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Review Paper

Tackling COVID-19 through possible plant-based science

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Abstract

The status of COVID-19 all over the world is pandemic. Plants have therapeutic action in curing the various diseases since ancient times. In order to tackle the various types of diseases, plants play an instrumental role. The present review article deals with the utility of plants in tackling COVID-19. After referring to a number of research papers on COVID-19, it can be concluded that plants are the best source of medicine against COVID-19 with fewer chances of side effects. Plants over the globe contain certain phytochemicals that have their action on the cell membrane of corona virus, facilitates the killing of its components and compositions of DNA. This would lead to the death of COVID-19.The epidemic models on the meteorological data of cities from countries like China, Italy, and Japan lead to the conclusion that such types of models cannot lead to a final prediction of an outbreak of corona viruses. More studies need to be conducted regarding the spread of COVID-19 and also on the evolution of such viruses to predict its epidemiological impact. We all need to come together to fight it out, and also we need to chalk out the ways to prevent future pandemics too.

Keywords: Therapeutic action, herbs, and trees, COVID-19, spread, meteorological factors.

Introduction

The word virus is derived from the Latin virus, meaning a poison. They are ultramicroscopic, causes diseases to all living organisms.

Characteristics of viruses[1]: i. They can reproduce in living cells, ii. They cannot be cultivated artificially in laboratories. iii. They can be studied by using an electric microscope. iv. They contain nucleic acid centrally enveloped by a sheath of glycoprotein through which it attaches itself to the immune complex of the host and leads to arrest respiratory system, v. Animal viruses live invertebrates, arthropods, and many other animals. The smallest viruses measure about 0.01 m in length, and the largest one is 0.5m. vi. Viruses are harmful to plants and animals, as they cause severe diseases to them. vii. Some of the viruses are possible means they complete their life cycle without causing any harmful effects to the organisms.

The systematic position of COVID-19
Family- Coronaviridae[2]
Order- Nidoviralles[2]

Morphology: The name of corona refers to the nature of the outer surface is in the form of crown-like spikes. They are microscopic organisms' measure about 65 to 125nm in diameter, and the nuclear material is in single-stranded RNA, Its size is from 26 to 32 kbs in length[2]. Alpha, beta, gamma, and delta are the subgroups of coronavirus. SARS-CoV Severe acute respiratory Syndrome), H5N1 influenza A, H1N1 2009 causes the severe respiratory syndrome. MERS-CoV (Middle East Respiratory Syndrome) coronavirus reported from the Middle East causes serious injury to the lungs[3]. ARDS (Acute Respiratory Distress Syndromes bring pulmonary failure and ultimately lead to death. The outbreak of coronavirus (SARS-CoV) for the first time reported in Guangdong, China, in 2002[4]. The primary host of this virus is a bat. The virus of bat and coronavirus are similar. It spreads through the human host. Its transmission is through human to human. The underlying source of this corona is infected animals. When such animals are consumed, the virus enters the human body. From infected persons to healthy persons, it is transmitted through a sneeze or any physical touch to healthy persons.

The becoming of a pandemic: The pandemic status of coronavirus started at the end of 2019 in Wuhan of China. The sudden outbreak of this virus killed more than 1800 people. In the first 50 days, 70,000 people got infected. The reported virus is from the Beta group. The Chinese researchers named this virus as Wuhan coronavirus 2019 novel coronavirus (2019-n COV). The nomenclature of this virus was done by the International Committee on Taxonomy of virus (IVTV) as SARS-COV-2 and the disease as COVID-19[2-4].Day by day, the percentage of infection is increased due to the rapid transmission of SARS- COV-2. From China, COV-19 spread all over the globe. The source of SARS-COV-2 from Guangdong, Chine, and the Source of MERS-Cov is from Saudi Arabia. In 2012, Arabs were subjected to the attack of infection caused by MER-COV coronavirus. It is a member of the Beta subgroup—

data of WHO revealed that 2428 people were infected by MERS-COV, and 838 people died[5].

