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Some home remedies used for treatment of COVID-19 in Bangladesh

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Abstract

Corona virus SARS-CoV-2, otherwise known as COVID-19 has since its outbreak in late December 2019, till as of June 23, 2020 has infected 9,162,375 people throughout the world and caused deaths of 473,087 persons. The Bangladesh statistics for COVID-19 are 122,660 infections and 1,582 deaths. Although the figures seem low for Bangladesh, it can surge anytime because of the high density of the population and limited practice of social distancing. Moreover, treatment of COVID-19 is costly and proper medical services not adequately available in rural areas of the country. As a result, many people who cannot afford to visit modern doctors rely on home remedies/folk medicine for treatment. In this article, we report several such cases of home remedies where the patient got cured with or without use of other types of treatment. Since most home remedies utilized plant(s), the possible significance of the phytochemicals in the plant(s) are discussed.

Keywords: Corona virus, COVID-19, C3-like protease, home remedies, medicinal plants

Introduction

Human corona viruses (HCoVs) are associated with multiple respiratory diseases, which may vary widely in severity. Up till now seven HCoVs have been identified, HCoV-229E, HCoV-NL63, HCoV-OC43, HCoV-HKU1, severe acute respiratory syndrome coronavirus (SARS-CoV), Middle East respiratory syndrome coronavirus (MERS-CoV) [1], and the latest emerging in Wuhan, China in December 2019 and named SARS-CoV-2 or COVID-19. COVID-19 has caused a global pandemic and has disrupted the global economy in a serious manner not seen since the Second World War. Corona virus SARS-CoV-2, otherwise known as COVID-19 has since its outbreak in late December 2019, till as of June 23, 2020 has infected 9,162,375 people throughout the world and caused deaths of 473,087 persons. The Bangladesh statistics for COVID-19 are 122,660 infections and 1,582 deaths.

The figures might seem low for Bangladesh with a population surpassing 160 million people and a small area of 55,000 square miles, leaving very little scope for practicing social distancing and other measures to reduce COVID-19 instances. Yet, treatment of this virus induced disease and other accompanying complications can be high and beyond the ability of the average person in Bangladesh. On top of it, although most viral cases lead to recovery, this is not guaranteed and proper medical facilities may not be available to the rural and remote area populations. This has led people to use other forms of medication besides allopathic medicines, more so, because allopathic medicine has no drug or vaccines to treat COVID-19.

The World Health Organization (WHO) supports the use of scientifically proven traditional medicines to treat COVID-19 [2]. Medicinal plants such as *Artemisia annua* are being considered as possible treatments for COVID-19 in Africa. Among medicinal herbal extracts assayed, *Cimicifuga rhizoma*, *Melaleuca cortex*, *Coptidis rhizoma*, *Phellodendron cortex* and *Sephorasubstrata radix* (Traditional Chinese Medicine plants or plant parts) may prove useful in treatment of COVID-19 [3]. Antiviral natural products against COVID-19 have been reviewed [4].

Traditional herbal remedies may help enhance a person's immunity and keep in check the symptoms of COVID-19, according to the Alternative Medical Care Department of the Directorate General of Health Services. According to bdnews24.com, in a statement in April, the Department suggested consuming warm water with ginger and clove extracts, black cumin seeds, honey and fruits with vitamin C to keep the symptoms at bay [5]. Garlic, turmeric, ginger, cinnamon, black pepper and honey are being reported to be used in Pakistan as home.

remedies against COVID-19 [6]. Most COVID sicknesses are mild and go away after a few days of rest. However, COVID-19 has created a state of panic among many people, so when infected, any and all sorts of medications are taken.

On the other hand, home remedies do not mean that they have to be necessarily bad or unsafe. Home remedies are a part of folk medicinal tradition, and whether they are good or bad depends on two factors – how long the remedies have been used without any adverse reports, and scientific reports to prove that they are safe and effective. Many modern drugs owe their root to folk medicine, which again arises from widespread use of a particular home remedy. The objective of this study was simply to collect various data on home remedies along with other medications (if any) taken by positively testing COVID-19 patients in several parts of Bangladesh and their outcome.

Methods

COVID-19 patients were brought to the knowledge of the authors through an informal network consisting of friends, neighbors and relatives. They were informally interviewed through cell phone and particularly questioned as to (I) whether they have tested COVID positive, (II) nature of medications they were taking or have taken and whether such medications included home remedies, allopathic medicines, or both, and finally (III) the outcome of their treatment. In this manuscript, any identity of the patients shall not be given, because COVID patients are more than not likely to be shunned by the general people. A map of Bangladesh is given in Figure 1 so that districts can be identified.

