

Research Article

Exploring Nature for Antidote for Corona Viruses

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Abstract

Corona virus are known for their crown like morphology. Corona virus is a group of different form of virus that cause mild to severe respiratory diseases; the latest type of this group is known as Covid-19. Since its outbreak and then becoming world pandemic, intense research has been done for development of vaccine, interferon type therapies and drugs, to cure this pandemic which has claimed a lot lives. The natural pharmacopeia is treasure for searching plants and herbs for possible remedy. This commentary aims to highlight some plants as potential antidote for ailments caused by Corona viruses.

Keywords: Natural supplements; Corona Virus; Herbs; Antidote; Covid-19

Introduction

Inspired by Corona virus's appearance under microscope, the virus's halo-like structure inspired scientists to name it as Corona. Corona viruses belong to the family Coronaviridae and are characterized by presence of club-shaped glycoprotein spikes in the envelope which give corona its coronal, appearance. The coronavirus genome consists of a single strand of positive-sense RNA. The nucleocapsid of these viruses is either helical or tubular. Depending upon the morphology of nucleocapsid, the corona viruses are divided into two genera, Coronavirus and Torovirus; former has helical capsid and later has tubular one.

Known for their ability to cause mild to moderate respiratory disorders in human, seven (07) various type of corona virus have been discovered; the first one been discovered in mid-1960s. each of these types can be further classified into one of the four sub-groups known as alpha, beta, gamma and delta. People around the world commonly get infected with human coronaviruses 229E, NL63, OC43, and HKU1. Sometimes coronaviruses that infect animals can evolve and become a new human coronavirus. Three recent examples of this are 2019-nCoV, SARS-CoV, and MERS-CoV. Figure 1 represents phylogenetic relationship between different forms of corona viruses.

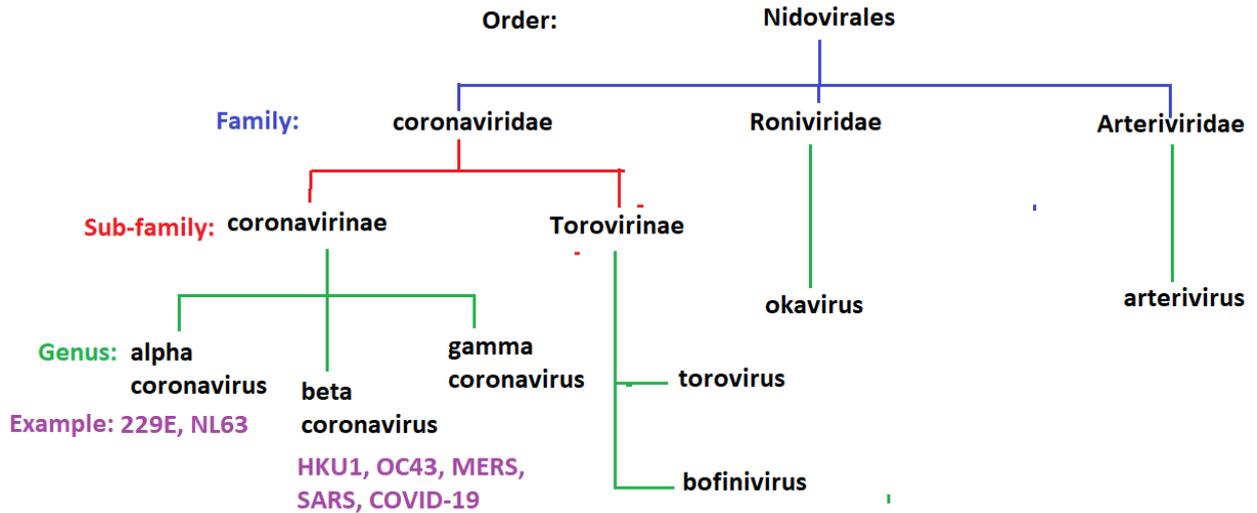


Figure 1: Phylogenetic relationship between different forms of corona viruses.

