

Effectiveness of Chinese Herbal Medicine and Persian Medicine against Viral Infections: A systematic Review

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ABSTRACT

The underlying aim of this study is to systematic discuss the effectiveness of Chinese and Persian herbal medicine through the analysis of the existing and available studies on the usage of such herbs, plant extracts and herbal formulations that are descended from these two traditional medicinal roots. Using the technique of a systematic literature review, the researcher extracted 64 articles, only 8 of which were reviews and all others were original clinical researches, from medical databases including Pub Med, NIH and other clinical and scientific reports. After putting effort in conducting a screening in accordance to the exclusion criteria, the researcher included 64 articles, all of which were from 2010 and onwards to conduct this analysis. The study can be concluded as suggesting that the herbal medicine is quite effective in helping to treat, prevent and cure viral infections and widespread viral diseases. However, there is need of much more research in this area and the future researchers need to make investigations into the area of combined impacts of herbal and traditional medicine.

Keywords: Traditional Chinese Herbal Medicine, Traditional Persian Medicine, antiviral, HIV, HSV, NDV, COVID-19.

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INTRODUCTION

There are many microorganisms spread across nature that lead to causing various kinds of infections and diseases to human beings, animals and even to plants. The microbial contagious diseases are a pioneer cause of mortality and morbidity worldwide¹. The recent epidemic of COVID-19 is a clear example of the fact that the microbial caused illnesses are still a dominant threat, despite the progression and efforts of the modern medical research. Over half of the deaths that occur in the developing region in the world are caused due to such microbial diseases^{2,3}. These diseases are more common and destructive in the countries where there is a limited access to modern medicine or the socioeconomic structure is such that the modern medicine is not easily accessible⁴. Moreover, all across the globe microbial resistance to multiple drugs and antibiotics is becoming more and more common, showing that these microbes are becoming stronger and resistant to modern medicine⁵. This is why there is currently a lot research going on regarding the increasing threat from drug resistant microorganisms to look for novel techniques and solutions that are based on natural ingredients such as plants and herbs⁶. There are numerous compounds that can be found in nature that are identified as having antimicrobial properties such as antiseptic, antibacterial, antifungal and antiviral natures and the sources of these compounds can be used in multiple ways to stand a chance in this fight against the microscopic pathogens⁷, making it clear that there is a pressing need to explore new ways of fighting infections to control the impact of these microbes.

People in China, Iran and other Asian countries have been using herbal medications for treating infections and other diseases since the days of early mankind. Even today, it is common in countries in China, India, Pakistan, Iran and the Southeast Asian countries to use their traditional remedies and medicine as the social and economic conditions of majority of the population in these countries is not very strong. Moreover, these people have a general fear of modern

medicine and rely on their herbal remedies more than the allopathic medicine. The people in these countries have been using plants and herbs to cure themselves long before there was any concept of recognizable proof of infection or experiments regarding effectiveness of treatments⁸. With the emergence of new viral infections that are contagious and non-containable, there is an increase in the usage of herbal medicine in combination with the modern medication all across the globe to try to find ways to treat the lethal diseases caused by these microbes. There is much research going on regarding the use of traditional Chinese Herbal Medicine (TCHM) and Traditional Persian Medicine (TPM) for the treatment of viral and other microbial caused infectious diseases on experimental as well as trial levels^{2,9-13}.

Both TCHM and TPM offer contributions the field of medicine in form of plants, herb and herbal formulas that can be used to treat the attacks by viral heat toxins that are the leading cause of diseases such as influenza, common cold, flus of various types, upper respiratory infections, and many common pediatric diseases, where the western or modern medicine fails and cannot offer anything except bed rest, fluid intake and antibiotics. Antibiotics actually make these conditions worse by further weakening the body's natural immune system¹⁴. Antibiotics are totally useless against viruses and cannot impact the timeframe of the infection and can also destroy the healthy gut bacteria along the way, allowing the growth of fungus *Candida Albicans*. This causes a catastrophic situation in the body where the immunity is at its weakest and the body becomes unable to fight even the simplest of the viral infections¹⁵. Due to these reasons, the medical experts in the western countries are looking into the effectiveness and efficiency of the Asian herbal medicine for treating diseases, especially the ones that are virus borne diseases. However, there is a lack of usage of these medicines up until this point and there is a need of examining the impact and effectiveness of using these treatments. This is why this research review has been conducted with the aim of

conducting a systematic review of various herbs and plant extracted medicines that are used in TCHM and TPM to summarize how they are effective for the treatment of viral infections across the globe. This is not an exhaustive review of these fields but in fact is a discussion about the viral behavior of some of the commonly used herbs, plant and herbal formulas in TCHM and TPM against the commonly occurring viral infections. The rest of the paper is divided into a discussion of the material collection and methods used in this review, findings of the review and a conclusive discussion of findings, limitations and implications of this review.

METHODOLOGY

The current study on the various herbs and plants that are used in Persian and Chinese medicine is a systematic analysis. In this kind of study, past articles and studies regarding the topic are collected and reviewed after which the researcher shortlists the most relevant papers so that the research remains authentic and relevant as well. After this, data from those articles and studies is extracted and discussed.

