



Medicinal Plants with Antiviral Properties to Tackle Covid-19 Pandemic: A Short-Review

Sadeek AM and Abdallah EM*

Department of Laboratory Sciences, College of Science and Arts at Al Rass, Qassim University, Saudi Arabia

*Corresponding author: Abdallah EM, Department of Laboratory Sciences, College of Science and Arts at Al Rass, Qassim University, Saudi Arabia; Email: emad100sdl@yahoo.com

Abstract

The dramatic spread of the new coronavirus (SARS-CoV-2) abbreviated as COVID-19 is considered the worst disaster for humanity in the 21st century. Extensive reports have been published since this pandemic was announced in December 2019. Regardless of the effectiveness of some vaccines that have been appeared the human body can be supported with some bioactive natural products and medicinal plants that may combat this coronavirus, reduce its deadly risks and even provide complete treatment. The future endeavors face many challenges as medicinal plant drug discovery has historically taken slower and more complex than most synthetic or chemical drugs. Therefore, faster and better methodologies must be employed. Interestingly, phytochemical molecules of antiviral activity extracted from medicinal plants have been reported as possible therapeutic agents in the treatment of COVID-19 disease, thereby warranting further comprehensive investigation. The current short-review aimed to highlight some medicinal plants of potential antiviral activity for extensive studies against SARS-CoV-2 virus causing COVID-19 disease and called to revisit and retrieve the interest in medicinal plants as possible anti-covid-19 agents and as a potential renewable source for antiviral drugs.

Keywords: Coronavirus; Covid-19; SARS-CoV-2; Medicinal plants

Introduction

At the beginning of the year 2020, the world faced a health catastrophe that had not been seen in centuries, named the Covid-19 pandemic. This epidemic has changed people's lifestyle all over the globe; social distancing, use of gloves, masks, and hand sanitizer have become daily human behaviors, millions of people have been put on lockdown, flights and transportation have been closed, and economic activities have been stopped which causes extensive job losses there is a direct loss to the world economy [1,2]. To date, more than 2,317,162 people have died across the world and the number of global positive cases overflow 106 million; it is anticipated that cases would rise gradually, at least in the coming months [3]. All of this helps one consider a serious question, which is: Have we mishandled or misjudge this pandemic. To answer this substantial question, we must first clarify the unsuccessful measures that have been introduced and

have no scientific basis, and have proven to be ineffective [4]. Summarized them into five measures:

1. The air disinfection of cities and communities,
2. The excessive usage of personal protective equipment,
3. The blind practice of blocking life activities and lockdown of cities and villages,
4. The spread of misinformation that leads to the expansion of panic, anxiety, and fear.
5. Growing and circulating the concept that there is no effective cure or drug to tackle Covid-19.

The author believes that the fifth misleading measure must be resisted with extensive scientific research on the possible sources for antiviral-remedies, Parallel to the efforts made to create effective vaccines. Medicinal plants and natural products were the largest renewable source of medication since ancient times and still is until now, and numerous plant extracts that exhibited remarkable antiviral activities have been reported in the literature,

Received date: 02 April 2021; **Accepted date:** 14 April 2021; **Published date:** 29 April 2021

Citation: Sadeek AM, Abdallah EM (2021). Medicinal Plants with Antiviral Properties to Tackle Covid-19 Pandemic: A Short-Review. SunText Rev Biotechnol 2(1): 122.

DOI: <https://doi.org/10.51737/2766-5097.2021.022>

Copyright: © 2021 Abdallah EM. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

deserve to be investigated and evaluated against the SARS-Cov-2 virus. The current mini-review aims to highlight and suggest some antiviral medicinal plants for urgent scientific investigations to tackle the Covid-19 pandemic [5].

