural products such as herbal plant extracts (used in ayurveda as mentioned in Charaka Samhita and Susruta Samhita or other traditional medicine practices), plant derived compounds (also known as phytoconstituents), extracts of specific plant parts (roots, stem, bark, flowers, fruits, and seeds), dietary supplements, and nutraceuticals have a wide range of applications in treating ailments ranging from common to rare infectious and non-infectious diseases. According to studies, one-quarter of regularly used medications contain chemicals extracted from plants[3].

In plant Flavonoids, terpenoids, lignans, sulphides, polyphenolics, coumarins, saponins, furyl compounds, alkaloids, polyines, thiophenes, proteins, and peptides have all been found as active phytochemicals. Some volatile essential oils from common culinary herbs, spices, and herbal teas have also shown significant antiviral activity[4].

VIRAL DISEASES:-

Viral infections are diseases caused by small organisms that exploit your cells to replicate themselves (viruses). Although viral infections are most usually associated with respiratory and digestive problems, viruses may infect virtually every other region of your body[5].

Influenza virus :-Influenza viruses infect numerous vertebrates, with Influenza A, B, and C viruses (IAV, IBV, and ICV) infecting humans.

The respiratory epithelium of humans is infected by influenza viruses. IAV and IBV haemagglutinin (HA) proteins or ICV haemagglutinin-esterase-fusion (HEF) proteins bind sialic acid, producing endocytosis. Unlike

other RNA viruses, the viral genome replicates in the nucleus.[6].

Dengue virus :- The dengue virus is an RNA virus with a single strand that belongs to the flaviviridae family. There are 4 serotypes (DEN 1-4) categorized based on biological and immunological parameters. The length of the viral genome is around 11 kb. The mature virion is made up of three structural proteins (core, membrane associated, and envelope) and seven non-structural proteins (NS1, NS2a, NS2b, NS3, NS4a, NS4b, and NS5). The envelope protein is important in the virus's primary biological actions. It attaches to receptors on host cells, allowing the virus to enter them. Non-structural proteins (NS1-NS5) have also been linked to the etiology of severe illness in both membrane-associated and secreted forms. NS1, unlike other viral glycoproteins, does not form a component of the virion but is expressed instead[7]

Hepatitis B & C :- Both hepatitis B and C viruses are parenterally transferred enveloped viruses that cause acute and chronic necroinflammatory liver disease. HBV is a partly double-stranded DNA virus that belongs to the hepadnaviridae family, whereas HCV is a positive-stranded RNA virus that belongs to the flaviviridae family. More than 90% of people who get HBV as adults recover from all clinical symptoms, whereas approximately 20-40% of people who get HBV as adults recover completely[8].

HIV / AIDS VIRUS :- The human immunodeficiency virus (HIV) causes acquired immunodeficiency syndrome (AIDS), a chronic, sometimes fatal illness. HIV impairs your body's capacity to fight infection and illness by destroying your immune system[9].

Primary infection (acute HIV):- FEVER, HEADACHE, Rash, diarrhea, weight loss etc
Symptomatic HIV infection :- fever, fatigue, swollen lymph node, diarrhea, pneumonia etc.
Progression to AIDS :- SWEAT, CHILL, RECURRING FEVER, WEAKNESS ETC.[9.1].

Herpes virus :- Herpesviruses infect both vertebrate and non-vertebrate organisms, and over a hundred have been at least partially described. Only eight of them have been routinely isolated from people and are addressed here. Human herpesviruses include herpes simplex virus type 1, herpes simplex virus type 2, varicella-zoster virus, CMV, Epstein-Barr virus, human herpesvirus 6, human herpesvirus 7, and, most recently, Kaposi's Sarcoma herpesvirus. A primate herpesvirus,

specifically B virus, is a rare human infection that can cause life-threatening sickness[10].

ANTIVIRAL HERBAL AGENTS FOR CLINICAL USE :-

Many herbal drugs are used as antivirals which prevent viral infection in our body. Mainly used are **Ginger (Zingiber officinale)[11]**, **Echinacea (Echinacea purpurea(L))[12]**, **Garlic (Allium sativum)[13]**, **Oregano (Origanum vulgare) [14]**, **Turmeric (Curcuma longa) [15]**.