Data Collection

The systematic quantitative literature review-based flowchart figure depicts the technique of collecting data in this study. PRISMA protocol has been shown in the following flowchart. In this systematic review, overall, 125 initial publications were considered by posting a keyword and then, 16 more were identified based on searching citation. At the end, total 141 publications were selected as the initial set of random observation in the overall systematic review. The researcher then removed any duplicates and book chapters from the study. Moreover, any reviews that were not on COVID-19 were also removed from the final collection. Finally, a set of 64 paper were added for the critical review. These peer review papers published in journals of English language and were selected based on the relevant keywords named as “Google Scholar”, “PubMed”, “EMBASE” (<https://www.embase.com>) and ClinicalTrials.gov (<https://clinicaltrials.gov>). This search was done with limited time frame from 2010-2019. Table 1 shows the details of the included papers in the review.

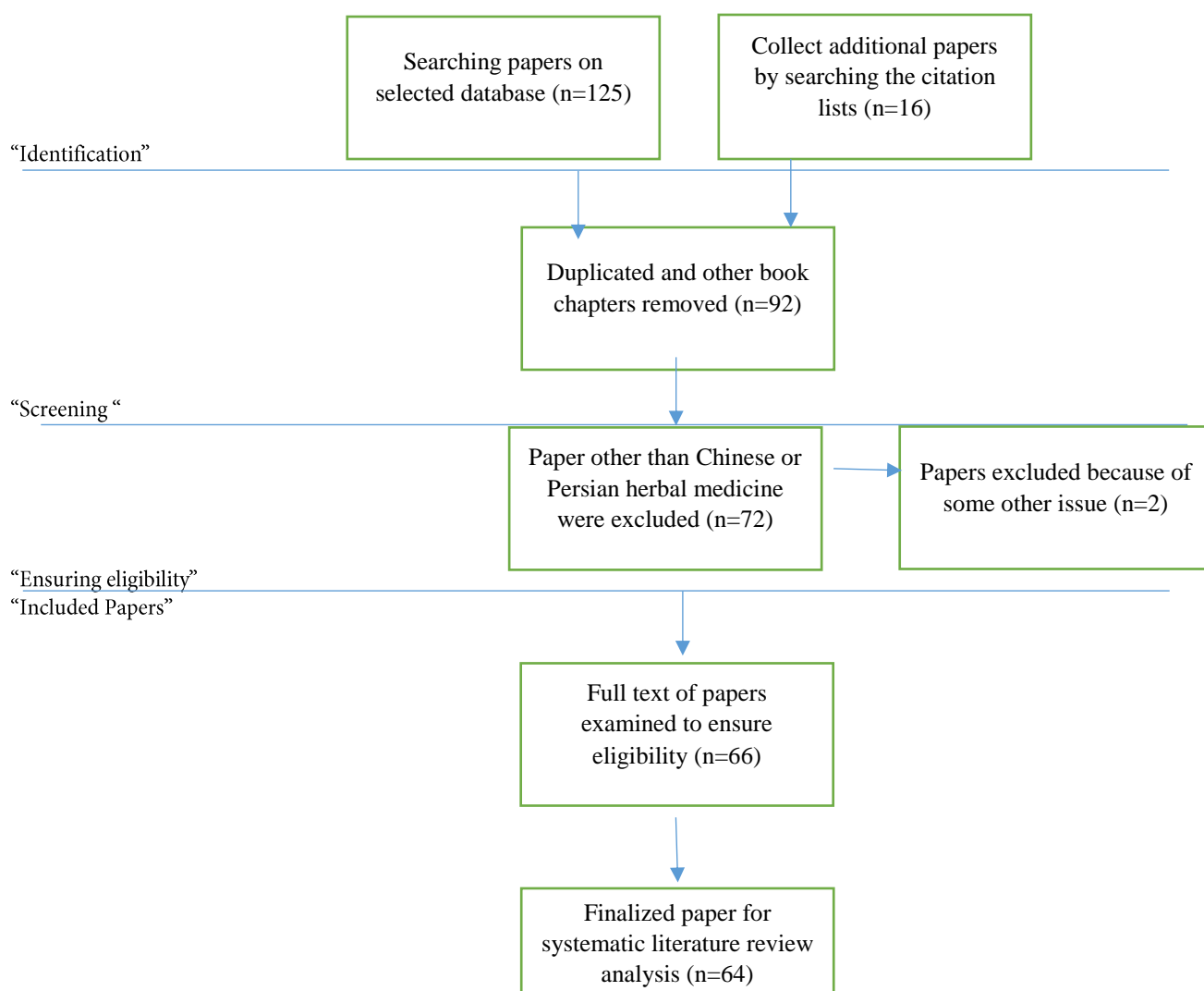


Figure 1. Systematic Quantitative Literature Review based Flow-Chart

Major Keywords Keywords used for data collection are “TCHM”, “TPM”, “Traditional Chinese Herbal Medicine”,

“Traditional Persian Medicine”, “COVID and Herbal Medicine”, “Iranian Medicine for Viral infections”, “Chinese

Medicine for Viral Infections” and “Viral diseases and Herbal medicine”. Moreover, in addition to these keywords, several diseases and virus names were used in combination of herbal medicine. These keywords were majorly considered because they fulfil the demand of topic of this review paper. Random publications were consisting of bulk of papers used in review, while the literature and review papers are only regarding potential of herbal medicine against COVID-19. Book chapters were scanned for references but otherwise discarded.

Processing and categorization

The researcher took extra time and effort to record information like title, author, journal, year, research design, herb studies, antiviral action of the herbs and the viruses against which action was taken. Table 1 shows the classification of the data based on the year and type of papers and figure 2 shows a graphical representation of the years the papers are taken from showing

that most of the data has been collected from the past five years.

