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Covid Pandemic and its Positive Impact on Environment

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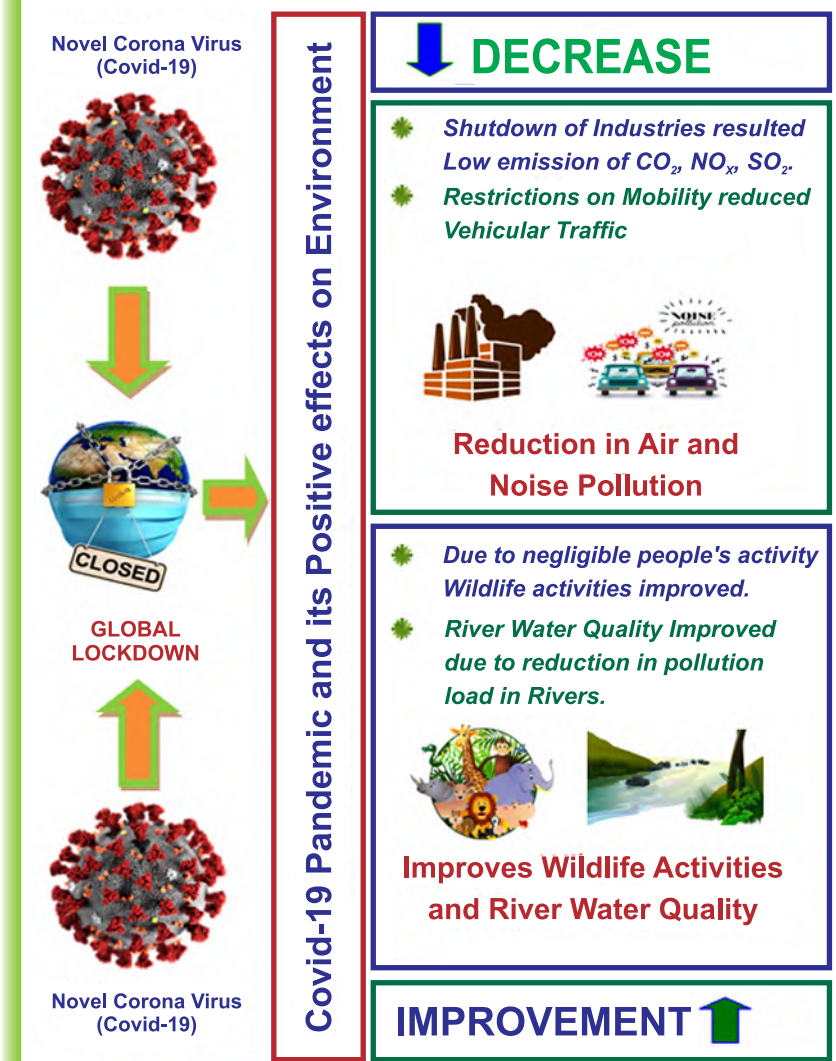

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Contents

Covid Pandemic and its Positive Impact on Environment

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Background:

The outbreak of an acute respiratory infection has first emerged at the end of December 2019 from Wuhan, China (Singhal 2020) that spreads more than 210 countries worldwide infecting more than 2 million people and causes mortality of more than 130000 people (WHO 2020). Due to its wide and rapid spread, the World Health Organisation declared it as an international public health emergency as a global pandemic. The pathogen causing this disease was identified as a novel enveloped RNA β-coronavirus and has a similar phylogeny to SARS-CoV (Lai et al. 2020). WHO named this new virus as the 2019 Novel Coronavirus (2019-nCoV) (Lu et al. 2020).

As Covid-19 is highly transmissible posing high mortality rates, countries worldwide have taken various precautionary measures to curb the spread of this virus. This involves massive screening diagnostic tests, social distancing, wearing of a mask, quarantine protocols, sanitization of hands etc. Government priority revolves around the safety of people's health. In India, the first case of Covid-19 was recorded in Kerala on Jan 30, 2020. India has taken various measures to restrict its spread across the country and this resulted in national and regional lockdown to limit the spread of the virus. This article is about highlighting the positive impact of Covid-19 on the environment.

Positive effects on the environment

1. Reduction in emission of Green House Gases and Decrease in Air Pollution

WHO estimated that around 7 million people lost their lives each year worldwide due to ambient air pollution (WHO 2020) and approximately 80% of urban population has been exposed to unhealthy air. Due to the global pandemic situation arise because of Covid-19, people are forced to stay at home during the lockdown.

Emissions from industries have declined significantly, because industries were not functional during the lockdown period. The use of fossil fuels or conventional energy sources has been dramatically reduced due to the reduced demand for electricity in the industrial sector. As a result, the ecosystem has been recovered significantly. The pollution level in tourist spots such as beaches, forests, and hills has also been reduced significantly (Chakraborty et al., 2020).

Due to the amid situation of Covid-19 pandemic a national and international lockdown was imposed. This has affected all forms of both public and private transport like planes, trains, buses and cars. Global road transport activity was decreased to 50% by mid of April 2020 in comparison to the previous year 2019 (Sung et al., 2020). That was a significant reason of decreasing in air pollution.

A. Indian Scenario:

- According to an analysis of the Central Pollution Control Board (CPCB) of 115 cities in India, sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and particulate matter (PM) emissions were significantly reduced during the lockdown imposed to curb the novel coronavirus spread. The urban Air Quality Index (AQI) of these cities has been improved from 44% to 78% during lockdown.