SARS-Cov-2 Infection and Treatment

The SARS-CoV-2 virus that causing COVID-19 disease was initially reported in Wuhan, China on 30 December 2019, it is a new human coronavirus candidate belongs to the family Coronaviridae; a diverse group of viruses that are mostly zoonotic and rarely infect human, approximately four coronaviruses were known to infect human and causing mild-symptoms of common cold or flu and mostly recovered in a short period without noticeable complications, these four infectious coronaviruses are HCoVOC43, HCoV-229E, HCoV-UKU1, and HCoV-NL63 [6]. Notably, coronaviruses had caused pandemics since the start of the new millennium, two highly pathogenic coronaviruses have emerged, severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002 and Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012 [7, 8]. Although, the last one that appeared at the end of 2019 (SARS-CoV-2) is the most devastating yet. Although the fatality ratio is of SARS-CoV-2 (2.3%) is less than that of previous contagious coronaviruses (SARS-CoV fatality rate = 9.5% and MERS-CoV fatality rate = 34.4% %), and it was estimated that the average mortality rate from covid-19 was 0.66%, in people over 80 years of age rose dramatically to 7.8% and declined to 0.0016% in children aged 9 and under However, the novel coronavirus SARS-CoV-2 (COVID-19) exhibited a higher reproductive number (R_0), which was (2.0–2.5) compared to the R_0 of SARS (1.7–1.9) and the R_0 of MERS (<1) [[9,10]. Regretfully, the number of deaths from COVID-19 is much higher than that of SARS and MERS and the number of confirmed cases is dramatically increasing every day amongst some countries Whatever the case, the With respect to the treatment and prevention, although previous trials have indicated that some antivirals, including oseltamivir, remdesivir, lopinavir/ritonavir, and even chloroquine, have been used for SARS and MERS, so far no adequate clinical trial results are available [11] (Figure 1).

Some scientists believed that we should apply the “One Health” approach in our struggle with COVID-19, which national and global levels for a collective, multisectoral and transdisciplinary approach to achieve optimum health outcomes against the disease (Mushi, 2020). Moreover, Scientists believed that vaccination is one of the most promising options to combat this disease, and accordingly, seven strategies have been explored as vaccines for COVID-19; Inactivated virus vaccines, Virus-like particle or nanoparticle vaccines, Protein subunit vaccines, Virus-vectored vaccines, Live-attenuated virus vaccines, DNA vaccines, and mRNA vaccines [12]. As 2020 draws to a close, the acceptance

by the regulatory FDA of COVID-19 vaccines has raised expectations and ambitions that the pandemic will be eliminated from our world by the end of 2021.

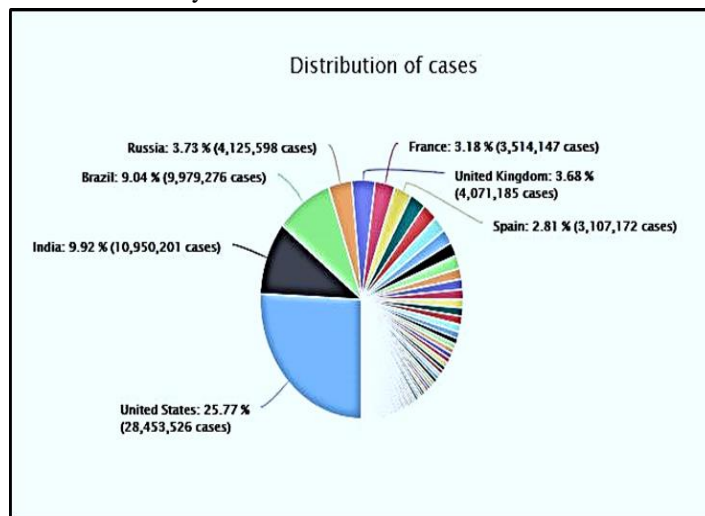


Figure 1: Distribution of COVID-19 cases in top 7 most affected countries.

However, the issue of vaccine production and delivery suggests that could beat the COVID-19 pandemic would be a long-winded marathon whose finish line is still far from being realized [13]. For all these attempts to counter COVID-19, the main source, which is medicinal plants, is ignored for all prescription medicines over the centuries.

Medicinal Plants of Antiviral Activity

It is ironic that plants were the main source of medicines and drugs throughout the ages and ancient civilizations, but they were so far neglected in modern civilization represented by the largest global pharmaceutical companies that turned to synthetic chemical compositions. Whereas, the WHO estimated that more than 80% of Earth's population relied on traditional medicine in their primary health care and that traditional medicine mostly depended on medicinal plants [14]. Since viruses occur before the advent of man on Earth, and man used to treat them with medicinal plants in the ages before Dmitri Ivanovsky discovered them in 1892. It is also clear that certain active compounds that are capable of defending against or destroying viruses can be found in medicinal plants. It is estimated that antiviral plant molecules undergo action by various mechanisms, such as inactivation of virus particles, reduction of endocytic activity, inhibition of viral enzymes and the viral molecular reproduction mechanisms, altering properties of virus capsid, acting as blocking agent during adsorption and penetration of virus on target human cell, inhibition of reverse transcriptase process, inhibition of translational process, decrease in expression level, and inhibiting viral assembly [15]. Interestingly, China, from which the