The pdb file (6LU7) of the main protease of SARS-CoV-2 3C-like protease or SARS-CoV-2 3CL^{pro} was used in the present study for molecular docking studies with several phytochemicals by AutoDock Vina.

Results and Discussion

Patient 1

Age: 33, male. The patient contracted COVID-19 in Jessore district, quickly had a test done and removed himself for self-isolation in Kushtia district.

Home remedies: *Ocimum sanctum* L. (holy basil) and *Piper nigrum* L. (black pepper) powder combination thrice daily. *Vitex negundo* L. (Chinese chaste tree) powder was taken thrice daily during the fasting month of Ramadan (first seven days of isolation) and four times a day after the end of Ramadan. Dried whole plants were powdered; the powder was soaked in water for 2-3 hours and the water taken orally. *Nigella sativa* L. (black cumin) seeds were taken every morning after Ramadan. Slices of rhizomes of *Zingiber officinale* Roscoe (ginger) and juice of *Citrus limon* (L.) Burm. (lemon) were taken several times daily. 3-4 cups of regular tea were taken daily. *Citrullus lanatus* Thunb. (watermelon) fruit slices were taken daily.

Other medications: Arsenicum Album-30 (homeopathic medication) at a dose of 2 drops every morning for 5 days (started on the fourth day following isolation). Two tablets of Ivermectin (6 mg each) were taken daily from isolation day 8. The patient can be considered a unique patient in that he tried allopathic, homeopathic and home remedies simultaneously apparently without any ill effect and now is completely cured.

Patient 2

Age: 27, male. The patient contracted COVID-19 in Jessore district, quickly had a test done and removed himself for self-isolation in Rangpur district.

Home remedies: *Ocimum sanctum* L. (holy basil) and *Piper nigrum* L. (black pepper) powder combination taken daily. *Vitex negundo* L. (Chinese chaste tree) powder was taken with tea daily.

Other medications: Ivermectin (6 mg each tablet) was taken daily.

Patient 3

Age: 36, male. The patient contracted COVID-19 in Dhaka district, and following positive test self-isolated at home in Dhaka city.

Home remedies: Leaf juice of *Ocimum sanctum* and *Vitex negundo*, lemon (*Citrus limon*) juice, sliced rhizomes of ginger (*Zingiber officinale*), tea, seeds of *Nigella sativa*, honey. Lemon juice was also added to semi-hot water and the vapor inhaled.

Other medications: Ivermectin (6 mg each tablet) was taken daily. The patient also took Vitamin D capsules.

Ivermectin (structure shown in Figure 2) has been shown to inhibit replication of SARS-CoV-2 or COVID-19 *in vitro* [7]. The Ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), India, have suggested the use of Arsenicum Album-30 for its possible role in preventing COVID-19 infection [8], but as should be noted, not for cure. It is very much possible that in this case, allopathic or homeopathic drug(s) taken were of limited significance, if any, because thus far no anti-COVID-19 drugs or vaccines have been reported, which has FDA approval. That leaves two possibilities; either the patient got cured with his own stamina, or his cure was expedited by the herbal substances he was taking.

Components of *Ocimum sanctum* like eugenol, linalool, apigenin, and ursolic acid have been reported to show antiviral activity against Hematopoietic Necrosis virus, polio virus type 3, herpes virus, hepatitis B virus, New Castle Disease virus, and adenoviruses. The antiviral activity of the plant has been reviewed [9]. Thus the possibility of these or other components of the plant to inhibit COVID-19 is a real possibility. The plant is effective against coughs, cold and flu and has been used as such in Ayurveda for possibly thousands of years. The plant is also used in Ayurveda against fever [10]. As a result the plant can prove useful in providing symptomatic relief against COVID-19.