Intensive research is going on to understand the mechanism how these viruses infect cells, cause disease and how these can be detected,

prevented and cured. These seven types of coronavirus are tabulated as table 1:

| Sr No | Type | Genome size | origin | Genus | Subgenus | Morbidity |
|-------|--|-------------------|--------------------|-----------------------|---|-------------------------------|
| 1 | 229E | 273 kb | 1966 | alpha coronavirus | Duvinacovirus | 25% (crude 30-day mortality) |
| 2 | NL63 | 28 kb | 1967 | alpha coronavirus | Setracovirus | 9.60% |
| 3 | OC43 | 30.7 kb | 1967 | beta coronavirus | Embecorona virus, specie: HCOV-HKU1, subspecie: HKU1-OC43 | 9.1% (crude 30-day mortality) |
| 4 | HKU1 | 29926 nucleotides | 2004 | beta coronavirus | Embecorona virus, specie: HCOV-HKU1 | - |
| 5 | MERS-CoV (MERS: Middle East Respiratory Syndrome) | 30.1 kb | 2012, Saudi Arabia | the beta coronavirus, | Merbecovirus; specie: MERS-CoV | 36 |
| 6 | SARS-CoV (SARS: severe acute respiratory syndrome) | 29.7 kb | 2002, China | beta coronavirus, | Serbecovirus | 774 |
| 7 | SARS-CoV-2 (aka COVID-19) | 29.9 kb | 2019, China | Novel coronavirus | Serbecovirus | 3.0 million |

Table 1: A comparison of various types of coronavirus.

Mechanism of action of Corona virus

The genome of corona virus consists of nearly 30000 nucleotides which code for four type of structure proteins:

Nucleocapsid (NC) protein: Nuclear capsid (NC-protein) of the corona viruses is enclosed in capsid (a protein shell). The N-terminal of the NC-protein which binds to genome (RNA) of virus is responsible for viral replication, replication and also for hijacking the human cell and turning them into virus manufacturing sites. Therefore, the mechanism of action of a drug effective against corona virus may involve blockage of N-terminus of NC-protein to prevent its binding with viral RNA.

Membrane (M) protein: M-protein is found profusely on virus surface and is responsible for integrity of corona virus.

Spike (S) protein: S-Protein is assimilated over virus surface is responsible for attachment of virus to host cell receptors and also catalyzes the fusion of host and viral cell membranes and entry of virus into host cell (Kirchdoerfer, et al. 2016).

Envelop (E) protein and several non-structural proteins (nsp): The E-protein plays an important role in virus assembly, membrane permeability of the host cell and virus-host cell interaction (Gupta, et al. 2020).

Hemagglutinin-esterase glycoprotein (HE): HE is a structural protein present only in beta corona viruses OC43 and HKU1. These proteins enhance uptake of viruses by the mucosal cells.

Various studies have revealed that the S-protein of the corona virus are made of glycoproteins of 3 identical chains, each with 1273 amino acids. These spikes have S1 and S2 subunits which are associated with cell recognition and fusion of cell membrane of virus and host. The mechanism of fusion of cell membrane still remains to be characterized [1,2].

The virus enters into the host cell once coronavirus spike (S) protein attaches to

angiotensin converting enzyme 2 (ACE2) receptors that is found on the surface of many human cells, including those in the lungs. host proteases enzymes cleave coronavirus S protein at two sites between subunit S1 and S2 which leads to activation of membrane fusion mechanism [3]. Finally, the viral genetic material is fully released into the cytoplasm where process of replication and transcription processes take place via formation of replication/transcription complex (RTC) made of non-structural proteins (nsp). As a result of these processes new nucleocapsids and structural viral proteins, M, S and E are synthesized in the cytoplasm and ultimately new virions are disseminated from infected cells so that these can infect other cells.