epidemic began, exceedingly prevailed over the pandemic, so is the reason due to their use of Traditional Chinese Medicine in the treatment of COVID-19. In literature, numerous studies suggested some herbs and plant products as a potential source for antiviral drugs, such plants are strongly recommended for scientific research on SARS-Cov-2 causing COVID-19. In the current study, some plants of interesting antiviral activity are presented in and some important phytochemical molecules of potential antiviral activity are demonstrated in (Figure 2).

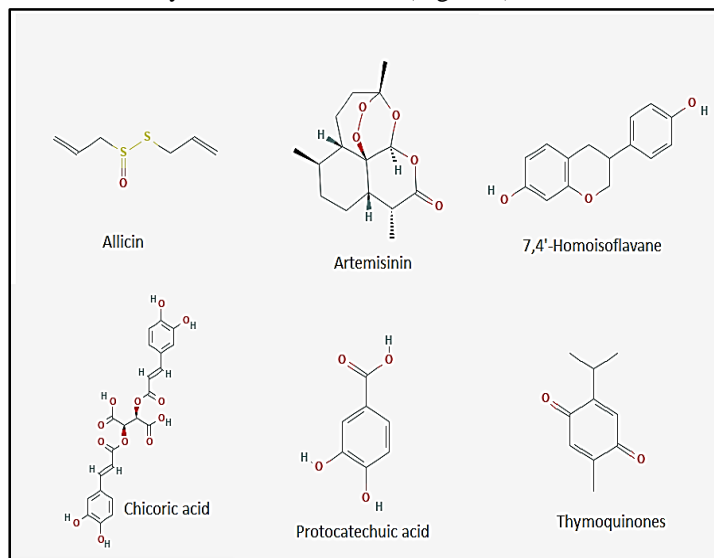


Figure 2: Phytochemical molecules of potential antiviral activity.

Up to 16 plant species were mentioned in, which reported a remarkable antiviral activity, to name but a few. Has published that garlic exhibited good antiviral activity (Table 1) [16]. Since ancient times, garlic is used to treat the common cold, this study showed that some bioactive compounds extracted from garlic such as allicin, diallyl trisulfide, and ajoene have antiviral activity, have examined up to 44 Chinese medicinal herbs against the respiratory syncytial virus (RSV), amongst the twenty-seven herbs that showed various antiviral activity, *Sophora flavescens* Ait [17]. And *Scutellaria baicalensis* Georgi. Recorded the highest antiviral potential and recommended as a promising drug. *Nigella sativa* (Black seed) is a natural product with various pharmacological activities, the essential oil of *Nigella sativa* represented remarkable antiviral potential against avian influenza virus (H9N2) and murine cytomegalovirus infection (MCMV) [18]. Fresh juice (but not dried) of ginger (*Zingiber officinale* Rosc.) exhibited high antiviral activity against human respiratory syncytial virus HRSV-induced, it decreased the numbers of viral plaques *in vitro* and blocked viral attachment and internalization

[19]. Aqueous extract of *Curcuma longa* Linn recorded interested antiviral effects against hepatitis B virus (HBV), it suppressed the production of HBV particles and inhibits HBV replication in HepG 2.2.15 cells [20]. The Purple coneflower (*Echinacea purpurea* L.) is a popular herbal medicine in Europe and North America, consumed as teas, sprays, extracts, and tinctures, ancient native Americans used it for the treatment of respiratory infections, studies reported that it has immunostimulatory effects and antiviral activity against Herpes simplex virus (HSV), influenza viruses, and respiratory syncytial virus (RSV) [21]. Interestingly, After the SARS coronavirus outbreak in 2002, the antiviral potential of *Artemisia annua* was evaluated by some researchers and the results revealed that its ethanolic extract has a high antiviral effect against SARS and recommend it as an effective treatment from SARS [22]. The Heartwood of *Caesalpinia sappan*, commonly known as Sappan wood was found to be active against influenza A virus subtypes H1N1, H3N2, and H9N2 [23]. Pseudorabies virus (PRV) is a causative agent of Aujeszky's disease, a Chinese herb named *Radix isatidis* has been recommended as a potent antiviral against that disease [24]. Leaves *Psidium guajava* of slowed markedly higher anti-influenza activities against clinical influenza A (H1N1) [25]. *Taraxacum officinale*, grown in Mexico, efficiently inhibited the replication of Dengue virus 2 and subsequent biological analysis of the bioactive molecules would be performed to develop therapeutics against Dengue virus 2 (DENV2) [26]. The crude extract of *Capsicum annuum* was active against the Herpes simplex virus and showed low cytotoxicity which can be utilized to treat herpes infection in conjunction with the regular medication [27]. The aqueous extract of a Chinese herb, *Houttuynia cordata* represented significant immunomodulatory and anti-SARS activities and results suggested that this antiviral plant may inhibit the pivotal enzymes which lead to slow down the viral replication process and accordingly trigger negative feedback control in the immune system [28].