New Delhi's India Gate on Oct. 17, 2019 (right) and on April 08, 2020 (left) during lockdowns. (Credit: Staff/Reuters/Newscom)

- More than 4 million deaths have occurred due to particulate matter pollution in the ambient air particularly due to $PM_{2.5}$. During lockdown, the level of $PM_{2.5}$ and NO_X reduced tremendously as compared to $PM_{2.5}$ level in 2019. In the lockdown period that the average $PM_{2.5}$ concentration in Delhi was 91 $\mu g/m^3$ as on March 20, 2020 which was decreased to 26 $\mu g/m^3$ as on March 27, 2020, with reduction of 71% of particulate matter in the ambient air within a week. (CPCB 2020; Mate et al. 2020; Mitra et al. 2020).
- As sky become more clear in lockdown period, people witnessed Dhauladhar range of Himachal Pradesh from the Jalandhar, Punjab which is about 200 km away. Similarly, Mount Kangchenjunga was also visible clearly from Siliguri, West Bengal. This incident has happened after 30 years.

The moment people saw the majestic hills from their rooftops in Jalandhar (Image Credit: Pexels)

❖ The emissions of Greenhouse gases and air pollution levels across the country have significantly reduced. Many metro cities like Delhi, Kolkata and Mumbai are currently experiencing the lowest levels of air pollution over the last decade or more. The effect of Covid-19 lockdown in the atmosphere was also studied via the Air Quality Index (AQI). AQI is one of the important measurement tools that can easily measure air quality.

AQI	Remark	Color Code	Possible Health Impacts
0-50	Good		Minimal Impact
51-100	Satisfactory		Minor breathing discomfort to sensitive people.
101-200	Moderate		Breathing discomfort to the people with lung, asthma and heart disease
201-300	Poor		Breathing discomfort to most people on prolonged exposure
301-400	Very Good		Respiratory illness to prolonged exposure
401-500	Severe		Affects healthy people and seriously impacts those with existing disease

Table 1: AQI values and their Impact (Source: National Air Quality Index-CPCB, 2020).

It categorizes the air quality index into six categories from Good (with AQI ranging from 0 to 50) to Severe (with AQI more than 401). To analyze the effect of lockdown caused by COVID-19, AQIs before and during lockdown for 4 Indian cities were compared.

Cities/Towns	AQI Value before lockdown	AQI Value during lockdown			
	January 2020	February 2020	March 2020	April 2020	May 2020
Kolkata-WBPCB	229	189	83	53	33
Mumbai-MPCB	235	177	138	54	14
Delhi-DPCC	448	236	83	77	130
Chandigarh-CPCC	128	94	50	30	59

Table 2: AQI values of Kolkata, Mumbai, Delhi and Chandigarh before lockdown and after (Source: https://app.cpcbccr.com/AQI_India/).

B. Global Scenario

The air pollution levels of New York City have dropped by up to 50% due to the global lockdown to control the spread of novel coronavirus (Henriques, 2020).

Before lockdown (May 17, 2019) After Lockdown (April 21, 2020)

Clearer skies of New York City after coronavirus lockdown (Lewis, 2020)

In addition, NO_2 emissions are one of the essential indicators of global economic activity in many countries like USA, Canada, China, Italy, Brazil, etc. show signs of decline due to recent disruptions (Biswal et al., 2020). NO_2 is emitted from the combustion of fossil fuels, about 80% of which comes from automobile exhaust (USEPA, 2016). In addition, NO_2 has been reported to cause several respiratory diseases suffered by humans that cause acid rain by the interaction of O_2 with H_2O (USEPA, 2016).

The European Environmental Agency (EEA) has revealed that Covid-19 lockdown reduced NO_2 emissions by 30% to 60% in many European cities including Barcelona, Rome, Milan, Madrid and Paris (EEA, 2020). In the United States, NO_2 emission has decreased by 25.5% compared to the previous year 2019 (Berman and Edisu, 2020).

23 December 2019 10 April 2020

Barcelona (Spain) after coronavirus lockdown (Lewis 2020)

In Canada (Ontario), reduction in NO_2 emission was also observed and the level has been reduced from 4.5 ppb to 1 ppb (Adams, 2020). During the lockdown period in Brazil (Sao Paulo), the concentration of NO was reduced by 77.3%, NO_2 by 54.3% and CO 64.8% in urban areas (Nakada and Urban, 2020).

In many other countries the pollution levels of NO_2 was significantly reduced by 58% in Portugal, Spain (51%), Norway (48%), Croatia (47%), France (44%), Italy (43%) and Finland (41%). The reductions in particulate matter pollution have also been reported in Portugal (55%), Greece (32%), Norway (30%), Sweden (28%), Spain (19%), Poland (17%) and Finland (16%) (Myllyvirta, 2020).

According to data of the European Environment Agency (EEA) member countries, it was observed that in many European cities where Covid-19 lockdown was introduced, the concentrations of NO_2 have been reduced because of the restrictions of road transport.

2. Improved water quality:

Before and after the lockdown of Covid-19, the water quality of the river Ganga has been improved. The Central Pollution Control Board analyzes the pollution load during the pre-lockdown and during lockdown period and found that the Ganga water is suitable for bathing and supports aquatic organisms at most of the monitoring centers from Garhmukteshwar in Uttar Pradesh to West Bengal. (Source: https://www.downtoearth.org.)

CPCB (Central Pollution Control Board) have examined the quality of the Ganga water at 65 locations [UK (6), UP (27), Bihar (17), WB (11) and Jharkhand (04)] during Pre-lockdown (March 2020) and 54 locations [UK (5), UP (14), Bihar (17),

Water quality of river Ganga improves as Har Ki Pauri Ghat is shut and industries closed amid Lockdown, in Haridwar. (ANI)

WB (14) and Jharkhand (04)] were selected and assessed during the lockdown period (April 2020). Four parameters viz. pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) were assessed and evaluated in the collected samples from 27 locations in Uttar Pradesh viz. pH level increased from 3.3-8.6 to 7.4-8.7, reduction in total coliforms counts increased from 170-31000 MPN/100ml to 130-9400 MPN/100 ml etc. This data depicts that the quality of the Ganga water has improved and it has been beneficial for the growth and survival of aquatic animals. ***(Source: https://cpcb.nic.in/upload/Assessment-of-Impact-Lockdown-WQ-MajorRivers.pdf)***

In India, more than 38,000 million liters of untreated wastewater were assumed to be discharged into rivers daily due to the limited wastewater treatment capacity of treating 38% of the total wastewater generated (CPCB, 2015). Industrial wastewater causes pollution to rivers. In Ganga river, industrial wastewater alone accounts for about 12% of total water pollution. Many industries in India, from large scale to small scale, were closed from March 22, 2020 to September 30, 2020, due to the nationwide lockdown imposed due to Covid-19 surge. During this period, the quality and quantity of water in many rivers improved in this period, especially of the river Ganga, which is covering 2,575 km long area. (Dutta et al., 2020; Shukla et al., 2021). Similarly the Yamuna river water pollution level also dropped significantly due to lockdown.

