Plants-Derived Biomolecules as Potent Antiviral Phytomedicines: New Insights on Ethnobotanical Evidences against Coronaviruses

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Abstract: SARS-CoV-2 infection (COVID-19) is in focus over all known human diseases, because it is destroying the world economy and social life, with increased mortality rate each day. To date, there is no specific medicine or vaccine available against this pandemic disease. However, the presence of medicinal plants and their bioactive molecules with antiviral properties might also be a successful strategy in order to develop therapeutic agents against SARS-CoV-2 infection. Thus, this review will summarize the available literature and other information/data sources related to antiviral medicinal plants, with possible ethnobotanical evidence in correlation with coronaviruses. The identification of novel antiviral compounds is of critical significance, and medicinal plant based natural compounds are a good source for such discoveries. In depth search and analysis revealed several medicinal plants with excellent efficacy against SARS-CoV-1 and MERS-CoV, which are well-known to act on ACE-2 receptor, 3CLpro and other viral protein targets. In this review, we have consolidated the data of several medicinal plants and their natural bioactive metabolites, which have promising antiviral activities against coronaviruses with detailed modes of action/mechanism. It is concluded that this review will be useful for researchers worldwide and highly recommended for the development of
naturally safe and effective therapeutic drugs/agents against SARS-CoV-2 infection, which might be used in therapeutic protocols alone or in combination with chemically synthetized drugs.

**Keywords:** SARS-CoV; COVID-19; coronavirus; medicinal plant; phytomedicine; ethnobotany; antiviral; natural products; bioactive compounds

1. Introduction

Coronaviruses (CoVs) are single-stranded RNA viruses under the family of Coronaviridae; first reported in 1960 [1]. CoVs can infect humans and a wide range of animals including camels, cattle, cats, and bats, causing respiratory, hepatic, neurological and gastrointestinal diseases [2,3]. CoVs are further divided into subfamily Orthocoronavirinae, and classified into four genera; alpha, beta, gamma and delta-CoVs [4,5]. However, to date, only seven types of human-CoVs (HCoVs) exist that can infect humans. They are Middle East Respiratory Syndrome-CoV (MERS-CoV), Severe Acute Respiratory Syndrome-CoV (SARS-CoV), HCoV-229E, HCoV-OC43, HCoV-NL63, HCoV-HKU1, and novel SARS-CoV-2 [4,5]. In early December 2019, novel SARS-CoV-2 first appeared in the city of Wuhan, China with symptoms of severe viral pneumonia [6,7]. The disease, caused by the novel SARS-CoV-2, has been given the name COVID-19 by the World Health Organization (WHO) [8]. In a short period of time, WHO issued guidelines for patients monitoring, sample collection, and various other detailed pieces of information on this pandemic disease [8]. Many reports confirmed the spread of SARS-CoV-2 by human to human transmission [5–7]. However, there are no specific drugs or vaccines currently available to cure COVID-19 infection. Thus, this scenario reflects the urgency and need to develop new drugs or vaccines against COVID-19 infection [9].

Under the current, difficult context, almost 27,236,916 people have been infected by SARS-CoV-2, and approximately 891,031 deaths has been reported as of 7 September 2020 due to COVID-19 infection globally [8,10,11]. The question raised here is “why researchers and global scientific community have also not taken in consideration the treatment of SARS-CoV-2 infection through natural plant-based compounds or usage of ethnomedicinal medicinal plants?”. Though we cannot bring about an instant cure, considering the urgency of eradicating the COVID-19 pandemic, this paper will open new perspectives about plant molecules in developing various strategies against infectious diseases [12,13]. Mother Nature has always been considered as the prime source for the discovery of unique and new bioactive compounds, which have helped in combatting various diseases and infections [14–22]. Medicinal plants are known to produce innumerable bioactive metabolites with different pharmacological properties, including anticancer, anti-inflammatory, antimicrobial, antioxidant, anti-malarial, anti-hypertension, anti-ageing, anti-diabetic, anti-hyperlipidemia, anti-osteoporotic, hepato-protective, immunomodulator, etc. [23–28]. Many are known to have proven antiviral effects with the ability to inhibit viral replication, and can cure various types of viral infections [13,29–31]. In this review, we have focused on specific medicinal plants and their bioactive compounds, which are known to use/can be used against coronaviruses, HIV, and other viruses to prevent the replication of viruses and reduce the viral load. In addition, how these medicinal plants and their derived biomolecules will be beneficial for the management of SARS-CoV-2 infection is also discussed; a repository of possible and effective antiviral plant candidates has also been made (Figure 1).

2. Therapeutic Potential of Medicinal Plants against SARS-CoV and MERS-CoV Infections

There are various medicinal plants which are known to have an inhibitory effect against SARS-CoV, HCoV-22E9, MERS-CoV and other viral infections (Table 1). They were chosen specifically due to their mode of action and potency, and have been used and researched with ethnobotanical evidence against coronaviruses or other viruses (HIV, Influenza, etc.). Coronaviruses belong to positive...
sense RNA viruses and mostly use the ACE-2 (Angiotensin-converting enzyme-2) receptor, 3CLpro (3 Chymotrypsin-like protease), PLpro (Papain-like protease), RdRp (RNA-dependent RNA polymerase) enzyme and other known factors to gain entry into the human cell and complete the life cycle. Thereby, all these selected plants have been tested by various researchers globally to act on these specific target proteins and receptors, and, moreover, inhibit RNA replication in the other viruses too. This was the chief rationale in selecting these plants, which are described in detail below with their mode of action, which may also possibly be considered as a therapeutic choice against SARS-CoV-2. This presentation is designed in order to open new pathways towards the management of highly contagious diseases with the help of natural compounds.

2.1. Bupleurum Species

_Bupleurum_ plant species are extensively dispersed in the northern hemisphere and are used as one of the oldest phytomedicines in China. Many reports have identified the activity of this herbal plant in the treatment of HCoV-22E9 and other viral infections [32,33]. Generally, *Radix bupleuri* (*R. bupleuri*) is derived from the dried roots of _Bupleurum_ species and used for the treatment of various diseases [34]. It has great pharmacologically significant activities, the main ones reported in the literature being: antiviral, anti-inflammatory, anti-tumor, neuro-modulation and immunoregulation [34,35]. Approximately 7% of naturally occurring saikosaponins (triterpene saponin glycosides) are present in _R. bupleuri_, which is the main component of this medicinal plant with potent effects. Four types of saikosaponins (SS) are found; SSa, SSb2, SSc and SSD, which are responsible for the most pharmacological activities in this medicinal plant [36]. The SSa, SSb2 and SSD have potential to inhibit the effects...
against coronavirus 229E, SARS-CoV and influenza A virus [35]. Moreover, the mechanism of action of these SS employing antiviral activity interrupts the early stage of viral replication inside the host cells [35]. In addition, these SS also attenuate pro-inflammatory cytokines production, inhibiting viral replication through down-regulating NF-κB signaling, caspase 3-dependent virus ribonucleoprotein nuclear export, lung neutrophil and monocytes recruitment in an experimental in vivo mice model [35].

2.2. Lycoris radiate (L’Hér.) Herb.

*Lycoris radiata* (*L. radiata*) belongs to the *Amaryllidaceae* family and originally it was found in China, Korea, Japan and Nepal [37]. This medicinal plant has wide-ranging biological activities comprising: antiviral, anticancer [37], anti-malarial [38], anti-inflammatory [39] and induction of nausea and emesis [40]. Additionally, and most importantly, *L. radiata* has been known to have antiviral effects on SARS-CoV [41,42], poliovirus, human immunodeficiency virus (HIV), measles virus, herpes simplex virus and coxsackie virus [42,43]. Its potent bioactive compound is lycorine, which is extracted from the flower and stem cortex of *L. radiata* plants. Currently, this plant is in use for the treatment of various diseases due to its broad-spectrum biological activities. It has also been recommended as a promising medicinal plant for the development of potential drugs against SARS-CoV infection [42,43]. The antiviral mechanism of action of this plant is by inhibiting virus replication in the cells through inhibiting autophagy [43]. Moreover, JNK/MAPK signaling pathway is closely connected to autophagy, and through this signaling pathway, the plant extract inhibits the process of autophagy due to reduced JNK phosphorylation induced by viral replication [43–44].

2.3. Artemisia annua L.

This Chinese medicinal plant has been used for a long time to treat various diseases such as bronchitis and hemorrhoids, and is potentially effective for its anti-malarial, antiviral, anticancer, etc., properties [45–47]. However, *Artemisia annua* (*A. annua*) has been known to possess antiviral activity and currently is in use for the treatment of Poliovirus, HIV, RSV, HSV1, hepatitis C, type 2 dengue virus and human cytomegalovirus [29,48]. *A. annua* contains quercetine, flavonoid, polyphenols, triterpenes, sterols, saponins, polysaccharides, dicaffeoylquinic acid and other molecules [48]. Due to the presence of these molecules, *A. annua* extracts (whole plant) have shown an important role, being assigned with immunomodulator, antiviral, antioxidant and anti-inflammatory properties. Moreover, these compounds/molecules have been known to inhibit the enzyme activity of 3CLPro [49, 50]. Previously, this medicinal plant has been used to treat SARS-CoV and MERS infections [50], and is currently being used against novel SARS-CoV-2 infection [49]. The mechanism of action of *A. annua* is to inhibit the enzymatic activity of 3CLPro, which is also produced by SARS-CoV-2, and increase the production of pro-inflammatory cytokines prostaglandin E2 (PGE2), IL-6, TNF-α, IFN-γ and enhance the genesis of CD4+ and CD8+ T cell populations [49–51].

2.4. Pyrrosia lingua (Thunb.) Farw.

*Pyrrosia lingua* (*P. lingua*) belongs to the *Polypodiaceae* family and mostly occurs in China, Japan, Korea and other Asian regions [52]. *P. lingua* is known for its antiviral, antioxidant, antibacterial and anticancer activities; it even stops the formation of urinary calculi [52,53]. Furthermore, it contains several bioactive components, such as flavonoids, chlorogenic acid, mangiferin, isomangiferin, astragalin and trifolin [54]. The extract of *P. lingua* leaves has been used by many researchers for the treatment of HIV, SARS and other viral infections [50,52,53]. In the case of SARS-CoV-1, this plant has shown the ability to inhibit viral infection, but the mechanism of action is still not clear [48,50].

2.5. Isatis indigotica Fortune ex Lindl.

*Isatis indigotica* (*I. indigotica*) is a very old Chinese herbal plant belonging to the *Cruciferae* family. It is mostly found in China, Hong Kong, Taiwan and other regions of Asia [55]. According to Lin et al., *I. indigotica* has the potential to inhibit/block SARS-CoV-1 entry and replication in its host [48]. However,
the research group used *Radix isatidis* (dried root) of *I. indigotica* for extracting potent compounds for the treatment of SARS-CoV-1-infected patients. Furthermore, its root contains indirubin, indican, indigo, sinigrin, β-sitosterol, hesperetin, aloe-emodin and many more bioactive compounds [55,56]. According to one in vitro study, all these extracted compounds were used against SARS-CoV-1 infection, and it was found that indigo, sinigrin, aloe-emodin and hesperetin were able to inhibit the virus entry and replication by inhibiting the SARS-CoV-1 3CLpro [57]. We know that coronavirus 3CLpro mediates the proteolytic processing of replicate polypeptides into the functional proteins and plays a key role in viral replication [58]. Therefore, *I. indigotica* can also be considered as a potential therapeutic choice against SARS-CoV-2.

2.6. *Torreya nucifera* L.

This plant is mostly found in snowy areas near the Sea of Jeju Island in Korea, and is considered as a traditional medicinal plant. Its leaves are mostly used for the treatment of stomachache, hemorrhoids and rheumatoid arthritis [59,60]. During SARS-CoV-1 infection, Young Bae Ryu et al. used *Torreya nucifera* (*T. nucifera*) plant leaves for in vitro experiments, and the results showed a potential inhibitory effect [48,61]. Ryu et al. isolated 12 phytochemical compounds from the ethanol extract of the *T. nucifera* leaves. Only the biflavonoid amentoflavone showed efficacy against SARS-CoV-1 [61]. This biflavonoid of *T. nucifera* has the potential to block the activity of 3CLpro of the coronavirus and can inhibit the viral replication [61].

2.7. *Houttuynia cordata* Thunb.

This Southeast Asian plant belongs to the family of *Saururaceae*, which is traditionally used for the treatment of lung disorders such as cough, lung abscess, phlegm, and dyspnea. *Houttuynia cordata* Thorn (HCT) is a Chinese herbal plant well-known for its potent effects in the treatment of pneumonia, refractory hemoptysis, and SARS-CoV-1 infection [62,63]. It has anti-inflammatory, anti-allergic, antioxidant and anticancer properties [62]. The bioactive compounds present in HCT are comprised of rutin, hyperin, isoquercitrin, quercetin, afzelin, reyoutrin, kalium sulfuricum, cordarine, decanoyl acetaldehyde, lauric aldehyde, myrcene, α-pinene, methyl nonyl ketone, d-limonene, linoleic acid, aspartic acid, palmitic acid, water-soluble polysaccharides, amino acids, vitamins, manganese, potassium, zinc, iron and copper [64–66]. During the SARS-CoV-1 infection, the leaves of this Chinese medicinal plant were used to treat patients and showed good efficacy against SARS-CoV-1 [48,57]. Lau et al. conducted one experiment using HCT against SARS-CoV-1. Results showed that HCT can inhibit SARS-CoV-1 activity including an immunomodulatory effect [63]. However, the mode of action of HCT is to inhibit the 3CLpro activity of SARS-CoV-1 and obstruct the activity of RdRp [63]. Hence, it can block the entry of the virus and impede viral replication [63]. This inhibitory mechanism makes HCT a good choice to be used against SARS-CoV-2 infections.

2.8. *Lindera aggregate* (Sims) Kosterm.

*Lindera aggregate* (*L. aggregate*) is a traditional Chinese medicinal plant belonging to the *Lauraceae* family and mostly found in China and Japan [67]. The root of this plant is mostly used to treat chest pain, inflammation, indigestion, cold hernia and other diseases. It contains several bioactive components, such as flavonoids, isoquinoline alkaloids, sesquiterpene lactones and tannins [68,69]. Moreover, *L. aggregate* has also showed other biological activities such as antiviral, anti-tumor, anti-inflammatory, antimicrobial and anti-diabetic activities [48,69,70]. *L. aggregate* leaves can also be used to drink as tea, due to their protective effect against oxidative stress [70]. In 2005, Shi-you Li et al. investigated the effect and efficacy of *L. aggregate* roots against SARS-CoV-1 [50]. An in vitro study showed that *L. aggregate* is able to inhibit SARS-CoV-1 with EC$_{50}$ value of 88.2 ± 7.7 µg/mL [50]. However, the mode of action is still not clear, but it was suggested that *L. aggregate* roots can possibly inhibit the viral replication and block the entry of virus [50].
Table 1. List of medicinal plants used for the treatment of MERS-CoV, SARS-CoV-1 and other viral infections with their potent bioactive compounds, biological activities and therapeutic effect against various diseases. These plants can possibly be used to target SARS-CoV-2.

| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------|------------|
| *Bupleurum* species (Root)                               |         | SSa, SSb2, SSc and SSD | Antiviral, anti-inflammation, anti-tumor, neuro-modulation, immune-regulation | CoVs and Influenza virus | [32,34,35] |
| *Lycoris radiate* (L’Hér.) Herb. (Flower and stem cortex) |         | Lycorine           | Antiviral effects, anticancer, anti-malarial, anti-inflammatory, induction of nausea and emesis | SARS-CoV-1, poliovirus, HIV, HSV and coxsackie virus | [41–44,71] |
| *Artemisia annua* L. (Whole plant)                       |         | Quercetin, flavonoid, polyphenols, triterpenes, sterols, saponins, polysaccharides, dicafeoylquinic acid | Anti-malarial, antiviral, anticancer, bronchitis, haemorrhoids | SARS-CoV-1, MERS-CoV, Poliovirus, HIV, RSV, HSV1, hepatitis C, type 2 dengue virus and human cytomegalovirus | [29,45,48–50,72] |
Table 1. Cont.

| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|-----------------------------------------------------------|---------|---------------------|-----------------------|--------------------------------------|------------|
| *Pyrosia lingua* (Thunb.) Farw. (Leaves)                 |         | Flavonoids, (mangiferin, isomangiferin, trifolin, astragalin), chlorogenic acid, mangiferin, isomangiferin, astragalin, and trifolin | Antiviral, antioxidant, antibacterial, anticancer | HIV, SARS-CoV-1 | [48,50,52,54,73] |
| *Isatis indigotica* Fortune ex Lindl. (Leaf and root)    |         | Indigo, indirubin, indican, β-sitosterol, sinigrin, hesperetin, aloe-emodin | Antiviral, antioxidant, antibacterial | SARS-CoV-1 3CLpro, HSV1, Influenza virus, coxsackie virus B3 | [48,55,57,58,74] |
| *Torreya nucifera* L. (Leaves)                          |         | Biflavonoid amentoflavone | Antiviral | SARS-CoV-1 3CLpro, stomachache, hemorrhoids, and rheumatoid arthritis | [48,59,61,75] |
| *Houttuynia cordata* Thunb. (Leaves)                    |         | Volatile oils, organic acids, flavonoids cordarine, kalium sulfuricum, potassium, zinc, iron, copper, amino acid, vitamins and manganese | Antiviral, anti-inflammatory, anti-allergic, anti-oxidant, Immunomodulatory and anticancer | SARS-CoV-1 3CLpro and RdRp, cough, lung abscess, phlegm, dyspnea, pneumonia, refractory hemoptysis | [48,57,63,65,66,76] |
| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------|------------|
| *Lindera aggregata* (Sims) Kosterm. (Root)               | ![](image1) | Flavonoids, isoquinoline alkaloids, sesquiterpene lactones and tannins | Antiviral, anti-tumor, anti-inflammatory, antimicrobial and anti-diabetic | SARS-CoV-1, chest pain, inflammation, indigestion, cold hernia | [48,50,68,69,77] |
| *Rheum palmatum* L. (Root)                              | ![](image2) | Emodin, physcion, chrysophanol, rhein, and aloe-emodin | Antiviral, anti-pyretic, anti-neoplastic, anti-pasmoletic, antibacterial, laxative, hemostatic, and anti-spasmodic | SARS-CoV-1 ACE2, laxative or astringent, stomachicum, hemorrhoids, liver bile disease or gastroenteritis | [78–83] |
| *Polygonum multiflorum* Thunb. (Root)                   | ![](image3) | Polygonumosides A, B, C, and D, resveratrol, chrysophanol, polydatin, emodin-1,6-dimethyl ether, rhaponticoside, emodin, 2-acetylemodin, physcion, rhein, citreorosein, apigenin, falacinol, tricin, rutin, quercetin, luteolin, kaempferol, iso-orientin, hyperoside, vitexin, quercetin-3-O-arabinoside, polygonflavanol A, hexadecanoic acid ethyl ester, phosphatidylethanolamine, hexanoic acid, copaene, eicosane, squalene, catechin, epicatechin, 3-O-galloyl-procyanidin B2, β-sitosterol, gallic acid, methyl gallate, daucosterol, and schizandrin | Anti-CoVs, antioxidant, immunomodulation, anti-hyperlipidemia, antitumor, anti-neoplastic, anti-sclerotic, anti-inflammatory, anti-inflammatory, and anti-diabetic | SARS-CoV-1 ACE2, rubella, scrofula, waist and knee pain, paralysis, vaginal discharge, hypercholesterolemia (liver and kidney), malaria, neuro-protective | [78,84–89] |
Table 1. Cont.

| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------|------------|
| **Cerasus avium** (L.) Moench (Stem)                     | ![Cerasus avium](image) | Polyphenols, carotenoids, vitamins, minerals | Antioxidant, antimicrobial and antiviral | SARS-CoV-1 ACE2, oxidative stress, tooth aches and mouth diseases | [78,90–95] |
| **Alcea digitata** (Boiss.) Alef (Flower)                 | ![Alcea digitata](image) | Unknown | Antiviral, antioxidant, anti-inflammatory, antimicrobial, anti-tussive, expectorant and laxative | SARS-CoV-1 ACE2, lung respiratory disorder, head and neck cancer and lubrication of throat | [91,92,96–98] |
| **Citrus aurantium** L. (Fruit)                           | ![Citrus aurantium](image) | Phenolics (flavanone glycosides, hydroxycinnamic acids), vitamin C, and carotenoids | Antiviral, antioxidant, anticancer | SARS-CoV-1 ACE2, anxiety, lung related disease, obesity, gastrointestinal disorder and prostate cancer | [91,92,99–102] |
| **Rubia tinctorum** L. (Root)                             | ![Rubia tinctorum](image) | Anthraquinone, Alizarin and pseudopurpurin | Antiviral, antimicrobial | SARS-CoV-1 ACE2, kidney, bladder stone, menstrual and urinary disorder | [91,92,103–105] |
| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------|------------|
| *Allium sativum* L. (Colves)                              | ![Allium sativum](image1) | Alliin, allicin, ajoenes, vinlyldithiins, and flavonoids | Antiviral, antimicrobial, antioxidant, anti-inflammatory, and anticancer | SARS-CoV-1 ACE2, inflammation, cancer and bacterial infection | [91,92,94,106–110] |
| *Quercus infectoria* G. Olivier (Gall)                   | ![Quercus infectoria](image2) | Phenolic compound (p-hydroxybenzoic acid, catechol, caffeine, pyrogallol, catechin, e-vanillic acid, 3-hydroxytyrosol cinnamic, p-Coumaric, gallic acids and resveratrol), flavonoid compounds | Antiviral, anti-fungal, antibacterial, antioxidant, anti-inflammatory, anti-diabetic, anti-parasitic, anti-venom | SARS-CoV-1 ACE2, diarrhea, menorrhagia, dysentery, gonorrhea, tonsillitis, impetigo and internal hemorrhages | [111–115] |
| *Onopordum acanthium* L. (Leaf, flower, stem and root)   | ![Onopordum acanthium](image3) | Flavonoids, sesquiterpene lactones, lignans, phenylpropanoids, triterpenoids, and sterols | Antiviral, anti-tumor, anti-inflammatory, antioxidant and cardio-tonic agent | SARS-CoV-1 ACE2, cancer, treat nervousness | [113,116–119] |
| *Berberis integerrim* Bunge (Root)                       | ![Berberis integerrim](image4) | Berbamine, berberuin, palmatine, oxyacanthine, malic acid, ascorbic acid, caffeic acid, ursolic acid, coumarin, beta carotene, and tannin | Antiviral, anti-inflammatory, anti-hyperglycemic, anti-hyperlipidemic, anticancer, antioxidant | SARS-CoV-1 ACE2, alleviate insomnia, bronchial diseases, and liver disorder | [113,120–123] |
| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|----------------------|-----------------------|--------------------------------------|------------|
| *Crataegus microphylla* C. Koch (Leaves, flower, stem and root) | ![Image](image1) | Phenols, phenolic acids, procyanidins, flavonoids, triterpenes, polysaccharides, catecho-lamines | Antiviral, antioxidant, anti-inflammatory and anti-diabetic | SARS-CoV-1 ACE2, heart muscle cells activation, coronary dilation, regulated blood flow | [113,120,124–127] |
| *Alnus japonica* (Thunb.) Steud. (Bark) | ![Image](image2) | Hirsutenone, oregonin, rubranoside rubranoside B, rubranol, and hirsutanonol | Antiviral, anticancer, anti-inflammatory, antioxidant and induction of lymphatic and gastroenteric disorders. | SARS-CoV-PLpro fever, cancer, blood and lymphatic disorders, gastroenteric disorders | [128–130] |
| *Psoralea corylifolia* L. (Seed) | ![Image](image3) | Neobavaisoflavone, isobavachalcone, Bavachinin, 40 –O-methyl bavachalcone, corylifol A and psoralidin | Antiviral, antioxidant, antibacterial and anti-depressant activities | SARS-CoV-PLpro leukoderma, psoriasis, vitiligo, asthma, ulcers, kidney disorders | [131–134] |
| *Paulownia tomentosa* (Thunb.) Steud. (Fruit) | ![Image](image4) | Tomentin A, tomentin B, tomentin C, tomentin D, tomentin E, geranylated flavonones | Antiviral, antioxidant and antibacterial | SARS-CoV-PLpro inflammatory bronchitis, upper respiratory tract infection, asthma, tonsillitis, gonorrhea, traumatic bleeding, enteritis, bacteriological diarrhea, erysipelas, swelling, bronchopneumonia, conjunctivitis, and hemorrhoid | [135–139] |
| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------|------------|
| *Tribulus terrestris* L. (Fruit)                         | ![Picture](image1.png) | Flavonoid and alkaloids | Antiviral, anti-inflammatory, antioxidant, anti-tumor, anti-diabetic and anti-uricotic | SARS-CoV-3CLpro and PLpro, hypertension, premature ejaculation, erectile dysfunction, vitiligo, and kidney | [140–143] |
| *Angelica keiskei* (Miq.) Koidz. (Leaves)               | ![Picture](image2.png) | Chalcones, flavanones and coumarins, coumarins phenolic, acetylenes, sesquiterpene, diterpene, and triterpenes | Antiviral, antibacterial, anti-diabetic, anticancer, anti-inflammatory, antioxidative, anti-coagulant, anti-obesity, anti-tumor, anti-mutagenic and hepato-protective | SARS-CoV-1 3CLpro, bacterial treatment, cancer and diabetes | [144–148] |
| *Sambucus nigra* L. (Leaf, flower and fruit)             | ![Picture](image3.png) | Flavonoids, lectins, anthocyanin, peptic polysaccharides, polyphenolic compound | Antiviral, Immunomodulatory activity, anti-inflammatory | Common cold, HIV, HSV1, influenza, urinary tract infection, edema, rheumatic | [149–156] |
| *Eleutherooccus senticosus* (Rupr. & Maxim.) Maxim. (Leaf and root) | ![Picture](image4.png) | Phenols, lignans, coumarins, phenylpropanoids, flavonoids, hyperin, rutin, azelain, quercetin, kaempferol, phenolic acids, triterpenic acids, and anthocyanin | Antiviral, anti-diabetic, anticancer, antioxidant | Influenza virus, chronic coughing, fatigue and infection, ischemic heart disease, diabetic, cancer, altitude sickness, neurodegenerative disorder | [101,149,157–160] |

Table 1. Cont.
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| Botanical Name and Vegetable Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases                                                                 | References |
|------------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------------------------------------------------------------------------|------------|
| *Salvia miltiorrhiza* Bunge (Root)                         | ![Salvia miltiorrhiza](image) | Lipophilic diterpenoids, flavonoids, triterpenoids and hydrophilic phenolic compound | Antiviral | HIV, enterovirus removing blood stasis, improving blood circulation, atherosclerosis, thrombosis, angina pectoris, cardiovascular disease | [161–165] |
| *Acacia arabica* (Lam.) Willd (Leaves)                     | ![Acacia arabica](image) | Methyl 3,4,5 tri hydroxyl benzoate, ferulic acid, p-coumaroylquinic acid, isoferulic acid, p-coumaroyl glucoside, epicatechin-3-gallate, ascorbic acid, quercetin, oleic acid, myristic acid, palmatic acid and steroidal sapogenin aglycone | Antiviral, antimicrobial, anti-diabetic, antioxidant | HIV, influenza virus, Newcastle disease, vaccinia virus, bursal disease virus, skin disease | [149,166–170] |
| *Ocimum sanctum* L. (Leaves)                              | ![Ocimum sanctum](image) | Flavonoids, tannins, saponins, alkaloids, phenols, anthocyanine, triterpenoids, anthocyanin, anthocyanin, anthocyanin, anthocyanin, anthocyanin | Antiviral, antimicrobial, anti-cataract, anti-inflammatory, anti-diabetic, anti-hypercholesterolemia, anti-hypertensive, anti-carcinogenic, anti-pyretic, anti-allergic, immunomodulatory, anti-asthmatic, anti-tussive, anti-fertility, anti-ulcer, anti-emetic, anti-spasmocid, anti-arthritis, adaptogenic, anti-leukodermal, anti-coagulant activities | H9N2 influenza disease anxiety, cough, asthma, diarrhea, fever, skin disease, dysentery, arthritis, eye diseases, otalgia, indigestion, hiccups, vomiting, gastric, cardiac and genitourinary disorders, back pain, skin diseases, ringworm, insect, snake and scorpion bites, malaria and antioxidant | [167,171–179] |
| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------|------------|
| Ocimum basilicum L. (Whole plant) | ![Picture](image1) | Phenolic compounds, flavonoids and anthocyanins | Antiviral, anti-inflammatory, antioxidant and antibacterial | HIV infection and bacterial infection | [149,180–185] |
| Theobroma cacao L. (Seed) | ![Picture](image2) | Polyphenol, theobromine and flavonoids (heobromine, lignin, dietary fiber, free fatty acid, minerals, zinc, copper, iron) | Antiviral, antioxidant, anti-inflammatory | Influenza virus | [186–190] |
| Pelargonium sidoides DC (Root) | ![Picture](image3) | Methoxycoumarin, proanthocyanidins, EPs 7639 and prodelphinidins | Antiviral and antioxidant | Influenza virus, tuberculosis, respiratory disease, cough, gastrointestinal infection, viral disease | [191–195] |
| Taraxacum officinale (L.) WEB. ex WIGG. (Aerial part and root) | ![Picture](image4) | Terpenes, flavonoids, phenolic compounds, terpenoids, triterpenoids, steroids, coumarins, phenols, saponins, flavones, flavonols, chalcones, phlobatannins, and cardiac glycosides | Antiviral, antibacterial, choleric, anti-diabetic, anti-inflammatory, antioxidant, hepatoprotective, diuretic and antifungal | HIV, influenza virus, kidney related disease, lung related disease, tumor of breast, diabetic, uterus related infection, digestive system related abnormality | [48,196–202] |
| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|--------------------------------------------------------|---------|---------------------|----------------------|------------------------------------|------------|
| *Illicium oligandrum* Merr and Chun (Root)             | ![Picture](image1) | Sesquiterpene lactones, neolignan glycosides, phenolic diglycosides and prenylated compounds | Antiviral | HSV, coxsackie virus and influenza virus, rheumatoid arthritis, neurotoxic and neurotrophic effects. | [203–207] |
| *Glycyrrhiza glabra* L. (Root)                         | ![Picture](image2) | Flavonoids, glycyrrhizic acid, triterpenoid, saponins | Antiviral, anti-inflammatory, antimicrobial, antioxidant, anti-tumorigenic and anti-ulcer | CoVs, HIV, influenza virus | [208–213] |
| *Polygala karensium* Kurz (Root)                       | ![Picture](image3) | Xanthones | Antiviral, antimicrobial, antioxidant, cytotoxicity activity | Influenza virus, cough, bronchitis, neurasthenia, inflammation and amnesia | [214–217] |
| *Calophyllum brasiliense* Cambess (Leaves)              | ![Picture](image4) | Tricyclic coumarin | Antiviral, antibacterial, anti-protozoal and antifungal | HIV, parasitic diseases, bacterial and fungal disease | [218–221] |
| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------|------------|
| Cimicifuga foetida L. (Rhizomes)                         |         | Cimicifugin, cycloartane triterpenoids and glycosides | Antiviral, anti-tumor, anti-inflammatory | Respiratory Syncytial Virus, fever, headache, sore throat, toothache, uterine prolapse and inflammation | [222–226] |
| Boerhavia diffusa L. (Leaf, stem and root)              |         | Flavonoids, triterpenoids, alkaloids, hypoxanthine, steroids, lipids, lignins, ursolic acid, boeravinone, punarnavoside | Antiviral, anti-fibrinolytic, anti-convulsant, antibacterial, anti-hepatotoxic, anti-asthmatic and anti-nematodal activity | Hepatitis C virus, abdominal pain, jaundice, dyspepsia, release the stress, spleen enlargement, liver | [227–231] |
| Terminalia chebula Retz (Leaf, bark and fruit)          |         | Flavonoids, polyphenols, terpenes, anthocyanins, glycosides, gallic acid, chebulagic acid, punicalagin, chebulinin, corilagin, neochebulinic acid, ellagic acid, chebulinic acid, alkaloids | Antiviral, antioxidiant, antibacterial, antifungal, anti/protozoal, anti-carcinogenic, anti-mutagenic, anti-diabetic, reno-protective, anti-inflammatory, anti-arthritis, anti-anaphylactic, anti-caries, anti-allergic, immunomodulatory, anti-ulcer, anti-spasmodic | Human cytomegalovirus, hepatitis C virus, dengue virus, measles virus, respiratory syncytial virus, irregular fevers, urinary diseases, diabetes, skin diseases, heart diseases, constipation, ulcers, vomiting, colic pain, hemorrhoids, digestive diseases | [232–238] |
### Table 1. Cont.

| Botanical Name and Vegetal Part Use for Medicinal Purpose | Picture | Bioactive Compounds | Biological Activities | Therapeutic Effect against Diseases | References |
|----------------------------------------------------------|---------|---------------------|-----------------------|-------------------------------------|------------|
| *Caesalpinia sappan* L. (Root)                           | ![Image](image) | Xanthone, sappanchalcone, coumarin, chalcones, flavones, homoisoflavonoids, and brazilin | Antiviral, anti-inflammatory, antioxidant, antibacterial, antifungal, anti-complementary | HIV, Influenza virus, tuberculosis, diarrhea, dysentery, skin infections and anemia | [219,239–242] |
3. Known Medicinal Plants Acting on ACE-2 Receptor

As of recently, it is known that SARS-CoV-2 is using the ACE-2 receptor to enter into human cells. There are various medicinal plants which have the potential to act on the ACE-2 receptor and are well-known for blocking the transmission or entry of CoVs. After an in-depth literature search, several plants have been found to act on the ACE-2 receptor, which could become promising antiviral agents and can help in combatting COVID-19 pandemic. They are Radix et Rhizoma Rhei, Radix Polygoni multiflori, Caulis Polygoni multiflori, Cerasus avium (L.) Moench, Alcea digitata (Boiss.) Alef, Rubia tinctorum L., Berberis integerrima Bge, Peganum harmala L. and Allium sativum L. [78,91].

3.1. Rheum palmatum L.

This herbal plant belongs to the family of Polygonaceae. It is mostly found in mountainous regions with high elevations, such as the Sichuan, Gansu and Shaanxi regions of China [81]. It is effectively used as a laxative or astringent for the treatment of stomachache, hemorrhoids, liver bile disease or gastroenteritis [243]. It contains some potent bioactive compounds including emodin, physcion, chrysophanol, rhin and aloe-emodin [80,82]. Known biological activities are antiviral, anti-pyretic, anti-neoplastic, anti-spasmolytic, antibacterial, laxative, hemostatic and anti-spasmodic [79,81,82,244]. It was also used against SARS-CoV-1 infection, due to its potential efficacy for acting on the ACE-2 receptor, leading to blockage of viral entry into cells and replication of the CoVs [78,80]. An in vitro study conducted by Ho et al. 2007 showed the potential of Radix et Rhizoma Rhei (root tubers of Rheum palmatum L.) in blocking the entry of SARS-CoV-1 to inhibition sites such as the ACE-2 receptor [78]. Furthermore, the major active component of this plant is emodin, which is responsible for blocking the binding of SARS-CoV-1 S protein to ACE-2 receptor [78,80]. Therefore, the use of emodin extracted from Radix et Rhizoma Rhei can be considered for the possible therapeutic management of COVID-19. This will possibly provide us with new insight into therapy against SARS-CoV-2.

