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Plant extracts as an efficient alternative therapy of respiratory tract infections

AMRISH NIGAM
Research Scholar
SRI SATYA SAI UNIVERSITY OF INFORMATION TECHNOLOGY AND MEDICAL SCIENCES
Dr. Syed Sahab Ahmad
Guide Name
SRI SATYA SAI UNIVERSITY OF INFORMATION TECHNOLOGY AND MEDICAL SCIENCES

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Abstract

Medicinal plants are advantageously used in the treatment of respiratory tract diseases. Upper respiratory tract catarrh is one of the diseases associated with seasonal weakening of immunity, and therefore, plant drugs with a non-specific immunomodulation effect are often used. Such plants include, but are not limited to, Echinacea (Echinacea pursuer) and American ginseng (Panax quinquefolius). In combination with medicinal plants having antibacterial and antiseptic effects, such as thyme (Thymus vulgaris) and pelargonium (Pelargonium sidoides), they can constitute efficient help in the treatment of respiratory tract diseases, shorten the duration of the disease and reduce the need of antibiotic therapy. The text presented summarizes the basic information about these plants, their ingredients, mechanisms of action and clinical tests confirming their effect and monitoring eventual adverse effects. Key words: Echinacea pursuers Panax quinquefolius Pelargonium sidoides Thymus vulgaris upper respiratory tract catarrh immunity.

Keywords: *Plant extracts,alternative therapy,respiratory tract infections.*

1. INTRODUCTION

Throughout history, mankind has been accompanied by infectious diseases that have, in one way or another, raised the question of its survival. This was the case with the Spanish influenza

(H1N1 virus) at the beginning of the last century, which resulted in the death of 5% of the world's population. Almost all the time, mutations in strains of influenza A viruses lead to the emergence of infectious diseases with new symptoms and consequences. Avian flu, swine flu

and other zoonotic influenza virus infections in humans lead to diseases ranging from mild upper respiratory tract infections to severe pneumonia, acute respiratory failure syndrome and death [1]. Each of them is initially regarded as a pandemic, but as soon as a treatment medication and a vaccine are developed, it is considered a regular seasonal flu. The coronavirus that led to the COVID-19 pandemic is similar to the pathogen SARS-CoV (viral respiratory disease of zoonotic origin) that caused the epidemic of 2003. A drug for atypical pneumonia that has passed clinical trials is yet to be developed. In 2020, humanity is being forced to return to the unfinished solution of the problem, whose initial conditions will be amended with new criteria. This SARS-CoV-2 virus has affected many people, not only in China but spreading to almost all countries and territories in a short time [2,3]. Many countries (China, the United States Germany, Great Britain, Russia, etc.) are intensively working on creating a vaccine, but even in this case, time is needed. The population only needs to wait for the work to be completed. However, every new day brings thousands of infected people [4], and some of them are not going to make it. Until there is a vaccine, all countries issue the same recommendations as follows: compliance with sanitary and hygienic standards; limited contacts up to complete self-isolation; strengthening of body's defense systems that will both protect and lead to recovery in the event of infection [5,6]. Herbs are traditionally used in many therapeutic practices, if not as the main, then as the accompanying therapy in combination with medications, aimed at boosting immunity for prevention. Phototherapy has repeatedly proven its effectiveness, including its ability to cope with infectious diseases [7]. There are medicinal plants whose extracts have an inhibitory effect on viruses such as herpes simplex virus type 2, HIV, hepatitis B virus (HBV), smallpox virus and severe acute respiratory syndrome, as well as on viral strains resistant to conventional antiviral drugs [8,9]. Plants from traditional Chinese medicine are rich sources of compounds used for the development of medicines for a wide range of diseases (from coughs and colds to parasitic infections and inflammations).The emphasis on the use of medicinal plants had hitherto been placed on the treatment rather than prevention of diseases. However, there exists in the literature considerable report in recent times on research work on the use of medicinal plants and their constituents in disease prevention. A World Health Organisation (WHO) Expert Group defined Traditional Medicine as the sum total of all knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental, or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing (WHO, 1976). For Africa, this may be extended further by including an expression, such as 'while bearing in mind the original concept of nature which includes the material world, the sociological environment whether living or dead and the metaphysical forces of the universe'.