A research based on satellite data showed suspended particulate matter (SPM) concentrations decreasing by an average of 16% compared to the previous year (2019) in Vembanad Lake, the longest lake in Kerala, India (Yunus et al., 2020).

Yamuna River on March 21, 2018 (Adnan Abidi/Reuters)
Yamuna River on April 8, 2020 (Adnan Abidi/Reuters)

Source: The New York Times

In addition, water pollution in San Francisco Bay, California, has been significantly reduced due to fewer traffic. During lockdown, restricted use of boats in river and water ways (due to less activities like fishery and tourism) diminished the pollution load in rivers. Thus river water becomes more clear.

3. Reduction of Noise Pollution:

In general, noise pollution adversely affects human biological system and causes various diseases like, high blood pressure, sleep deprivation, cardiovascular disease and reduction in physiological health (Kerns et al., 2018). Shutdown of industries and vehicular traffic has reduced noise pollution around the world due to the Covid19 lockdown. The earth experienced a more peaceful time than ever before. People have seen unusual silence from Earth due to the infectious disease i.e Covid-19.

About 360 million people are susceptible to hearing loss due to noise pollution (Sims, 2020). Unnecessary noise also adversely affects invertebrates, helping to control environmental processes essential to the balance of ecosystems (Solan et al., 2016). But quarantine and containment measures required people to stay at home, reducing economic activity worldwide and ultimately reducing noise in most cities.

For example, noise level in Delhi has significantly decreased by 40-50% during recent lockdowns (Somani et al., 2020). The noise levels of residential areas of Delhi were decreased from 55 dB (day) and 45 dB (night) to 40 dB (day) and 30 dB (night) respectively (CPCB 2020).

Similarly, in Kanpur, the average noise levels before lockdown and during lockdown were found to be in the range of 44.85 dB to 79.57 dB and 38.55 dB to 57.79 dB, respectively. (Anirudh Mishra et al., 2021).

Reduction in noise pollution was also observed in US cities, New York experienced the greatest reduction of 3.1dB and 2.4dB in Florida. (Smith et al., 2020)

4. Impact on wildlife

The Covid-19 crisis has almost stopped people's and industrial activities worldwide. It offered a relief to get out of the allocated wildlife habitats for animal to roam around. Wildlife activity is restricted and not allowed to enter in human inhabited areas. The Wildlife Institute of India has released data via an app named "Lockdown Wildlife Tracker" to record and notify wildlife movements in people's territory (Paital, 2020).

Many reports are published on wildlife movement in people-dominated areas: mountain goats move in Wales, Penguin walks at Cape Town, Peahens were seen on road at New Delhi, Lions napping in Capetown, South Africa, Wild Boar found in Italy, Deer were once seen in California, US.

"Lockdown Wildlife Tracker" App developed by Wildlife Institute of India

Goats roam at Wales, UK on March 31, 2020. (Credit: Christopher Furlong)

An African penguin walks at Cape Town, South Africa on April 14, 2020. (Credit: Rodger Bosch)

Peahens seen at New Delhi on April 19, 2020. (Credit: Arvind Yadav/Hindustan Times)

Lions napping at South Africa on April 15, 2020. (Credit: Richard Sowry)

Deer feed in Yosemite Valley at California on April 11, 2020. (Credit: Carolyn Cole)

Grey langurs run along a deserted road at Ahmedabad on April 19, 2020. (Credit: Sam Panthaky/AFP Photo)

The evidences of behavioural changes of animals and birds during lockdown to curve Covid-19 Pandemic

Conclusion: Covid-19 is a global pandemic and serious threat to human health, but the positive impact of this global lockdown has experienced in reduction of pollution and reclaiming nature itself. Due to this global pandemic, countries have shut down their factories, transport, vehicles and aviation activities to reduce spread of the coronavirus. The positive indications from all over the world have shown improving environmental conditions especially air and water quality. During the lockdown period, resilience recovery of mother nature is being witnessed by everyone. We are witnessing clean air, water and livable cities that we have demanded for so long. We have learned from this lockdown that how to reduce pollution on long term basis by restricting our industrial and vehicular activities. Covid-19 lockdown has given us a rare opportunity to assess ourselves to protect the environment.

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Role of Medicinal Plants to Protect Human Health Against Covid-19

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Introduction

Covid-19 disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARSCoV2), is taking lives of thousands of people everyday world over due to the lack of actual drugs for cure. At present, there is no effective drug to control SARSCoV2. New drug development programs may take quite a few years for approval of medical regulatory agencies.

Natural products have been used since ancient times and their effectiveness is well proven. Medicinal plants are the source of primary healthcare for nearly 85% of the world's population (Pešic, 2015), and more than 40% of the synthetic drugs available in the pharmaceutical market are derived from plant and microbial-based natural products (Bauer & Brönstrup, 2014).