3.2. Polygonum multiflorum Thunb

Polygonum multiflorum Thunb (PMT) is mostly found in China, Korea and Japan, belonging to Polygonaceae family [245]. Radix Polygoni multiflori (root tubers of PMT) is mostly used in treating many kinds of diseases, such as rubella, scrofula, waist and knee pain, paralysis, vaginal discharge, hypercholesterolemia (liver and kidney), malaria, and various other diseases, possessing neuro-protective, antioxidation, immunomodulation, anti-hyperlipidemia, anticancer, heap-toprotection, anti-inflammation, and anti-CoV functions [86,87,246]. The potent bioactive compounds present in PMT which are responsible for the therapeutic effects against various diseases are listed in Table 1 [84,85,88,247]. However, Ho et al. found that emodin is the most effective compound against SARS-CoV-1. The data were published to show the potential and efficacy of PMT in blocking the entry of SARS-CoV-1 by acting on the ACE-2 receptor [78]. The mode of action of PMT is similar to Rheum palmatum L and the major active constituent is found to be emodin in both plants. Therefore, it is highly recommended to focus on emodin for possible and effective management of SARS-CoV-2 infection, combination with other therapeutic approaches.

3.3. Cerasus avium (L.) Moench

This Persian medicinal plant belongs to the Rosaceae family and is mostly used as an antioxidant, antimicrobial and antiviral [93]. Its stem contains polyphenols, carotenoids, vitamins, minerals and many other bioactive components [90,248]. However, this plant has strong potential to act on the ACE-2 receptor and block the further processing of the viruses [78,92,94]. According to Ziai et al.’s 2009 in vitro study, this plant showed very good potential to inhibit or completely block the ACE-2 receptor [94]. Subsequently, Heidary et al., 2020 recently suggested that this plant has good potency against SARS-CoV-2 and must be used for the treatment of its infection [91].
3.4. *Alcea digitata* (Boiss.) Alef

*Alcea digitata* (*A. digitata*) is a Persian medicinal plant belonging to the *Malvaceae* family with antiviral, antioxidant, anti-inflammatory, antimicrobial, anti-tussive, expectorant and laxative therapeutic effects [96,97]. The flowers of *A. digitata* have been used for lung and respiratory disorders, head and neck cancer, and lubrication of the throat [97]. According to one published report [96], *A. digitata* is known to have good potential to block or inhibit the ACE-2 receptor. Recently, Heidary et al., 2020 suggested that *A. digitata* can possibly show good inhibitory effects against SARS-CoV-2 infection [91].

3.5. *Citrus aurantium* L.

*Citrus aurantium* (*C. aurantium*) belongs to the family of *Rutaceae* and is generally known as bitter orange [249]. This plant is known to have many essential components with biological effects [100,101], such as phenolics (flavanone glycosides, hydroxycinnamic acids), vitamin C, and carotenoids [99,249,250]. However, *C. aurantium* fruit extract is mainly used for the treatment of anxiety, lung related diseases, obesity, gastrointestinal disorders and prostate cancer [249,251], buts has potential to inhibit or block the ACE-2 receptor. Some in vitro studies have shown its efficacy in inhibiting ACE-2 receptors [91].

3.6. *Rubia tinctorum* L.

*Rubia tinctorum* (*R. tinctorum*) is mostly found in Southern Europe, Western Asia and North Africa and belongs to the family of *Rubiaceae* [252]. *R. tinctorum* is mostly used to treat kidney and bladder stones, and menstrual and urinary disorders [104,253]. Furthermore, the root of *R. tinctorum* contains red color due to the presence of anthraquinone, alizarin and pseudopurpurin, which is also used for dyeing purposes [103]. On the other hand, *R. tinctorum* has shown potential to inhibit or block the ACE-2 receptor [91]. in vitro studies revealed the efficient use of *R. tinctorum* to inhibit ACE-2 receptors [91].

3.7. *Allium sativum* L.

The common name of *Allium sativum* (*A. sativum*) is garlic, and it belongs to the *Amaryllidaceae* family. *A. sativum* use for human welfare has been reported for thousands of years in the form of a spice [108]. It is an aromatic herbaceous plant and is consumed worldwide as a food as well as a remedy for different diseases [108]. *A. sativum* is reported to have numerous biological properties, such as antibacterial, antifungal, anti-carcinogenic, antioxidant, anti-diabetic, reno-protective, anti-atherosclerotic, and anti-hypertensive effects. Cloves of this traditional medicinal plant contain several potent components, such as alliin, allicin, ajoenes, vinyldithiins, and flavonoids [108,109,254–256], due to which it is mostly used for treatment of various disorders [106–109,257]. On the other hand, an in vitro study conducted by Ziai et al., 2009 on *A. sativum* and its potential efficacy to inhibit the ACE-2 receptor reported some effective results [94].

3.8. *Quercus infectoria* G. Olivier

*Quercus infectoria* (*Q. infectoria*) is commonly known as gall oak and belongs to the family of *Fagaceae* [112]. This medicinal plant is traditionally used for the treatment of diarrhea, menorrhagia, dysentery, gonorrhea, tonsillitis, impetigo and internal hemorrhages [112,258]. Bioactive constituents of *Q. infectoria* gall extract include phenolic compounds (catechol, p-hydroxybenzoic acid, caffeine, catechin, pyrogallol, e-vanillic acid, 3-hydroxytyrosol cinnamic, p-coumaric, gallic acids and resveratrol), flavonoids (naringin, rutin, 7-hydroxyflavone and hispertin) [111,259,260] with biological activities such as antiviral, antifungal, antibacterial, antioxidant, anti-inflammatory, anti-diabetic, anti-parasitic, anti-venom, etc. [112,114,261]. *Q. infectoria* has also shown strong potential to completely block the ACE-2 receptors due to the presence of many potent and tannin active components in vitro [113].
Similarly, this medicinal plant can also be considered for combinational therapeutic approaches in controlling the COVID-19 pandemic directly or indirectly.

3.9. Onopordum acanthium L.

_Onopordum acanthium_ (O. acanthium) basically belongs to a family of Asteraceae and is commonly known as Scotch thistle [118]. It is found all over the world [262]. The biological activities of _O. acanthium_ include antiviral, anti-tumor, anti-inflammatory and antioxidant effects. Extracts from the leaf, flower, stem and root of _O. acanthium_ are also used as cardiotonic agents. _O. acanthium_ contains many bioactive components, such as flavonoids, triterpenoids, lignans, phenylpropanoids, sesquiterpene lactones, and sterols [116,117,262]. Moreover, _O. acanthium_ has shown efficacy to completely inhibit the activity of ACE-2 due to the presence of tannin bioactive components, as demonstrated by Sharifi et al., 2013 in his in vitro study. This makes it a considerable choice to test against SARS-CoV-2.

3.10. Berberis integerrima Bunge

_Berberis integerrima_ (B. integerrima) belongs to the family of Berberidaceae, with different parts of the plant showing different colors [121]. It is mostly found in Iran and contains many types of alkaloids [122]. Bioactive components extracted from the root of _B. integerrima_ include berbamine, berberuin, palmatine, oxyacanthine, malic acid, ascorbic acid, caffeic acid, ursolic acid, coumarin, beta-carotene and tannin [120,122]. _B. integerrima_ possesses many bioactive properties, such as antiviral, anti-inflammatory, anti-hyperglycemic, anti-hyperlipidemic, anticancer, and antioxidant effects, as well as being a liver protective agent [120–122]. Moreover, this medicinal plant was tested by Sharifi et al., 2013 in vitro. His team showed that the usage of a 330 μg/mL concentration of _B. integerrima_ was able to inhibit the ACE-2 receptor due to 88.2 ± 1.7 IC$_{50}$ [113]. Therefore, _B. integerrima_ can be further investigated for its potent medicinal values and may provide fruitful results against SARS-CoV-2.

3.11. Crataegus microphylla C. Koch

This medicinal plant belongs to the family of Rosaceae and almost all parts of the plant are used for remedial purposes [126]. It is widely used for the treatment of many diseases, including heart muscle cells activation, coronary dilation, regulated blood flow, use as an antioxidant and anti-diabetic, and many others [125,126]. It contains flavonoids (phenols, phenolic acids, procyanidins, flavonoids, triterpenes, polysaccharides, catecho-lamines) which help in controlling/regulating various diseases [120,124–126]. Furthermore, it has also showed efficacy to inhibit the ACE-2 receptor and prohibit the entry of virus into the cell [113]. in vitro results suggested the use of a 330 μg/mL concentration of _Crataegus microphylla_ was able to inhibit the virus binding to the ACE-2 receptor, and their IC$_{50}$ was observed as 80.9 ± 1.3 [113]. The occurrence of some potential bioactive compounds in this medicinal plant and their efficacy against SARS-CoV-2 must be tested for better drug therapy to manage COVID-19.

3.12. Alnus japonica (Thunb.) Steud.

_Alnus japonica_ (A. japonica) belongs to Betulaceae family and originally it was found in Japan, Korea, China and Russia [128]. This medicinal plant has wide range of biological activities comprising antiviral, anticancer, anti-inflammatory, and antioxidant effects, as well as the induction of lymphatic and gastroenteric disorders [128,130]. It is mostly used for the treatment of various diseases such as fever, cancer, and blood, lymphatic and gastroenteric disorders [263]. Additionally, and most importantly, _A. japonica_ has been known to have an antiviral effect on SARS-CoV, and its potent bioactive compounds include hirsutene, oregonin, rubranoside rubranoside B, rubranol, and hirsutanonol, which are extracted from the bark of the _A. japonica_ plant [130]. These bioactive components have also been recommended as a promising medicinal plant for the development of potential drugs against SARS-CoV PLpro. In 2012, Park et al. investigated the effect and efficacy of _A. japonica_ bark against SARS-CoV. An in vitro study showed that _A. japonica_ is able to inhibit the SARS-CoV PLpro with IC$_{50}$ value ranging
from 3 to 44.5 µM of these compounds (hirsutenone, oregonin, rubranoside rubranoside B, rubanol, and hirsutanonol) [130]. However, the mode of action suggested that *A. japonica* bark can possibly inhibit the SARS-CoV PLpro activity.

### 3.13. *Psoralea corylifolia* L.

*Psoralea corylifolia* (*P. corylifolia*) belongs to the *Leguminosae* family and mostly occurs in India, China, Bangladesh, Indonesia, Malaysia, Sri Lanka and other Asian countries. *P. corylifolia* is known for its antiviral, antioxidant, antibacterial and anti-depressant activities [132,133]. Furthermore, it contains several potent bioactive components such as neoba-vaisoflavone, isobavachalcone, Bavachinin, 40-O-methyl bavachalcone, corylifol A, and psoralidin [264]. In 2014, Kim et al. investigated the effect of *P. corylifolia* seed extract and showed an imperative inhibitory effect of SARS-CoV PLpro, and their IC₅₀ was 15 µg/mL [134]. Furthermore, all these bioactive components were tested by Kim et al., and the IC₅₀ of these components against SARS-CoV PLpro was estimated to range between 4.2 to 38.4 µM. In addition, psoralidin and isobavachalcone showed the highest inhibitory activity against SARS-CoV PLpro, with IC₅₀ of 4.2 ± 1.0 µM and 7.3± 0.8 µM, respectively [134].

### 3.14. *Paulownia tomentosa* (Thunb.) Steud.

*Paulownia tomentosa* (*P. tomentosa*) is an old Chinese medicinal plant belonging to the *Scrophulariaceae* family. It is mostly found in central and western China, Taiwan and Korea. *P. tomentosa* has wide-ranging biological activities comprising antiviral, antioxidant and antibacterial effects [136,138]. It is mostly used for the treatment of various diseases, such as inflammatory bronchitis, upper respiratory tract infection, asthma, tonsillitis, gonorrhea, traumatic bleeding, enteritis, bacteriological diarrhea, erysipelas, swelling, bronchopneumonia, conjunctivitis, and hemorrhoids [139,265]. Furthermore, *P. tomentosa* has been known to have an antiviral effect on SARS-CoV PLpro. *P. tomentosa* fruit contains many bioactive components such as tomentin A, tomentin B, tomentin C, tomentin D, tomentin E, geranylated flavonones and others [137]. In 2013, Cho et al. examined the effect and efficacy of *P. tomentosa* fruit-extracted bioactive components against SARS-CoV. An in vitro study showed that *P. tomentosa* is able to inhibit SARS-CoV PLpro activity with an IC₅₀ value ranging from 5.0 to 14.4 µM [137]. Out of all those studied, Tomentin E showed the most promising and highest inhibitory effect against SARS-CoV, with the lowest IC₅₀ 5.0 ± 0.06 µM [137].

### 3.15. *Tribulus terrestris* L.

*Tribulus terrestris* (*T. terrestris*) is mostly found in China, India, Pakistan, South Americas, Bulgaria, Mexico and Spain, and is considered as a traditional medicinal plant. *T. terrestris* belongs to the *Zygophyllaceae* family and possesses several biological activities such as antiviral, anti-inflammatory, antioxidant, anti-tumor, anti-diabetic and anti-urolithic properties [141,143]. It contains several bioactive compounds, mainly flavonoids and alkaloids [142,266]. In 2014, Song et al. studied the effect of *T. terrestris* fruit extract (six cinnamic amides), and showed significant inhibitory effects against SARS-CoV PLpro [142]. Furthermore, all bioactive components tested by Song et al. against SARS-CoV PLpro were estimated to have an IC₅₀ in a range between 15.8 and 70.1 µM [142]. However, terrestrimine[[(E)-N-(1-hydroxy-2-(4-hydroxyphenyl)-2-oxoethyl)-3-(4-hydroxy3-methoxyphenyl) acrylamide] showed the utmost inhibitory activity against SARS-CoV PLpro with an IC₅₀ of 15.8 ± 0.6 µM [142].

### 4. Other Medicinal Plants in Use against Various Viral Infections and Possibility for the Therapeutic Strategy against COVID-19

Currently, there are several plants which are clinically in use for the treatment of various diseases including viral infections. Considering their mode of action, potency and efficacy, here we have detailed some useful medicinal plants, which can possibly be used for the combinational therapeutic management of COVID-19 by inhibiting various protein targets of SARS-CoV-2.
4.1. Sambucus nigra L.

This plant belongs to the family of *Caprifoliaceae* and is mostly used in the treatment of common cold, HIV, HSV-1, influenza, urinary tract infection, edema and other rheumatic diseases [149,267]. It contains several active components extracted from the leaves, flower and fruit parts of the plant, such as flavonoids, lectins, anthocyanin, etc., which have been found to increase the immunity and inhibit the viral activity [150,152–154]. However, in case of the H1N1 influenza virus, this plant has shown great potential to block or impede the entry of the virus into the host cells [149,155,268]. Furthermore, the presence of lectins in this plant is responsible for controlling the symptoms or pathogenesis of the influenza virus [149,151]. It also has immunomodulating activity due to the presence of peptic polysaccharides, polyphenolic compounds and flavonoids [149]. Due to several significant and antiviral relevant properties of this plant, it can possibly be used against SARS-CoV-2.

4.2. Eleutherococcus senticosus (Rupr. & Maxim.) Maxim.

*Eleutherococcus senticosus* (*E. senticosus*) belongs to the family of *Araliaceae* and is mostly found in China, Japan and Korea [269]. *E. senticosus* is used for the treatment of chronic coughing, ischemic heart disease, diabetes, cancer, altitude sickness, neurodegenerative disorders, and chronic fatigue [149,159,269,270]. Moreover, its leaves are used as food in the form of tea, wine, soups and many others [271]. *E. senticosus* leaves have the potential efficacy to inhibit bacterial glucosidase activity, reported in vitro results by many researchers. The nature of the component of *E. senticosus* responsible for its antiviral activity remains to be determined, and is currently under investigation together with the characterization of the target molecules and the molecular basis of the antiviral efficacy of *E. senticosus*. However, its extract is able to inhibit the replication of the influenza virus, and viral replication is common in all kinds of viruses [157–159,272]. Several potent bioactive components are known to be present in the roots of this medicinal plant, such as phenols, lignans, coumarins, phenylpropanoids, flavonoids, hyperin, rutin, afzelin, quercetin, kaempferol, phenolic acids, triterpenic acids, and anthocyanin, etc. Due to the presence of these bioactive compounds, in vitro results showed some antiviral activity too, by blocking the replication of influenza virus in the cells [149,273]. Therefore, it is a possible recommendation that plant should go further investigation and may be helpful in directly or indirectly controlling SARS-CoV-2.

4.3. Salvia miltiorrhiza Bunge

This plant belongs to the family of *Lamiaceae* and is commonly known as red sage [274]. Its bioactive components are extracted from the root, including lipophilic diterpenoids, flavonoids, triterpenoids and hydrophilic phenolic compounds [163,274,275]. It is also used for the treatment of various diseases, such as removing blood stasis, improving blood circulation, atherosclerosis, thrombosis, angina pectoris, other cardiovascular diseases and antiviral activity of HIV-1 and Enterovirus by inhibiting RdRp enzyme activity [161–164].

4.4. Acacia arabica (Lam.) Willd.

*Acacia arabica* (*A. arabica*) belongs to the family of *Fabaceae* and is widely distributed in Asian regions [167]. It is basically used for the treatment of various diseases, such as Newcastle disease, vaccinia virus, bursal disease virus, H9N2 influenza disease, skin diseases, and possesses many biological properties including antimicrobial, anti-diabetic, and antioxidant effects. The mechanism of action of *A. arabica* is known. It specifically inhibits the stage of viral intracellular multiplication [149,167–169]. Furthermore, *A. arabica* contains several bioactive components extracted from the leaves of the plant which are responsible for its bioactivity, such as flavonoids, methyl 3,4,5 tri hydroxyl benzoate, *p*-coumaroyl glucoside, *p*-coumaroylquinic acid, ferulic acid, isoferulic acid, epicatechin-3-gallate, ascorbic acid, quercetin 3-O-(4′-O-acetyl)-rhamnopyranoside, oleic acid, myristic acid, palmitic acid and steroidal sapogenin aglycone [166–168,276]. *A. arabica* also has the potential
to inhibit the viral replication against HIV infection [149,169]. Due to its antiviral nature, it is highly recommended to use A. arabica for controlling/managing SARS-CoV-2 infection.