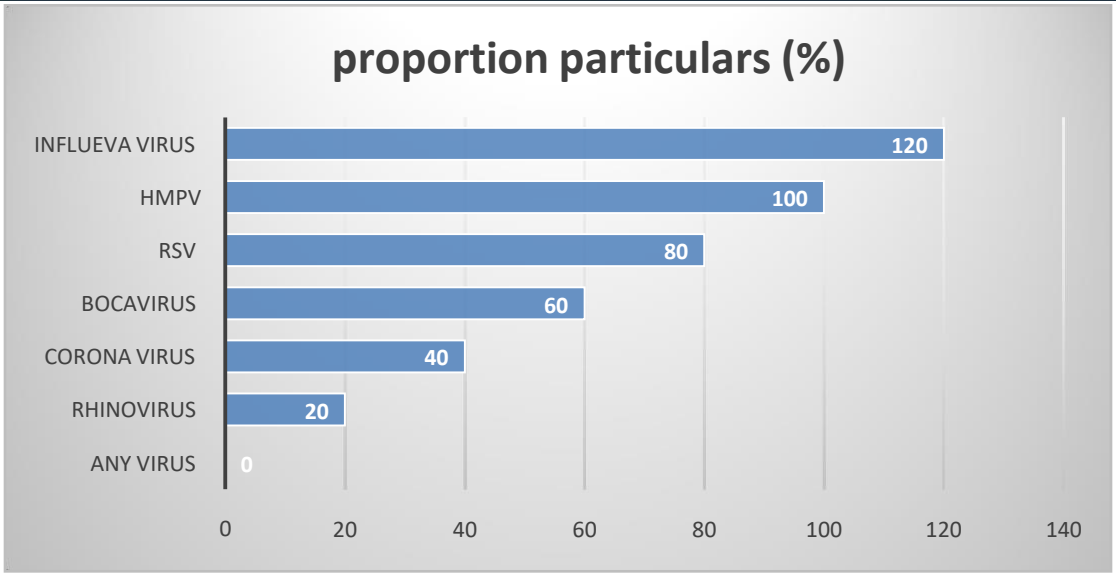

Figure: 1 proportion particulars (%)

1.1 Etiology

Common cold continues to be a large burden on society, economically and socially. The most common virus is rhinovirus. Other viruses include the influenza virus, adenovirus, enterovirus, and respiratory syncytial virus. Bacteria may cause roughly 15% of sudden onset pharyngitis presentations. The most common is S. pyogenes, a Group A streptococcus.

1.2 Risk factors for a URTI

- Close contact with children: both daycares and schools increase the risk fo URI
- Medical disorder: People with asthma and allergic rhinitis are more likely to develop URI
- Smoking is a common risk factor for URI

Immunocompromised individuals including those with cystic fibrosis, HIV, use of corticosteroids, transplantation, and post-splenectomy are at high risk for URI

Anatomical anomalies including facial dimorphic changes or nasal polyposis also increase the risk of URI.