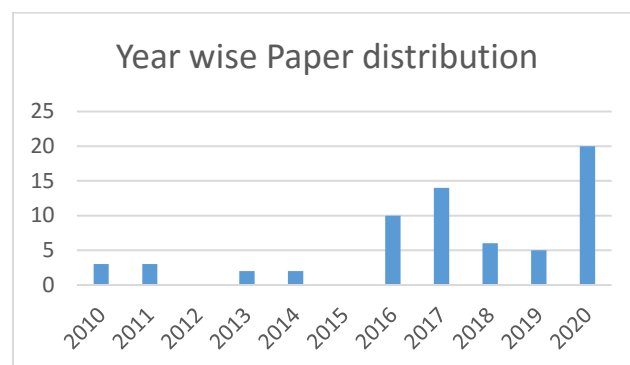


Figure 2. Division of papers across Years

Table 1. Paper Types in Reviewed Papers

| Paper Type | Total | | Time Period division | | | | | | | | | | | |
|-------------------|--------------|--------|----------------------|------|------|------|------|------|------|------|------|------|------|--|
| | Publications | % | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | |
| Original Research | 57 | 87.7 % | 3 | 3 | 0 | 2 | 2 | 0 | 10 | 14 | 6 | 5 | 12 | |
| Review papers | 8 | 12.3 % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | |

FINDINGS

Details of paper included

The papers included in the study are listed in the table 2. This table includes details of the time the papers were published,

author names, journal names and other important details of all the papers that were used to conduct this systematic review.

Table 2: Papers Used in the Systematic Analysis

| Author | Year | Title | Classification | Journal | References |
|----------------------|------|--|----------------|--|------------|
| Jang Hoon Kim et. Al | 2017 | “Tyrosinase inhibitory components from Aloe vera and their antiviral activity” | Persian | Journal of Enzyme Inhibition and Medicinal Chemistry | 42 |
| Rezazadeh F., et al. | 2015 | “Assessment of Anti HSV-1 Activity of Aloe Vera Gel Extract: an In Vitro Study” | Persian | Journal of dentistry (Shiraz, Iran) | 21 |
| Yee Ching Ng et. al | 2017 | “Suppression of norovirus by natural phytochemicals from Aloe vera and Eriobotryae Folium” | Persian | <u>Food Control</u> | 43 |
| Mpiana et. al | 2020 | “Identification of potential inhibitors of SARS-CoV-2 main protease from Aloe vera compounds: A molecular docking study” | Persian | Chemical physics letters | 44 |
| Ali et al | 2016 | “Determination of antioxidant activity, phenolic contents | Persian | Tropical Journal of Pharmaceutical Research | 22 |

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|-----------------------|------|---|---------|--|--------|
| | | and antiviral potential of methanol extract of <i>Euphorbia spinidens</i> Bornm (Euphorbiaceae)” | | | |
| Farahani | 2013 | “Antiviral Effect Assay of Aqueous Extract of <i>Echium Amoenum</i> -L against HSV-1” | Persian | Zahedan Journal of Research in Medical Sciences | 45 |
| Mohsen | 2010 | “Antiviral activity of borage (<i>Echium amoenum</i>)” | Persian | Archives of medical science: AMS | 46 |
| Namazi et. al | 2013 | “Inhibitory Activity of <i>Avicennia marina</i> , a Medicinal Plant in Persian Folk Medicine, against HIV and HSV” | Persian | Iranian Journal of Pharmaceutical Research | 2 6 |
| Mohammadhassan et al. | 2016 | “ANTIVIRAL ACTIVITY OF ECHINACEA (ECHINACEA PURPUREA)” | Persian | International Journal of Biology, Pharmacy and Allied Sciences | 30 |
| Fusco et al | 2010 | “ <i>Echinacea purpurea</i> aerial extract alters course of influenza infection in mice” | Persian | Vaccine | 31 |
| Hudson et al | 2017 | “The phytochemistry <i>Echinacea Purpurea</i> contains light dependent and lightindependent antiviral activities” | Persian | Journal of Innovations in Pharmaceutical and Biological Sciences (JIPBS) | 32 |
| Farahani | 2017 | “Antiviral Effect Assay of <i>Thymus Kotschyanus</i> on HSV-1 Multiplication” | Persian | Alborz University Medical Journal | 23 |
| El-Serehy et al | 2016 | “In vitro antioxidant and anti-herpes activities of <i>Cuminum cyminum</i> seeds extract” | Persian | Biomedical research | 24 |
| Karimi et al | 2016 | “Anti-adenovirus activity, antioxidant potential, and phenolic content of black tea (<i>Camellia sinensis</i> Kuntze) extract” | Persian | Journal of Complementary and Integrative Medicine | 17 |
| Salih et al | 2017 | “Antiviral Effects of <i>Olea europaea</i> Leaves Extract and Interferon-beta on Gene Expression of Newcastle Disease Virus” | Persian | Advances in Animal and Veterinary Sciences | 47 |
| Mohammad et al | 2018 | “In Vivo Anti-Viral Effect of <i>Melaleuca alternifolia</i> (Tea Tree Oil) and <i>Olea europaea</i> (Olive Leaf Extract) on Vero Cell | Persian | International journal of Pharmacy and Pharmaceutical Research | 27 |