1:-ECHINACEA :-



Figure 1 (echinacea purple coneflower) [16]

BOTANICAL NAME:- ECHINACEA PURPUREA (L.)

FAMILY:- ASTERACEAE[17]

PART USE :- FLOWER HEADS, ROOT, LEAVES.

Herbal preparations of Echinacea are usually made in the form of extracts, tinctures, teas, sprays etc. derived from various parts of one or of three species of Echinacea: *E. purpurea*, *E. angustifolia*, and *E. pallida* [18]. Echinacea, also known as the purple coneflower, is an herbal medicine that has been used for centuries, customarily as a treatment for the common cold, coughs, bronchitis, upper respiratory infections, and some inflammatory conditions. Research on echinacea, including clinical trials, is limited and largely in German. More information is needed before a definitive statement about the efficacy of echinacea can be made. Future work needs to clearly identify the species of echinacea and distinguish between the efficacy of the different plant parts (roots versus upper plant parts)[19]

Chemical composition :-

Many different chemical components found in echinacea species contribute to their action. High molecular weight polysaccharides,

polyacetylenes, highly unsaturated alkamides, and derivatives of caffeic acid are the main substances that are responsible for activity (BAUER & WAGNER 1991). While certain components are exclusive to a single species, others are found in two or more of the economically significant species.[20] .

Pharmacology:-

Several polysaccharides have been identified and their pharmacological effects on the immune system have been analyzed.

Heteroxylan, a high molecular weight polysaccharide, possesses the ability to initiate phagocytosis. The production of tumour necrosis factor (TNF), which raises the levels of macrophageinterlekin 1 and interferon beta 2, is induced by another polysaccharide called arabinogalactan.

Phagocytosis is also stimulated by chicoric acid glycosides and alkylamides. Among the alkylamides, isobutylamide has a strong flavor and aroma for . By modulating the immune system have antibacterial or antiviral action, acting on infection indirectly. Since the efficacy of formulations taken orally is unknown, parenteral formulation was employed in a number of pharmacology investigations on preprations[21].

Three processes account for the plant's or its preparations' immunostimulant action: fibroblast stimulation, phagocytosis activation, and increased respiratory activity, which raises leukocyte motility. Many in vivo investigations on the immunomodulatory and anti-inflammatory properties of *E. purpurea* indicate that the plant may strengthen innate immunity and fortify the immune system against pathogenic infections by activating neutrophils, macrophages, polymorphonuclear leukocytes (PMN), and natural killer (NK) cells. It can thus be helpful in the prevention and treatment of a number of infectious disorders, including infections of the wound healing process, the upper and lower respiratory tract, and persistent pelvic infections.[22] .

Medicinal uses :- In complementary medicine, echinacea has been suggested as a potentially useful treatment for vaginal yeast infections and the common cold.

Echinacea has also been used to improve athletic performance and cure ear infections. Nevertheless, studies have indicated that echinacea might not work well in certain circumstances.[23]

Side effect :- The most typical adverse effects include heartburn, vomiting, diarrhea, constipation,

stomach pain, and rash. Some people may experience adverse responses, particularly those who are allergic to daisies, ragweed, mums, or marigolds.[24]

2:-GARLIC :-



Figure 2 (bulb of the garlic) [25]

BOTNICAL NAME :- ALLIUM SATIVUM

FAMILY :- AMARYLLIDACEAE [26]

PART USE :-BULB OF THE GARLIC [27]

The antiviral properties of garlic and its sulfur compounds have been confirmed against coxsackievirus species, herpes simplex virus types 1 and 2, influenza B, para-influenza virus type 3, vaccinia virus, vesicular stomatitis virus, human immunodeficiency virus type 1, and human rhinovirus type 2. Ajoene, allicin, allyl methyl thiosulfanate, and methyl allyl thiosulfanate were the chemicals in garlic that had the most virucidal activity; alliin, deoxyalliin, diallyl disulfide, and diallyl trisulfide showed no virucidal activity. Garlic is an effective therapy for the herpes simplex virus and the influenza B virus, according to several scientific investigations.[28]