A morphological comparison of corona and toro virus indicates that both types of virus have a lipid membrane, prominent 20 nm spike proteins (S) and an integral membrane protein (M). the purpose of spikes of corona and toro viruses is to mediate binding of virus to a specific glycoprotein receptor on the cell surface of host cell. HE is a nonessential protein that serve as initial or additional binding molecule the same protein assists in removal of the virus when attached to no susceptible cells or aiding in virus release. all beta coronaviruses, and some toroviruses, have an HE protein that forms a layer of 7 nm spikes. The envelope (E) protein is the smallest and least well-characterized of the four major structural proteins found in coronavirus virions. It is an integral membrane protein less than 110 amino acid residues long. Coronaviruses, but not toroviruses, contain a small number of molecules of an E protein. Sometimes, the plasma cells create abnormal proteins. These abnormal proteins are called M proteins, or monoclonal proteins. Cryoelectron microscopy has indicated the presence of a core structure in coronaviruses, comprising a nucleocapsid (NC: N protein plus genomic RNA) and the carboxyterminal endodomain of the M protein (M). The nucleocapsid of corona viruses is in

form of a ring whereas that of toroviruses has the appearance of a torus [4].

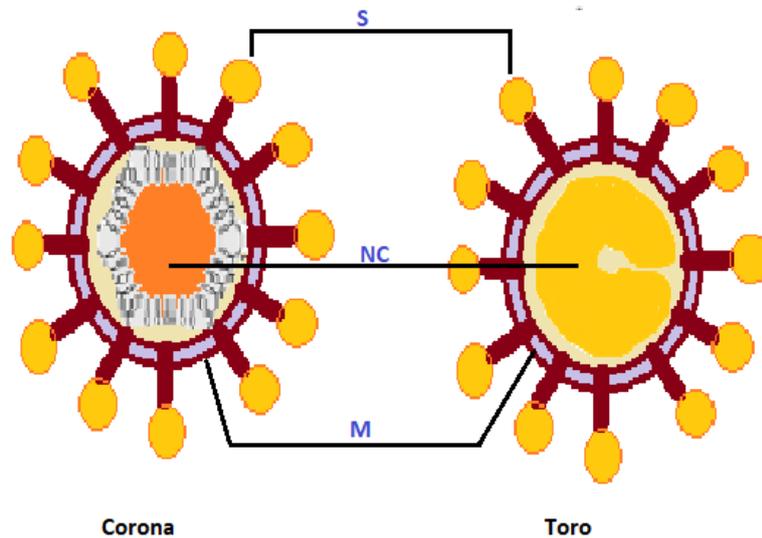


Figure 1: Generalized representation of corona and toroviruses.

Remedy of Corona Virus and Nature

From the ancient times, the role of natural plants and their derivatives for an effective disease management therapy has been recognized and with the passage of time, the significance of natural products and phytochemicals has increased and gained attention all around the world [5,6]. Earlier before the advent of antibiotics natural products were used [7-9]. Thus, the role of herbal medicine is not only recognized or significant for single disease management but for the management of plethora of all illness including for acute and chronic disease cases. Also, phytochemicals with their bioactive components are also effective against a number of viral pathogens such as influenza virus, dengue virus, measles virus, hepatitis B, C virus, HIV, enterovirus, corona virus and many more [10].

Medicinal herbs have been discovered and used in traditional medicine medical practices since prehistoric times. Plants synthesize hundreds of chemical compounds for functions including defense against insects, fungi, diseases, and herbivorous mammals. Numerous

phytochemicals with potential or established biological activity have been identified. But the phytochemical content and pharmacological actions (if any) of many plants having medicinal potentials remain unassessed by scientific research to define efficacy and safety [11].

One major pattern that seems to be common to all corona viruses is that all causes symptoms related to cold and these symptoms are exacerbated in people with compromised immunity. Other symptoms include asthenia, myalgia, dyspnea, fever, cough (usually dry), pneumonia and thrombo-cytopenia,^{12,13} dysquesia, anosmia, fatigue and rapid heartbeat inclusive. Nature is quite rich in serving as source of potential remedy for a number of physiological disorders. Although the advancement in Science and Technology is touching new horizons, but still nature has its own importance and we seek nature for sudden outbreaks even in this era. Here, the role of nature in treating symptoms of Covid-19 will be discussed.