4.5. Ocimum sanctum L.

Ocimum sanctum (O. sanctum) belongs to the family of Lamiaceae and is commonly known as tulsi [167,173]. This aromatic plant is basically found in all Asian countries. It is used for the treatment of diseases such as cough, anxiety, arthritis, dysentery, diarrhea, asthma, fever, skin and eye disorders, otalgia, gastrointestinal disorders, cardiac and genitourinary disorders, back pain, snake, insect and scorpion bites, malaria, and H9N2 influenza disease [16,167,168,173,178]. The leaves of O. sanctum contain several bioactive compounds, such as alkaloids, saponins, tannins, flavonoids, phenols, anthocyanins and triterpenoids [167,172,173]. However, this medicinal plant has the potential to block the activity of different pathogens and can act as a potent antiviral, antifungal, anti-protozoan, anti-malarial, anti-helminthic, antibacterial, mosquito repellent, etc.; its other clinical activities are detailed in Table 1 [167,171–177]. Ghoke et al. showed that treatment with the crude extract derived from the leaves of O. sanctum leads to significant H9N2 virus reduction in assessing all three—virucidal, therapeutic and prophylactic—activities using an in vivo model. They suggested that the crude extract of O. sanctum could be a promising extract for developing safe and efficacious antiviral compounds against the H9N2 virus. The protecting effectiveness of the crude extract of O. sanctum might be ascribed to multiple mechanisms of action (specific inhibition of viral intracellular multiplication stage and non-specific interference with virus–cell interactions such as masking/blocking the HA glycoprotein [167]. Due to these vast known biological properties, it would be of great importance to study the potential particular active ingredient or combinations, which are responsible for its broader antiviral activity, further. Therefore, O. sanctum might be helpful for the treatment of COVID-19, and can potentially block the entry of virus as well as its replication.

4.6. Ocimum basilicum L.

This medicinal herb belongs to the family of Lamiaceae and it is also known as sweet basil [149,181]. It is mostly used in industries as food, perfumes and cosmetics [181] due to its potent antiviral, anti-inflammatory, antioxidant and antibacterial activities [180,181,183,184]. Moreover, it contains several bioactive components such as phenolic compounds, flavonoids and anthocyanin extracted from the whole plant of O. basilicum [182–184]. This herb has been used for HIV treatment and showed very good potential to inhibit the replication of the HIV virus, and blocks further viral processing [149,181].

4.7. Theobroma cacao L.

Theobroma cacao (T. cacao) belongs to the family of Sterculiaceae. The seeds of this cocoa plant are commonly used in food industries [277]. It contains several types of bioactive compounds, such as polyphenol, theobromine and flavonoids [278], which are responsible for its antioxidant, antiviral, anti-inflammatory and many other biological activities [186,188,189]. However, some studies reported the anti-influenza activity of T. cacao, due to presence of flavonoids, theobromine, lignin, dietary fiber, free fatty acid, and minerals (zinc, copper, iron) [186–188]. Kamei et al., 2014 investigated the effect of T. cacao against the influenza virus and found that it enhances the antibody response due to stimulatory effect [187]. Furthermore, it has also been observed that, T. cacao helps in developing acquired immunity and activates the NK cells against the influenza virus [187]. Further investigation may lead to the use of T. cacao against SARS-CoV-2, and can help in boosting immunity.

4.8. Pelargonium sidoides DC.

Pelargonium sidoides (P. sidoides) belongs to the family of Geraniaceae and is commonly known as Umckaloabo [191]. It is found all over the world and roots of this plant are traditionally used for remedial purposes against tuberculosis, respiratory diseases, cough, gastrointestinal infection, viral diseases and others [191,193]. P. sidoides roots are known to have some potent compounds, such as
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methoxycoumarin, proanthocyanidins and prodelphinidins [192]. Furthermore, its roots are also used for the production of herbal drugs known as EPs 7639 by ethanolic extract, which have been approved for the treatment of respiratory tract infections [191,194]. According to Theisen et al., 2012, P. sidoides also has the potential to inhibit the viral entry of the influenza virus [194]. Therefore, it is suggested that roots of P. sidoides should be further investigated for the treatment of COVID-19.

4.9. Taraxacum officinale (L.) WEB. ex WIGG.

This medicinal plant belongs to the family of Asteraceae and it is commonly known as dandelion [48]. It is traditionally used for the treatment of various diseases such as kidney diseases, lung diseases, breast tumor, diabetes, uterus infections, digestive system related abnormalities, etc. [198,279]. Pharmacological research has proven the efficacy of this medicinal plant as antiviral, antibacterial, choleretic, anti-diabetic, anti-inflammatory, antioxidant, hepato-protective, diuretic and antifungal [198]. It contains several bioactive components, extracted from the aerial parts and roots, such as terpenes, flavonoids, phenolic compounds, terpenoids, triterpenoids, steroids, coumarins, phenols, saponins, flavones, flavonols, chalcones, phlobatannins, and cardiac glycosides [193,195,280]. Han et al., 2011 found the potential of this medicinal plant to inhibit the viral replication of HIV [199]. Similarly, Lee et al., 2012 also suggested its potential to enhance pro-inflammatory cytokines and improve the immune system [201]. Furthermore, it is also known to inhibit the influenza virus’ entry into cells [48,200]. Therefore, due to its vast and significant antiviral properties, it is highly recommended to conduct further investigation on this medicinal plant for the discovery of potent drugs against COVID-19.

4.10. Illicium oligandrum Merr & Chun

Illicium oligandrum (I. oligandrum) belongs to the family of Magnoliaceae, being a rich source of seco-prezizaane type sesquiterpenes [203]. It is known to have antiviral activity against herpes simplex virus type 2, coxsackie virus and influenza virus [204,206]. It has some potent bioactive compounds, such as sesquiterpene lactones, neolignan glycosides, phenolic diglycosides and prenylated compounds which are responsible for its antiviral activities [204,206]. However, this medicinal plant is also used for the treatment of rheumatoid arthritis, and neurotoxic and neuro-trophic effects [205]. Ma et al., 2013 reported the ethanolic extraction of spirooliganones A 1 & B from the roots of I. oligandrum and showed its potential to inhibit the activity of influenza virus (H3N2) (IC₅₀ 3.70–33.33 µM) and coxsackie virus B3 [204].

4.11. Glycyrrhiza glabra L.

Glycyrrhiza glabra (Liquorice) belongs to the family of Fabaceae and is among the most ancient medicinal plants [212]. It has several very well-known biological activities, such as antiviral (HIV, SARS-CoV), anti-inflammatory, antimicrobial, antioxidant, anti-tumorigenic and anti-ulcer properties [209,210]. The root of Liquorice is known to have many bioactive components, including flavonoids, glycyrrhizic acid, triterpenoid, saponins, etc. [210,212]. Few studies showed that chalcones extracted from Liquorice have the ability to block or inhibit the activity of influenza virus [48,208]. Therefore, there is a possibility that this plant might be useful against SARS-CoV-2 due to its antiviral properties.

4.12. Angelica keiskei (Miq.) Koidz.

Angelica keiskei (A. keiskei) belongs to the family of Umbelliferae, and its leaves are basically used for remedial purposes [147]. Its bioactive components include chalcones, flavanones and coumarins, coumarins phenolic, acetylenes, sesquiterpene, diterpene, and triterpenes [144,146]. A. keiskei is known and considered to be antiviral, anticancer, anti-inflammatory, anti-obesity, anti-oxidative, anti-coagulant, anti-tumor, anti-diabetic, antibacterial and hepato-protective [144–146]. Park et al., 2016 extracted bioactive components (9 alkylated chalcones and 4 coumarins) from A. keiskei plant [146], and revealed that the extracted chalcones were able to significantly block the entry of
coronavirus (SARS-CoV-1) by inhibiting the chymotrypsin-like protease (75% inhibition using 30 µg/mL dose) and a papain-like protease (88% inhibition using 30 µg/mL dose) [146]. In addition, the IC$_{50}$ of this chalcone and chalcone 6 are 11.4 and 1.2 µM, respectively [146]. Therefore, due to this very specific inhibition property of A. keiskei deserves further investigation for the development of potent antiviral agents against COVID-19.

4.13. Polygala karensium Kurz

*Polygala karensium* (*P. karensium*) is a medicinal plant belonging to the family of Polygalaceae and can mostly be found in China, Myanmar, Thailand, and Vietnam [215]. It has important and potent bioactive compounds, i.e., xanthones, which have shown many biological activities such as antiviral, antimicrobial, antioxidant, cytotoxicity, etc. [214–216]. In addition, it is also used to treat various ailments such as cough, bronchitis, neurasthenia, inflammation and amnesia [215]. However, Dao et al., 2012 conducted one in vitro study on H1N1, H9N2, and novel H1N1 (WT) strains using ethanol-extracted xanthones from the root of *P. karensium*, and found that xanthones have the potential to completely inhibit influenza virus activity [214]. Therefore, xanthones from *P. karensium* can also be one of the choices worth investigation for the further development of phytomedicine against SARS-CoV-2.

4.14. Calophyllum brasiliense Cambess.

*Calophyllum brasiliense* (*C. brasiliense*) is a medicinal plant, and basically belongs to the family of Clusiaceae, mostly found in South America, Central America and the Caribbean region [218]. It is used as a remedy to treat several diseases, such as parasitic, viral, bacterial and fungal diseases [218,220]. Its potent biological activities include antiviral, antibacterial, anti-protozoal and antifungal effects [218,219]. However, Kudo et al., 2013 investigated the role of this medicinal plant in HIV disease, firstly by extracting tricyclic coumarin from the leaves of *C. brasiliense* and testing in vitro [220]. Hence, they revealed that tricyclic coumarin from *C. Brasiliense* possesses great potential to inhibit viral replication by blocking the NFkB pathway [220].

4.15. Cimicifuga foetida L.

*Cimicifuga foetida* (*C. foetida*) belongs to the family of Ranunculaceae and it is also known as Shengma. It is abundantly distributed in Asian region [225]. It is basically used to treat various ailments, such as fever, headache, sore throat, toothache, uterine prolapse and inflammation [224]. It contains several bioactive compounds extracted from rhizomes, including cycloartane triterpenoids and glycosides with antiviral, anti-tumor, anti-inflammatory activities [225]. Wang et al., 2012 investigated the role of *C. foetida*, especially the cimicifugin component of it, against Respiratory Syncytial Virus, and found that the plant has a strong potential to inhibit viral attachment and internalization [223,224]. Moreover, cimicifugin was also able to stimulate epithelial cells and initiate the secretion of cytokines such as IFN-β, to clear the viral infection/load [281]. Furthermore, another in vitro study conducted by Dai et al., 2016 observed the potential of *C. foetida* in inhibiting the hepatitis B virus transcription and replication by producing pro-inflammatory cytokines [222]. Due to the capacity of producing strong pro-inflammatory cytokines and immunomodulatory properties, *C. foetida* can be used to treat COVID-19 disease.

4.16. Boerhavia diffusa L.

*Boerhavia diffusa* (*B. diffusa*) belongs to the family of Nyctaginaceae and is commonly known as punarnava [282]. It is mostly found in Asian countries and is basically used for the treatment of various diseases, such as abdominal pain, jaundice, dyspepsia, stress, spleen enlargement and liver diseases [228]. *B. diffusa* bioactive components extracted from leaf, stem and root include flavonoids, triterpenoids, alkaloids, hypoxanthine, steroids, lipids, lignin, proteins, ursolic acid, boeravinone, punarnavoside, etc. [227,230]. However, Bose et al., 2017 suggested that *B. diffusa* has a strong potential to inhibit the entry of hepatitis C virus and its major compound (boeravinone H component) were able
to block the initial phase of HCV entry through acting directly on the viral particles [228]. Moreover, Manu et al., 2007 also showed that its second major bioactive compound (Punarnavine) was also able to enhance the immune response, especially IFN-\(\gamma\) and interleukin-2 cytokines [229]. This categorizes B. diffusa as a therapeutically important plant to be considered under the current circumstances of the COVID-19 pandemic and worth further investigation.

4.17. Terminalia chebula Retz

Terminalia chebula (T. chebula) belongs to the family of Combretaceae and is mostly found in the Asian region [283]. It is one of the most important medicinal plants due to the presence of a huge number of different kinds of phytoconstituents [232]. It is customarily used as a household remedy and also in modern, Ayurveda, Unani and Homoeopathic medicines [232,283]. Its bioactive components extracted from the leaves, bark and fruit of the plant include flavonoids, polyphenols, terpenes, anthocyanins, glycosides, gallic acid, chebulagic acid, punicalagin, chebulanin, corilagin, neochelubulin acid, ellagic acid, chebulinic acid, alkaloids and many more [232,237,284]. It is also known to be used as a cure for irregular fevers, urinary diseases, diabetes, skin diseases, heart diseases, constipation, ulcers, vomiting, colic pain, hemorrhoids, digestive diseases, and others [232,235,237]. However, T. chebula has many pharmacological activities such as antiviral, antioxidant, antibacterial, antifungal, anti-protozoal, anti-carcinogenic, anti-mutagenic, radio-protective, chemo-preventive, hepato-protective, cardio-protective, cyto-protective, anti-diabetic, renoprotective, anti-inflammatory, anti-arthritis, adaptogenic, anti-anaphylactic, hypolipidemic, hypocholesterolemic, anti-caries, wound healing, anti-allergic, immunomodulatory, anti-ulcer, anti-spasmodic and gastrointestinal motility properties [232,233,235–237]. Lin et al., 2013 conducted an in vitro study and found that chebulagic acid and punicalagin from the fruit of T. chebula have the potential to inhibit the activity of different viruses, such as human cytomegalovirus, HCV, dengue virus, measles virus, and respiratory syncytial virus [234]. Due to its strong biological properties, it is highly recommended to study T. chebula as a possible remedy against SARS-CoV-2.

4.18. Caesalpinia sappan L.

Caesalpinia sappan (C. sappan) belongs to the family of Caesalpiniaceae and it is usually known as Brazil or Sappan wood [219]. It is mostly found in Southeast Asian regions and is traditionally used for the treatment of various diseases such as tuberculosis, diarrhea, dysentery, skin infections, anemia, etc. [219,240]. C. sappan is effectively considered as an antiviral, anti-inflammatory, antioxidant, antibacterial, antifungal, and anti-complementary [219,240,241]. Its bioactive constituents include xanthone, coumarin, chalcones, flavones, homoisoflavonoids, and braziliin [240]. Tewtrakul et al., 2015, extracted nine compounds from the roots of C. sappan. The results showed that, out of those nine, sappanchalcone (IC\(_{50}\) 2.3 \(\mu\)M) and protosappanin A (IC\(_{50}\) 12.6 \(\mu\)M) presented the strongest effect against HIV-1 IN [240]. On the other hand, Liu et al., 2009 also investigated the role of this medicinal plant against influenza virus. The in vitro study showed that 3-deoxysappanchalcone and sappanchalcone component isolated from C. sappan exhibited the highest activity against influenza virus (H3N2), with IC\(_{50}\) 1.06 and 2.06 \(\mu\)g/mL, respectively [239]. Therefore, sappanchalcone from C. sappan should also be considered for further examination against SARS-CoV-2.

5. Plant-Based Antiviral Drug Discoveries and Future Perspectives

There are several plant-based natural compounds which are either under investigation, in preclinical trials or in clinical trials. Two such plant-based antiviral compounds under clinical trials are (+)-Calanolide A and SP-303. Calanolide A is isolated from the Calophyllum langigerum, and is mostly found in Malaysia. It is a C22 coumarin mostly used for the treatment of HIV infection [285–287]. This natural product has completed the phase 1 clinical trial (NCT00002243). On the other hand, SP-303 is isolated from the latex of a Latin American plant Croton lechleri. However, this natural compound is the mixture of oligomeric proanthocyanidins with a molecular weight of 2100 daltons [285,288].
SP-303 is used for the treatment of HSV and HIV infection. It is currently under clinical trial (NCT00002408). Furthermore, seven known FDA-approved antiviral drugs (famciclovir, ganciclovir, sorivudine, zidovudine, didanosine, zalcitabine and stavudine) are originally modeled on a natural product parent [285].

It is strongly believed that natural compounds or drugs have good potential to effectively treat virus-related diseases. Though the process of drug development from the natural product is time-consuming, their efficacy is known to produce long-term effectiveness. Recent developments in advance instrumentations and novel techniques helped in identifying various novel and effective plant-based natural drugs, leading to the development of potent antiviral compounds. Moreover, they can also be referred as supplementary foods or nutraceuticals due to their therapeutic potential, which can ultimately aid in promoting good health. Therefore, in vivo model studies, safety certifications, and mandatory clinical trial implementations of natural compounds should fulfill the emergency demands against serious diseases. This will also directly or indirectly contribute to controlling the pandemic situation.

6. Conclusions

Medicinal plants and their natural bioactive compounds provide significant and powerful resources, displaying diverse antiviral properties. Their biodiversity serves as an excellent source of new antiviral drugs, revealing new chemical structures that can act on various biochemical pathways, leading to the development of novel and effective therapeutic drugs against viral diseases. Some medicinal plants and their natural products are identified to possess robust antiviral activities, mainly against coronaviruses, HIV and influenza. It is necessary that their identification/discovery should go for further investigations to provide the population with therapeutic agents against SARS-CoV-2 with increased efficiency and compliance. Most of the studies in this field are still in the initial stages of research, with a few being in in vivo experiments and clinical trials. Therefore, it is very important to not ignore the potency of medicinal plants that should be further investigated and explored in characterizing specific bioactive agents, as well as their mechanism, efficacy, and application through in vivo studies. This will lead us to natural therapeutic approaches against various infectious diseases including COVID-19. In addition, these plants can also be used in combinational therapy, due to the presence of natural compounds which can act as immunomodulators and might be helpful in battling the diseases in a natural way, or can work as adjuvants to create a good drug therapy. We strongly believe that phytomedicines will play an imperative role and continue to support in developing potential drugs against SARS-CoV-2.