In tissue culture, garlic extract had an inhibitory action against the human cytomegalovirus that was dosage dependent. Garlic extract (GE) had a prolonged antiviral impact on infected cells, and its maximum antiviral activity was shown when it was administered consistently.[29]

Chemical Composition :-

There are hundreds of phytochemicals found in *A. sativum* bulbs, including sulfur-containing compounds (Table 1) like thiosulfates (allicin), vinylthiins (2-vinyl-(4H) -1,3-dithiin, 3-vinyl-(4H)-1,2-dithiin), sulfides (diallyl disulfide

(DADS), diallyl trisulfide (DATS)), and others that account for 82% of the total sulfur content of garlic [30]. After chopping off the garlic and dissolving the parenchyma, the enzyme allinase converts alliin, the primary cysteine sulfoxide, into allicin [31]. In freshly milled garlic homogenates, the principal odoriferous compounds are S-methyl cysteine-sulfoxide (MCSO), allicin, and S-propyl cysteine-sulfoxide (PCSO) [31]. In addition to the allinase enzyme, which may react with the combination of MCSO, PCSO, and alliin to form additional compounds such as allyl methane thiosulfonates, PCSO can produce over fifty metabolites, depending on temperature and water content.[30]

Pharmacology :-

The antiviral properties of garlic and its sulfur components have been shown against a variety of viruses, including coxsackievirus spp., herpes simplex virus types 1 and 2, influenza B, parainfluenza virus type 3, vaccinia virus, vesicular stomatitis virus, human immunodeficiency virus type 1, and human rhinovirus type 2. The overall progression of a virucidal impact was as follows: Allicin > ajoene > allyl methyl thiosulfinate > methyl allyl thiosulfinate > methyl allyl.[31]

Medicinal uses :-

It is commonly known that garlic has antimicrobial properties against bacteria, viruses, fungus, and even parasites. Allicin, the main ingredient in freshly crushed garlic, has been shown in one research to have antiviral qualities and to be effective against a variety of bacteria, including forms of E. coli that are resistant to drugs.

Allicin was also shown to possess antifungal qualities, namely against *Candida albicans*, the yeast infection-causing organism.[32]

Side effect :- Raw garlic frequently has harsher adverse effects. Additionally, some people may experience allergic reactions including bleeding when they consume garlic.

Garlic products may be harmless when administered topically. Garlic-infused mouthwashes, gels, and pastes have been around for three months. Garlic, however, may result in burn-like skin injury. When administered topically, RAW garlic may be harmful. It might really irritate your skin.[33]

Antiviral drug resistance :-

Antiviral drug resistance is a growing concern in immunocompromised patient populations, where prolonged drug exposure and ongoing viral replication result in the selection of resistant strains. Phenotypic assays can be used to identify resistance in viruses immediately, and management of drug resistance involves managing host factors and drug delivery, selecting alternative therapies based on knowledge of mechanisms of resistance, and developing new antivirals.[34].

Individuals who use antivirals for extended periods of time to treat long-term viral diseases such as HIV, herpes genitalis, hepatitis B or hepatitis C are more likely to develop resistance to these drugs.

Antiviral resistance is also more common in people whose immune systems have been weakened by malignancies treated with chemotherapy, organ transplants, or autoimmune diseases.[35].

Several patient and viral factors have been linked to drug resistance. Among the host factors that increase the risk of drug resistance are older age, high body mass index, noncompliance with medication, immunosuppression, high pre-treatment HBV DNA levels, baseline hepatic enzyme elevations, and abundant replication space (many uninfected hepatocytes, such as in a newly transplanted liver). Important viral determinants in drug resistance include the frequency of viral mutations, the magnitude and rate of virus replication, and the overall replication fitness of the mutant[36].

Comparison of herbal and allopathy medicine :-

Adverse or side effects of synthetic medications account for around 8% of hospital admissions in the US. These poisons claim the lives of almost 100,000 individuals annually. This indicates that the number of Americans murdered by prescription medication overdoses is at least three times higher than the number killed by drunk drivers. Thousands of individuals also pass away every year from apparently "safe" over-the-counter medications. Herb-related deaths or hospital admissions are quite uncommon. In fact, there is no section in the database of the National Poison Control Centers of the United States dedicated to adverse or side effects of herbs. As a result, individuals resort to herbal therapy every year because they think plant-based therapies have no negative side effects [37].