The fruits of *Piper nigrum* are used to treat asthma, sinus and fever. It also helps chronic indigestion [11]. Chloroform extract of seeds showed antiviral activity against Vesicular stomatitis Indiana virus and Human para influenza virus in HeLa cell line [12]. Piperamides present in the seeds of the plant have been shown to be responsible for the antiviral activity against Coxsackie virus Type B3 [13]. Leaf extract of *Vitex negundo* has been shown to inhibit the Asian strain of Chikungunya virus [14]. Besides being active against asthma, cough, bronchitis, headache, fever, and influenza, the seeds of *Nigella sativa* reportedly showed antiviral activity against murine cytomegalo virus infection, avian influenza (H9N2), Chistosoma Mansonii Infection, PPR (Peste des petits ruminants) virus, Broad bean mosaic virus, HIV (human immunodeficiency virus), Hepatitis C Virus, Zucchini Yellow Mosaic Virus, and Papaya Ring Spot Virus (reviewed in [15]). Extract of rhizomes of *Zingiber officinale* (ginger) reportedly blocked viral attachment and internalization of human respiratory syncytial virus (HRSV) with human cell lines *in vitro* [16]. Ginger and its bioactive compounds have bronchodilatory activity and have been used for asthma [17, 18]. Ginger is also known to contain the flavonoid quercetin,

which has shown *in silico* potential to bind with the active catalytic site of the main protease (3CL_{pro}) of SARS-CoV and SARS-CoV-2 [19]. Molecular docking of quercetin to the main protease of SARS-CoV-2 is shown in Figure 3 (docking study done by the authors). *Citrus limon* also contains flavonoids like hesperidin and eriocitrin (structures shown in Figure 4) [20]. Although these flavonoids are yet to be studied, they may have antiviral properties. And finally, though nothing antiviral has been reported of *Citrullus lanatus*, consumption of the fruit is advised by doctors to avoid dehydration and as a febrifuge [21]. Molecular docking and binding energies of hesperidin and eriocitrin to the main protease of SARS-CoV-2 are shown in Figures 5 and 6 and the two compounds show high binding affinities to the protease.

Several studies have reported antiviral effects of Ivermectin (Figure 2) on RNA viruses such as Zika, dengue, yellow fever, West Nile, Hendra, Newcastle, Venezuelan equine encephalitis, chikungunya, Semliki Forest, Sindbis, Avian influenza A, Porcine Reproductive and Respiratory Syndrome, Human immunodeficiency virus type 1, and severe acute respiratory syndrome coronavirus 2. Ivermectin is also reportedly active against some DNA viruses [22]. There are some promising results of Ivermectin on COVID-19 patients. The compound was originally approved for treatment of some roundworm parasitic infections. Headache, dizziness, muscle pain, nausea, or diarrhea may occur on taking the drug. From that view point, herbal medications without side-effects are a better choice further

taking into mind that Ivermectin is not suitable for all patients with COVID-19.

Leaving aside Ivermectin, the two main plants that appear to be effective against COVID-19 are *Ocimum sanctum* and *Vitex negundo*. *Piper nigrum* and *Nigella sativa* are taken in only small amounts; there are multiple adverse effects of the two spices in large doses. However, *Citrus limon* and *Zingiber officinale* can also be of importance, but it is to be noted that these two latter plant juice or rhizomes were not taken by Patient 2. That leaves *Ocimum sanctum* and *Vitex negundo* as the main plants.

What is interesting and of importance in the present study is the possibility that traditional method(s) of treatment of coughs, fever, diarrhea, and respiratory problems with medicinal plants can not only give symptomatic relief in COVID-19, but as shown in the molecular docking studies can be of importance in binding to the main protease and possibly inhibiting COVID-19 virus itself. It may be noted in this regard, that the current antimalarial drug artemisinin was discovered from *Artemisia annua*, a plant in ancient Chinese herbal remedy for relapsing fever [23]. Thus an antimalarial drug was discovered from what was a treatment of a malaria symptom, namely fever. Thus appropriate scientific analysis and studies can result in discovery of therapeutics against COVID-19 from plants used in home remedies. The home remedies of the three patients had quite a few things in common, which suggests that the remedies worked (at least according to the patients since all of them got cured).