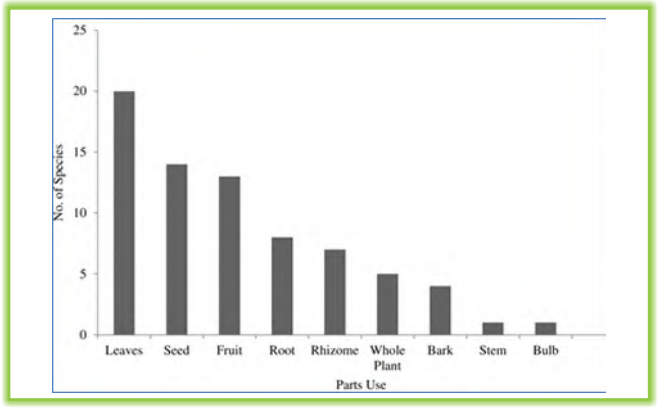
The antiviral mechanism of plant extracts depends on the structure of the virus and the replication process. In addition, some plants help to boost antiviral immunity in humans (Webster et. al, 2006).

Case Studies of medicinal plants to prevent Covid-19

(i) Nepal

Plants have long been used as a traditional medicine in Nepal. The people of Nepal often used traditional herbal medicine due to various historical cultural and ecological reasons and this trend increased significantly in recent years. People of Nepal have been using traditional medicine from the ancient period and it has a clear therapeutic effect (Kunwar et al, 2009). Thus, Nepalese medicinal plants have active pharmacological effects (Taylor et al, 1996). Therefore during Covid-19 pandemic period, when there are no specific medicines available and people relying more on the use of medicinal plants.

A total of 60 species from 36 families and 54 genera were documented in the literature which can act as an immunity booster. The most common families were Apiaceae (6 species), Lamiaceae (4 species), Amaryllidaceae (4 species) and Zingiberaceae (4 species) and the most common genus were *Allium* (3 species), *Mentha* (2 species), *Cinnamomum* (2 species), *Terminalia* (2 species) and *Syzygium*. The most popular species used by common people to enhance immunity in Nepal was *Zingiber officinale* (39.79%) followed by *Curcuma angustifolia* (34.11%). The habit analysis among the 60 species showed that the medicinal plants used as an immunity booster belonged to herb, shrub, climber, and tree species and were 56.67%, 11.67%, 6.67% and 25%, respectively (Khadka et al. 2021).

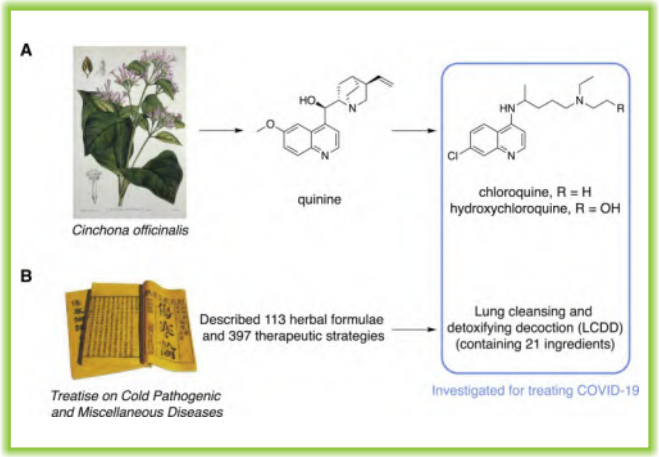


Parts of plants used for medicinal purpose to prevent COVID-19

Around 33.68% leaves of different medicinal plants were used to combat the Covid-19 disease, and approximately 23.33% of seeds were used as an immunity booster. Similarly 21.67% fruits, 13.33% roots, 11.67% rhizomes, 6.67% bark, 1.67% stems, 1.67% bulbs and around 8.33% whole plants were used to combat the Covid-19 disease. The most commonly used preparation method was to boil the plant parts in water or milk. After that this boiled mixture was taken orally. In addition, people were using more medicinal plants during the Covid-19 period, claiming that they could prevent or reduce the damage to human body due to Covid-19 (Khadka et al. 2021).

(ii) China

In China, the fight against Covid-19 the Traditional Chinese Medicine (TCM) has played an important role. At the end of January 2020, China's Director General of National Administration of Traditional Chinese Medicine (NATCM) organized an urgent research section to identify effective TCM prescriptions to prevent and treat Covid-19. Preliminary clinical studies have recently shown promising results for



Plant-Derived Medicines Currently under Investigation for COVID-19 Treatment.
(A) Quinine was discovered as the principal bioactive compound from Cinchona officinalis, Chloroquine and hydroxychloroquine are synthetic analogs of quinine.
(B) The lung cleansing and detoxifying decoction (LCDD) widely used in treating COVID-19 patients in China (Sourse: https://europepmc.org/article/PMC/7237358)

chloroquine and hydroxychloroquine to reduce SARSCoV2 viral load in patients of Covid-19. Interestingly, chloroquine and hydroxychloroquine are synthetic analogs of quinine. (*http://www.gov.cn/xinwen/gwylflkjz95/index.htm*)

Based on the symptoms observed in patients with early Covid-19, several TMC medicine formulas have been developed. Lung Cleansing and Detoxification Decoction (LCDDs) were the most widely used and shown notable therapeutic effects on COVID-19 (Liu et al., 2020). LCDD is a complex formula developed based on the Traditional Chinese Medicine methods and contains 21 ingredients; *Bupleurum chinense, Belamcanda chinensis, Polyporus umbellatus, Pinelliae rhizoma, Poria cocos, Tangerine* (citrus) peel, *Rhizoma atractylodis, Zingiber officinale* (ginger), *Dioscorea polystachya* (Chinese yam), *Glycyrrhiza glabra, Asarum, Aster tataricus, Rhizoma alismatis, Prunus dulcis* (almond), *Agastache rugosa, Flos farfarae, Ephedra sinica, Cassia Twig, Scutellaria baicalensis, Fructus aurantii* and gypsum. It was 90% effective in Covid-19 patients, among 214 patients enrolled in the initial trial. In another study conducted on 1262 patients, including 57 with severe symptoms, approximately 99% of studied patients had recovered with LCDD treatment (Weng JK, 2020).

(iii) India: AYUSH Recommendations for Management of Covid-19

Based on the various Indian medicine systems, Ministry of AYUSH (Government of India) issued several recommendations from time to time for Covid-19 management. The recommended formulations for plant Ayurveda are described below.