The activity of protocatechuic acid extracted from *Hibiscus sabdariffa* was examined against Herpes simplex virus 2 (HSV-2), the protocatechuic acid exhibits potent anti-HSV-2 activity compared to that of acyclovir drug [29]. A Controversial homeopathic drug derived from an Indian plant known as *Arsenicum album* is recommended as an anti-COVID-19 drug by some scientific reports, and believed that it is effective against SARS-CoV-2 (COVID-19) and it has an immune-modulator effect, however, its effectiveness and possible negative symptoms such as toxicity should be extensively studied due to suspicion of potential toxicity [30].

Table 1: Some plant species used for the treatment of different viral infections.

Plant name	Common name (s)	Part used	Extract or major active compound (s)	Effective against virus	Reference
<i>Allium sativum</i>	Garlic	Bulb	Allicin, diallyl trisulfide and ajoene	Influenza A and B, cytomegalovirus, rhinovirus, HIV, herpes simplex virus herpes simplex virus 2 viral pneumonia, and rotavirus.	[16]
<i>Sophora flavescens</i>	Ku Shen (bitter root)	Root	Anagyrine, oxymatrine, sophoranol, wogonin, and oroxylin A.	Respiratory syncytial virus (RSV) also called human respiratory syncytial virus (HRSV)	[17]
<i>Scutellaria baicalensis</i>	Baikal skullcap (Chinese skullcap)	Root			
<i>Nigella sativa</i>	Black cumin	Seeds	Thymoquinones	Avian influenza virus (H9N2) and murine cytomegalovirus infection (MCMV)	[18]
<i>Zingiber officinale</i>	Ginger	Rhizomes	Only fresh juice were active, it is rich in phytochemical molecules such as alkaloids, saponins, flavonoids, polyphenols and cardiac glycosides	Human respiratory syncytial virus (HRSV) also called Respiratory syncytial virus (RSV)	[19]
<i>Curcuma longa</i>	Curcumin	Rhizomes	Aqueous extract of have antiviral activity, major compound is turmeric	hepatitis B virus (HBV)	[20]
<i>Echinacea purpurea</i>	Purple coneflower, hedgehog	Areal parts	Chicoric acid, caffeic acids, alkylamides, and polysaccharides	Herpes simplex virus (HSV), influenza viruses, and respiratory syncytial virus (RSV)	[21]
<i>Artemisia annua</i>	Sweet wormwood, sweet annie	Whole plant	Artemisinin	Severe Acute Respiratory Syndrome virus (SARS-CoV)	[22]

<i>Caesalpinia sappan</i>	Sappan Wood	Heartwood	7,4'-Homoisoflavane	influenza A virus subtypes H1N1, H3N2, and H9N2	[23]
<i>Radix isatidis</i>	Ban-Lan-Gen	Roots	Polysaccharides	Pseudorabies virus (PRV)	[24]
<i>Psidium guajava</i>	Guava	Leaves	Tannins	Influenza A (H1N1)	[25]
<i>Taraxacum officinale</i>	Dandelion	Leaves	Phenolics	Dengue virus 2 (DENV2)	[26]
<i>Capsicum annuum</i>	Cayenne pepper	Fruits	Polyphenolics and flavonoids	Herpes simplex virus (HSV-1 and HSV-2)	[27]
<i>Houttuynia cordata</i>	Fish mint, fish leaf, Chinese lizard tail,	Undefined	Flavonoids, polyphenols, and alkaloids.	Severe Acute Respiratory Syndrome (SARS)	[28]
<i>Hibiscus sabdariffa</i>	Roselle	Calyces	Protocatechuic acid	Herpes simplex virus 2 (HSV-2),	[29]
<i>Arsenicum album</i>	Undefined	Undefined	Arsenic	SARS-CoV-2 (COVID-19)	[30]