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|----------------|------|---|---------|---|----|
| | | Adapted Avian Influenza Virus” | | | |
| Salih et al | 2017 | “Olea europaea leaves extract downregulate Newcastle disease virus gene expression in cancer cells” | Persian | Iraqi Journal of Cancer and Medical Genetics | 48 |
| Maqbool et al | 2016 | “Antimicrobial potential of green synthesized ceO2 nanoparticles from Olea europaea leaf extract” | Persian | International Journal of Nanomedicine | 49 |
| Rahayu et al | 2018 | “The immunomodulatory effect of green tea (Camellia sinensis) leaves extract on immunocompromised Wistar rats infected by Candida albicans” | Persian | Veterinary world | 33 |
| Moradi et al | 2017 | “Anti-adenovirus activity, antioxidant potential, and phenolic content of dried flower buds of Syzygium aromaticum extract in HEp2 cell line” | Persian | Marmara Pharma J. | 18 |
| Moradi et al | 2016 | “In vitro Anti-adenovirus activity of pomegranate (Punica granatum L.) peel extract” | Persian | Advanced Herbal Medicine | 19 |
| Moradi et al | 2016 | “In Vitro Anti-adenovirus Activity, Antioxidant Potential and total Phenolic Compounds of Melissa officinalis L. (Lemon Balm) Extract” | Persian | International Journal of Pharmacognosy and Phytochemical Research | 16 |
| Moradi et al | 2017 | “In vitro and in vivo effects of Peganum harmala L. seeds extract against influenza A virus” | Persian | Avicenna journal of phytomedicine | 50 |
| Mendoza et. al | 2014 | “Antiviral activity of maca (Lepidium meyenii) against human influenza virus” | Persian | Asian Pacific journal of tropical medicine | 34 |
| Ortega et. al | 2017 | “The role of the glycosyl moiety of myricetin derivatives in anti-HIV-1 activity in vitro” | Persian | AIDS research and therapy | 25 |
| Mehmood et al | 2020 | “Antiviral activity of green silver nanoparticles produced using aqueous buds extract of Syzygium aromaticum” | Persian | Pak. J. Pharm. Sci | 28 |

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|--------------------|------|---|---------|--|---------------|
| Mahmood et al | 2018 | “Evaluation of Antiviral Activity of Azadirachta indica (Neem) Bark Extract against Newcastle Disease Virus” | Persian | Pakistan Veterinary Journal | ⁹ |
| Ashraf et al | 2017 | “In vivo antiviral potential of Glycyrrhiza glabra extract against Newcastle disease virus” | Persian | Pakistan Journal of Pharmaceutical Sciences | ²⁹ |
| Lee et al | 2020 | “Antiviral activity of furanocoumarins isolated from Angelica dahurica against influenza A viruses H1N1 and H9N2” | Chinese | Journal of Ethnopharmacology | ⁵¹ |
| Lee et al | 2014 | “Methanol Extract of Alpinia katsumadai Hayata has Anti-viral Activity by Inhibition of α -glucosidase” | Chinese | Journal of Applied Biological Chemistry | ⁵² |
| Liu et al | 2016 | “A New Diarylheptanoid from the Rhizomes of Alpinia officinarum” | Chinese | Chemistry of Natural Compounds | ⁵³ |
| Sawamura et al | 2010 | “Antiviral activities of diarylheptanoids against influenza virus in vitro” | Chinese | Journal of natural medicine | ⁵⁴ |
| Lakshmanan et. al. | 2020 | “A compound isolated from Alpinia officinarum Hance. inhibits swarming motility of Pseudomonas aeruginosa and down regulates virulence genes” | Chinese | Journal of Applied Microbiology | ⁵⁵ |
| Chen et al | 2016 | “The antiviral activity of arctigenin in traditional Chinese medicine on porcine circovirus type 2” | Chinese | Research in veterinary science | ⁵⁶ |
| Zhang et al | 2020 | “Anti-inflammatory activity of alkali-soluble polysaccharides from Arctium lappa L. and its effect on gut microbiota of mice with inflammation” | Chinese | International Journal of Biological Macromolecules | ⁵⁷ |
| Dias et al | 2017 | “In vitro schistosomicidal and antiviral activities of Arctium lappa L. (Asteraceae) against Schistosoma mansoni and Herpes simplex virus-1” | Chinese | Biomedicine & Pharmacotherapy | ⁵⁸ |

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|-------------------|------|--|---------|--|----|
| | | | | | |
| Liang et. al. | 2019 | “Astragalus Membranaceus Treatment Protects Raw264. 7 Cells from Influenza Virus by Regulating G1 Phase and the TLR3-Mediated Signaling Pathway” | Chinese | Evidence-Based Complementary and Alternative Medicine | 59 |
| Farag et. al. | 2019 | “The role of Astragalus membranaceus as immunomodulator in poultry” | Chinese | World's Poultry Science Journal | 60 |
| Boo et. al. | 2011 | “Anti-bacterial and Anti-viral Activity of Extracts from Paeonia lactiflora Roots” | Chinese | Journal of the Korean Society for Applied Biological Chemistry | 61 |
| Sochocka et al | 2019 | “Hampering herpesviruses HHV-1 and HHV-2 infection by extract of Ginkgo biloba (EGb) and its phytochemical constituents” | Chinese | Frontiers in microbiology | 62 |
| Borenstein et. al | 2020 | “Ginkgolic acid inhibits fusion of enveloped viruses” | Chinese | Scientific reports | 63 |
| Wang et al | 2019 | “Ginkgo biloba extract may alleviate viral myocarditis by suppression of S100A4 and MMP-3” | Chinese | Journal of medical virology | 64 |
| Bailly et. al | 2020 | “Glycyrrhizin: An alternative drug for the treatment of COVID-19 infection and the associated respiratory syndrome?” | Chinese | Pharmacology & Therapeutics | 65 |
| LuoLiu et. al. | 2020 | “Pharmacologic perspective: glycyrrhizin may be an efficacious therapeutic agent for COVID-19” | Chinese | International Journal of Antimicrobial Agents | 20 |
| Gao et.al | 2011 | “Anti-adenovirus activities of shikonin, a component of Chinese herbal medicine in vitro” | Chinese | Biological and Pharmaceutical Journal | 66 |
| Ma et. al | 2020 | “Liu Shen Wan inhibits influenza a virus and excessive virus-induced inflammatory response via suppression of | Chinese | Journal of Ethnopharmacology | 67 |