Fig: The processed raw materials of "Lung Cleansing and Detoxifying Decoction" in treating COVID-19.
(Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7175912/figure/fig0005/?report=objectonly)

Sl. No.	Name of the formulation	Composition	Properties	References
(1)	AYUSH Kwath	*Cinnamomum verum, Ocimum sanctum, Piper nigrum, Zingiber officinale*	antiviral immuno boosting	Goel et al. (2010), Ghoke et al. (2018), Soni K. et al. (2015), Niphade et al. (2009), Brochot et al. (2017), Kandhare et al. (2013), Zhou et al. (2006), Chang et al. (2013), Khan et al. (2015), Majdalawieh and Carr (2010), Mair et al. (2016), Tasleem et al. (2014)
(2)	AYUSH-64	*Picrorhiza kurroa, Caesalpinia crista, Alstonia scholaris, Swertia chirayita*	antiviral, antiasthmatic immuno boosting	Iwo et al. (2000), Antony et al. (2014), Zhao et al. (2017), Sharma et al. (1994), Win et al. (2019), Sehgal et al. (2013), Woo et al. (2019), Khan et al. (2012), Ramesh et al. (2014)
(3)	Samshamani Vati (Guduchi ghana vati)	*Tinospora cordifolia*	antiviral, antipyretic, antiinflammatory	Alsuhaibani and Khan (2017), Pruthvish and Gopinatha (2018), Tiwari et al. (2014)
(4)	Agasthaya Hareetaki (Avaleha kalpana)	*Achyranthes aspera, Aegle marmelos, Clerodendron serratum, Convolvulus pluricaufis, Desmodium gangeticum, Gmelina arborea, Hedychium spicatum, Hordeum vulgare, Inula racemosa, Oroxylum indicum, Piper chaba, Uraria picta, Tribulus terrestis, Terminalia chebula, Stereospermum suaveolens, Solanum surattense, Solanum indicum, Sida cordifolia, Premna mucronta, Plumbago zeylanica, Piper longum, Mucuna pruriens*	antiviral, antiasthmatic, antiinflammatory immuno boosting	Patel and Asdaq (2010), Kumari et al. (2014) , Zaveri et al. (2008), Panda et al. (2017), Balasubramanian et al. (2010), Dianita and Jantan (2017), Gulati et al. (2002), Nagarkar et al. (2013), Kaunda and Zhang (2019), Kaunda and Zhang (2019), Malik et al. (2018), Kang et al. (2017), Lampariello et al. (2012), Agarwal et al. (2014), Uttara and Mishra (2009), Ghildiyal et al. (2012), Tekade et al. (2008), Singh S. et al. (2011), Sireeratawong et al. (2012), Narayan and Kumar (2014), Mukherjee et al. (2013), Khuda et al. (2013), Tripathi et al. (1999), Jiang et al. (2013), Kaushik et al. (2012) , Gebre-Mariam et al. (2006), Juvekar et al. (2006), Mishra et al. (2016), Vadnere et al. (2009), Gul et al. (2014), Shivaprasad et al. (2006), Kesharwani et al. (2017), Haq et al. (2013)
(5)	Anuthaila	*Leptadenia reticulate, Cedrus deodara, Vetiveria zizanioides, Ocimum sanctum, Berberis aristata, Glycyrrhiza glabra, Cyperus rotundus, Asparagus racemosus, Aegle marmelos, Solanum indicum, Solanum xanthocarpum, Uraria picta, Embelia ribes, Cinnamomum verum, Elettaria cardamomum, Vitex negundo, Sesamum indicum*	cough, asthma, fever, respiratory infections	Pravansha et al. (2012), Mohanty et al. (2015), Raghavendhar et al. (2019), Lavanya et al. (2016), Goel et al. (2010), Ghoke et al. (2018), Soni K. et al. (2015), Yan et al. (2018), Wang et al. (2017), Kumar et al. (2016), Mitra Mazumder et al. (2012), Ashraf et al. (2017), Patel et al. (2009) Soumaya et al. (2013), Xu et al. (2015), Jin et al. (2011), Gautam et al. (2009), Patel and Asdaq (2010), Kumari et al. (2014) Kaunda and Zhang (2019), Kumar and Pandey (2014), Nagarkar et al. (2013), Mahendran et al. (2011), Niphade et al. (2009), Brochot et al. (2017), Kandhare et al. (2013), Rahman et al. (2017), Lad et al. (2016), Kannan et al. (2012), Chattopadhyay et al. (2012), Khorrami et al. (2018), Nagpurkar and Patil (2017)

AYUSH recommended approach through Ayurvedic formulations.
Ref: AYUSH Ministry of Health Corona Advisory -F.No. Z 25.23/09/2018–2020-DCC (AYUSH); dated: 24th April, 2020.)

Conclusion:

There are rarely any countries that are not affected by the Covid-19 pandemic. The world, including 210 countries, is applying lockdown at varying degrees of strictness to reduce the spread of Covid-19. The Covid-19 containment has given us a rare opportunity to step back and evaluate our environmental impact. SARSCoV2 poses a threat to the population because drugs for its treatment are not available. Many herbs reported to work as an immunity booster against other viral infections and possess anti-allergic/anti-inflammatory activities that need to be tested against Covid-19. Many herbs played an essential role as immune boosters against viral infections. They showed their anti-allergic and anti-inflammatory action for coronaviruses. Covid-19 caused panic around the world, but also had a very positive impact on the global environment. Quarantine regulations have had a specific positive impact in India and abroad. The government and policymakers must take necessary steps so that healing process does not become a temporary one. For better living we need to rely more on plants and plant based solutions. Only this way we can balance the development and the environment.