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References

1. Adhikari, S.P.; Meng, S.; Wu, Y.-J.; Mao, Y.-P.; Ye, R.-X.; Wang, Q.-Z.; Sun, C.; Sylvia, S.; Rozelle, S.; Raat, H.; et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: A scoping review. Infect. Dis. Poverty 2020, 9, 29. [CrossRef] [PubMed]

2. Boopathi, S.; Poma, A.B.; Kolandaivel, P. Novel 2019 coronavirus structure, mechanism of action, antiviral drug promises and rule out against its treatment. J. Biomol. Struct. Dyn. 2020, 1–10. [CrossRef] [PubMed]
3. Asai, A.; Konno, M.; Ozaki, M.; Otsuka, C.; Vecchione, A.; Arai, T.; Kitagawa, T.; Ofusa, K.; Yabumoto, M.; Hirotsu, T.; et al. COVID-19 drug discovery using intensive approaches. *Int. J. Mol. Sci.* 2020, 21, 2839. [CrossRef] [PubMed]

4. Mohammadi, M.; Meskini, M.; Pinto, A.L.D.N. 2019 Novel coronavirus (COVID-19) overview. *J. Public Health* 2020, 19, 1–9. [CrossRef] [PubMed]

5. Ye, Z.-W.; Yuan, S.; Yuen, K.-S.; Fung, S.-Y.; Chan, C.-P.; Jin, D.-Y. Zoonotic origins of human coronaviruses. *Int. J. Biol. Sci.* 2020, 16, 1686–1697. [CrossRef] [PubMed]

6. Hasöksüz, M.; Kiliç, S.; Saraç, F. Coronaviruses and SARS-COV-2. *Turk. J. Med. Sci.* 2020, 50, 549–556. [CrossRef] [PubMed]

7. Hemida, M.G.; Abduallah, M.M.B. The SARS-CoV-2 outbreak from a one health perspective. *One Health* 2020, 10, 100127. [CrossRef]

8. WHO. Coronavirus Disease 2019 (COVID-19) Situation Report. 2020. Available online: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200429-sitrep-100-covid-19.pdf?sfvrsn=bbfbf3d1_2 (accessed on 7 September 2020).

9. Siddiqui, A.J.; Jahan, S.; Ashraf, S.A.; Alreshidi, M.; Ashraf, M.S.; Patel, M.; Snoussi, M.; Singh, R.; Adnan, M. Current status and strategic possibilities on potential use of combinational drug therapy against COVID-19 caused by SARS-CoV-2. *J. Biomol. Struct. Dyn.* 2020, 1–14. [CrossRef]

10. ECDC. European Centre for Disease Prevention and Control. Available online: https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases (accessed on 7 September 2020).

11. WorldOmeter. Coronavirus WorldOmeter. Available online: https://www.worldometers.info/coronavirus/ (accessed on 7 September 2020).

12. Aanouz, I.; Belhassan, A.; El Khatabi, K.; Lakhlfii, T.; El Idrissi, M.; Bouachrine, M. Moroccan medicinal plants as inhibitors against SARS-CoV-2 main protease: Computational investigations. *J. Biomol. Struct. Dyn.* 2020, 1–9. [CrossRef] [PubMed]

13. Prasad, A.; Muthamilarasan, M.; Prasad, M. Synergistic antiviral effects against SARS-CoV-2 by plant-based molecules. *Plant Cell Rep.* 2020, 39, 1109–1114. [CrossRef] [PubMed]

14. Azad, C.S.; Saxena, M.; Siddiqui, A.J.; Bhardwaj, J.; Puri, S.K.; Dutta, G.P.; Anand, N.; Saxena, A.K.; Anand, N. Synthesis of primaquine glyco-conjugates as potential tissue schizontocidal antimalarial agents. *Chem. Biol. Drug Des.* 2017, 90, 254–261. [CrossRef] [PubMed]

15. Bhardwaj, J.; Siddiqui, A.J.; Goyal, M.; Prakash, K.; Soni, A.; Puri, S.K. Repetitive live sporozoites inoculation under arteether chemoprophylaxis confers protection against subsequent sporozoite challenge in rodent malaria model. *Acta Trop.* 2016, 158, 130–138. [CrossRef] [PubMed]

16. Prakash, K.; Goyal, M.; Soni, A.; Siddiqui, A.J.; Bhardwaj, J.; Puri, S.K. Molecular cloning and biochemical characterization of iron superoxide dismutase from the rodent malaria parasite *Plasmodium vinckei*. *Parasitol. Int.* 2014, 63, 817–825. [CrossRef] [PubMed]

17. Siddiqui, A.J.; Bhardwaj, J.; Goyal, M.; Prakash, K.; Adnan, M.; Alreshidi, M.M.; Patel, M.; Soni, A.; Redman, W. Immune responses in liver and spleen against *Plasmodium yoelii* pre-erythrocytic stages in Swiss mice model. *J. Adv. Res.* 2020, 24, 29–41. [CrossRef] [PubMed]

18. Siddiqui, A.J.; Bhardwaj, J.; Goyal, M.; Prakash, K.; Soni, A.; Tiwari, V.; Puri, S.K. Assessment of real-time method to detect liver parasite burden under different experimental conditions in mice infected with *Plasmodium yoelii* sporozoites. *Microb. Pathog.* 2015, 89, 35–42. [CrossRef]

19. Siddiqui, A.J.; Bhardwaj, J.; Puri, S.K. mRNA expression of cytokines and its impact on outcomes after infection with lethal and nonlethal *Plasmodium vinckei* parasites. *Parasitol. Res.* 2011, 110, 1517–1524. [CrossRef]

20. Siddiqui, A.J.; Adnan, M.; Jahan, S.; Redman, W.; Saeed, M.; Patel, M. Neurological disorder and psychosocial aspects of cerebral malaria: What is new on its pathogenesis and complications? A minireview. *Folia Parasitol.* 2020, 67, 67. [CrossRef]

21. Soni, A.; Goyal, M.; Prakash, K.; Bhardwaj, J.; Siddiqui, A.J.; Puri, S.K. Cloning, expression and functional characterization of heme detoxification protein (HDP) from the rodent malaria parasite *Plasmodium vinckei*. *Gene* 2015, 566, 109–119. [CrossRef]

22. Adnan, M. Bioactive potential of essential oil extracted from the leaves of Eucalyptus globulus (Myrtaceae). *J. Pharmacogn. Phytochem.* 2019, 8, 213–216.
23. Patel, M.; Ashraf, M.S.; Siddiqui, A.J.; Ashraf, S.A.; Sachidanandan, M.; Snoussi, M.; Adnan, M.; Hadi, S. Profiling and role of bioactive molecules from puntuiss sophore (freshwater/brackish fish) skin mucus with its potential antibacterial, antiadhesive, and antibiofilm activities. *Biomolecules* 2020, 10, 920. [CrossRef]

24. Reddy, M.N.; Adnan, M.; Alreshidi, M.M.; Saeed, M.; Patel, M. Evaluation of anticancer, antibacterial and antioxidant properties of a medicinally treasured fern tectaria coadunata with its phytoconstituents analysis by HR-LCMS. *Anticancer Agents Med. Chem.* 2020, 20, 1. [CrossRef] [PubMed]

25. Adnan, M.; Patel, M.; Deshpande, S.; Alreshidi, M.; Siddiqui, A.J.; Reddy, M.N.; Emira, N.; De Feo, V. Effect of adiantum philippense extract on biofilm formation, adhesion with its antibacterial activities against foodborne pathogens, and characterization of bioactive metabolites: An in vitro-in silico approach. *Front. Microbiol.* 2020, 11, 1–19. [CrossRef] [PubMed]

26. Adnan, M.; Patel, M.; Reddy, M.N.; Alshammari, E. Formulation, evaluation and bioactive potential of *Xylaria primorskensis* terpenoid nanoparticles from its major compound xylarpanic acid. *Sci. Rep.* 2018, 8, 1740. [CrossRef] [PubMed]

27. Patel, M.; Sachidanandan, M.; Adnan, M. Serine arginine protein kinase 1 (SRPK1): A moonlighting protein with theranostic ability in cancer prevention. *Mol. Biol. Rep.* 2018, 46, 1487–1497. [CrossRef] [PubMed]

28. Adnan, M.; Alshammari, E.; Ashraf, S.A.; Patel, K.; Lad, K.; Patel, M. Physiological and molecular characterization of biosurfactant producing endophytic fungi *xylaria regalis* from the cones of thuja plicata as a potent plant growth promoter with its potential application. *Biomed Res. Int.* 2018, 1, 1–11. [CrossRef]

29. Arunkumar, G.; Mudgal, P.P.; Maity, H.; Dowarha, D.; Devadiga, S.; Nag, S.; Arunkumar, G. Herbal plants and plant preparations as remedial approach for viral diseases. *Virusdisease* 2015, 26, 225–236. [CrossRef]

30. Ashraf, S.A.; ElKhalifa, A.E.O.; Siddiqui, A.J.; Patel, M.; AwadEkareem, A.M.; Snoussi, M.; Ashraf, M.S.; Adnan, M.; Hadi, S. Cordycepin for health and wellbeing: A potent bioactive metabolite of an entomopathogenic cordyceps medicinal fungus and its nutraceutical and therapeutic potential. *Molecules* 2020, 25, 2735. [CrossRef]

31. Ben-Shabat, S.; Yarmolinsky, L.; Porat, D.; Dahan, A. Antiviral effect of phytochemicals from medicinal plants: Applications and drug delivery strategies. *Drug Deliv. Transl. Res.* 2019, 10, 354–367. [CrossRef]

32. Yao, R.-Y.; Zou, Y.-F.; Chen, X.-F. Traditional use, pharmacology, toxicology, and quality control of species in genus *Bupleurum L.* *Chin. Herb. Med.* 2013, 5, 245–255. [CrossRef]

33. Cheng, P.-W.; Ng, L.-T.; Chiang, L.-C.; Lin, C.-C.; Ng, L.-T. Antiviral effects of saikosaponins on human coronavirus 229E in vitro. *Clin. Exp. Pharmacol. Physiol.* 2006, 33, 612–616. [CrossRef]

34. Yang, F.; Dong, X.; Yin, X.; Wang, W.; You, L.; Ni, J. Radix bupleuri: A review of traditional uses, botany, phytochemistry, pharmacology, and toxicology. *BioMed Res. Int.* 2017, 2017, 1–22. [CrossRef] [PubMed]

35. Chen, J.; Duan, M.; Zhao, Y.; Ling, F.; Xiao, K.; Li, Q.; Li, B.; Lu, C.; Qi, W.; Zeng, Z.; et al. Saikosaponin A inhibits influenza A virus replication and lung immunopathology. *OncoTarget* 2015, 6, 42541–42556. [CrossRef] [PubMed]

36. Tykheev, Z.A.; Taraskin, V.V.; Radnaeva, L.D.; Zhang, F.Q.; Chen, S.L. Total saikosaponin content in some *Saikia japonica* and *Xylaria regalis* terpenoid nanoparticles from its major compound xylaranic acid. *IOP Conf. Ser. Earth Environ. Sci.* 2019, 1–19. [CrossRef] [PubMed]

37. Lamoral-Theys, D.; Decaeester, C.; Mathieu, V.; Dubois, J.; Kornienko, A.; Kiss, R.; Evidente, A.; Pottier, L. Lycorine and its derivatives for anticancer drug design. *Mini Rev. Med. Chem.* 2010, 10, 41–50. [CrossRef] [PubMed]

38. Cedrón, J.C.; Gutiérrez, D.G.; Flores, N.; Ravelo, Á.G.; Estévez-Braun, A. Synthesis and antiplasmodial activity of lycorine derivatives. *Bioorg. Med. Chem.* 2010, 18, 4694–4701. [CrossRef]

39. Mikami, M.; Kitahara, M.; Kitano, M.; Ariki, Y.; Mimaki, Y.; Sashida, Y.; Yamazaki, M.; Yui, S. Suppressivie activity of lycorcidiol (narciclasine) against cytotoxicity of neutrophil-derived calprotectin, and its suppressive effect on rat adjuvant arthritis model. *Biol. Pharm. Bull.* 1999, 22, 674–678. [CrossRef]

40. Kretzing, S.; Abraham, G.; Seiwert, B.; Ungemach, F.R.; Krügel, U.; Regenthal, R. Dose-dependent emetic effects of the Amaryllidaceous alkaloid lycorine in beagle dogs. *Toxicol* 2011, 57, 117–124. [CrossRef]

41. Ieven, M.; Berghe, D.A.V.D.; Vlieghe, A.J. Plant antiviral agents. IV. Influence of lycorine on growth pattern of three animal viruses. *Planta Med.* 1983, 49, 109–114. [CrossRef]

42. Liu, J.-N.; Yang, Y.; Xu, Y.; Ma, C.; Qin, C.; Zhang, L. Lycorine reduces mortality of human enterovirus 71-infected mice by inhibiting virus replication. *Virol. J.* 2011, 8, 483. [CrossRef]

43. Wang, H.; Guo, T.; Yang, Y.; Yu, L.; Pan, X.; Li, Y.-H. Lycorine derivative LY-55 inhibits EV71 and CVA16 replication through downregulating autophagy. *Front. Microbiol.* 2019, 9, 277. [CrossRef]
44. Mukhtar, M.; Arshad, M.; Ahmad, M.; Pomerantz, R.J.; Wigdahl, B.; Parveen, Z. Antiviral potentials of medicinal plants. *Virus Res.* 2008, 131, 111–120. [CrossRef] [PubMed]

45. Effert, T.; Romero, M.R.; Wolf, D.G.; Stamminger, T.; Marin, J.J.G.; Marschall, M. The antiviral activities of artemisinin and artesunate. *Clin. Infect. Dis.* 2008, 47, 804–811. [CrossRef] [PubMed]

46. Alesaeidi, S.; Miraj, S. A systematic review of anti-malarial properties, immunosuppressive properties, anti-inflammatory properties, and anti-cancer properties of artemisia annua. *Electron. Physician* 2016, 8, 3150–3155. [CrossRef] [PubMed]

47. Ho, W.E.; Peh, H.Y.; Chan, T.K.; Wong, W.F. Artemisinins: Pharmacological actions beyond anti-malarial. *Pharmacol. Ther.* 2014, 142, 126–139. [CrossRef] [PubMed]

48. Lin, L.-T.; Hsu, W.-C.; Lin, C.-C. Antiviral natural products and herbal medicines. *J. Tradit. Complement. Med.* 2014, 4, 24–35. [CrossRef]

49. Law, S.; Leung, A.W.; Xu, C. Is the traditional Chinese herb “Artemisia annua” possible to fight against COVID-19? *Integr. Med. Res.* 2020, 9, 100474. [CrossRef]

50. Li, S.-Y.; Chen, C.; Zhang, H.-Q.; Guo, H.-Y.; Wang, H.; Wang, L.; Zhang, X.; Hua, S.-N.; Yu, J.; Xiao, P.-G.; et al. Identification of natural compounds with antiviral activities against SARS-associated coronavirus. *Antivir. Res.* 2005, 67, 18–23. [CrossRef]

51. Benatouil, C.P.; Reanimator, A. Action of Artemisia Annua on Adaptive Immunity in COVID-19 Infections. Available online: https://lavierebelle.org/action-de-l-artemisia-annua-sur-l?lang=en (accessed on 22 June 2020).

52. Gao, D.; Fan, Y.; Feng, H.; Liu, L.; Zhang, Y.; Xin, X. Chemical components and antibacterial activity of the essential oil of six pyrrosia species. *Chem. Biodivers.* 2020, 10, 1–10. [CrossRef]

53. Zheng, M. Experimental study of 472 herbs with antiviral action against the herpes simplex virus. *Chin. J. Mod. Dev. Tradit. Med.* 1990, 10, 39–41.

54. Xiao, W.; Peng, Y.; Tan, Z.; Lv, Q.; Chan, C.-O.; Yang, J.; Chen, S. Comparative evaluation of chemical profiles of pyrrosiae folium originating from three pyrrosia species by HPLC-DAD combined with multivariate statistical analysis. *Molecules* 2017, 22, 2122. [CrossRef]

55. Chen, Y.; Fan, C.-L.; Wang, Y.; Zhang, X.-Q.; Huang, X.-J.; Ye, W.-C. Chemical constituents from roots of Isatis indigotica. *China J. Chin. Mater. Med.* 2018, 43, 2091–2096.