Conclusions

Three highly pathogenic and virulent human coronaviruses have arisen within the last two decades, namely SARS, MERS, and finally SARS-CoV-2 (causing COVID-19 disease). Throughout that period, mankind has not shown a high ability to combat these pandemics. This serious situation required new strategies to deal with such viral diseases and effective antiviral agents are urgently needed to combat them. Vaccination, cellular therapy, and immunotherapy may be brilliant therapeutic strategies. However, medicinal plants could play an intrinsic role to tackle the Covid-19 pandemic. Scientific researches on plant products as possible anti-COVID-19 are scant and neglected. In the current study, some compounds of medicinal plants that have demonstrated potential anti-viral properties are recommended for further investigations against COVID-19. Finally, the risk of similar coronavirus outbreaks in the future remains high unless we use all possible remedial measures, and medicinal plants remain the best sources and it should not be neglected in our struggle with COVID-19 disease.

Acknowledgment

None

Conflicts of Interest

The authors declare no conflict of interests.

Funding

This research is not supported by any organization or institution.

Ethical Approval

Non-applicable

References

1. Sadat SR, Rawtani D, Hussain CM. Environmental perspective of COVID-19. *Sci the Total Environ*. 2020; 728:138870.
2. Gupta M, Abdelmaksoud A, Jafferany M, Lotti T, Sadoughifar R, Goldust M, et al. COVID-19 and economy. *Dermatologic therapy*. 2020; 33:13329.
3. Marson FAL. COVID-19 – Six million cases worldwide and an overview of the diagnosis in Brazil: A tragedy to be announced. *Diagnostic Microbiol Infect Disease*. 2020; 115:113.
4. Xiao Y, Torok ME. Taking the right measures to control COVID-19. *The Lancet Infect Dis*. 2020; 20: 523-524.
5. Abdallah EM. Plants: an alternative source for anti-microbials. *J Appl Pharma Scie*. 2011; 1: 16-20.
6. Hemida MG, Abdullah MM. The SARS-CoV-2 outbreak from a one health perspective. *One Health*. 2020; 10: 100127.
7. Bolles M, Donaldson E, Baric R. SARS-CoV and emergent coronaviruses: viral determinants of interspecies transmission. *Current Opinion Viro*. 2011; 1: 624-634.
8. Yakan SA, Kanj SS. Emergence of MERS-CoV in the Middle East: origins, transmission, treatment and perspectives. *PLoS pathogens*. 2014; 10: 1004457.
9. Mahase E. Covid-19: death rate is 0.66% and increases with age, study estimates. *BMJ*. 369:1327