Number of beneficial herbs which effective for covid-19 include: *Pericarpium citri reticulatae*,

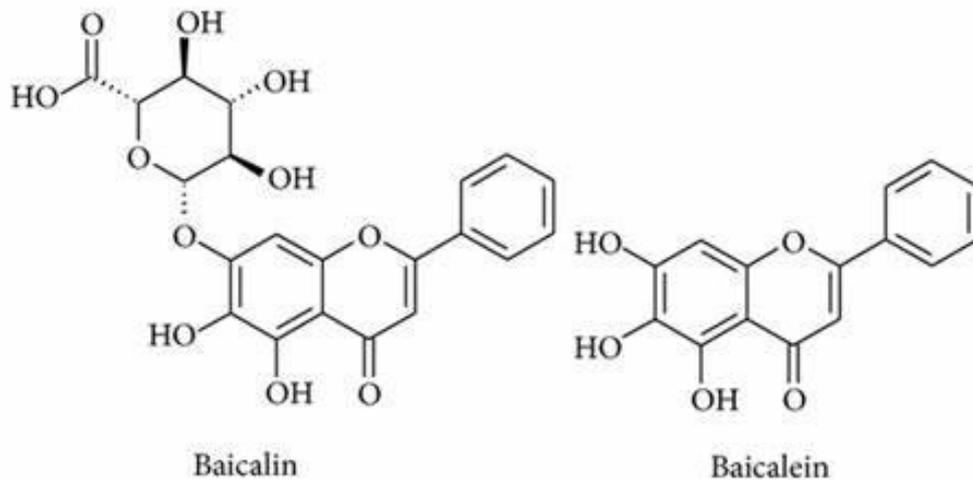
Herba pogostemonis, Rhizome dioscoreae, Rhizome asari radix, Belamcandae, immaturus Aurantia fructus, Radix et rhizome asteris, Rhizome zingiberis recens, Radix bupleuri, Reticulatae citri, Fructus aurantii Pericarpium, decoction of gancao-ganjiang, decoction of Qingfeipaidu, fuzhengrecette qingfeitouxie, decoction of Sheganmahuang and Fibrosum polyporus gypsum are effective against coronavirus [14,15].

Natural products such as like Rein scutella, Myricetin and flavonoids have also been found to have good anti-viral properties [16] while methoxide-crypto pleurine, homo-harringtonine, silvestrol, ouabain, lycorine and tylophorine are reported to have potential to manage the COVID-19 viral infection [17].

Plant extracts are thought to be effective for the management with possible cure for corona virus infection [18-20]. These in combination with supplements such as vitamin c, zinc, elderberry (botanically known as Nigra sambucus), medicinal mushroom (also effective), licorice, Sidoides pelargonium,

vitamin b complex, andrographis, garlic, selenium, astragalus, curcumin, propolis & echinacea are thought to be essential for boosting the immunity [21]. Moreover, Vitamin C and D are thought to be very effective against viral infection, reducing the chances of corona virus infection. From recent research, it was confirmed that, taking vitamin D orally reduces the chances of influenza and corona virus infection [22].

Other several important herbs, which have shown effectiveness against this virus includes: Baicalensis scutellaria (also known as skull-cap Chinese), Ginseng panax, Lucidum ganoderma, Zeylanica plumbago, Purpurea echinacea, bran white, alba lawsonia, aloe vera, velvet leaf, membranaceus astragalus and gigas angelica [23]. Also, along this line are; Lamba scythian, spider red lily, liquorice Chinese & and mahogany Chinese. Two important plant derived component baicalin and baicalein are found to be good inhibitors of corona virus [24-26].