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Abstracts

Environmental impact of the COVID-19 pandemic-a lesson for the future

Mohamed E. El Zowalaty, Sean G. Young & Josef D. Järhult

Infection Ecology & Epidemiology, 2020, Vol. 10, Page 1-2

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The environment is an integral component of human and animal health. COVID-19 is a global health challenge in the twenty-first century. The emergence of SARS-CoV-2 in Wuhan, China in December 2019, and its spread to regional countries and nowadays affecting more than 210 countries worldwide represents the first pandemic in history to be caused by a coronavirus. The COVID-19 pandemic has huge impacts on most aspects of human activities, as well as on the economy and health care systems. Lock-downs, quarantines and border closures in the wake of the pandemic have led to reductions in air pollution through decreased travel and production. These positive environmental effects are likely mostly temporary, but may serve as an example that changes in our way of life can have prompt positive effects for the environment and demonstrate the usefulness of travel-reducing measures such as teleconferencing. Thus, acknowledging that COVID-19 is first and foremost a global disaster, the pandemic may inspire to future behavioral changes with positive environmental effects.

COVID-19 pandemic and its positive impacts on environment: an updated review

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In December, 2019 in Wuhan city of China, a novel coronavirus (SARS-CoV-2) has garnered global attention due to its rapid transmission. World Health Organization (WHO) termed the infection as Coronavirus Disease 2019 (COVID-19) after phylogenic studies with SARS-CoV. The virus causes severe respiratory infections with dry cough, high fever, body ache and fatigue. The virus is primarily transmitted among people through respiratory droplets from COVID-19 infected person. WHO declared this COVID-19 outbreak a pandemic and since February, 2020 affected countries have locked down their cities, industries and restricted the movement of their citizens to minimize the spread of the virus. In spite of the negative aspects of coronavirus on the globe, the coronavirus crisis brought a positive impact on the natural environment. Countries where the movement of citizens was seized to stop the spread of coronavirus infection have experienced a noticeable decline in pollution and greenhouse gases emission. Recent research also indicated that this COVID-19-induced lockdown has reduced the environmental pollution drastically worldwide. In this review, we have discussed some important positive impacts of coronavirus on environmental quality by compiling the recently published data from research articles, NASA (National Aeronautics and Space Administration) and ESA (European Space Agency).

Environment and COVID-19: Pollutants, impacts, dissemination, management and recommendations for facing future epidemic threats

Winfred Espejo, José E. Celis, Gustavo Chiang & Paulina Bahamonde

Science of The Total Environment, 2020, Vol. 747, Page 1-8

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Coronavirus disease 2019 (COVID-19) has become a global pandemic. Its relationship with environmental factors is an issue that has attracted the attention of scientists and governments. This article aims to deal with a possible association between COVID-19 and environmental factors and provide some recommendations for adequately controlling future epidemic threats. Environmental management through ecosystem services has a relevant role in exposing and spreading infectious diseases, reduction of pollutants, and control of climatic factors. Pollutants and viruses (such as COVID-19) produce negative immunological responses and share similar mechanisms of action. Therefore, they can have an additive and enhancing role in viral diseases. Significant associations between air pollution and COVID-19 have been reported. Particulate matter (PM2.5, PM10) can obstruct the airway, exacerbating cases of COVID-19. Some climatic factors have been shown to affect SARS-CoV-2 transmission. Yet, it is not well established if climatic factors might have a cause-effect relationship to the spreading of SARSCoV-2. So far, positive as well as negative indirect environmental impacts have been reported, with negative impacts greater and more persistent. Too little is known about the current pandemic to evaluate whether there is an association between environment and positive COVID-19 cases. We recommend smart technology to collect data remotely, the implementation of "one health" approach between public health physicians and veterinarians, and the use of biodegradable medical supplies in future epidemic threats.

Environmental effects of COVID-19 pandemic and potential strategies of sustainability

Tanjena Rume & S.M. Didar-Ul Islam

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The global outbreak of coronavirus disease 2019 (COVID-19) is affecting every part of human lives, including the physical world. The measures taken to control the spread of the virus and the slowdown of economic activities have significant effects on the environment. Therefore, this study intends to explore the positive and negative environmental impacts of the COVID-19 pandemic, by reviewing the available scientific literatures. This study indicates that, the pandemic situation significantly improves air quality in different cities across the world, reduces GHGs emission, lessens water pollution and noise, and reduces the pressure on the tourist destinations, which may assist with the restoration of the ecological system. In addition, there are also some negative consequences of COVID-19, such as increase of medical waste, haphazard use and disposal of disinfectants, mask, and gloves; and burden of untreated wastes continuously endangering the environment. It seems that, economic activities will return soon after the pandemic, and the situation might change. Hence, this study also outlines possible ways to achieve long-term environmental benefits. It is expected that the proper implementation of the proposed strategies might be helpful for the global environmental sustainability.

Medicinal Plants in COVID-19: Potential and Limitations

Xin Yi Lim, Bee Ping Teh and Terence Yew Chin Tan

Frontiers in Pharmacology, 2020, Vol. 12, Page 1-8

D0I: 10.3389/fphar.2021.611408

Currently, the search to identify treatments and vaccines for novel coronavirus disease (COVID-19) are ongoing. Desperation within the community, especially among the middle-and low-income groups acutely affected by the economic impact of forced lockdowns, has driven increased interest in exploring alternative choices of medicinal plant-based therapeutics. This is evident with the rise in unsubstantiated efficacy claims of these interventions circulating on social media. Based on enquiries received, our team of researchers was given the chance to produce evidence summaries evaluating the potential of complementary interventions in COVID-19 management. Here, we present and discuss the findings of four selected medicinal plants (*Nigella sativa*, *Vernonia amygdalina*, *Azadirachta indica*, *Eurycoma longifolia*), with reported antiviral, anti-inflammatory, and immunomodulatory effects that might be interesting for further investigation. Our findings showed that only *A. indica* reported positive antiviral evidence specific to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) based on preliminary *in silico* data while all four medicinal plants demonstrated differential anti-inflammatory or immunomodulatory effects. The definitive roles of these medicinal plants in cytokine storms and post-infection complications remains to be further investigated. Quality control and standardisation of medicinal plant-based products also needs to be emphasized. However, given the unprecedented challenges faced, ethnopharmacological research should be given a fair amount of consideration for contribution in this pandemic.