If we concentrate on the symptoms led by both the types of Cov-19, exhibit a similar type of symptoms. The patients suffer from respiratory diseases. Their initial stage causes pneumonia, creates obstacles in breathing, and leads to respiratory diseases, and, ultimately, renal failure[6]. The epidemic condition of SARS COV-19 started in the Hunan seafood market from the Wuhan city of China. Chinese are fond of eating animals. The Consume bats, frogs, snakes, birds, marmots, rabbit[7]. The people in the Hunan market suffered from infection. The organisms were identified as coronavirus on the basis of the genetic sequence. The people from China visited the seafood market and consumed infected animals or birds and suffered from pneumonia. From COVID-19 spread from human to human. The virus spread from humans to human. The current investigation publicized that it is spread in more than 100 countries. As it is contagious, individuals to individuals come in contact with infected persons and exhibit the symptoms of coughing, sneezing, respiratory droplets, or aerosols. The aero-sport enters into the lungs via breathing[8-12]. If proper precautions are not taken, many people may get infected by these viruses[13]. The primary current source of the virus is being tabbed on bats[14], while secondary hosts are found to be Palm civets[15]. To identify this virus, the researcher observed dogs and palm civet. The samples of these animals were collected from the seafood market. It has been observed that palm civet identified with the same genome of the virus, so they came to the conclusion that palm civet might be a secondary host for the COVID-19[16].

Possible plant-based compounds to tackle the spread of the virus: Plants over the globe contain certain phytochemicals or bioactive compounds that have their action on the cell membrane of coronavirus, facilitates the killing of its components and compositions of DNA. Finally, this would lead to the death of COVID-19. Bioactive compounds are secondary metabolites. Lower plants and higher plants contain secondary metabolites. The secondary metabolites are used from ancient times in Indian medicine for folk remedies[17]. Among the lower plants, the significant role is of seaweeds from algae. Members of Class Rhodophyceae and class Chlorophyceae enriched in sulfated polysaccharides. The extract of plants is a factory of an inordinate amount of phytochemicals meant for curing the number of diseases. The plants are the great source of the polysaccharides, and many such compounds used against coronaviruses.

The symptoms laid by viruses at their different stages of growth, cured by antiviral properties of medicinal plants[18]. The screening of effective antiviral compounds from the plant extracts or fractions based on the accessibility of bioassay system[19]. Antiviral drugs can be manufactured synthetically, but plants are the banks of raw material for the manufacturing of antiviral drugs[20].

Marine algae are the rich source of a biocompatible compound that plays an essential role in the prevention of the spread of the coronavirus[21]. It has been mentioned that the species of *Porphyridium*, a red alga produced sulfated polysaccharides (carrageenan, a gelling and thickening agent). These biocompatible compounds have antiviral activity for respiratory viruses. In their research paper, they have published that the coating of sulfated polysaccharides on sanitary items stops coronavirus from remaining on the surfaces. Sulfated polysaccharides or SPs used against coronaviruses will have their role in the production of antiviral drugs. Another source of sulfated polysaccharides in green algae. *Ulva* and *Enteromorpha* from the class Chlorophyceae contain major H20 soluble polysaccharides in the form of sulfate, rhamnose, xylose, and glucuronic acid[22,23]. Sulfated polysaccharides act as an antiviral agent by inhibiting the replication of enveloped viruses of respiratory diseases, dengue, HIV, HSV[24-26]. Table-1 shows the sources of SPs.

Table-1: The SPs present in marine algae[27-29].

Polysaccharide	Seaweed
Agar, Agarose	*Gracillaria, Gelidium, Pterocladia*
Alginic Acid (Alginate)	*Macrocystis, Laminaria, Ascophyllum, Sargassum*
Carrageenans	*Gigartina, Chondrus, Kappaphycus (Euchema)*
Fucoidan	*Fucusserratus*
Fucans, galactans	*Fucusvesiculosus, Cladosiphonokamuranus*
Laminarin	*Laminaria japonica* (brown seaweeds)
Furcelleran	*Furcellarialumbricialis, F. fastigiata*
Ulvan	*Ulvarigida, Enteromporphacompressa*

Galactans have been described angiosperms. One of the marine angiosperm *Ruppiamaritime* grows in saline habitat synthesized galactans[30]. Galactans proved to be antiviral[31]. The source of galactans in terrestrial plants functions as an antiviral agent. The extracted galactans from *Stevia rebaudiana* from family Asteraceae and *Bassiarubra* from Sapotaceae[32].