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|------------------|------|--|---------|--|----|
| | | TLR4/NF-κB signaling pathway in vitro and in vivo” | | | |
| Ma et. al | 2020 | “Liu Shen capsule shows antiviral and anti-inflammatory abilities against novel coronavirus SARS-CoV-2 via suppression of NF-κB signaling pathway” | Chinese | Pharmacological research | 68 |
| Sreekanth et. al | 2018 | “Ultra-sonication-assisted silver nanoparticles using Panax ginseng root extract and their anti-cancer and antiviral activities” | Chinese | Journal of Photochemistry and Photobiology B: Biology | 69 |
| Wang et.al | 2018 | “Antiviral activity of fermented ginseng extracts against a broad range of influenza viruses” | Chinese | Viruses | 70 |
| Choi et. al | 2019 | “Antiviral activity of ethanol extract of Geranii Herba and its components against influenza viruses via neuraminidase inhibition” | Chinese | Scientific reports | 71 |
| Chen et al | 2011 | “In vitro anti-adenoviral activity of five Allium plants” | Chinese | Journal of the Taiwan Institute of Chemical Engineers | 72 |
| Sze et al | 2017 | “Sophoraflavenone G restricts Dengue and Zika virus infection via RNA polymerase interference” | Chinese | Viruses | 36 |
| Peng et. al | 2017 | “Luteolin restricts dengue virus replication through inhibition of the proprotein convertase furin” | Chinese | Antiviral Research | 37 |
| Maryam et al | 2020 | “Antiviral activity of traditional Chinese medicinal plants Dryopteris crassirhizoma and Morus alba against dengue virus” | Chinese | Journal of Integrative Agriculture | 35 |
| Gao et. al | 2018 | “Structure Analysis of Effective Chemical Compounds against | Chinese | Canadian Journal of Infectious Diseases and Medical Microbiology | 10 |

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|-------------------|------|---|--------------|--|----|
| | | Dengue Viruses Isolated from <i>Isatis tinctoria</i> ” | | | |
| Lee et al | 2017 | “Honeysuckle aqueous extract and induced let-7a suppress dengue virus type 2 replication and pathogenesis” | Chinese | Journal of ethnopharmacology | 73 |
| Khan et al | 2020 | “Plant Derived Antiviral Products for Potential Treatment of COVID-19: A Review” | Mixed Review | Phyton | 38 |
| Jahan et. al | 2020 | “Potentials of plant-based substance to inhabit and probable cure for the COVID-19” | Mixed Review | Turkish Journal of Biology | 39 |
| Vandebroek et. al | 2020 | “Reshaping the future of ethnobiology research after the COVID-19 pandemic” | Mixed Review | Nature Plants | 40 |
| Qamar et al | 2020 | “Structural basis of SARS-CoV-2 3CLpro and anti-COVID-19 drug discovery from medicinal plants” | Mixed Review | Journal of pharmaceutical analysis | 13 |
| Mirzaie | 2020 | “A narrative literature review on traditional medicine options for treatment of corona virus disease 2019 (COVID-19)” | Mixed Review | Complementary Therapies in Clinical Practice | 41 |
| Iranzadasl et. al | 2020 | “Persian medicine recommendations for the prevention of pandemics related to the respiratory system: a narrative literature review” | Mixed Review | Integrative Medicine Research | 11 |
| Cui et. al | 2020 | “Traditional Chinese medicine for treatment of coronavirus disease 2019: a review” | Mixed Review | Traditional Medicine Research | 12 |
| Bhuiyan et. al | 2020 | “Plants Metabolites: Possibility of Natural Therapeutics Against the COVID-19 Pandemic” | Mixed Review | Medical frontiers | 74 |

The antiviral details of the antigens from each paper are given in table 3 while the findings for several prominent diseases are listed in this section.