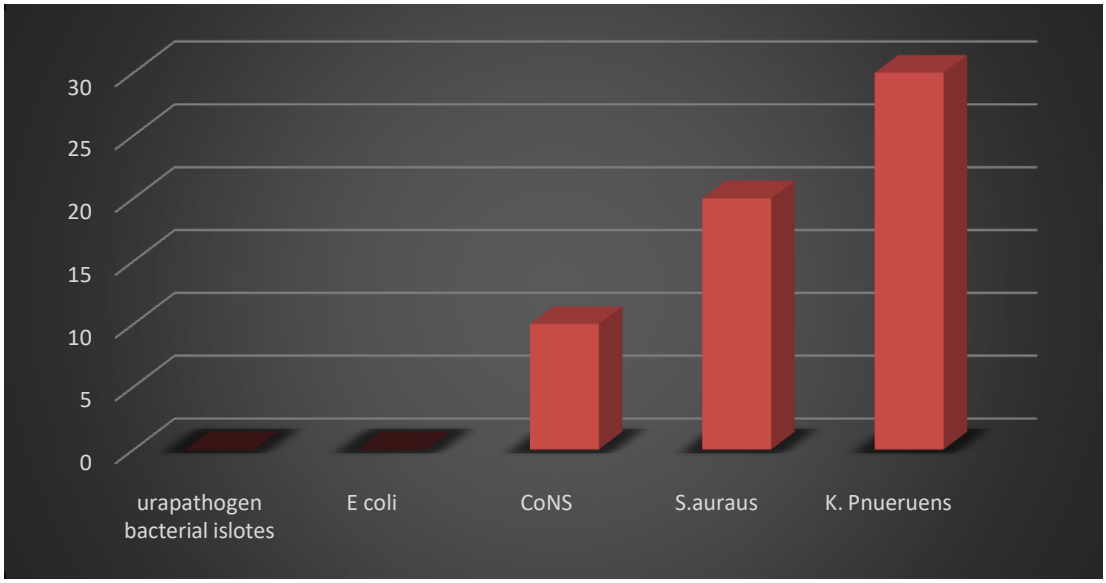

Figure 1.2 Risk factors for a URT

2. REVIEW OF LITERATURE

2.1 Bacterial Infection

Bacteria cause multi various infections in various parts of the human body. They spread easily and rapidly through contact, body fluid and aerosol to people especially immune compromised individuals.

Samples from wound discharge were collected using sterile swab and the bacterial pathogens were isolated and identified in a tertiary hospital in Gujarat. Staphylococcus aureus was the predominant organism followed by Pseudomonas aeruginosa, Escherichia coli, Klebsiella pneumonia, Proteus mirabilis and Proteus vulgaris. Staphylococcus aureus was highly sensitive to Rifampicin.

The bacterial strains were isolated from the wound swab samples collected from patients in Aminu Kano Teaching hospital, Kano, Nigeria. Among the bacterial isolates, Staphylococcus aureus was the predominant followed by Pseudomonas aeruginosa, Citrobacter species, Escherichia coli and Proteus mirabilis. The antibiotic susceptibility test showed that Pseudomonas aeruginosa was susceptible to Ceftazidime, Ciprofloxacin and Gentamycin while enteric bacteria were more resistant to these antibiotics.

2.2. Respiratory tract Infections

The sputum samples were collected from the respiratory tract infected patients of University College hospital. London. The samples were cultured in selective media and were subjected to PCR assay and C-polysaccharide antigen detection using ELISA. The diagnostic results confirmed that autolysin PCR was suitable for the detection of Streptococcus pneumoniae.

Oropharyngeal, sputum and broncho alveolar lavage samples were evaluated from 38 stable cystic fibrosis patients of Children University hospital, Germany for the detection of Pseudomonas aeruginosa. The bacterial isolates were typed by PFGE of DNA macro restriction fragments which confirmed Pseudomonas infection.

2.3 Upper Respiratory Tract Infections

Four Acinetobacter species were isolated from the upper respiratory tract of healthy humans and were biotyped as Acinetobacterleoffii and Acinetobacterjunii. All Acinetobacter spp. were found to produce extracellular lectin with in first 24 hours of incubation at 37°C as checked by haemagglutination assay. The agglutination was inhibited by 0.2M N-acetyl Dglucosamine and therefore the lectin was found to be specific for N- acetyl D-glucosamine.

Children are susceptible to bacterial infections during or soon after upper respiratory tract infection. Streptococcus pneumoniae, Haemophilusinfluenzae, Moraxella catarrhalis and Staphylococcus aureus often colonize the nasopharynx. Nine hundred and sixty eight throat swabs collected from 212 children indicated that Streptococcus pneumoniae colonization is negatively associated with the colonization by Haemophilusinfleuenzae.