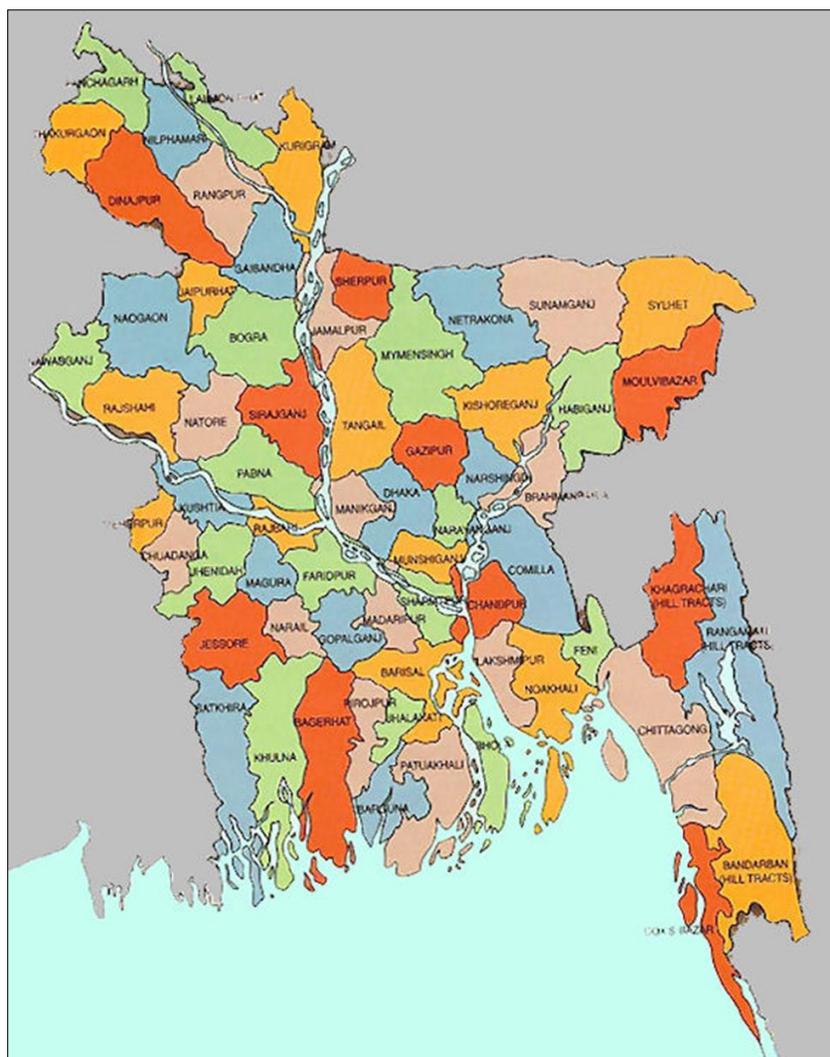


Fig 1: Map of Bangladesh showing the various districts.

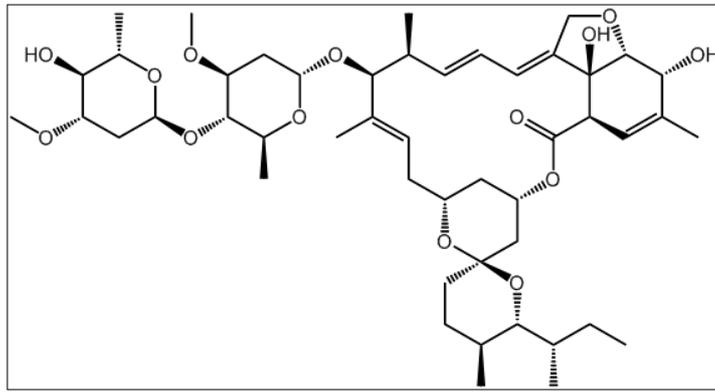


Fig 2: Structure of Ivermectin.