56. Zhang, D.; Shi, Y.; Xu, R.; Du, K.; Guo, F.; Chen, K.; Li, Y.; Wang, R. Alkaloid enantiomers from the roots of isatis indigotica. *Molecules* 2019, 24, 3140. [CrossRef] [PubMed]

57. Lin, C.-W.; Tsai, F.-J.; Tsai, C.-H.; Lai, C.-C.; Wan, L.; Ho, T.-Y.; Hsieh, C.-C.; Chao, P.-D.L. Anti-SARS coronavirus 3C-like protease effects of Isatis indigotica root and plant-derived phenolic compounds. *Antivir. Res.* 2005, 68, 36–42. [CrossRef] [PubMed]

58. Chang, S.-J.; Chang, Y.-C.; Lu, K.-Z.; Tsou, Y.-Y.; Lin, C.-W. Antiviral activity of isatis indigotica extract and its derived indirubin against japanese encephalitis virus. *Evid. Based Complement. Altern. Med.* 2012, 2012, 1–7. [CrossRef]

59. Oh, J.; Rho, H.S.; Yang, Y.; Yoon, J.Y.; Lee, J.; Hong, Y.D.; Kim, H.C.; Choi, S.S.; Kim, T.W.; Shin, S.S.; et al. Extracellular signal-regulated kinase is a direct target of the anti-inflammatory compound amentoflavone derived from Torreya nucifera. *Mediat. Inflamm.* 2013, 2013, 1–11. [CrossRef]

60. Endo, Y.; Osada, Y.; Kimura, F.; Shirakawa, H.; Fujimoto, K. Effects of Japanese Torreya (*Torreya nucifera*) seed oil on the activities and mRNA expression of lipid metabolism-related enzymes in rats. *Biosci. Biotechnol. Biochem.* 2007, 71, 231–233. [CrossRef]

61. Ryu, Y.B.; Jeong, H.J.; Kim, J.H.; Kim, Y.M.; Park, J.-Y.; Kim, D.; Naguyen, T.H.; Park, S.-J.; Chang, J.S.; Park, K.H.; et al. Biflavonoids from *Torreya nucifera* displaying SARS-CoV 3CLpro inhibition. *Biosorg. Med. Chem.* 2010, 18, 7940–7947. [CrossRef]

62. Shingnaisui, K.; Dey, T.; Manna, P.; Kalita, J. Therapeutic potentials of *Houttuynia cordata* Thunb. against inflammation and oxidative stress: A review. *J. Ethnopharmacol.* 2018, 220, 35–43. [CrossRef]

63. Lau, K.-M.; Lee, K.-M.; Koon, C.-M.; Cheung, C.S.-F.; Lau, C.-P.; Ho, H.-M.; Lee, M.Y.-H.; Au, S.W.-N.; Cheng, C.H.K.; Lau, C.B.; et al. Immunomodulatory and anti-SARS activities of *Houttuynia cordata*. *J. Ethnopharmacol.* 2008, 118, 79–85. [CrossRef]

64. Chiow, K.; Phoon, M.; Putti, T.; Tan, B.K.; Chow, V.T.K. Evaluation of antiviral activities of *Houttuynia cordata* Thunb. extract, quercetin, quercetin and cinanserin on murine coronavirus and dengue virus infection. *Asian Pac. J. Trop. Med.* 2016, 9, 1–7. [CrossRef]
65. Cheng, D.; Sun, L.; Zou, S.; Chen, J.; Mao, H.-Y.; Zhang, Y.; Liao, N.; Zhang, R.-H. Antiviral effects of Houttuynia cordata polysaccharide extract on Murine Norovirus-1 (MNV-1)—A human norovirus surrogate. *Molecules* **2019**, *24*, 1835. [CrossRef] [PubMed]

66. Chen, M.-Y.; Li, H.; Lu, X.-X.; Ling, L.-J.; Weng, H.-B.; Sun, W.; Chen, D.-F.; Zhang, Y.-Y. *Houttuynia cordata* polysaccharide alleviated intestinal injury and modulated intestinal microbiota in H1N1 virus infected mice. *Chin. J. Nat. Med.* **2019**, *17*, 187–197. [CrossRef]

67. Xu, C.; Yang, B.-X.; Zhu, W.; Li, X.; Tian, J.; Zhang, L. Characterisation of polyphenol constituents of Linderae aggregate leaves using HPLC fingerprint analysis and their antioxidant activities. *Food Chem.* **2015**, *186*, 83–89. [CrossRef]

68. Wei, G.; Chen, H.; Nie, F.; Ma, X.; Jiang, H. 1, 3, 6-trihydroxy-7-methyl-9, 10-anthracenedione isolated from genus lindera with anti-cancer activity. *Anticancer Agents Med. Chem.* **2017**, *17*, 1604–1607. [CrossRef]

69. Xiao, M.; Cao, N.; Fan, J.-J.; Shen, Y.; Xu, Q. Studies on flavonoids from the leaves of Lindera aggregata. *J. Chin. Med. Mater.* **2011**, *34*, 62–64.

70. Jung, S.-H.; Han, J.-H.; Park, H.-S.; Lee, J.-J.; Yang, S.Y.; Kim, Y.; Heo, K.-S.; Myung, C.-S. Inhibition of collagen-induced platelet aggregation by the secobutanolide secolincomolide a from lindera obtusiloba blume. *Front. Pharmacol.* **2017**, *8*, 560. [CrossRef]

71. Extension Gardener. Lycoris Radiata. Available online: https://plants.ces.ncsu.edu/plants/lycoris-radiata/ (accessed on 24 August 2020).

72. Artennua. Artemisia Annua Characteristics. Available online: https://www.artennua.com/artemisia-annua/ (accessed on 24 August 2020).

73. Hardy Fern Foundation. Pyrrosia Lingua Tongue Fern. Available online: https://hardyferns.org/ferns/pyrrosia-lingua/ (accessed on 22 August 2020).

74. The Sunlight Experiment. COVID-19: Searching For Potential Treatment Options in Plants. Available online: https://thesunlightexperiment.com/blog/herbal-medicine-covid-19 (accessed on 22 August 2020).

75. Torreya Nucifera. Available online: https://alchetron.com/Torreya-nucifera (accessed on 20 August 2020).

76. Wikipedia. Houttuynia cordata. Available online: https://en.wikipedia.org/wiki/Houttuynia_cordata (accessed on 20 August 2020).

77. Useful Tropical Plants. Lindera Aggregata. Available online: http://tropical.theferns.info/viewtropical.php?id=Lindera+aggregata (accessed on 21 August 2020).

78. Ho, T.-Y.; Wu, S.-L.; Chen, J.-C.; Li, C.-C.; Hsiang, C.-Y. Emodin blocks the SARS coronavirus spike protein and angiotensin-converting enzyme 2 interaction. *Antivir. Res.* **2007**, *74*, 92–101. [CrossRef]

79. Lee, J.-C.; Tseng, C.-K.; Wu, S.-F.; Chang, F.-R.; Chiu, C.-C.; Wu, Y.-C. San-Huang-Xie-Xin-Tang extract suppresses hepatitis C virus replication and virus-induced cyclooxygenase-2 expression. *J. Viral Hepat.* **2011**, *18*, e315–e324. [CrossRef] [PubMed]

80. Yang, K.L.; Gao, Y.; Yang, F.W.; Liu, M.; Shi, S.Z.; Chen, Y.M.; Zhang, J.H.; Tian, J.H. Analysis of traditional Chinese medicine from patent information sharing platform of coronavirus disease 2019 (COVID-19). *China J. Chin. Mater. Med.* **2020**, *45*, 3001–3006. [CrossRef]

81. Zhao, M.-J.; Chao, J.; Dai, Y.-T.; Chen, S.-L.; Li, Q.; Fan, Z.-Q.; Wang, D.-D. Quality evaluation of Rhei Radix et Rhizoma decoction. *China J. Chin. Mater. Med.* **2018**, *43*, 861–867.

82. Zheng, L.; Chen, S.; Cao, Y.; Zhao, L.; Gao, Y.; Ding, X.; Wang, X.; Gu, Y.; Wang, S.; Zhu, Z.; et al. Combination of comprehensive two-dimensional prostate cancer cell membrane chromatographic system and network pharmacology for characterizing membrane binding active components from Rhei Radix et Rhizoma and their targets. *J. Chromatogr. A* **2018**, *1564*, 145–154. [CrossRef] [PubMed]

83. Wikipedia. Rheum Palmatum. Available online: https://en.wikipedia.org/wiki/Rheum_palmatum (accessed on 21 August 2020).

84. Cheng, W.; Li, Y.; Yang, W.; Wu, S.; Wei, M.; Gao, Y.; Kang, C.; Zhang, S.; Li, Y. Simultaneous determination of 13 constituents of radix polygoni multiflori in rat plasma and its application in a pharmacokinetic study. *Int. J. Anal. Chem.* **2020**, *2020*, 4508374. [CrossRef]

85. He, Q.; Tu, C.; Wang, J.-B.; Liu, Z.-J.; Sha, M.-C.; Zhang, L.; Li, C.-Y.; Xiao, X.-H. Antiplatelet aggregation bioactivity of Polygoni Multiflori Radix with chemical fingerprints and spectrum-effect correlation analysis. *China J. Chin. Mater. Med.* **2017**, *42*, 1679–1684.
86. Lee, B.-J.; Lee, K. Discrimination and proper use of polygoni multiflori radix, cynanchi wilfordii radix, and cynanchi auriculati radix in Korea: A descriptive review. *Evid. Based Complement. Altern. Med.* 2015, 2015, 1–7. [CrossRef] [PubMed]

87. Liang, Z.T.; Chen, H.; Yu, Z.-L.; Zhao, Z.-Z. Comparison of raw and processed Radix Polygoni Multiflori (Heshouwu) by high performance liquid chromatography and mass spectrometry. *Chin. Med.* 2010, 5, 29. [CrossRef] [PubMed]

88. Lin, L.; Ni, B.; Lin, H.; Zhang, M.; Yan, L.; Qu, C.; Ni, J. Simultaneous determination of 14 constituents of Radix polygoni multiflori from different geographical areas by liquid chromatography-tandem mass spectrometry. *Biomed. Chromatogr.* 2014, 29, 1048–1055. [CrossRef]

89. Plants For A Future. *Polygonum Multiflorum—Thunb.* Available online: https://pfaf.org/user/Plant.aspx?LatinName=Polygonum+multiflorum (accessed on 20 August 2020).

90. Console, L.; Giangregorio, N.; Cellamare, S.; Bolognino, I.; Palasciano, M.; Indiveri, C.; Incampo, G.; Campana, S.; Tonazzi, A.; Lara, C.; et al. Human mitochondrial carnitine acylcaritinine carrier: Molecular target of dietary bioactive polyphenols from sweet cherry (*Prunus avium L.*). *Chem. Interact.* 2019, 307, 179–185. [CrossRef]

91. Heidary, F.; Varnaseri, M.; Gharebaghi, R. The potential use of persian herbal medicines against COVID-19 through angiotensin-converting enzyme. *Arch. Clin. Infect. Dis.* 2020, 15, e102838. [CrossRef]

92. Kouchmeshky, A.; Jameie, S.B.; Amin, G.; Ziai, S.A. Investigation of angiotensin-converting enzyme inhibitory effects of medicinal plants used in traditional persian medicine for treatment of hypertension: Screening study. *Thrita Stud. J. Med. Sci.* 2012, 1, 13–23. [CrossRef]

93. Serteser, A.; Kargioglu, M.; Gök, V.; Bağcı, Y.; Özcan, M.M.; Arslan, D. Determination of antioxidant effects of some plant species wild growing in Turkey. *Int. J. Food Sci. Nutr.* 2008, 59, 643–651. [CrossRef]

94. Ziai, S.A.; Heidari, M.R.; Amin, G.H.; Koochemeshki, A.; Heidari, M. Inhibitory effects of germinal angiotensin converting enzyme by medicinal plants used in iranian traditional medicine as antihypertensive. *J. Kerman Univ. Med Sci.* 2009, 16, 134.

95. Drug Information of *Cerasus Avium*. *Cerasus Avium*. Available online: https://www.rpsi.ir/en/medicinalherb/item/1285/cerasus_avium (accessed on 22 August 2020).

96. Ameri, A.; HeydariRad, G.; Rezaeizadeh, H.; Choopani, R.; Gobadi, A.; Gachkar, L. Evaluation of efficacy of an herbal compound on dry mouth in patients with head and neck cancers. *J. Evid. Based Integr. Med.* 2015, 21, 30–33. [CrossRef]

97. Nasser, R.; Jafari, F.; Rezaeizadeh, H.; Nasser, M.; Kamalinejad, M.; Gobadi, A.; Shamspour, M.; Zargaran, A.; Ameri, A. Efficacy of a persian medicine herbal compound (alcea digitaalefandmalva sylvestrisl.) on prevention of radiation induced acute mucositis in patients with head and neck cancer: A pilot study. *Int. J. Cancer Manag.* 2017, 10, e8642. [CrossRef]

98. Kew Science. *Alcea Digitata*. Available online: http://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:558657-1 (accessed on 20 August 2020).

99. He, W.; Li, Y.; Liu, M.; Yu, H.; Chen, Q.; Chen, Y.; Ruan, J.; Ding, Z.; Zhang, Y.; Wang, T. *Citrus aurantium* L. and its flavonoids regulate TNBS-induced inflammatory bowel disease through anti-inflammation and suppressing isolated jejunum contraction. *Int. J. Mol. Sci.* 2018, 19, 3057. [CrossRef] [PubMed]

100. Süntar, I.; Khan, H.; Patel, S.; Celano, R.; Rastrelli, L. An overview on *Citrus aurantium* L.: Its functions as food ingredient and therapeutic agent. *Oxidative Med. Cell. Longev.* 2018, 2018, 1–12. [CrossRef] [PubMed]

101. Zhao, H.-Y.; Yang, L.; Wei, J.; Huang, M.; Jiang, J.-G. Bioactivity evaluations of ingredients extracted from the flowers of *Citrus aurantium* L. var. amara Engl. *Food Chem.* 2012, 135, 2175–2181. [CrossRef] [PubMed]

102. Kew Science. *Citrus × Auranitum* L. Available online: http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:59600-2 (accessed on 20 August 2020).

103. Lajkó, E.; Bányai, P.; Zámbró, Z.; Kursinski, L.; Szőke, É.; Kohidai, L. Targeted tumor therapy by *Rubia tinctorum* L.: Analytical characterization of hydroxyanthraquinones and investigation of their selective cytotoxic, adhesion and migration modulator effects on melanoma cell lines (A2038 and HT168-M1). *Cancer Cell Int.* 2015, 15, 1–15. [CrossRef]

104. Nejad, H.E. Ahmad esalat nejad. *Rubia tinctorum L.* (Rubiaceae) or madder as one of the living color to dyeing wool. *Int. J. Adv. Biol. Biomed. Res.* 2013, 1, 1315–1319.

105. Kew Science. *Rubia tinctorum*. Available online: http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:765369-1 (accessed on 20 August 2020).
106. Baek, S.C.; Nam, K.H.; Yi, S.; Jo, M.S.; Lee, K.H.; Lee, Y.H.; Lee, J.; Kim, K.H. Anti-adipogenic effect of β-carboline alkaloids from garlic (Allium sativum). *Foods 2019*, 8, 673. [CrossRef]

107. Burian, J.P.; Carlos, I.Z.; Sacramento, L.V.S. Fungal infection control by garlic extracts (Allium sativum L.) and modulation of peritoneal macrophages activity in murine model of sporotrichosis. *Braz. J. Biol. 2017*, 77, 848–855. [CrossRef]

108. Batiha, G.E.-S.; Beshbishy, A.M.; Wasef, L.; Elewa, Y.H.A.; Abdel-Daim, M.; El-Hack, M.; Taha, A.E.; Abd-Elhakim, Y.M.; Devkota, H.P. Chemical constituents and pharmacological activities of garlic (Allium sativum L.): A review. *Nutrients 2020*, 12, 872. [CrossRef] [PubMed]

109. Phan, A.D.; Netzel, G.; Chhim, P.; Netzel, M.E.; Sultanbawa, Y. Phytochemical characteristics and antimicrobial activity of australian grown garlic (Allium sativum L.) cultivars. *Foods 2019*, 8, 358. [CrossRef] [PubMed]

110. Biomedical Education. *Allium sativum L*. Available online: http://iprsindh.com.pk/allium-sativum-l// (accessed on 23 August 2020).

111. Chokpaisarn, J.; Urao, N.; Voravuthikunchai, S.P.; Koh, T.J. Quercus infectoria inhibits Set7/96-NF-kB inflammatory pathway in macrophages exposed to a diabetic environment. *Cytokine 2017*, 94, 29–36. [CrossRef] [PubMed]

112. Chusri, S.; Phatthalung, P.N.; Voravuthikunchai, S. Anti-biofilm activity of Quercus infectoria G. Olivier against methicillin-resistant Staphylococcus aureus. *Lett. Appl. Microbiol. 2012*, 54, 511–517. [CrossRef] [PubMed]

113. Sharifi, N.; Souri, E.; Ziai, S.A.; Amin, G.; Amanlou, M. Discovery of new angiotensin converting enzyme (ACE) inhibitors from medicinal plants to treat hypertension using an in vitro assay. *Darü 2013*, 21, 74. [CrossRef] [PubMed]

114. Shrestha, S.; Kaushik, V.S.; Eshwarappa, R.S.B.; Subaramaihha, S.R.; Ramanna, L.M.; Lakkappa, D.B.; Prasad, S.B.B. Pharmacognostic studies of insect gall of Quercus infectoria Olivier (Fagaceae). *Asian Pac. J. Trop. Biomed. 2014*, 4, 35–39. [CrossRef]

115. Natural Medicine Facts. Top Plants Containing Gallic-Acid. Available online: https://www.naturalmedicinefacts.info/plant/quercus-infectoria.html (accessed on 23 August 2020).

116. Abusamra, Y.A.-K.; Scuruchi, M.; Habibatni, S.; Maammeri, Z.; Benayache, S.; D'Ascola, A.; Avenoso, A.; Campo, G.M.; Spina, E. Evaluation of putative cytotoxic activity of crude extracts from *Onopordum acanthium* leaves and *Spartium junceum* flowers against the U-373 glioblastoma cell line. *Pak. J. Pharm. Sci. 2015*, 28, 1225–1232.

117. Csupor-Löffler, B.; Zupkó, I.; Molnár, J.; Forgo, P.; Hohmann, J. Bioactivity-guided isolation of antiproliferative compounds from the roots of *Onopordum acanthium*. *Nat. Prod. Commun. 2014*, 9, 337–340. [CrossRef]

118. Robertovna, G.E.; Alexeevich, K.D.; Alexeevich, S.A.; Petrovna, G.M.; Kenzhebaeva, O.K.; Garsiya, E.R.; Konovalov, D.A.; Илымалов, А.А.; Glushko, М.Р.; Оразсабаева, К.К. A traditional medicine plant, *Onopordum acanthium* L. (asteraceae): Chemical composition and pharmacological research. *Plants 2019*, 8, 40. [CrossRef]

119. Natural Medicine Facts. Available online: https://www.wikiwand.com/en/Onopordum_acanthium (accessed on 21 August 2020).