Table 3. Details of Herbs, Plants, and Herbal Combinations that are reported in Selected Literature

| Name of Herb/ Plant/ Herbal combination | Origin | Attacked Virus | Antiviral activity | References |
|---|--------|---|--|------------|
| Aloe Vera | TPM | Attacks plant virus called mild mottle virus HSV Human <u>norovirus</u> (HuNoV)) SARS-CoV-2 | Compounds extracted from Aloe Vera (3 and 7) inhibit the pepper mild mottle virus. Inhibitory effect of 0.2-5% Aloe Vera gel against the growth of HSV-1 Inoculating fresh cabbage with MNV-1 on the surface the activity was suppressed using Aloe Vera Molecular docking of ten Aloe vera molecules with SARS-CoV-2 showed that ligands 6, 1 and 8 can inhibit growth | 21, 42-44 |
| Eriobotryae Folium | TPM | Human <u>norovirus</u> (HuNoV) | Eriobotryae Folium treatment suppressed the MNV-1 on cabbage surface. | 43 |
| Euphorbia spinidens Bornm (Euphorbiaceae) | TPM | HSV | There is a methanol extract from E. spinidens which is high in content of flavanoids and of phenolic compounds which have an antiviral effect on HSV-1 | 22 |
| Echium Amoenum | TPM | HSV Viruses that cause food borne diseases | The extracts from the flower part were found to be having most antiviral activity when if used one hour later than the inoculation of the virus. Aqueous extract of dried flower stopped the growth of microbes and antiviral activity of the extract is heat resistant. | 45, 46 |
| avicennia marina | TPM | HSV HIV-1 | Methanol extract from the mangrove tree has the highest antiviral activity that inhibited the growth of HSV, however, the antiviral activity HIV was mild | 26 |
| Echinacea Purpurea | TPM | Influenza and other viral diseases | Findings showed that E. purpurea has the ability to alter the clinical course of several viruses including the influenza A by the usage of cytokine modulation instead of a direct antiviral activity. E. purpurea's antiviral activity improves with light as it is found to be light sensitive | 30-32 |
| Thymus Kotschyanus | TPM | HSV | Thymus kotschyanus plant' aqueous extract showed maximum antiviral activity when introduces after an hour of virus inoculation and decreased afterwards. | 23 |

| | | | | |
|--------------------------|-----|---|--|-----------|
| Cuminum cyminum | TPM | HSV | Cuminum cyminum seeds extract has a phenolic and Flavonoid concentration as well as methanolic extract, all three of which show inhibitory action against HSV viruses. | 24 |
| Camellia sinensis Kuntze | TPM | Adenovirus | Camellia sinensis crude extract was found to have inhibitory action adsorption and/or post-adsorption stages of the adenovirus virus replication cycle showing potential of possible treatment | 17 |
| Olea europaea | TPM | New Castle Disease Virus Avian Influenza Viruses | The monophylaxis function of Olea europaea has shown potential antiviral activity against New Castle Disease virus in poultry animals and also has a potential to stop the spread of Avian Influenza Viruses. Moreover, it has shown inhibitory action against several other viruses | 27, 47-49 |
| Melaleuca alternifolia | TPM | New Castle Disease Virus | The extracts of Melaleuca alternifolia have shown antiviral potential to stop spread of New Castle Disease Virus | 27 |
| Camellia sinensis | TPM | Influenza | Camellia sinensis has immunomodulatory potential and can increase the expression of IL-17A, IL-8, and HBD-2 that can reduce the viral impact of several influenza viruses | 33 |
| Syzygium aromaticum | TPM | Adenovirus | The phenolic content in the curd prepared of the flower has shown a potential to decrease the viral activity of adenoviruses and can be used to inhibit growth | 18 |
| Punica granatum L. | TPM | Adenovirus | pomegranate (Punicagranatum L.) peel extract was studied, and its phenol and Flavonoid contents were responsible for showing a potential of inhibitory action | 19 |
| Melissa officinalis L. | TPM | Adenovirus | 50% Cytotoxicity Concentration (CC50) of the extracts of Melissa officinalis L. and a 50% inhibitory concentration (IC50) of the extract on the on adenovirus showed that the viral activity was hindered. | 16 |
| Peganum harmala L. | TPM | Influenza | Ethanol extract from the Peganum harmala L. has a high activity against the influenza virus | 50 |
| maca (Lepidium meyenii) | TPM | Influenza | Maca showed antiviral activity through inhibition, against several flu viruses | 34 |
| myricetin | TPM | HIV | The glycosylated moiety extracts have the potential to improve the anti-HIV-1 activity by myricetin as it has the potential to inhibit the reverse transcriptase that is the | 25 |

| | | | | |
|----------------------------------|------|---|--|----------------|
| | | | responsible actor of the antiviral activity | |
| <i>Syzygium aromaticum</i> | TPM | NDV | <i>Syzygium aromaticum</i> extract was combined with the silver nanoparticles to convert into CESN that has shown a great potential to inhibit NDV | 28 |
| <i>Azadirachta indica</i> | TPM | NDV | The extracts from the bark <i>Azadirachta indica</i> have shown potential to inhibit the growth and production of NDV | 9 |
| <i>Glycyrrhiza glabra</i> | TPM | NDV | The extracts from the leaves of <i>Glycyrrhiza glabra</i> have shown potential to inhibit the growth and production of NDV | 29 |
| <i>Angelica dahurica</i> | TCHM | Influenza A viruses | <i>Angelica dahurica</i> is effective against viruses causing colds and ulcers. It has the ability to show cytopathic effects due to oxypeucedanin compound and has antiviral activity against H1N1 and H9N2 | 51 |
| <i>Alpinia katsumadai</i> Hayata | TCHM | NDV | <i>Alpinia katsumadai</i> Hayata extracts have an inhibition activity against the α -glucosidase due to which they are effective in treating the BHK cells infected with the virus of new castle diseases | 52 |
| <i>Alpinia officinarum</i> | TCHM | Influenza and other flu viruses | Ethanoic extracts of <i>Alpinia officinarum</i> have shown to have antiviral properties against several viruses. The diarylheptanoids extract from <i>Alpinia officinarum</i> also have antiviral properties against influenza virus. These extracts down-regulate the growth of viruses | 53-55 |
| <i>Arctium lappa</i> | TCHM | Gut diseases and HSV in humans and Porcine circovirus in pigs | The inoculation after 4 or 8 hours of the extracts in the Porcine circovirus infected cells shows greater antiviral impact of inhibition. The infections and microbial activities in the gut were improved as a result of using a polysaccharide extract of <i>Arctium lappa</i> L. Moreover, the extracts from this plant also inhibit the activities against HSV. | 58 57 56 |
| <i>Astragalus Membranaceus</i> | TCHM | Influenza and HSV viruses | Injects of aqueous solution extracted from <i>Astragalus membranaceus</i> has antiviral activity against influenza virus. Moreover, the flavonoids and terpenes extracts from this plant have antiviral activity of inhibition against several kinds of HSV viruses. | 59, 60 |
| <i>Paeonia lactiflora</i> | TCHM | Zikavirus, influenza viruses, HSV, etc. | The extracts from this plant have shown antiviral activity by inhibiting and stopping expression for herpes | 61 |