Some common herbs (eg liquorice, cumin black, and garlic) which have shown significant pharmacological activities such as; anti-oxidant, anti-viral, anti-inflammatory, to enhance body immunity and to also improves gut problems. A number of traditional Chinese medicine may have played some significant role for the cure of corona virus. One of the

important Chinese medicinal formula Lianhua qingwen has been found to suppress the moderate symptoms of Covid-19 patients [27]. Some other plants including: Purpura echinacea [28,29], astragalus [30] have shown good potency and effective control against this disease [31]. The table 1 show depicts supplements of plants origin with good

response to corona virus infection, and hence and an antidote to infections due to COVID-19 exposure.

| Natural plants their extract component& supplement | Inhibit coronavirus |
|--|---|
| Radiata lycoris | SARS ³² |
| Annuna artemisa | SARS ³² |
| Lingua pyrrosia | SARS ³² |
| Aggregate lintera | SARS ³² |
| Indigotica Isotis | SARS ³² |
| Multiflorum polygonum | Inhibit severe acute respiratory syndrome coronavirus protein spike ³² |
| Cordata houttuynia | SARS ³² |
| Emodin aloe (Indigotica Isatis) | SARS ³² |
| Flavoneamento (Nucifera torreya) | SARS ³² |
| Apigenin (Nucifera torreya) | SARS ³² |
| Bava-chinin (Corylifolia psoralea) | SARS ³² |
| Sitosterolbeta (Indigotica Isatis) | SARS ³² |
| Berbamine | SARS ³² |
| Betulonic acid | SARS ³² |
| Betulinic acid | SARS ³² |
| Ethanol extract of Sambucus javanica subsp. chinensis (major phytochemicals: caffeic, chlorogenic, and gallic acid) | NL63 ³³ |
| Extracts of Cibotium barometz (L.) J.Sm. rhizome | SARS ³⁴ |
| Extracts of rhizomes of Gentiana scabra Bunge | SARS ³⁴ |
| Extracts of tuber of Dioscorea polystachya Turcz | SARS ³⁴ |
| Extracts of seed of Senna tora (L.) Roxb | SARS ³⁴ |
| Extracts of stem and leaves of Taxillus chinensis (DC.) Danser | SARS ³⁴ |
| Berberis integerrima Bunge | Covid-19 ³⁵ |
| Crataegus laevigata (Poir.) DC (active phytochemical: Onopordum acanthium L., and Quercus infectoria) | Covid-19 ³⁵ |
| Extract of Tribulus terrestris L. fruits (Active phytochemical: N-trans-Feruloyloctopamine, N-trans-Coumaroyltyramine, N-trans-Caffeoyltryamine, Terrestrimine, N-trans-Feruloyltryamine, and Terrestramide) | SARS ³⁶ |
| Cordata houttuynia | Covid-19 ³⁷ |

| | |
|----------------------|------------------------|
| Sidoides pelargonium | Covid-19 ³⁷ |
|----------------------|------------------------|

Table 2: Natural plants and supplements for corona virus.

Michaelis , Doerr, et al. (2011) demonstrated that phyto-chemicals show some inhibitory effects at early stage of COVID by inhibiting the replication, penetration and absorption [38]. Moreover, various medicinal herbs that could be targeted against covid-19 as there their bioactive components are thought to work via mechanistic processes that include inhibiting the replication process and can also stimulate the process of mediated cell immunity against several viruses [37]. The extract of *Glabra glycyrrhiza* (licorice) [39] and black seeds (*Sativa nigella*) [40], are known shown to be effective against severe acute respiratory syndrome for which coronavirus have been implicated [41,42] Other important plants with potential to act as anti-COVID-19 herbs are: *Annua artemisia*, *Radiata lycoris*, *Lingua pyrrosia* and *Aggregate lintera* [43].

Although the number of reports on use of herbs and plants / phytochemicals as potential remedy of Covid-19 is quite large, more efforts are needed in this area to explore the nature and help mankind in this pandemic.

Conclusion

Nature is very rich and we turn to it to find solution to our problems; and in one way or the other nature gives us a way through. In search of remedy for the Covid-19, exploring nature has indeed yielded some promising results which are worth exploring. More research is needed to check the active ingredient in various plants that have been found effective against this infectious disease which has claimed a large number of human lives.

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