10. Petrosillo N, Viceconte G, Ergonul O, Ippolito G, Petersen E. COVID-19, SARS and MERS: are they closely related. *Clinical Microbiol Infect: the official publ the Euro Soci Clinical Microbiol Infect Dis.* 2020; 26: 729-734.
11. Millán Oñate J, Morales RAJ, Moreno CG, Ramírez MH, Sabogal RIA, Moreno ACA, et al. A new emerging zoonotic virus of concern: the 2019 novel Coronavirus (SARS CoV-2). *Infectio.* 2020; 24: 187-192.
12. Dai L, Gao GF. Viral targets for vaccines against COVID-19. *Nature Rev Immunol.* 2021; 21: 73-82.
13. El Khatib S. COVID-19 Vaccines. a Global Marathon between Methodical Heritages Future Challenges *CPQ Med.* 2021; 11: 3.
14. Akerele O. Nature's medicinal bounty: don't throw it away. *World Health Forum.* 1993; 14: 390-395.
15. Adhikari B, Marasini B, Rayamajhee B, Lamichhan G, Khadayat K, Adhikari A, et al. Potential roles of medicinal plants for the treatment of viral diseases focusing on COVID-19: A review. *Phytotherapy Res.* 2020; 11: 1-15.
16. Bayan L, Koulivand PH, Gorji A. Garlic: a review of potential therapeutic effects. *Avicenna J phytomedicine.* 2014; 4: 1-14.
17. Ma SC, Du J, But PP, Deng XL, Zhang YW, Ooi VE, et al. Antiviral Chinese medicinal herbs against respiratory syncytial virus. *J Ethnopharm.* 2002; 79: 205-211.
18. Ahmad A, Rehman MU, Alkharfy KM. An alternative approach to minimize the risk of coronavirus (Covid-19) and similar infections. *Europ Review Med Pharma Sci.* 2020; 24: 4030-4034.
19. Chang JS, Wang KC, Yeh CF, Shieh DE, Chiang LC. Fresh ginger (*Zingiber officinale*) has anti-viral activity against human respiratory syncytial virus in human respiratory tract cell lines, *J Ethnopharm.* 2013; 145: 146-151.
20. Kim HJ, Yoo HS, Kim JC, Park CS, Choi MS, Kim M, et al. Antiviral effect of *Curcuma longa* Linn extract against hepatitis B virus replication. *J Ethnopharm.* 2009; 124:189-196.
21. Nugraha RV, Ridwansyah H, Ghozali M, Khairani AF, Atik N. Traditional Herbal Medicine Candidates as Complementary Treatments for COVID-19: A Review of Their Mechanisms, Pros and Cons. *Evidence Based Comple Alternative Med.* 2020; 12.
22. Haq FU, Roman M, Ahmad K, Rahman SU, Shah SMA, Suleman N, et al. *Artemisia annua*: Trials are needed for COVID-19. *Phytotherap Res.* 2020; 34: 2423-2424.
23. Jeong HJ, Kim YM, Kim JH, Kim JY, Park JY, Ryu YB, et al. Homoisoflavonoids from *Caesalpinia sappan* displaying viral neuraminidases inhibition. *Biolog Pharm Bulletin.* 2012; 35: 786-790.
24. Tong C, Chen Z, Liu F, Qiao Y, Chen T, Wang X, et al. Antiviral activities of *Radix isatidis* polysaccharide against pseudorabies virus in swine testicle cells. *Complem Med Therapies.* 2020; 20: 48-53
25. Sriwilaijaroen N, Fukumoto S, Kumagai K, Hiramatsu H, Odagiri T, Tashiro M, et al. Antiviral effects of *Psidium guajava* Linn. (guava) tea on the growth of clinical isolated H1N1 viruses: Its role in viral hemagglutination and neuraminidase inhibition. *Antiviral Res.* 2012; 94: 139-146.
26. Ocelotl FMR, Murrieta RNH, Moreno DA, Ruiz VV, Leyva RRJ, Domínguez F, et al. *Taraxacum officinale* and *Urtica dioica* extracts inhibit dengue virus serotype 2 replication in vitro. *BMC Complem Alter Med.* 2018; 18: 95-96.
27. Hafiz TA, Mubarak MA, Dkhil MA, AlQuraishy S. Antiviral Activities of *Capsicum annum* Methanolic Extract against Herpes Simplex Virus 1 and 2. *P J Zoolog.* 2017; 49: 267-272.
28. Lau KM, Lee KM, Koon CM, Cheung CS, Lau CP. Immunomodulatory and anti-SARS activities of *Houttuynia cordata*, *Journal of Ethnopharmacology.* 2008; 118: 79-85.
29. Hassan STS, Švajdlenka E, Bímová, BK. *Hibiscus sabdariffa* L and Its Bioactive Constituents Exhibit Antiviral Activity against HSV-2 and Anti-enzymatic Properties against Urease by an ESI-MS Based Assay. *Molecules.* 2017; 22: 722-723.
30. Mallick P, Mallick C, Guha B, Bukhsh KA. Ameliorating effect of microdoses of a potentized homeopathic drug, *Arsenicum Album*, on arsenic-induced toxicity in mice. *Complem Altern Medi.* 2003; 3: 1-13.
31. Jahangir MA, Muheem A, Rizvi MF. Coronavirus (COVID-19): History, Current Knowledge and Pipeline Medications. *Inter J Pharm Pharm.* 2020; 4: 140-150.
32. Mushi V. The holistic way of tackling the COVID-19 pandemic: the one health approach. *Tropical Med Health.* 2020; 48: 69-70.
33. Vellingiri B, Jayaramayya K, Iyer M, Narayanasamy A, Govindasamy V, Giridharan B, et al. COVID-19: A promising cure for the global panic. *Sci The Total Environ.* 2020; 725: 138277.