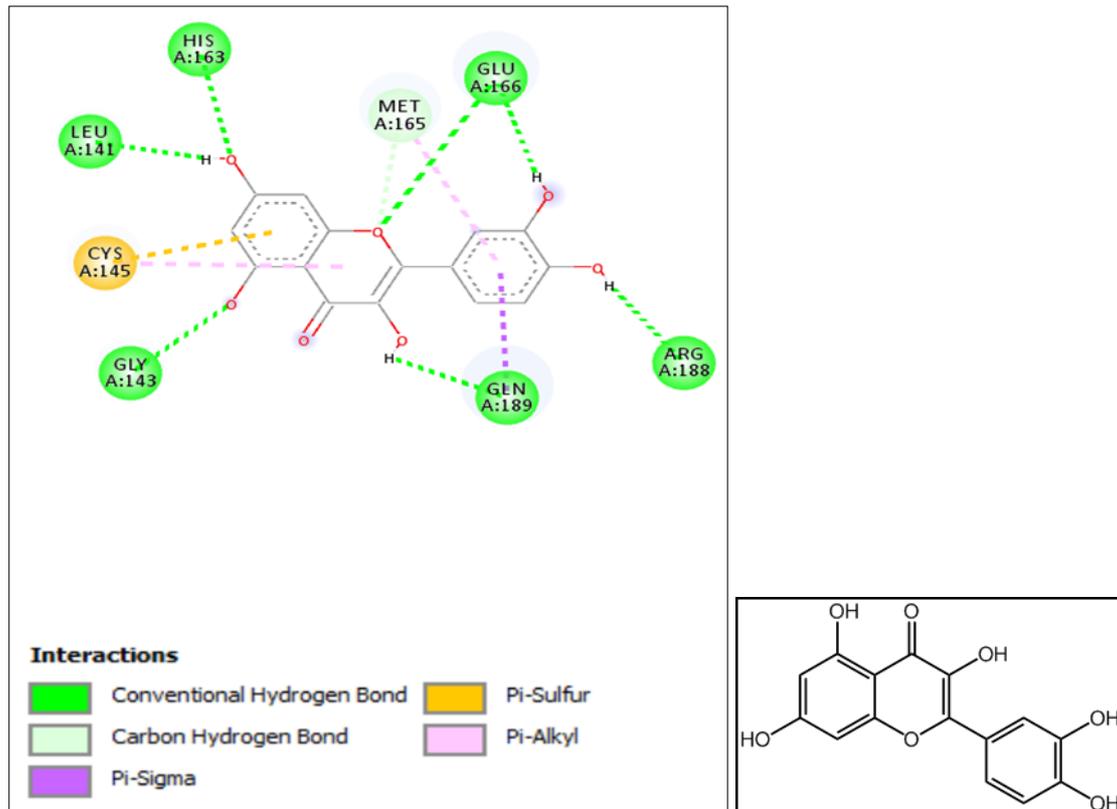


Fig 3: Binding of quercetin (structure shown at right) to main protease (3CL^{PRO}) of SARS-CoV-2 (shown in the left of the Figure, binding energy, $\Delta G = -7.4$ kcal/mol). The SARS-CoV-2 main protease has two domains. The upper domain is the catalytic domain and contains two key catalytic residues His41 and Cys145. It can be seen from the Figure that quercetin interacts with Cys145 making it a potential inhibitor of the protease.

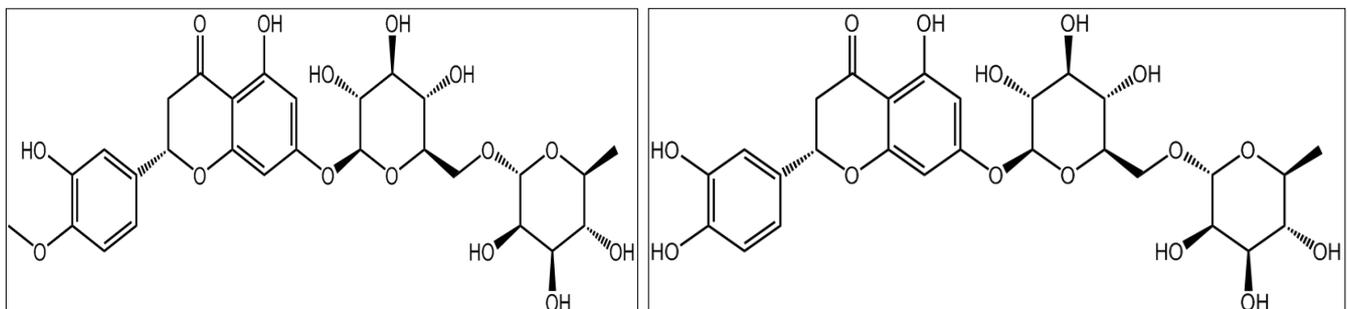


Fig 4: Structure of hesperidin (top) and eriocitrin (bottom). Both compounds are present in *Citrus limon*.