2.4 Importance of Medicinal Plants

The use of whole plant preparations or plant extracts for medicinal purposes extends well back before recorded history. In recent times that many plants derived products have reached the market place as useful drugs for treating human disorders. The plants normally use these chemicals asas their secondary metabolites and their defense system and generating a mixture of attractive aromas for pollinating insects. So far nearly 13,000 plant species are identified for these properties. The plants used for medicinal purpose rich in secondary metabolites such as alkaloids, glycosides, steroids and relative active metabolites are used as drugs in pharmaceutical industry to treat various ailments.

The different extracts of Bryophyllum pinnate were tested against respiratory tract pathogens. The n-hexane soluble fraction showed the higher activity against Staphylococcus aureus, Klebsiellapneumoniae and Salmonella typhi whereas ethyl acetate fraction showed mild activity against Escherichia coli, Staphylococcus aureus and Salmonella typhi.

3. METHODS

In this review, we define antimicrobials as agents that inhibit the growth of microbes (bacteria, fungi, viruses, and protozoans). We define antibiotics as agents that inhibit the growth of bacteria specifically, and we consider antibiotic effects to be synonymous with antibacterial effects. The minimum inhibitory concentration (MIC) is defined as the lowest concentration of an antimicrobial agent that inhibits visible growth of a microorganism in vitro (CLSI, 2012). This value is commonly used as an indicator of antimicrobial potency. In combination with pharmacokinetic/pharmacodynamics parameters, the MIC is also used to predict the antimicrobial efficacy in vivo (Drusano et al., 2004). We also define the MIC as the lowest concentration of an antimicrobial agent that inhibits 90% of bacterial growth as detected by optical density measurement of liquid culture medium. The IC50 refers to the concentration of agent inhibiting 50% of the bacterial growth as measured and reported by optical density.

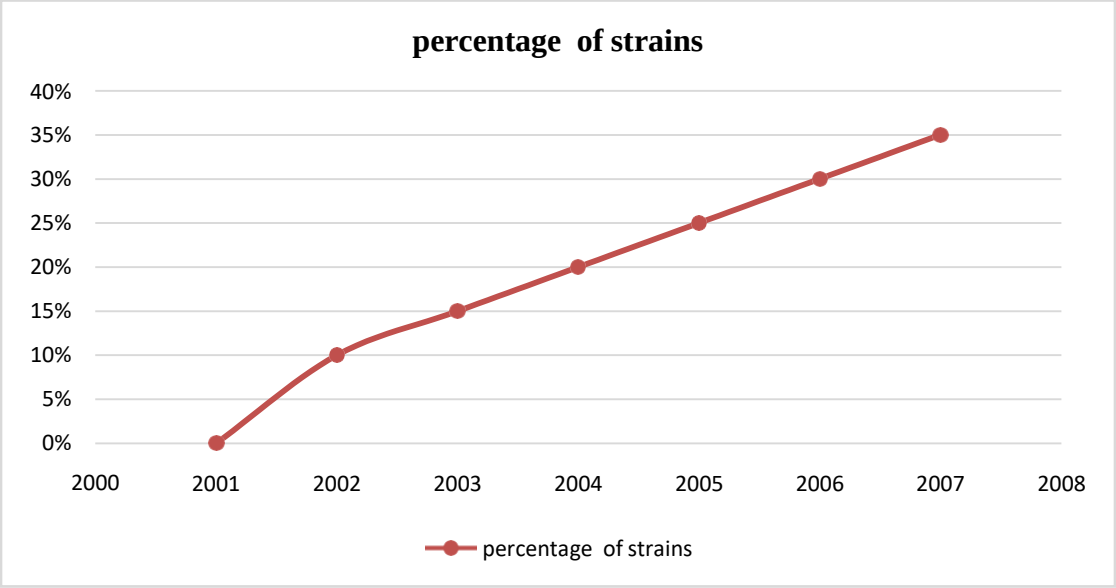

Figure: 3percentage of strains

4. RESULTS AND DISCUSSION

Medicinal plants have great potential for use as alternative medicines and are the basis for the discovery of natural compounds for the development of therapeutic agents in pharmacology. Flavonoids of medicinal plants are considered to be powerful immunomodulatory agents [14]. For colds, doctors in Russia traditionally advise to use herbs and forest berries, such as raspberries, rosehip, sage, chamomile, St. John's wort, etc. They can be used for brewing teas and making gargle solutions. However, the new coronavirus infection is more insidious than all previously encountered flu infections. It is known that the lungs are the organ most severely affected by COVID-19, similar to SARS [15,16]. Thus, special attention was paid to medicinal plants that protect the lungs and support the immune system. Traditionally, ginger and ginger

