IJAYUSH
International Journal of AYUSH
AYURVEDA, YOGA, UNANI, SIDDHA AND HOMEOPATHY
http://internationaljournal.org.in/journal/index.php/ijayush/

International Journal
Panacea
Research library
ISSN: 2349 7025

Short Communication **Volume 9 Issue 2** **April – June 2020**

HERBAL PLANTS AS AFFORDABLE AND SUSTAINABLE NATURAL 'EDIBLE VACCINE' FOR EPIDEMICS AND PANDEMICS

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Abstract:

COVID 19 pandemic and the frequent emergence of SARS epidemics lead us to think of several factors. We do not have a vaccine against SARS to date, we must work on alternatives. Plants synthesize a variety of secondary metabolites that are utilized in their defense mechanisms. We can exploit plant defense compounds to directly or indirectly protect our body from pathogenic infections. The process of routine drug/vaccine development is lengthy and time-consuming. By contrast, herbal drugs are prepared from many recognized plants and are known to us for hundreds or thousands of years. Thus, during the emergencies like war or health catastrophe, it is absolutely safe to immediately consume powders or decoctions of one or more medicinal plant parts as an 'edible vaccine' for the prevention of diseases and to stimulate natural immunity. We have tabulated few herbal plants that can be used as the first line of defense against respiratory illness. These plants and plant parts can be taken as a whole or as home-made decoctions as a part of their daily regimens.

INTRODUCTION:

The sudden outbreak of atypical pneumonia due to a novel Coronavirus emerging at Wuhan, China in December 2019 has spread like a hurricane in 213 countries across the globe and declared pandemic within three months. A total of 38, 55,788 affected cases (as of 9th May 2020) have been reported, including deaths of 2,65, 862 people irrespective of caste, creed, and economic status (WHO).

The virus has been identified as a novel Coronavirus 19 (COVID-19) causing severe acute respiratory syndrome (SARS). Clinical presentation and pathology of COVID-19 resemble the 2003-SARS-CoV and 2012-middle east respiratory syndrome-coronavirus (MERS-CoV). 2003-SARS epidemic also emerged from another province of China which took nearly 800 lives among 8000 affected people. MERS-CoV emerged in Saudi Arabia in 2012 had taken the lives of 919 out of 2521 (35%) people affected (Paraskevis et al. 2020). COVID-19 pandemic arises due to its high rate of human to human transmission. Humanity is facing such a catastrophe after World War II.

COVID-19 is a non-segmented, single-stranded, enveloped positive-sense RNA virus (Jin et al. 2020). In contrast to SARS and MERS, COVID-19 has highly evolved spikes with specific receptors encircling the capsid which resemble a monarch's crown justifying its name corona. COVID-19 generally has a high reproductive number, a long incubation period (14 days or more), and a low case fatality rate (much higher in patients with comorbidities like diabetes, hypertension, cardiovascular diseases) (Jin et al. 2020). It is highly contagious and as the incubation period is longer, patients can cause multiple infections before symptoms become observable. It has been already reported that although bats are the repository and the primary carrier of different types of coronaviruses, the trans-species jump and amplification of these viruses takes place within an intermediate host which is not yet known for COVID-19 (Jin et al. 2020).

The frequent emergence of SARS epidemics leads us to think of several factors. Are we paying service charges for transforming nature in our way and naively ruining the ecological equilibrium of mother earth? Is it another outcome of climate change? Plants are imperative components of the earth as they provide food and habitat of several plants and animals. The present circumstances are intensely sending a signal that the conservation of plants is essential for the safe and sound human population.

Plants are also an important source of medicines. Nearly 80% of the world population still rely on plant remedies for healthcare.

In the case of infectious diseases, specific targeted drugs, and vaccines are formulated at the cost of millions of dollars which are time-consuming. However, due to constant climate change and other factors, multi-drug resistant bacteria, viral strains, and the novel strains are emerging giving constant challenges to drug developers. An effective cure for COVID-19 at affordable prices within a short time frame will be a challenging task. Thus, we must work on alternatives. The 'convalescent-plasma (CP) transfusion' where one dose of CP derived from recently COVID-19 recovered donors with the neutralizing antibody titers above 1:640 was transfused to the patients along with medicines and maximal supportive care showed improvement in clinical symptoms (Duan et al. 2020). Another approach is to engineer plants producing specific proteins against viral diseases through plant biotechnological tools. However, time is a crucial factor, particularly during emergencies.

The most affordable alternative considering all the above options is redeploying traditional herbal knowledge. Plants carry a natural molecular laboratory and synthesis diverse phytochemicals basically for their defense against natural predators. Our age-old traditional systems have utilized these beneficial plants for human welfare particularly as curative and preventive measures at a very affordable cost. Compared to chemical drugs, herbal drug preparations follow different procedural steps. These have been prescribed from ancient time and thus their safety and effects have been constantly verified. Thus, during the emergencies like war or health catastrophe, it is absolutely safe to consume powders or decoctions from one or more medicinal plant parts as the natural 'edible vaccine' for the prevention of diseases and to stimulate natural immunity.

India is a repository of medicinal plants. Our ancient traditional knowledge of Ayurveda, Unani, Siddha, and Folk (tribal) use more than 8000 herbal remedies of which several have been employed as the first line of defense against respiratory illness. We have tabulated (Table 1) few herbal plants besides many effective against respiratory diseases and stimulate immunity.