Almost all medications have side effects in allopathy. Unquestionably, in an emergency, this type of therapy works quite well. But germs are becoming less susceptible to these medications. Additionally, the illnesses are becoming more chronic and recurrent.

herbal treatments derived from little amounts of natural resources. As a result, the likelihood of adverse consequences is quite low.[38].

II. CONCLUSION :-

Antiviral is commonly used in the treatment of viral infection mainly all medications have side effects in allopathy. Unquestionably, in an emergency, this type of therapy works quite well . the herbal medicine gentler on the body. The demand for traditional medicinal herbs is increasing very rapidly, mainly because of the undesirable side-effects of some synthetic chemical drugs . the herbal drug is natural obtained to they harmless for the body . some drugs used as antiviral synthetic where prolonged drug exposure and ongoing viral replication result in the selection of resistant strains Antiviral drug resistance is a growing concern in immunocompromised patient populations where the herbal medicine is beneficial for the human older age and high body mass index. the number of Americans murdered by prescription medication overdoses is at least three times higher than the number killed by drunk drivers. The herbal plant is balance the ecosystem.

REFERENCE :-

- [1]. Mukherjee, Pulok K. "Antiviral evaluation of herbal drugs." *Quality control and evaluation of herbal drugs* (2019): 599
- [2]. Kitazato, Kaio, Yifei Wang, and Nobuyuki Kobayashi. "Viral infectious disease and natural products with antiviral activity." *Drug Discov Ther* 1.1 (2007): 14-22.
- [3]. Jassim, Sabah AA, and Mazen A. Naji. "Novel antiviral agents: a medicinal plant perspective." *Journal of applied microbiology* 95.3 (2003): 412-427.
- [4]. <https://my.clevelandclinic.org/health/diseases/24473-viral-infection>.
- [5]. Lin, Liang-Tzung, Wen-Chan Hsu, and Chun-Ching Lin. "Antiviral natural products and herbal medicines." *Journal of traditional and complementary medicine* 4.1 (2014): 24-35.
- [6]. Hutchinson, Edward C. "Influenza virus." *Trends in microbiology* 26.9 (2018): 809-810.
- [7]. Malavige, G. N., et al. "Dengue viral infections." *Postgraduate medical journal* 80.948 (2004): 588-601.
- [8]. Rehmann, Barbara, and Michelina Nascimbeni. "Immunology of hepatitis B virus and hepatitis C virus infection." *Nature Reviews Immunology* 5.3 (2005): 215-229.
- [9]. <https://www.mayoclinic.org/diseases-conditions/hiv-aids/symptoms-causes/syc-20373524>.
- [10]. Whitley, Richard J. "Herpesviruses." (2011).
- [11]. <https://www.hindawi.com/journals/bmri/2021/7872406/> .
- [12]. <https://www.healthline.com/nutrition/echinacea> .
- [13]. National Center for Biotechnology Information (2023). PubChem Taxonomy Summary for Taxonomy 4682, *Allium sativum* (garlic). Retrieved November 16, 2023 from <https://pubchem.ncbi.nlm.nih.gov/taxonomy/Allium-sativum>
- [14]. Britannica, The Editors of Encyclopaedia. "oregano". *Encyclopedia Britannica*, 3 Nov. 2023, <https://www.britannica.com/plant/oregano>. Accessed 16 November 2023.
- [15]. Parham S, Kharazi AZ, Bakhsheshi-Rad HR, Nur H, Ismail AF, Sharif S, RamaKrishna S, Berto F. Antioxidant, Antimicrobial and Antiviral Properties of Herbal Materials. *Antioxidants* (Basel). 2020 Dec 21;9(12):1309. doi: 10.3390/antiox9121309. PMID: 33371338; PMCID: PMC7767362
- [16]. <https://worldoffloweringplants.com/echinacea-purpurea-eastern-purple-coneflower/>.
- [17]. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9102300/>
- [18]. Hudson, J.; Vimalanathan, S. Echinacea—A Source of Potent Antivirals for Respiratory Virus Infections. *Pharmaceuticals* **2011**, *4*, 1019-1031.
- [19]. Percival, Susan S. "Use of Echinacea in medicine." *Biochemical pharmacology* 60.2 (2000): 155-158.
- [20]. MISTRÍKOVÁ I. & Vaverková Š. (2006): *Echinacea – chemical composition*,