The extract found to be useful against herpes simplex type virus 1 and 2. It has been suggested that the antiviral properties of polysaccharides seem to be linked with glycosidic linkages and monosaccharides composition, molecular weight, and sulfate contents.The methods of extraction of terrestrial plants and mushrooms based on several steps till the purified fractions [32, 33].An Indian scientist also observedthe role of glycosides and flavonoids derivatives of Garlic, *Senna*, and *Salvia officinalis* produce certain phytochemicals that are able to damage gyrase of coronavirus COVID-19[34].

Table-2: AYUSH (Government of India) recommended medicinal plant extracts for treating COVID-19[35].

Herb Name	Methodology	Market Tag	Local medical preparation	Grounding	Suggested usage	Operative counter
Probable Defensive Measures						
Tinospora Cordifolia	Solvent	Samshamani Vati	Ayurveda	Samshamani Vatihalf kg inlukewarm H20	Two times/day for 15 days	Lingering High body Temperature
Andrographis Paniculata	Solvent	Nilavem bukudineer	Siddha	Nilavembukudineer 60 ml extract	Two times/day for 14 days	High body temperature and sore throat
Cydonia Oblonga Zizyphus Jujube CordiaMyxa	Solvent	Behidana Unnab Sapistan	Unani	Behidanafor 3 g Unnabfor 5 Nos Sapistanfor nine nos.	Two times/day for 14 days	Antioxidant, immune-modulatory, anti-allergic, smooth muscle relaxant, anti-influenza activity
Arsenicum Album 30	Pill	Arsenicum album 30	Homeopathy	–	Daily once in empty stomach for three days (should be repeated after one month till the infection persist).	Effective against SARS-CoV-2, immune-modulator.
Suggestive Symptom Controlling Measures						
Ayush -64	Pill	–	Ayurveda	–	2 Pills for two times/day	Respiratory infections
Agastya Haritaki	Powdery extract	Agasthya Rasayanam	Ayurveda	5 g in lukewarm H2O	Two times/day	Upper respiratory infections
Anuthaila	Oily extract	Sesame Oily extract	Ayurveda	–	Two drops in each nostril daily morning	Respiratory infections
Adathodai Manapagu	Solvent	AdathodaiManapagu	Siddha	–	10 ml for two times/day	High body Temperature
Bryonia Alba	Pill	Bryonia	Homeopathy	–	–	Reduce lung inflammation
Rhus Toxico Dendron	Pill	Rhustox	Homeopathy	–	–	Viral infections
Atropa Belladonna	Pill	Belladonna	Homeopathy	–	–	Asthma and chronic lung diseases
Bignonia Sempervirens	Pill	Gelsemium	Homeopathy	–	–	Asthma
Eupatorium Perfoliatum	Pill	Eupatorium perfoliatum	Homeopathy	–	–	Respiratory symptoms
Auxiliary Intermediations to the Orthodox Precaution						
Vishasura Kudineer	Pill	Poly-herbal preparation	Siddha	Liquid extract 60 ml	Two times/day	High body Temperature
Kaba Sura Kudineer	Pill	Poly-herbal preparation	Siddha	Liquid extract Decoction 60 ml	Two times/day	High body temperature, cough, sore throat, shortness of breath

Table-3: List of Indian medicinal herbs, which might inhibit the HCoVs and other viruses[36].