volatile oils, curcumin, Panax L. (Araliaceae) and garlic are recommended and used to strengthen immunity and reduce the likelihood of inflammatory respiratory diseases [2,17,18]. In an in vitro study [19], Allium sativum L. (Amaryllidaceae) extract inhibited influenza A (H1N1) virus by inhibiting the synthesis of viral nucleoproteins and polymerase activity. The paper recommended a decoction of Allium cepa L. (Amaryllidaceae) for colds.

Based on the experience gained during the SARS epidemic, we selected plants that are effective before or at the initial stage of infection. Roy et al. suggested a number of medicinal plants with these properties, although most of them grow in warm and hot areas, but there are plants found in Northeast Asia.

5. STRENGTHS AND LIMITATIONS

We did not investigate whether the loss of certain references had resulted in changes to the conclusion of the reviews. Of course, the loss of a minor non-randomized included study that follows the systematic review's conclusions would not be as problematic as losing a major included randomized controlled trial with contradictory results. However, the wide range of scope, topic, and criteria between systematic reviews and their related review types make it very hard to answer this question.

We found that two databases previously not recommended as essential for systematic review searching, Web of Science and Google Scholar, were key to improving recall in the reviews we investigated. Because this is a novel finding, we cannot conclude whether it is due to our dataset or to a generalizable principle. It is likely that topical differences in systematic reviews may impact whether databases such as Web of Science and Google Scholar add value to the review. One explanation for our finding may be that if the research question is very specific, the topic of research might not always be mentioned in the title and/or abstract. In that case, Google Scholar might add value by searching the full text of articles. If the research question is more interdisciplinary, a broader science database such as Web of Science is likely to add value. The topics of the reviews studied here may simply have fallen into those categories, though the diversity of the included reviews may point to a more universal applicability.

6. CONCLUSIONS

We have reported the antibacterial activities of 958 plants by reviewing the literature published from 2012 to 2019, which represents 66% of the total literature on this subject since 1946. Our review was focused to include the literature that followed established guidelines for botanical authentication and biological screening. These numbers of plants and plant natural products, while large, are miniscule in comparison to the 374,000 (Christenhusz and Byng, 2016) estimated total plants, or even the 28,187 medicinal species used by humans (MNPS, 2020). Medicinal plants and their natural products thus remain largely untapped as sources of antibacterial compounds.

Lower respiratory tract pathogens are very dreadful in nature and cause mortality in most cases. These bacterial pathogens often become resistant to most of the commercially available antibiotics and they are very difficult to control under normal conditions. Antimicrobial

resistance among these pathogens may be due to community acquired infections such as pneumonia, bronchitis, etc. Hospital outbreaks caused by multidrug resistant Acinetobacter Baumann have increased worldwide and were detected in ICU's especially in critically ill patients. Endemic and epidemic infections caused by drug resistant strains of Klebsiella pneumonias have become a major concern in hospital settings. Hence it is utmost important to study the genetic polymorphism among these pathogens based on the antibiotic sensitivity pattern. The present study revealed the existence of genetic variability in both lower respiratory tract pathogens Acinetobacter Baumann and Klebsiella pneumonia.