120. Kooch, Y.; Noghre, N. The effect of shrubland and grassland vegetation types on soil fauna and flora activities in a mountainous semi-arid landscape of Iran. *Sci. Total. Environ. 2020*, 703, 135497. [CrossRef]

121. Rafiee, F.; Nejati, V.; Heidari, R.; Ashraf, H. Department of biology, faculty of science, urmia university, urmia, iran protective effects of hawthorn against genotoxicity induced by gamma irradiation in human blood lymphocytes. *Radiat. Environ. Biophys. 2008*, 48, 95–98. [CrossRef] [PubMed]

122. Hosseinimehr, S.J.; Mahmoudzadeh, A.; Azadbakht, M.; Akhlaghpour, S.; Azadbakht, M. Radioprotective effects of hawthorn against genotoxicity induced by gamma irradiation in human blood lymphocytes. *Radiat. Environ. Biophys. 2008*, 48, 95–98. [CrossRef] [PubMed]

123. Melikoğlu, G.; Bittis, L.; Meriçli, A.H. Flavonoids of crataegus microphylla. *Nat. Prod. Res. 2004*, 18, 211–213. [CrossRef]
126. Renda, G.; Ozel, A.; Barut, B.; Korkmaz, B.; Yayh, N. The in vitro protection by *Crataegus microphylla* extracts against oxidative damage and enzyme inhibition effects. *Turk. J. Pharm. Sci.* 2018, 15, 77–84. [CrossRef]

127. Wikipedia. *Crataegus Microphylla*. Available online: https://en.wikipedia.org/wiki/Crataegus_microphylla (accessed on 21 August 2020).

128. Tung, N.H.; Kwon, H.-J.; Kim, J.-H.; Ra, J.C.; Kim, J.A.; Kim, Y. An anti-influenza component of the bark of *Alnus japonica*. *Arch. Pharmacal Res.* 2010, 33, 363–367. [CrossRef]

129. Wikipedia. *Alnus japonica*. Available online: https://en.wikipedia.org/wiki/Alnus_japonica (accessed on 22 August 2020).

130. Park, J.-Y.; Jeong, H.J.; Kim, J.H.; Park, S.-J.; Kim, M.; Park, K.H.; Lee, W.S.; Ryu, Y.B. Diarylheptanoids from *Alnus japonica* inhibit papain-like protease of severe acute respiratory syndrome coronavirus. *Biol. Pharm. Bull.* 2012, 35, 2036–2042. [CrossRef]

131. Wikipedia. *Psoralea Corylifolia*. Available online: https://en.wikipedia.org/wiki/Psoralea_corylifolia (accessed on 22 August 2020).

132. Alam, F.; Khan, G.N.; Bin Asad, M.H.H. *Psoralea Corylifolia* L: Ethnobotanical, biological, and chemical aspects: A review. *Phytother. Res.* 2017, 32, 597–615. [CrossRef]

133. Chopra, B.; Dhingra, A.K.; Dhar, K.L. *Psoralea corylifolia* L. (Buguch)—Folklore to modern evidence: Review. *Fitoterapia* 2013, 90, 44–56. [CrossRef]

134. Kim, D.W.; Seo, K.H.; Curtis-Long, M.J.; Oh, K.Y.; Oh, J.-W.; Cho, J.K.; Lee, K.H.; Park, K.H. Phenolic phytochemical displaying SARS-CoV papain-like protease inhibition from the fruits of *Psoralea corylifolia*. *J. Enzym. Inhib. Med. Chem.* 2013, 29, 59–63. [CrossRef]

135. Wikipedia. *Paulownia tomentosa*. Available online: https://en.wikipedia.org/wiki/Paulownia_tomentosa (accessed on 21 August 2020).

136. Ali, S.A.; Ibrahim, N.A.; Mohammed, M.M.; El-Hawary, S.; Refaat, E.A. The potential chemo preventive effects of ursolic acid isolated from *Paulownia tomentosa*, against N-diethylnitrosamine: Initiated and promoted hepatocarcinogenesis. *Helthyon* 2019, 5, 01769. [CrossRef] [PubMed]

137. Cho, J.K.; Curtis-Long, M.J.; Lee, K.H.; Kim, D.W.; Ryu, H.W.; Yuk, H.J.; Park, K.H. Phenolic flavonoids and cytoprotective activities of several C-geranyl-substituted flavanones from *Psoralea corylifolia* fruit. *Molecules* 2010, 15, 6035–6049. [CrossRef] [PubMed]

138. Schneiderová, K.; Smejkal, K. Phytochemical profile of *Paulownia tomentosa* (Thunb.) steud. *Phytochem. Rev.* 2014, 14, 799–833. [CrossRef] [PubMed]

139. Zima, A.; Hošek, J.; Treml, J.; Muselík, J.; Suchy, P.; Pražanová, G.; Lopes, A.; Žemlička, M. Antiradical and cytotoxic protective activities of several C-geranyl-substituted flavanones from *Paulownia tomentosa* fruit. *Molecules* 2010, 15, 6035–6049. [CrossRef] [PubMed]

140. Wikipedia. *Tribulus Terrestris*. Available online: https://en.wikipedia.org/wiki/Tribulus_terrestris (accessed on 22 August 2020).

141. Stefanescu, R.; Tero-Vescan, A.; Negruiu, A.; Aurică, E.; Ari, C. A comprehensive review of the phytochemical, pharmacological, and toxicological properties of *Tribulus terrestris* L. *Bioorg. Med. Chem.* 2019, 27, 01817–01824. [CrossRef] [PubMed]

142. Kil, Y.-S.; Pham, S.T.; Seo, E.K.; Jafari, M. Angelica keiskei, an emerging medicinal herb with various bioactive constituents and biological activities. *Arch. Pharm. Res.* 2017, 40, 655–675. [CrossRef]

143. Kweon, M.; Lee, H.; Park, C.; Choi, Y.H.; Ryu, J.-H. A chalcone from Ashtabha (*Angelica keiskei*) stimulates myoblast differentiation and inhibits dexamethasone-induced muscle atrophy. *Nutrients* 2019, 11, 2419. [CrossRef]

144. Stefanescu, R.; Tero-Vescan, A.; Negruiu, A.; Aurică, E.; Vari, C. A comprehensive review of the phytochemical, pharmacological, and toxicological properties of *Tribulus terrestris* L. *Bioorg. Med. Chem.* 2020, 10, 752. [CrossRef]

145. Kweon, M.; Lee, H.; Park, C.; Choi, Y.H.; Ryu, J.-H. A chalcone from Ashtabha (*Angelica keiskei*) stimulates myoblast differentiation and inhibits dexamethasone-induced muscle atrophy. *Nutrients* 2019, 11, 2419. [CrossRef]
147. Zhang, T.; Wang, Q.; Fredimoses, M.; Gao, G.; Wang, K.; Chen, H.; Wang, T.; Oi, N.; Zykov, T.A.; Reddy, K.; et al. The Ashitaba (Angelica keiskei) chalcones 4-hydroxyderricin and xanthoangelol suppress melanomagenesis by targeting BRAF and PI3K. *Cancer Prev. Res.* 2018, 11, 607–620. [CrossRef] [PubMed]

148. Wikipedia. Ashitaba. Available online: https://en.wikipedia.org/wiki/Ashitaba (accessed on 18 August 2020).

149. Akram, M.; Tahir, I.M.; Shah, S.M.A.; Mahmood, Z.; Altaf, A.; Ahmad, K.; Munir, N.; Daniyal, M.; Nasir, S.; Mehboob, H. Antiviral potential of medicinal plants against HIV, HSV, influenza, hepatitis, and coxsackievirus: A systematic review. *Phytother. Res.* 2018, 32, 811–822. [CrossRef] [PubMed]

150. Chen, C.; Zuckerman, D.M.; Brantley, S.E.; Sharpe, M.; Childress, K.O.; Hoffcyz, E.; Pendleton, A.R. Sambucus nigra extracts inhibit infectious bronchitis virus at an early point during replication. *BMC Vet. Res.* 2014, 10, 24. [CrossRef] [PubMed]

151. Della, V.A.; Ricci, G.; Ralli, M.; Gambacorta, V.; De Lucia, A.; Minni, A.; Pirozzi, C.; Paccone, M.; Pastore, V.; Di Stadio, A. The effects of oral supplements with *Sambucus nigra*, Zinc, Tyndallized Lactobacillus acidophilus (HA122), Arabinogalactans, vitamin D, vitamin E and vitamin C in otitis media with effusion in children: A randomized controlled trial. *Eur. Rev. Med. Pharmacol. Sci.* 2019, 23, 6360–6374. [PubMed]

152. Młynarczyk, K.; Walkowiak-Tomczak, D.; Łysiak, G. Bioactive properties of *Sambucus nigra* L. as a functional ingredient for food and pharmaceutical industry. *J. Funct. Foods* 2018, 40, 377–390. [CrossRef]

153. Porter, R.S.; Bode, R.F. A review of the antiviral properties of black elder (*Sambucus nigra* L.) products. *Phytother. Res.* 2017, 31, 533–554. [CrossRef]

154. Ulbricht, C.; Basch, E.; Cheung, L.; Goldberg, H.; Hammerness, P.; Isaac, R.; Khalsa, K.P.S.; Romm, A.; Rychlik, I.; Varghese, M.; et al. An evidence-based systematic review of elderberry and elderflower (*Sambucus nigra*) by the national standard research collaboration. *J. Diet. Suppl.* 2014, 11, 80–120. [CrossRef]

155. Zakay-Rones, Z.; Varsano, N.; Zlotnik, M.; Manor, O.; Regev, L.; Schlesinger, M.; Mumcuoglu, M. Inhibition of several strains of influenza virus in vitro and reduction of symptoms by an elderberry extract (*Sambucus nigra* L.) during an outbreak of influenza B panama. *J. Altern. Complement. Med.* 1995, 1, 361–369. [CrossRef]

156. Wikipedia. *Sambucus nigra* L. Available online: http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:30122169-2 (accessed on 19 August 2020).

157. Lee, S.; Shin, N.-S.; Oh, K.-B.; Shin, K.H. Antibacterial compounds from the leaves of *Acanthopanax senticosus*. *Arch. Pharm. Res.* 2003, 26, 40–42. [CrossRef]

158. Wang, Z.; Jiang, H.; Xia, Y.-G.; Yang, B.-Y.; Kuang, H.-X. α-glucosidase inhibitory constituents from acanthopanax senticosus harm leaves. *Molecules* 2012, 17, 6269–6276. [CrossRef]

159. Yamauchi, Y.; Ge, Y.-W.; Yoshimatsu, K.; Komatsu, K.; Kuboyama, T.; Yang, X.; Tohda, C.; Komastu, K. Memory enhancement by oral administration of extract of *Eleutherococcus senticosus* leaves and active compounds transferred in the brain. *Nutrients* 2019, 11, 1142. [CrossRef] [PubMed]

160. Kew Science. *Sambucus nigra* L. Available online: https://www.plantsoftheworldonline.org/taxon/urn:lsid:en.wikipedia.org:names:30122169-2 (accessed on 18 August 2020).

161. Wikipedia. *Eleutherococcus senticosus*. Available online: https://en.wikipedia.org/wiki/Eleutherococcus_senticosus (accessed on 20 August 2020).

162. Lee, S.; Shin, N.-S.; Oh, K.-B.; Shin, K.H. Antimicrobial compounds from the leaves of *Acanthopanax senticosus*. *Arch. Pharm. Res.* 2003, 26, 40–42. [CrossRef]

163. Wang, Z.; Jiang, H.; Xia, Y.-G.; Yang, B.-Y.; Kuang, H.-X. α-glucosidase inhibitory constituents from acanthopanax senticosus harm leaves. *Molecules* 2012, 17, 6269–6276. [CrossRef]

164. Yamauchi, Y.; Ge, Y.-W.; Yoshimatsu, K.; Komatsu, K.; Kuboyama, T.; Yang, X.; Tohda, C.; Komastu, K. Memory enhancement by oral administration of extract of *Eleutherococcus senticosus* leaves and active compounds transferred in the brain. *Nutrients* 2019, 11, 1142. [CrossRef] [PubMed]

165. Wikipedia. *Eleutherococcus senticosus*. Available online: https://en.wikipedia.org/wiki/Eleutherococcus_senticosus (accessed on 20 August 2020).

166. El Gendy, A.E.-N.G.; Al-Mahdy, D.A.M.; El Dine, R.S.; Fahmy, S.; Yassin, A.; Porzel, A.; Brandt, W. Structure activity relationships of antimicrobial gallic acid derivatives from pomegranate and acacia fruit extracts against potato bacterial wilt pathogen. *Chem. Biodivers.* 2015, 12, 955–962. [CrossRef]
167. Ghoke, S.S.; Sood, R.; Kumar, N.; Paterniya, A.K.; Bhatia, S.; Mishra, A.; Dixit, R.; Singh, V.K.; Desai, D.; Kulkarni, D.D.; et al. Evaluation of antiviral activity of Ocimum sanctum and Acacia arabica leaves extracts against H9N2 virus using embryonated chicken egg model. *BMC Complement. Altern. Med.* 2018, 18, 174. [CrossRef] [PubMed]

168. Hegazy, G.A.; Alnoury, A.M.; Gad, H.G. The role of Acacia Arabic extract as an anti-diabetic, anti-hyperlipidemic, and antioxidant in streptozotocin-induced diabetic rats. *Saudi Med. J.* 2013, 34, 727–733.

169. Nutan, N.; Modi, M.; Dezzutti, C.S.; Kulshreshtha, S.; Rawat, A.K.S.; Srivastava, S.K.; Malhotra, S.; Verma, A.; Ranga, U.; Gupta, S.K. Extracts from Acacia catechu suppress HIV-1 replication by inhibiting the activities of the viral protease and Tat. *Virol. J.* 2013, 10, 309. [CrossRef]

170. Acacia. Available online: http://www.ephrarmacognosy.com/2012/10/acacia-acacia-arabica-lam-willd.html (accessed on 21 August 2020).

171. Ahirwar, P.; Shashikiran, N.D.; Sundarrajan, R.K.; Singhla, S.; Thakur, R.A.; Maran, S. A clinical trial comparing antimicrobial efficacy of “essential oil of Ocimum sanctum” with triple antibiotic paste as an intracanal medicament in primary molars. *J. Indian Soc. Pedod. Prev. Dent.* 2018, 36, 191–197. [CrossRef]

172. Baliga, M.S.; Jimmy, R.; Thilakchand, K.R.; Sunitha, V.; Bhat, N.R.; Saldanha, E.; Rao, S.; Rao, P.; Arora, R.B.; Palatty, P.L. *Ocimum sanctum* L (holy basil or tulsi) and its phytochemicals in the prevention and treatment of cancer. *Nutr. Cancer* 2013, 65, 26–35. [CrossRef] [PubMed]

173. Cohen, M.; Cohen, M. Tulsi—*Ocimum sanctum*: A herb for all reasons. *Indian J. Physiol. Pharmacol.* 2010, 53, 291–306. [CrossRef] [PubMed]

174. Kamyab, A.A.; Eshraghian, A. Anti-inflammatory, gastrointestinal and hepatoprotective effects of *Ocimum sanctum* Linn: An ancient remedy with new application. *Inflamm. Allergy Drug Targets* 2013, 12, 378–384. [CrossRef] [PubMed]

175. Mondal, S.; Mirdha, B.R.; Mahapatra, S.C. The science behind sacredness of Tulsi (*Ocimum sanctum* Linn.). *Indian J. Physiol. Pharmacol.* 2010, 54, 291–306.

176. Pattanayak, P.; Behera, P.; Das, D.; Panda, S.K. *Ocimum sanctum* Linn. A reservoir plant for therapeutic applications: An overview. *Pharmacogn. Rev.* 2010, 4, 95–105. [CrossRef]

177. Penmetsa, G.S.; Pitta, S.R. Efficacy of *Ocimum sanctum*, Aloe vera and chlorhexidine mouthwash on gingivitis: A randomized controlled comparative clinical study. *An. Int. Q. J. Res. Ayurveda* 2019, 40, 23–26. [CrossRef]

178. Prakash, P.; Gupta, N. Therapeutic uses of *Ocimum sanctum* Linn (Tulsi) with a note on eugenol and its pharmacological actions: A short review. *Indian J. Physiol. Pharmacol.* 2005, 49, 125–131.

179. The National Innovation Foundation (NIF)—India. Uses of *Ocimum Sanctum* L. Available online: http://nif.org.in/OCIMUM-SANCTUM-L (accessed on 23 August 2020).

180. Alegria-Herrera, E.; Herrera-Ruiz, M.; Román-Ramos, R.; Zamilpa, A.; Santillán-Urquiza, M.A.; Aguilar, M.I.; Avilés-Flores, M.; Fuentes-Mata, M.; Jiménez-Ferrer, E. Effect of *Ocimum basilicum*, *Ocimum selloi*, and rosmarinic acid on cerebral vascular damage in a chronic hypertension model. *Biol. Pharm. Bull.* 2019, 42, 201–211. [CrossRef]

181. Ayuob, N.; El Wahab, M.G.A.; Ali, S.S.; Abdel-Tawab, H.S. *Ocimum basilicum* improve chronic stress-induced neurodegenerative changes in mice hippocampus. *Metab. Brain Dis.* 2018, 33, 795–804. [CrossRef]

182. Rashidian, A.; Roohi, P.; Mehrzadi, S.; Ghannadi, A.R.; Minaiyan, M. Protective effect of *Ocimum basilicum* essential oil against acetic acid–induced colitis in rats. *J. Evid. Based Integr. Med.* 2016, 21, NP36–NP42. [CrossRef]

183. Sestili, P.; Ismail, T.; Calcabrini, C.; Guesci, M.; Catanzaro, E.; Turrini, E.; Layla, A.; Akhtar, S.; Fimognari, C. The potential effects of *Ocimum basilicum* on health: A review of pharmacological and toxicological studies. *Expert Opin. Drug Metab. Toxicol.* 2018, 14, 679–692. [CrossRef] [PubMed]

184. Singh, P.; Chakraborty, P.; He, D.-H.; Mergia, A. Extract prepared from the leaves of *Ocimum basilicum* inhibits the entry of Zika virus. *Acta Virol.* 2019, 63, 316–321. [CrossRef] [PubMed]

185. Monaco Nature Encyclopedia. *Ocimum basilicum*. Available online: https://www.monaconatureencyclopedia.com/ocimum-basilicum/?lang=en (accessed on 23 August 2020).