Herbalcradle	Contrivance of accomplishment	Aim	Germ
Acacia nilotica	Reticence	–	HIV-PR
Allium sativum	Proteo-lytic and haem-agglutinating action and viral duplication	–	SARS
Andrographispaniculata	Clampdown	NLRP3, capase-1, and IL-1β	SARS-COV and likely SARS-CoV-2
Boerhaaviadiffusa	Reticence	ACE	–
ClerodendruminermeGaertn	Inactivation	Ribosome	SARS-CoV-2
Clitoriaternatea	Metalloproteinase inhibitor	ADAM17	–
Coriandrumsativum	Reticence	ACE	–
Cynarascolymus *Cassia occidentalis* *Cosciniumfenestratum*	Reticence	ACE	–
Embelia Ribes	Reticence	ACE	–
Eugenia jambolana	Reticence	Protease	–
Euphorbia granulata	Reticence	–	HIV-1 PR
Glycyrrhizaglabra	The reticence of viral duplication; Intonation of membrane changeability		SARS; HIV-1
Gymnemasylvestre	The reticence of virus-related DNA production	–	–
Hyoscyamusniger	Reticence and Nebulizer	Ca2+	–
Ocimumkilim and *scharicum*	Reticence	–	HIV-1
Ocimum sanctum	Reticence	–	HIV-1
Punicagranatum	Reticence	ACE	–
Salaciaoblonga	Clampdown	angiotensin II, AT1 signal	–
Sambucusebulus	Reticence	–	Enveloped virus
Solanumnigrum	–	–	HIV-1
Sphaeranthusindicus	Reticence	–	Mouse corona virus and Herpes virus
Strobilanthescallosa	Blocking	–	HCoV-NL63
Strobilanthescusia	Blocking	–	HCoV-NL63
Vitexnegundo	Reticence	–	HIV-1
Vitextrifolia	Reduction	–	SARS-COV

Indigoferatinctoria (AO), Vitextrifolia, Gymnemasylvestre, Abutilon indicum, Leucasaspera, Cassia alata, Sphaeranthusindicus, Clitoriaternatea, Clerodendruminerme Gaertn, Pergulariadaemi and Evolvulusalsinoide can also be a source of possible plant based extracts to the fight the pandemic. Quinone is derived from Cinchona is well recognised for its antimalarial properties. Artemisia annuafrom the family Asteraceae with an active compound artemisin used against malaria[37]. There are species which are used as support tomore than five formulations include: Glycyrrhiza *spp.*, Magnolia officinalis, Scutellariabaicalensis, Ephedra *spp.*, Armeniaca *spp.*, Atractylodesmacrocephala, Forsythia suspensa, and Pogostemon cablin[36].

The hype around the role of climatic factors in the spread of COVID-19

Hypothetical conclusions were derived from the new observations from the University of Maryland. According to their findings, the meteorological parameters like temperature, humidity, latitude, and longitude have their role in the spread of the coronaviruses COVID-19[38].Scientists were of the opinion that the spread of COVID-19 happened in those regions whose latitude, temperature, and humidity were similar[39]. They studied the major outbreak of COVID-19 in some of the countries like China, Iran, Japan, South Korea, Italy, and Washington State[39].

The temperature between 41 & 52degree Fahrenheit or 5 and 11 degrees Celsius and humidity ranging from 47 to 79% favors the spread of the COVID-19[38]. Many reports have suggested that an increase in the range of temperature slows down the spread of corona virus[40]. The meteorological parameters like temperature, humidity, wind velocity, and visibility are significant in the spread of the corona virus[41]. The epidemic models on the meteorological data of cities from countries like China, Italy, and Japan lead to the conclusion that such types of models cannot lead to a final prediction of an outbreak of corona viruses[42]. More studies need to be conducted regarding the spread of COVID-19; also on the evolution of such viruses to predict its epidemiological impact[40]. We all need to come together to fight it out, and also we need to chalk out the ways to prevent future pandemics too.

Conclusion

The status of COVID-19 all over the world is pandemic. The plants which contain secondary metabolites are medicinally important. Plants can tackle the various types of diseases, on the basis of all these secondary metabolites. The present review article deals with the utility of plants in tackling COVID-19. After referring to a number of research papers on COVID-19, it can be concluded that plants are the best source of medicine against COVID-19 with fewer chances of side effects. Plants over the globe contain certain phytochemicals that have their action on the cell membrane of coronavirus, facilitates the killing of its components and compositions of DNA. This would lead to the death of COVID-19. The epidemic models on the meteorological data of cities from countries like China, Italy, and Japan lead to the conclusion that such types of models cannot lead to a final prediction of an outbreak of coronaviruses. More studies need to be conducted regarding the spread of COVID-19 and also on the evolution of such viruses to predict its epidemiological impact. We all need to come together to fight it out, and also we need to chalk out the ways to prevent future pandemics too.

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