Table 1: Indian medicinal plants used against respiratory tract infections and as natural immunity booster (Khare C.P 2007)

No.	Scientific Name	Common name	Family	Parts used	Bioactive compound	Application
1	*Adhatoda vasica*	Vasaka	Acanthaceae	Leaves	Vasicine	Broncho dilatory Expectorant, anti-asthmatic, antispasmodic
2	*Allium sativum*	Garlic	Liliaceae	Bulb	Diallyl disulfide, allicin, alliin	Antibiotic, bacteriostatic, used for upper respiratory tract infections
3	*Bacopa monnieri*	Brahmi	*Scrophulariaceae*	Whole Plant	Bacosides	Enhance memory and brain rejuvenation, hepatoprotective, antispasmodic, used in bronchitis, asthma
4	*Centella asiatica*	Mandu-kaparni	Apiaceae	Shoot	Asiaticoside, madeca-ssoside, madecassic acid	Adaptogen, central nervous system relaxant, antibiotic, detoxifier, blood-purifier
5	*Cinnamomum zeylanicum*	Daalchini	Lauraceae	Bark, leaf & root	Cinnamaldehyde (bark), eugenol (leaf), camphor (root)	anti-inflammatory and anti-microbial boosting cognitive function
6	*Curcuma longa*	Haldi	Zingiberaceae	Rhi-zome	Curcumin	Anti-inflammatory, hepatoprotective, anti-asthmatic, antioxidant, antitumor
7	*Ephedra sinica*	Somlata	Ephedraceae	Whole plant	L-Ephedrine, D-pseudoephedrine	In diseases of the respiratory tract and mild bronchospasms
8	*Glycyrrhiza glabra*	Yashti-madhu	Papilionaceae; Fabaceae	Roots	Glycyrrhizin	upper respiratory tract and gastric infections, duodenal ulcers.
9	*Ocimum sanctum*	Tulsi	Lamiaceae	Leaves, roots, seeds	ursolic acid, apigenin, luteolin,	antispasmodic, anti-asthmatic, anti-rheumatic,

					apigenin-7-O-glucuronide	expectorant, hepatoprotective
10	*Piper longum*	Long pepper / piplamul	Piperaceae	Entire spike with fruits	Piperine and numerous alkaloids	Diseases of the respiratory tract (cough, bronchitis, asthma)
11	*Piper nigrum*	Golmoric h	Piperaceae	Fruits	Piperine	Anti-asthmatic, stimulant, carminative, diuretic
12	*Syzygium aromaticum*	Lavang	Myrtaceae	Flower buds	Eugenin, triterpene acids, Eugenol	In inflammatory changes of oral and pharyngeal mucosa; in dentistry
13	*Tinospora cordifolia*	Guduchi	Menisperma ceae	Whole herb	Different classes of compounds	Anti-inflammatory, antirheumatic, spasmolytic, hypoglycaemic, hepatoprotective
14	*Withania somnifera*	Aswa-gandha	Solanaceae	Roots	Withaferin,	Immunomodulatory, anti-stress, antiviral
15	*Zingiber officinale*	Adrak/ ada	Zingiberace ae	Rhizo me	Gingerols, gingeberine , curcumine, farnesene	Acute, chronic cough, cold, fever, chronic bronchitis, respiratory troubles, antibacterial, antiviral

These plants and plant parts can be taken as a whole or as home-made decoctions as a part of their daily regimens. Now we know that people with the weaker immune system are at high risk of COVID-19. We should take initiative to provide these medicinal herbs as the cost-effective natural 'edible vaccine' to those people who are unable to purchase a healthy balanced meal and branded herbal products. Moreover, applying these herbal remedies to the affected people along with other treatments may reduce the quarantine period which will indirectly decrease the number of infected people.

COVID 19 has changed the perception of life. Some 4.5 billion people around the world are in lockdown now. The pandemic underlines the fact that certain Govt. policies and strategies in living conditions, housing, public health, and sanitation are needed to revise to ensure a controlled or disease-free world. We can promote the gardening of the suitable plants from our list in normal house premises and gardening as one's hobby will also detoxify all negative energy which might develop due to the isolation and will

allow people to spend quality time. Besides, the suggestion of AYUSH to perform 'Yoga' and 'Meditation' along with herbal medicines may exert a combinatorial effect to eliminate our stress and maintain a healthy and happy life.

CONCLUSION:

- Native wildlife depends on native plant species. In the context of the emergence of frequent epidemics and wild animals as their underlying sources, priority should be given on restoration of forest and prevention of habitat loss of wild plants and animals so that they can survive in their environment and get less exposure to the human population.
- It is apprehended that different types of SARS including the ongoing COVID-19 may have been enlisted as a recurring communicable disease. So, we must reinforce the use of herbal plants in a sustainable manner and promote herbal prevention as a cost-effective natural 'edible vaccines'.
- Considering the agro-climatic diversity, AYUSH Govt. of India is requested to make a policy formulation to encourage every school, village, district, town, and city to have their specific medicinal plant garden for their sustainable use at the local level.

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Acknowledgement:

Authors acknowledge encouragement of the Principal, Maulana Azad College, Kolkata.