7. REFERENCES

1. Li, S.Y.; Chen, C.; Zhang, H.Q.; Guo, H.Y.; Wang, H.; Wang, L.; Zhang, X.; Hua, S.-N.; Yu, J.; Xiao, P.-G.; et al. Identification of natural compounds with antiviral activities against SARS-associated coronavirus. Antivir. Res. 2005, 67, 18–23. [CrossRef]
2. Lin, L.-T.; Hsu, W.-C.; Lin, C.-C. Antiviral Natural Products and Herbal Medicines. J. Tradit. Complement. Med. 2014, 4, 24–35. [CrossRef] 23. Nair, J.J.; Wilhelm, A.; Bonnet, S.L.; van Staden, J. Antibacterial constituents of the plant family Amaryllidaceae. Bioorg. Med. Chem. Lett. 2017, 4943–4951. [CrossRef]
3. Cimmino, A.; Masi, M.; Evidente, M.; Superchi, S.; Evidente, A. Amaryllidaceae alkaloids: Absolute configuration and biological activity. Chirality 2017, 29, 486–499. [CrossRef]
4. Nair, J.J.; van Staden, J. Antifungal constituents of the plant family Amaryllidaceae. Phytother. Res. 2018, 32, 976–984. [CrossRef]
5. Wang, X.; Chen, M.H.; Wang, F.; Bu, P.B.; Lin, S.; Zhu, C.G.; Li, Y.H.; Jiang, J.D.; Shi, J.G. Chemical constituents from root of Isatisindigotica. China J. Chin. Mater. Med. 2013, 38, 1172–1182. [CrossRef]

6. Meng, L.J.; Guo, Q.L.; Zhu, C.G.; Xu, C.B.; Shi, J.G. Isatindigodiphindoside, an alkaloid glycoside with a new diphenylpropylindole skeleton from the root of Isatisindigotica. Chin. Chem. Lett. 2017. [CrossRef]

7. Meng, L.J.; Guo, Q.L.; Chen, M.H.; Jiang, J.D.; Li, Y.H.; Shi, J.G. Isatindolignanoside A, a glucosidicindole-lignan conjugate from an aqueous extract of the Isatisindigotica roots. Chin. Chem. Lett. 2017. [CrossRef]

8. Chaieb, K., Hajlaoui, H., Zmantar, T., Kahla-Nakbi, A. B., Rouabhia, M., Mahdouani, K., et al. (2007). The chemical composition and biological activity of clove essential oil, *Eugenia caryophyllata* (*Syzigiumaromaticum* L. Myrtaceae): a short review. *Phytother Res.* 21, 501–506. doi:10.1002/ptr.2124.

9. Higgins JPT, Green S. Cochrane handbook for systematic reviews of interventions: The Cochrane Collaboration, London, United Kingdom. 2011.

10. Aagaard T, Lund H, Juhl C. Optimizing literature search in systematic reviews—are MEDLINE, EMBASE and CENTRAL enough for identifying effect studies within the area of musculoskeletal disorders? BMC Med Res Methodol. 2016;16:161. doi: 10.1186/s12874-016-0264-6.

11. Dao, T.T.; Nguyen, P.H.; Lee, H.S.; Kim, E.; Park, J.; Lim, S.I.; Oh, W.K. Chalcones as novel influenza A (H1N1) neuraminidase inhibitors from Glycyrrhiza inflate. Bioorg. Med. Chem. Lett. 2011, 21, 294–298.

12. Chen, L.; Chen, X.; Su, L.; Jiang, Y.; Liu, B. Rapid characterization and identification of compounds in Saposhnikovia Radix by high-performance liquid chromatography coupled

with electrospray ionization quadruple time-of-flight mass spectrometry. Nat. Prod. Res. 2018, 32, 898–901.

13. Rodnick J. E, Gude J. K, Diagnosis and antibiotic treatment of community acquired pneumonia. Western Journal of Medicine, 1991, 154, 405-409.

14. Christopher Aye Egbe, CasimirNdiokwere and Richard Omoregie, Microbiology of Lower Respiratory Tract Infections in Benin City, Nigeria, Malaysian Journal of Medicinal Science, 2011, 18(2), 27-31.

15. Bergogne-Berezin E and Towner K. J. Acinetobacter spp. As Nosocomial Pathogens: Microbial, Clinical and Epidemiological Features, Clinical Microbiology Reviews. 1996, 9(2), 148-165.

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