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|---------------|------|--|---|-------------------|
| | | | simplex virus type 1, through inhibition for Human cytomegalovirus (HCMV) and through stopping replication of Zika virus (ZIKV) infection. | |
| Ginkgo biloba | TCHM | Coxsackievirus B3 (CVB3) SARs-CoV-2 | The extract from Ginkgo biloba improve the myocardial activity by increasing the fibrosis activity and suppress viral activity by inhibition and suppression of S100A4 and MMP-3. Moreover, molecular docking showed that there are cytoplasmic impacts of the extracts from Ginkgo biloba that have a potential to hinder the impact of coronavirus. | ^{62, 63} |
| Glycyrrhizin | TCHM | SARs-CoV-2 | The extracts of triterpene saponin from glycyrrhizin have a potential of showing antiviral affects against coronaviruses. | ^{64, 65} |
| shikonin | TCHM | Adenovirus | The extracts from shikonin have anti-Adv3 capabilities and can inhibit the growth and expression of the Adv3 | ²⁰ |

Adenovirus

The Human Adenovirus causes a wide range of diseases such as hepatitis, gut diseases, conjunctivitis, pneumonia and myocarditis. These viruses attack mostly kids of young ages. Immune-compromised patients, however, may face fatal illnesses in light of adenovirus. There are no medicines available in modern medicine that can stop the activity of the adenoviruses. However, there are various studies in Persian and Chinese medicine that have shown that some herbs can help in the regulation of the adenovirus caused diseases. The following are some examples.

- M.officinalis hydroalcoholic extract has a potential to impact the growth and activity of reproduction of the adenovirus ¹⁶. The antiviral mechanism of the extract can be used in the pretreatment phase and the findings showed that if not used in pretreatment, it cannot stop replication
- Black tea extracts were found to be effective in the inhibition of the adenovirus replication in both the pre- adsorption and the post- adsorption stages ¹⁷. The antiviral activities of these extracts can likely stop the cycle of the adenovirus.
- The in vitro anti-adenovirus experimentation showed that the extract made from the dried flowers buds of Syzygium aromaticum has the potential to hinder adenovirus growth due to the flavonoid and phenol contents ¹⁸
- The extracts from the peel of pomegranate have exhibited anti-adenovirus activity and has a high concentration of phytoconstituents that are a promising fact for future medicine ¹⁹.
- The extract in Chinese herbal medicine known as Shikonin also has potential of impacting the growth and replication of adenoviruses ²⁰.

HSV

Herpes simplex viruses 1 and 2 are both viruses that affect humans and are a contagious viral infection. These viruses cause the disease **herpes** which has the potential to appear in various parts of the body, most commonly on the genitals or mouth. There are medications for this disease in modern medicine but the virus is becoming resistant against them, thus traditional medicine is being used increasingly to solve the issues caused by this disease.

- Tropical application of Aloe Vera extracts can help in the inhibition of HSV-1 virus and is a viable treatment for herpes simplex ²¹.
- Euphorbia spinidens Bornm is a herb that has a large content of methanol extract which has been found to be an effective treatment for antiviral effect on HSV-1 as it has the ability to inhibit the viral replication ²²
- Thymus kotschyanus plant's aqueous extract has antiviral properties that were established using cytopathic effect on the inhibition assay at three different hours after the inoculation of HSV-1 and the extract is most effective at the first hour ²³
- The flavonoids and phenol extracts in the Cuminum cyminum seeds have inhibitory impact on all types of herpes viruses ²⁴

HIV

HIV infection is caused by the human immunodeficiency virus (HIV) that is contracted through physical contact with blood or seminal/vaginal fluids. This disease renders the immune system ineffective and is the most fatal epidemic to date. Modern medicine has no treatment for HIV and the only used drugs are taken to slow down the impact of the virus. Several plant extracts and herbs have been effective in helping HIV patients.

- The myricetin is an extract in Chinese medicine that has shown to have anti-HIV-1 activity as it has the

ability to inhibit the process of reverse transcriptase²⁵.