News

Cleaner River Water, Better Air Quality - Positive Effects of Lockdown

The nationwide lockdown that brought 1.3 billion people to a stop has apparently caused positive changes in the environment, atleast temporarily. Skies are clearer and river water seems cleaner. Visuals of a cleaner River Ganga have emerged from Uttar Pradesh's Kanpur as well as Varanasi. The clear water is a result of the shutdown of most industries.

In a rare sighting, fishes can be seen near the Varanasi ghaat steps. This seems to have happened because of absence or crowds and clean water. The lockdown has also led to better air quality. According to the World Air Quality, the average concentration of PM 2.5 in New Delhi came down by 71 per cent for a week last month. Nitrogen Dioxide, a pollutant, has also witnessed a decline of 71 percent.

While in most parts of Delhi, the water of River Yamuna has also started to appear clearer in southeast Delhi's Kalindi Kunj, the heavy amount of toxic foam that is usually seen around the year still continues. The toxic foam is caused due to a mix of sewage, detergents and chemicals from industrial waste. Aam Aadmi Party MLA and Delhi Jal Board Vice-Chairman Raghav Chadha said absence of people has made the Yamuna cleaner.

"Many industries and offices are closed due to the lockdown these days and therefore the Yamuna is looking cleaner. The stoppage of industrial pollutants and industrial waste has definitely had a positive effect on water quality. We will conduct testing of the water to ascertain the percentage of improvement in the quality," he said.

In the case of River Ganga too, the lab results of the water quality are awaited. Experts say that along with the lockdown, other factors too have contributed to cleaner water.

Himanshu Thakkar, co-ordinator at South Asia Network on Dams, Rivers and People (SANDRP) told NDTV, "Alongwith lockdown there is increased waterflow due to unseasonal rainfall and snowfall in some parts. Religious activities have decreased, especially in Varanasi, where lesser cremations are happening. The current scenario should shape our future approach of how authorities should minimise industrial effluents in the water bodies."

Source: *https://www.ndtv.com/india-news/cleaner-river-water-better-air-quality-positive-effects-of-lockdown-2206553*

How to improve our relationship with nature after coronavirus

In the middle of the coronavirus crisis, many of us have turned to nature to reduce stress levels, improve mental health and stay physically active. Yet, human interaction with nature and ecosystems contributed to the existence of the current pandemic in the first place. So what can we take away from this?

Human action has altered our planet, from land to ocean, and has led to a loss of ecosystems. There is strong evidence that the emergence of zoonotic diseases – those that jump between animals – is linked to alteration of ecosystems and human encroachment into wildlife habitats, and the United Nations has recently linked environmental degradation to the emergence of pandemics.

There are two main ways that our impact on the environment is increasing the threat of pandemics such as the current coronavirus outbreak. First, with growing human settlements and land-clearing for agriculture, the transition zones between different ecosystems have grown. This leads to species from different habitats mixing and interacting with each other in new ways. These new contacts provides new opportunities for diseases to jump between species, as coronavirus did.

Our expansion into wild areas is increasing the threat of new diseases such as coronavirus. huyangshu/Shutterstock

The second important driver for the emergence of zoonotic disease is biodiversity loss. With decreasing biodiversity, disease vectors – those animals that carry and transmit an infectious pathogen – are more likely to feed on vertebrates

than other species which are no longer as abundant. Those other species then become the primary reservoir of the pathogen.

An example of this is the increased risk of Lyme disease to humans in North America. It was shown that forest fragmentation led to reduced diversity of vertebrates and increased the abundance of some generalist species such as the white-footed mouse, which has become the primary reservoir of the bacteria causing Lyme disease.

High biodiversity, on the other hand, can reduce the risk to human health. The underlying mechanism is called "the dilution effect" and it works by reducing both the relative density of animals that serve as a natural reservoir for pathogens and the population density of the pathogen vectors (such as ticks). This means fewer encounters between vectors and the animals they infect with the disease.

The benefits of nature

But greater contact between humans and their environment has been one of the most important responses to the pandemic, from a mental health perspective.

Many of us who have been fortunate enough to live in areas where lockdown restrictions still permitted outdoor activities turned to walking and exercising outdoors and enjoying the beauty of rivers, urban green spaces and forests, all the while adhering to the prescribed regulations on physical distance and group size.

As we respond to the pandemic, the draw of such spaces for improving well-being cannot be overlooked. Science has long established that access to urban green areas such as parks and lakes has positive impacts on health, typically due to improved air quality, increased physical activity, social cohesion, and stress reduction. It has also been shown that interaction with nature helps us to better recover from stress.

Getting out into nature has been an important balm for many during a stressful time. Filip Singer/EPA

Greening cities not only supports human health but comes with a wide range of other benefits: it is economical, helps reduces the heat island effect in a time of increasingly extreme temperatures and improves air quality.

Green areas can also contribute to flood risk reduction by allowing more water to infiltrate into the soil and thus reducing the amount of excess water during rainstorms. Finally, urban green can create new habitats for plant and animal species.

What we can do next

In light of this, my hope is that the coronavirus pandemic will instigate action to address the underlying drivers of disease emergence, including ecosystem degradation and biodiversity loss. The challenge of protecting the environment in an era of a rapidly escalating climate crisis is enormous and individuals often feel overwhelmed and unable to contribute to change.

But our recent positive experiences with the environment also present a unique opportunity to emerge from the pandemic with a better relationship with nature. Recognition of the value of green spaces should be encouraged long after the pandemic has passed and, if managed properly, could encourage action on the community level to protect ecosystems from further human incursions.

As we look to the future, growing cities need to prioritise existing green spaces and build new ones within existing city boundaries. Green areas within cities support health objectives without degrading biodiverse areas elsewhere. Experiencing nature outside cities will remain important to maintain human health but will only be possible to access and experience in the long run if we can find a healthy balance between our resource use and nature protection.