- immunostimulatory activities and uses. –
Thaiszia – J.Bot. 16: 11-26. – ISSN 1210-
0420.
- [21]. Kumar, K. M., and Sudha Ramaiah. "Pharmacological importance of Echinacea purpurea." *International Journal of Pharma and Bio Sciences* 2.4 (2011): 304-314.
- [22]. Manayi, Azadeh, Mahdi Vazirian, and Soodabeh Saeidnia. "Echinacea purpurea: Pharmacology, phytochemistry and analysis methods." *Pharmacognosy reviews* 9.17 (2015): 63.
- [23]. <https://www.drugs.com/mtm/echinacea.html>.
- [24]. <https://www.webmd.com/vitamins/ai/ingredientmono-981/echinacea>.
- [25]. <https://www.earth.com/news/garlic-medicine/>.
- [26]. Britannica, The Editors of Encyclopaedia. "garlic". *Encyclopedia Britannica*, 8 Sep. 2023, <https://www.britannica.com/plant/garlic>. Accessed 16 November 2023.
- [27]. <https://www.backdoorsurvival.com/medicinal-use-of-garlic/>.
- [28]. Gebreyohannes, Gebreselema, and Mebrahtu Gebreyohannes. "Medicinal values of garlic: A review." *International Journal of Medicine and Medical Sciences* 5.9 (2013): 401-408.
- [29]. Singh, Radha, and Kusum Singh. "Garlic: A spice with wide medicinal actions." *Journal of Pharmacognosy and Phytochemistry* 8.1 (2019): 1349-1355.
- [30]. El-Saber Batiha, G.; Magdy Beshbishy, A.; G. Wasef, L.; Elewa, Y.H.A.; A. Al-Sagan, A.; Abd El-Hack, M.E.; Taha, A.E.; M. Abd-Elhakim, Y.; Prasad Devkota, H. Chemical Constituents and Pharmacological Activities of Garlic (*Allium sativum* L.): A Review. *Nutrients* 2020, 12, 872. <https://doi.org/10.3390/nu12030872>.
- [31]. <https://doi.org/10.1155/2021/8817288>.
- [32]. <https://www.webmd.com/diet/garlic-good-for-you>.
- [33]. <https://www.webmd.com/vitamins/ai/ingredientmono-300/garlic>.
- [34]. Strasfeld L, Chou S. Antiviral drug resistance: mechanisms and clinical implications. *Infect Dis Clin North Am.* 2010 Jun;24(2):413-37. doi: 10.1016/j.idc.2010.01.001. Corrected and republished in: *Infect Dis Clin North Am.* 2010 Sep;24(3):809-33. PMID: 20466277; PMCID: PMC2871161.
- [35]. <https://my.clevelandclinic.org/health/articles/23217-antiviral-resistance>.
- [36]. Strasfeld L, Chou S. Antiviral drug resistance: mechanisms and clinical implications. *Infect Dis Clin North Am.* 2010 Jun;24(2):413-37. doi: 10.1016/j.idc.2010.01.001. Corrected and republished in: *Infect Dis Clin North Am.* 2010 Sep;24(3):809-33. PMID: 20466277; PMCID: PMC2871161.
- [37]. Karimi A, Majlesi M, Rafieian-Kopaei M. Herbal versus synthetic drugs; beliefs and facts. *J Nephropharmacol.* 2015 Jan 1;4(1):27-30. PMID: 28197471; PMCID: PMC5297475.
- [38]. <https://ayushnext.ayush.gov.in/detail/post/why-should-we-switch-from-allopathy-to-homeopathy-treatment>.