- The methanol extracts in the avicennia marina have a mild inhibition impact on the HIV-1 virus²⁶

New Castle Disease

Newcastle disease is an infection that impacts the domestic poultry and various other Avian species with the virus Newcastle disease virus (NDV). This disease does not impact humans; however, this is a very well researched viral infection in medical sciences as it leads to heavy economic losses in case of widespread in poultry animals. The several herbal findings for this disease are as followed:

- *Olea europaea* has ability to inhibit the replication and growth of New Castle Disease Virus (38-41).
- *Melaleuca alternifolia*'s extracts can inhibit growth in NDV through hindrance of its RNA replication process²⁷.
- *Syzygium aromaticum* when used in combination with silver particles forms a strong antiviral medication against the NDV that also acts through inhibitory action²⁸.
- *Azadirachta indica* is another medical plant of Persian decent that is used for extraction of extract from its bark to treat the NDV in poultry⁹.
- *Glycyrrhiza glabra*'s leaves are used to make extracts the inhibit reproduction in NDV²⁹

Influenza

Influenza is a respiratory tract viral infection of that attacks nose, lungs and the throat. The virus causes flu like symptoms. While there is medication for these viruses in western medication, the viruses are becoming resistant and that is why herbal medication is preferred.

- *E. purpurea* is a medicinal plant extract that has ability of modulating the viral activity of the influenza viruses³⁰⁻³².
- *Camellia sinensis* increases production of several antigens that can lead to controlling the impact of the influenza viruses³³.
- The extract from *Peganum harmala* L. are ethanolic in nature and have a high antiviral impact against the influenza virus (43).
- Maca is a medicinal plant that also has inhibition activity against several flu viruses including influenza³⁴.

Dengue Fever

Dengue fever is caused by a mosquito-borne viral infection with the virus Dengue (DENV) and it causes a severe flu-like illness that can sometimes be fatal. The incidence of this disease has increased in the past few years, especially in the developing countries and tropical regions and it lacks a definite specified treatment in the modern medication. However, there are several TCHM remedies that have been effective in controlling this virus.

- *Dryopteris crassirhizoma* (DC) and *Morus alba* (MA) are two plants whose extracts have been the most potential bearing against the DENV infections. DC is more antiviral active at the later stages of the infection whereas the findings show that MA has early activity and also have the ability of prophylactic activity³⁵.

- Flaviviruses is a family of viruses that have caused several global outbreaks including the Zika, Dengue and Hepatitis C virus. One Chinese medication that is suggested for this class is the extracts from *Sophora flavescens* as they have the ability to inhibit replication and growth and thus are effective in anti-dengue medications³⁶
- Luteolin is a heat clearing extract that is also effective against dengue and is originated from Chinese Herbs³⁷.

SARs-CoV-2

There are several reviews included in this study regarding the possible herbal solutions and treatments to dampen the risks and complications of SARs-CoV-2^{38 39 40 13 41}. Overall, the COVID-19 has been a very fatal and devastating pandemic for health as well as economic impacts across the globe and despite efforts of scientists and heavy investments being put into research, still there is a lack of reliable and a certified medication or a combination of medicine for COVID-19. However, while the world is focused on western medicine, there is evidence in these reviews that there is possibility of treatment in herbal and traditional medicine. Iranzadasl, Karimi¹¹ outlines the recommendations of the Persian medicine against pandemic respiratory diseases from the past and they are all in accordance to the preventive and treatment options that the modern medicine is currently using. This implies that there is a chance that Persian and Chinese medicine holds the secret to solving the COVID-19 issue and bringing the world to peace.

DISCUSSION

Discussion and Conclusion

In this systematic analysis, several herbs and herbal extracts from the Chinese and the Persian medicine field were discussed. While there are proofs that these herbs can be effective against the various illnesses caused by viruses across the globe, there is need of research on the combined impacts of these herbal medicines and the modern western medicine. Overall, the study can be concluded by pointing out that there are widespread applications of herbal medicines and plant extracts that need to be experimented and observed for curing the fatal diseases that are faced by mankind. The implications and limitations of the study are discussed below.

Implications

Viral diseases are causing more than half of the deaths across the globe and are responsible for widespread and epidemic diseases. There is no accurate medicine for viral diseases in modern western medication and for the purpose of disease prevention, awareness of effectiveness and the possible treatments that are available in the context of Chinese and Persian Herbal medicine, this study was crucial. The researcher conducted an overview survey in systematic analysis technique for both these fields and discussed several available herbal extracts and herbal medications that can be useful in the treatment of some of the most widely occurring viral diseases such as the HIV AIDS, Herpes, COVID-19, Adenovirus diseases and influenza viruses in humans and the new castle disease that impacts a wide amount of cattle and poultry across the globe every year. The study has provided a crux of the best available herbal concoctions that

can be used for treating these diseases. Thus, this study has implications in theory, practice as well as in policy making perspectives. The theoretical implications of this study lie in the fact that it covers the various herbal details and the practical implications are evident in the possible indication of usage of these herbal medicines.

Limitations and Recommendations for future research

The current study is a novel and valuable addition in the previous studies conducted as a systematic analysis of traditional herbal medicine for the viral diseases, however, it is accompanied by its own limitations. The researcher collected nearly 150 studies only out of which only 64 were used in the analysis. Moreover, the herbs and herbal extracts discussed in this paper are varied and still not all inclusive. This makes the study overall a literature review that is not clear in direction. This is why it is suggested that in the future, systematic reviews are conducted on either one kind of herb or a single virus and the impacts of various herbs and herbal extracts on it. Moreover, there is scope of researching the combined effects of various kinds of herbs with western medication for untreatable viral diseases like HIV and COVID-19.

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