Enforcement and strengthening environmental regulations to protect or restore biodiverse areas will be vital. The cost of managing those areas for biodiversity conservation and recreation is easier to communicate if the full range of benefits are considered, including the contribution they make to human health.

A green strategy that helps us build back better after coronavirus can support sustainable development on many accounts, not only for mental and physical well-being, but also to ensure that multiple global goals, such as combating climate change and reducing natural hazard risks, can be achieved.

Source: *https://theconversation.com/how-to-improve-our-relationship-with-nature-after-coronavirus-139451*

Some Herbal Compounds May be Effective Against Covid-19: Study

Ever since the beginning of the COVID-19 pandemic, concerted efforts have been made globally to try and find the best treatment protocols for the disease. Even as some vaccine trials are reportedly nearing success, it's important to remember that an effective treatment for the disease could be even more useful currently.

A new study, published in the journal Frontiers of Pharmacology, suggests that such an effective treatment protocol may be at hand if we use certain natural and herbal compounds that can inhibit the SARS-CoV-2 virus. If these compounds are found to be effective against the virus then we could have a new treatment protocol or therapy for COVID-19. Natural methods of treating COVID-19 The study, conducted by researchers in China and the USA, states that herbal and natural compounds have low toxicity, unlike many medications. This is the reason why they can be widely consumed and with adequate tolerance by people across the globe. What's more, the study says such natural compounds also have prophylactic properties, which can not only make breathing easier for COVID-19 patients but may also help prevent acute respiratory distress syndrome (ARDS). It must be noted here that the Indian AYUSH Ministry also came up with an Ayurvedic treatment protocol in October 2020, which includes natural compounds that are known to have antiviral properties like ashwagandha, mulethi, chyawanprash, etc. Several studies have also shown that herbs and roots used in traditional Chinese medicine like ginseng and bitter apricot seeds are rich in flavonoids, which can help fight against diseases that harm the lungs.

Which natural compounds are effective? The new study also focuses on the natural compounds mentioned above and suggests that they are already being widely used due to their traditional healing roles and widespread commercial availability. The study indicates that the compounds found in these natural products are able to slow the progression of COVID-19 infection, reduce the time for which a patient is hospitalised and may even help tackle mild symptoms of the disease.

The following are some herbal and natural compounds that the study claims are effective against SARS-CoV-2:

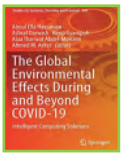
- Plant-based estrogens or phytoestrogens, found in many herbs like turmeric, liquorice, alfalfa, red clover and hops, can target SARS-CoV-2 spike proteins and stop them from binding to human cells.
- The leaves of ashwagandha can reduce the creation of an enzyme called transmembrane protease serine 2 (TMPRSS2), which will inhibit the entry of SARS-CoV-2 into healthy cells.
- Certain compounds present in ginger and galangal can bind with an enzyme in the body called papain-like protease (PL pro), which studies have shown to be capable of breaking down SARS-CoV-2 proteins.
- Quercetin and gallic acid are phytochemical compounds found in many foods like grapes, strawberry, cherries and broccoli. These compounds can inhibit the growth of the RNA-dependent RNA polymerase (RdRp) enzyme and thus prevent the spread of SARS-CoV-2 in the body.

While this new study focuses on the above-mentioned herbal compounds, other studies are also being conducted to test the efficacy of natural products on COVID-19 infection and disease progression.

Source: *https://www.news18.com/news/lifestyle/natural-compounds-effective-against-covid19-myupchar-3093629.html*

BOOKS

Environmental Resilience and Transformation in Times of COVID-19
ISBN: 9780323858038, 0323858031
Publisher: Elsevier Science
Editors: A.L. Ramanathan, Francisco Muñoz Arriola, M.P. Jonathan, M.V. Prasanna, Pankaj Kumar, S Chidambaram



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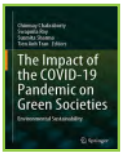
Publisher: Springer Nature
Editors: Hassanien, A.E., Darwish, A., Gyampoh, B.A., Abdel-Monaim, A.T., Anter



The Impact of the COVID-19 Pandemic on Green Societies
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Editors: Chinmay Chakraborty, Swapnila Roy, Susmita Sharma, Tien Anh Tran

Environmental and Health Management of Novel Coronavirus Disease (COVID-19)
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Plants as a Source for Medicines, from Pharmaceuticals to Herbal Remedies
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ISBN: 0691200181, 978-0691200187
Authors: Melanie-Jayne R. Howes, Elizabeth A. Dauncey

CONFERENCES

International Conference on Plants and Environmental Pollution
Venue: Los Angeles, United States
Date: October 28-29, 2021
Weblink: https://waset.org/plants-and-environmental-pollution-conference-in-october-2021-in-los-angeles

International Conference on Ecotoxicology and Pollution Management
Venue: Istanbul, Turkey
Date: August 16-17, 2022
Weblink: https://waset.org/ecotoxicology-and-pollution-management-conference-in-august-2022-in-istanbul

International Conference on Methods and Technology for Assessing Urban Air Quality
Venue: Tokyo, Japan
Date: September 09-10, 2021
Weblink: https://waset.org/methods-and-technology-for-assessing-urban-air-quality-conference-in-september-2021-in-tokyo

International Conference on Phytoremediation Processes and Management
Venue: Jeddah, Saudi Arabia
Date: November 15-16, 2021
Weblink: https://waset.org/phytoremediation-processes-and-management-conference-in-november-2021-in-jeddah

11th International Conference on Environmental Pollution and Remediation (ICEPR'21)
Date: August 5-7, 2021 (Virtually)
Website: https://icepr.org

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Environmental Days (July-September)

- Van Mahotsav Week — 1st-7th July
- World Nature Conservation Day — 28th July
- World Ozone Day — 16th September
- Zero Emission Day — 21st September
- World Rivers Day — 26th September

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