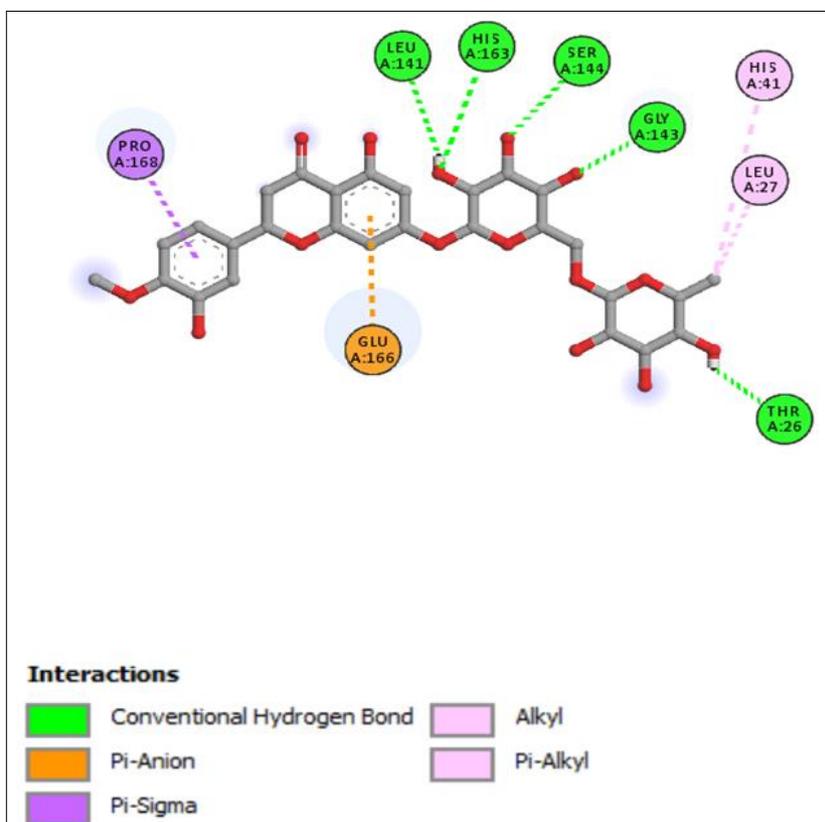


Fig 5: Binding of hesperidin (structure shown in Figure 4) to main protease (3CL^{pro}) of SARS-CoV-2 (binding energy, $\Delta G = -8.3$ kcal/mol). It can be seen from the Figure that hesperidin interacts strongly with the protease. Among other amino acids, hesperidin interacts with His41.

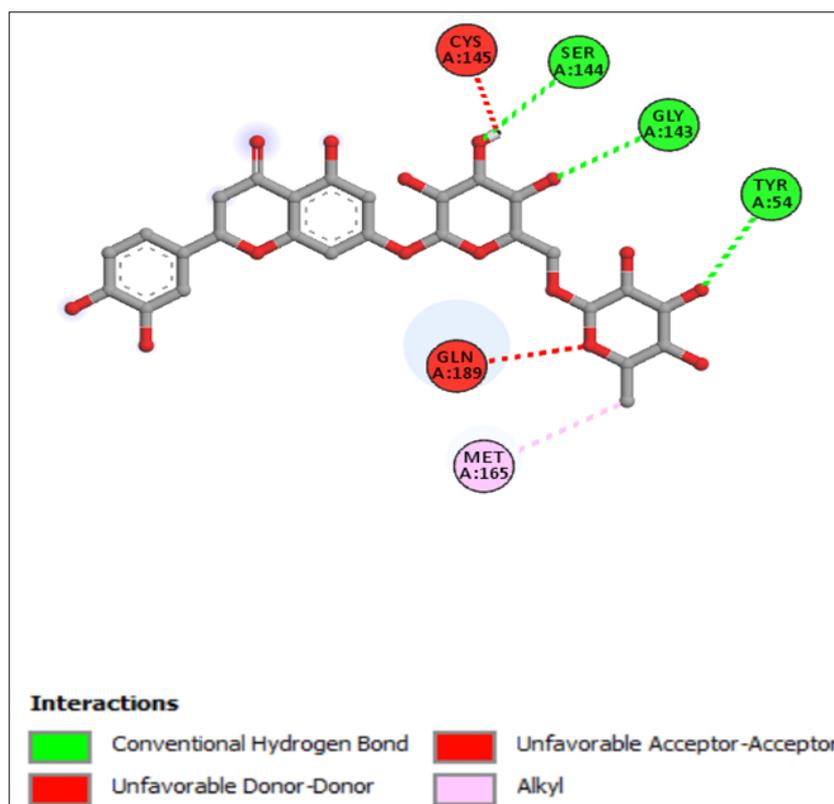


Fig 6: Binding of eriocitrin (structure shown in Figure 4) to main protease (3CL^{pro}) of SARS-CoV-2 (binding energy, $\Delta G = -8.4$ kcal/mol). It can be seen from the Figure that eriocitrin interacts strongly with the protease. Interacting amino acids of the protease with eriocitrin include Cys145.

Conclusion

COVID-19 has become a pandemic and has disrupted the daily life and economic stability of billions of people throughout the world. Thus far, there has been no discovery of drugs or vaccines able to cure or prevent COVID-19. In this

aspect, home remedies used in Bangladesh (and elsewhere) can be promising, because these age old treatments can be of use in at least alleviating COVID-19 symptoms and may prevent or cure the viral disease itself.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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