186. Goya, L.; Martin, A.E.; Sarriá, B.; Ramos, S.; Mateos, R.; Bravo-Clemente, L. Effect of cocoa and its flavonoids on biomarkers of inflammation: Studies of cell culture, animals and humans. *Nutrients* 2016, 8, 212. [CrossRef] [PubMed]
187. Kamei, M.; Nishimura, H.; Takahashi, T.; Takahashi, N.; Inokuchi, K.; Mato, T.; Takahashi, K. Anti-influenza virus effects of cocoa. *J. Sci. Food Agric.* 2015, *95*, 1150–1158. [CrossRef]

188. Latif, R. Chocolate/cocoa and human health: A review. *Neth. J. Med.* 2013, *71*, 63–68.

189. Oyeleke, S.A.; Ajayi, A.M.; Umukoro, S.; Aderibigbe, A.; Ademowo, O.G. Anti-inflammatory activity of *Theobroma cacao* L. stem bark ethanol extract and its fractions in experimental models. *J. Ethnopharmacol.* 2018, *222*, 239–248. [CrossRef]

190. Wikipedia. *Theobroma Cacao*. Available online: https://en.wikipedia.org/wiki/Theobroma_cacao (accessed on 22 August 2020).

191. Careddu, D.; Pettenazzo, A. *Pelargonium sidoides* extract EPs 7630: A review of its clinical efficacy and safety for treating acute respiratory tract infections in children. *Int. J. Gen. Med.* 2018, *11*, 91–98. [CrossRef]

192. Moyo, M.; Aremu, A.O.; Gruz, J.; Subrtová, M.; Szučová, L.; Doležal, K.; Van Staden, J. Conservation strategy for *Pelargonium sidoides* DC: Phenolic profile and pharmacological activity of acclimatized plants derived from tissue culture. *J. Ethnopharmacol.* 2013, *149*, 557–561. [CrossRef]

193. Moyo, M.; Van Staden, J. Medicinal properties and conservation of *Pelargonium sidoides* DC. *J. Ethnopharmacol.* 2014, *152*, 243–255. [CrossRef]

194. Theisen, L.L.; Muller, C.P. EPs® 7630 (Umckaloabo®), an extract from *Pelargonium sidoides* roots, exerts anti-influenza virus activity in vitro and in vivo. *Antivir. Res.* 2012, *94*, 147–156. [CrossRef]

195. Wikipedia. *Pelargonium Sidoides*. Available online: https://en.wikipedia.org/wiki/Pelargonium_sidoides (accessed on 21 August 2020).

196. Abdel-Magied, N.; Fattah, S.M.A.; Elkady, A.A. Differential effect of *Taraxacum officinale* L. (dandelion) root extract on hepatic and testicular tissues of rats exposed to ionizing radiation. *Mol. Biol. Rep.* 2019, *46*, 4893–4907. [CrossRef] [PubMed]

197. Choi, J.; Yoon, K.D.; Kim, J. Chemical constituents from *Taraxacum officinale* and their α-glucosidase inhibitory activities. *Bioorg. Med. Chem. Lett.* 2018, *28*, 476–481. [CrossRef] [PubMed]

198. Flores-Ocelotl, M.R.; Rosas-Murrieta, N.H.; Moreno, D.A.; Vallejo-Ruiz, V.; Reyes-Leyva, J.; Dominguez, F.; Santos-López, C. *Taraxacum officinale* and *Urtica dioica* extracts inhibit dengue virus serotype 2 replication in vitro. *BMC Complement. Altern. Med.* 2018, *18*, 95. [CrossRef] [PubMed]

199. Han, H.; He, W.; Wang, W.; Gao, B. Inhibitory effect of aqueous dandelion extract on HIV-1 replication and reverse transcriptase activity. *BMC Complement. Altern. Med.* 2011, *11*, 112. [CrossRef]

200. He, W.; Han, H.; Wang, W.; Gao, B. Anti-influenza virus effect of aqueous extracts from dandelion. *Virol. J.* 2011, *8*, 538. [CrossRef] [PubMed]

201. Lee, B.-R.; Lee, J.-H.; An, H.-J. Effects of *Taraxacum officinale* on fatigue and immunological parameters in mice. *Molecules* 2012, *17*, 13253–13265. [CrossRef]

202. Herbs and Remedies. Medicinal Use of Dandelion—*Taraxacum officinale* (Asteraceae). Available online: https://herbsandremedies.club/medicinal-plants/medicinal-use-of-dandelion-taraxacum-officinale-asteraceae/ (accessed on 22 August 2020).

203. Lü, H.-N.; Ma, S.-G.; Liu, Y.-B.; Qu, J.; Li, Y.; Xu, S.; Zhu, H.; Yu, S.-S. Sesquiterpenes from the roots of *Illicium oligandrum*. *J. Asian Nat. Prod. Res.* 2015, *17*, 430–438. [CrossRef]

204. Ma, S.-G.; Gao, R.-M.; Li, Y.-H.; Jiang, J.-D.; Gong, N.-B.; Li, L.; Lu, Y.; Tang, W.-Z.; Liu, Y.-B.; Qu, J.; et al. Antiviral spirooiganones A and B with unprecedented skeletons from the roots of *Illicium oligandrum*. *Org. Lett.* 2013, *15*, 4450–4453. [CrossRef]

205. Tang, W.-Z.; Liu, Y.; Yu, S.-S.; Qu, J.; Su, D.-M. New sesquiterpene lactone and neolignan glycosides with antioxidant and anti-inflammatory activities from the fruits of *Illicium oligandrum*. *Planta Med.* 2007, *73*, 484–490. [CrossRef]

206. Zhu, Q.; Tang, C.-P.; Ke, C.-Q.; Wang, W.; Zhang, H.-Y.; Ye, Y. Sesquiterpenoids and phenylpropanoids from pericarps of *Illicium oligandrum*. *J. Nat. Prod.* 2009, *72*, 238–242. [CrossRef] [PubMed]

207. Burncoose Nurseries. *Illicium oligandrum*. Available online: https://www.burncoose.co.uk/site/plants.cfm?pl_id=6283 (accessed on 22 August 2020).

208. Dao, T.T.; Nguyen, P.H.; Lee, H.S.; Kim, E.; Park, J.; Lim, S.I.; Oh, W. Chalcones as novel influenza A (H1N1) neuraminidase inhibitors from *Glycyrrhiza inflata*. *Bioorg. Med. Chem. Lett.* 2011, *21*, 294–298. [CrossRef] [PubMed]

209. Dastagir, G.; Rizvi, M.A. Review—*Glycyrrhiza glabra* L. ( Liquorice). *Pak. J. Pharm. Sci.* 2016, *29*, 1727–1733. [PubMed]
210. Harding, V.; Stebbing, J. Liquorice: A treatment for all sorts? Lancet Oncol. 2017, 18, 1155. [CrossRef]

211. Pastorino, G.; Cornara, L.; Soares, S.; Rodrigues, F.; Oliveira, M. Liquorice (Glycyrrhiza glabra): A phytochemical and pharmacological review. Phytother. Res. 2018, 32, 2323–2339. [CrossRef] [PubMed]

212. Kew Science. Glycyrrhiza glabra L. Available online: http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:496941-1 (accessed on 23 August 2020).

213. Dao, T.T.; Dang, T.T.; Nguyen, P.H.; Kim, E.; Thuong, P.T.; Oh, W. Xanthones from Polygala karensium inhibit neuraminidases from influenza A viruses. Biorg. Med. Chem. Lett. 2012, 22, 3688–3692. [CrossRef] [PubMed]

214. Le Pogam, P.; Boustie, J. Xanthones of lichen source: A 2016 update. Molecules 2016, 21, 294. [CrossRef]

215. Panda, S.; Chand, M.; Sakhuja, R.; Jain, S. Xanthones as potential antioxidants. Curr. Med. Chem. 2013, 20, 4481–4507. [CrossRef]

216. EOL. Polygala Karensium Kurz. Available online: https://eol.org/pages/2886028 (accessed on 23 August 2020).

217. Domeneghetti, L.; Demarchi, I.G.; Caitano, J.Z.; Pedroso, R.B.; Silveira, T.G.V.; Lonardoni, M.V.C. Calophyllum brasiliense modulates the immune response and promotes Leishmania amazonensis intracellular death. Mediat. Inflamm. 2018, 2018, 1–9. [CrossRef]

218. Jeong, H.J.; Kim, Y.M.; Kim, J.H.; Kim, J.Y.; Park, J.-Y.; Park, S.-J.; Ryu, Y.B.; Lee, W.S. Homoisoflavonoids from Caesalpinia sappan displaying viral neuraminidases inhibition. Biol. Pharm. Bull. 2012, 35, 786–790. [CrossRef]

219. Kudo, E.; Taura, M.; Matsuda, K.; Shimamoto, M.; Kariya, R.; Goto, H.; Hattori, S.; Kimura, S.; Okada, S. Inhibition of HIV-1 replication by a tricyclic coumarin GUT-70 in acutely and chronically infected cells. Bioorg. Med. Chem. Lett. 2013, 23, 606–609. [CrossRef]

220. Wikipedia. Calophyllum Brasiliense. Available online: https://en.wikipedia.org/wiki/Calophyllum_brasiliense (accessed on 24 August 2020).

221. Dai, X.; Yi, X.; Sun, Z.; Ruan, P. Cimicifuga foetida L. plus adeovir effectively inhibits the replication of hepatitis B virus in patients with chronic hepatitis B. Biomed. Rep. 2016, 4, 493–497. [CrossRef] [PubMed]

222. Gai, Y.-Y.; Liu, W.; Sha, C.-J.; Wang, Y.-L.; Sun, Y.-T.; Li, X.-J.; Fawcett, J.P.; Gu, J. Pharmacokinetics and bioavailability of cimicifugosides after oral administration of Cimicifuga foetida L. extract to rats. J. Ethnopharmacol. 2012, 143, 249–255. [CrossRef] [PubMed]

223. Wang, K.-C.; Chang, J.-S.; Lin, L.-T.; Chiang, L.-C.; Lin, C.-C. Antiviral effect of cimicifugin from cimicifuga foetida against human respiratory syncytial virus. Am. J. Chin. Med. 2012, 40, 1033–1045. [CrossRef] [PubMed]

224. Zhu, G.-L.; Zhu, D.-F.; Wan, L.-S.; Peng, X.-R.; Bao, N.-M.; Zhang, Z.-R.; Zhou, L.; Qiu, M.-H. Six new 9,19-cycloarane triterpenoids from Cimicifuga foetida L. Nat. Prod. Bioprospect. 2016, 6, 187–193. [CrossRef] [PubMed]

225. Efloras. Cimicifuga Foetida. Available online: http://www.efloras.org/object_page.aspx?object_id=108347&flora_id=800 (accessed on 24 August 2020).

226. Anbazhagan, G.K.; Palaniyandi, S.; Joseph, B. Antiviral plant extracts. Plant Extr. 2019, 1–10. [CrossRef]

227. Bose, M.; Kamra, M.; Mullick, R.; Bhattacharya, S.; Das, S.; Karande, A.A. A plant-derived dehydrorotenoid: A new inhibitor of hepatitis C virus entry. FEBS Lett. 2017, 591, 1305–1317. [CrossRef]

228. Manu, K.; Kuttan, G. Effect of punarnavine, an alkaloid from boerhaavia diffusa, on cell-mediated immune responses and TIMP-1 in B16F-10 metastatic melanoma-bearing mice. Immunopharmacol. Immunotoxicol. 2007, 29, 569–586. [CrossRef]

229. Mishra, S.; Aeri, V.; Gaur, P.K.; Jachak, S.M. Phytochemical, therapeutic, and ethnopharmacological overview for a traditionally important herb: Boerhavia diffusa Linn. BioMed Res. Int. 2014, 2014, 1–19. [CrossRef]

230. Wikipedia. Boerhavia Diffusa. Available online: https://en.wikipedia.org/wiki/Boerhavia_diffusa (accessed on 24 August 2020).

231. Bag, A.; Bhattacharyya, S.K.; Chattopadhyay, R.R.; Rashid, R.A. The development of Terminalia chebula Retz. (Combretaceae) in clinical research. Asian Pac. J. Trop. Biomed. 2013, 3, 244–252. [CrossRef]

232. Kesharwani, A.; Polachira, S.K.; Nair, R.; Agarwal, A.; Mishra, N.N.; Gupta, S.K. Anti-HSV-2 activity of Terminalia chebula Retz extract and its constituents, chebulagic and chebulic acids. BMC Complement. Altern. Med. 2017, 17, 110. [CrossRef]

233. Lin, L.-T.; Chen, T.-Y.; Lin, S.-C.; Chung, C.-Y.; Lin, T.-C.; Wang, G.-H.; Anderson, R.; Lin, C.-C.; Richardson, C.D. Broad-spectrum antiviral activity of chebulagic acid and punicalagin against viruses that use glycosaminoglycans for entry. BMC Microbiol. 2013, 13, 187. [CrossRef] [PubMed]
234. Nigam, M.; Mishra, A.P.; Adhikari-Devkota, A.; Dirar, A.I.; Hassan, M.; Adhikari, A.; Belwal, T.; Devkota, H.P. Fruits of *Terminalia chebula* Retz.: A review on traditional uses, bioactive chemical constituents and pharmacological activities. *Phytother. Res.* 2020, 10, 1–9. [CrossRef]

235. Sheng, Z.; Zhao, J.; Muhammad, I.; Zhang, Y. Optimization of total phenolic content from *Terminalia chebula* Retz. fruits using response surface methodology and evaluation of their antioxidant activities. *PLoS ONE* 2018, 13, e0202368. [CrossRef] [PubMed]

236. Zhang, X.; He, L.; Lu, Q.; Li, D. Pharmacological activity of *Terminalia chebula*. *China J. Chin. Mater. Med.* 2016, 41, 619–623. [CrossRef]

237. Promila, P.; Madan, V.K. Therapeutic & phytochemical profiling of *Terminalia chebula* Retz. (harad): A review. *J. Med. Plants Stud.* 2018, 6, 25–31.

238. Liu, A.; Shu, S.-H.; Qin, H.-L.; Lee, S.; Wang, Y.-T.; Du, G. In vitro anti-influenza viral activities of constituents from *Caesalpinia sappan*. *Planta Med.* 2009, 75, 337–339. [CrossRef] [PubMed]

239. Tewtrakul, S.; Chaniad, P.; Pianwanit, S.; Karalai, C.; Ponglimanont, C.; Yodsaoue, O. Anti-HIV-1 integrase activity and molecular docking study of compounds from *Caesalpinia sappan* L. *Phytother. Res.* 2015, 29, 724–729. [CrossRef]

240. Yang, F.; Zhou, W.-L.; Liu, A.; Qin, H.-L.; Lee, S.M.; Wang, Y.-T.; Du, G. The protective effect of 3-deoxysappanchalcone on in vitro influenza virus-induced apoptosis and inflammation. *Planta Med.* 2012, 78, 968–973. [CrossRef]

241. Natures Beauty Creations. *Caesalpinia sappan* L. Available online: https://www.asia-medicinalplants.info/caesalpinia-sappan-l (accessed on 23 August 2020).

242. Wagner, H.; Bauer, R.; Melchart, D.; Xiao, P.-G.; Staudinger, A. Radix et Rhizoma Rhei—Dahuang. In Chromatographic Fingerprint Analysis of Herbal Medicines: Thin-Layer and High Performance Liquid Chromatography of Chinese Drugs; Wagner, H., Bauer, R., Melchart, D., Xiao, P.-G., Staudinger, A., Eds.; Springer Vienna: Vienna, Austria, 2011; pp. 857–874.

243. Su, B.; Li, X.-B. Advance in studies on *Rubia tinctorum* L. Available online: https://www.asia-medicinalplants.info/rubia-tinctorum-l/ (accessed on 23 August 2020).

244. Wei, Y.; Liu, M.; Liu, J.; Li, H. Influence factors on the hepatotoxicity of polygoni multiflori Radix. *Evid. Based Complement. Altern. Med.* 2019, 2019, 5482896. [CrossRef]

245. Kim, Y.-J.; Lee, J.Y.; Kim, H.-J.; Kim, D.-H.; Lee, T.H.; Kang, M.S.; Choi, Y.-K.; Lee, H.L.; Kim, J.; An, H.-J.; et al. Inhibitory effect of emodin on raw 264.7 activated with double stranded rna analogue poly I:C. *Afr. J. Tradit. Complement. Altern. Med.* 2017, 14, 157–166. [CrossRef] [PubMed]

246. Liang, L.; Xu, J.; Liang, Z.-T.; Dong, X.-P.; Chen, H.; Zhao, Z.-Z. Tissue-specific analysis of secondary metabolites creates a reliable morphological criterion for quality grading of polygoni multiflori Radix. *Molecules* 2018, 23, 1115. [CrossRef]

247. Budak, N.H. Bioactive components of *Prunus avium* L. black gold (red cherry) and *Prunus avium* L. stark gold (white cherry) juices, wines and vinegars. *J. Food Sci. Technol.* 2012, 54, 613–617. [CrossRef]

248. Shen, C.-Y.; Jiang, J.-G.; Zhu, W.; Ou-Yang, Q. Anti-inflammatory and anti-aggregant effects of *Citrus aurantium* L. var. *amara* Engl. *J. Agric. Food Chem.* 2017, 65, 8586–8594. [CrossRef] [PubMed]

249. Stohs, S.J. Safety, efficacy, and mechanistic studies regarding citrus aurantium (bitter orange) extract and p-synephrine. *Phytother. Res.* 2017, 31, 1463–1474. [CrossRef]

250. Pimenta, F.C.F.; Alves, M.F.; Melo, S.A.L.; De Almeida, A.A.F.; Leite, J.R.; Pordeus, L.C.D.M.; Diniz, M.D.F.F.M. Anxiolytic effect of citrus aurantium L. on patients with chronic myeloid leukemia. *Phytother. Res.* 2016, 30, 613–617. [CrossRef]

251. Marhoume, F.Z.; Laaradia, M.A.; Zaid, Y.; Laadraoui, J.; Oufruir, S.; Aboufatima, R.; Chait, A.; Bagri, A.; Zaid, Y.; Oufkir, S. Anti-aggregant effect of butanolic extract of *Rubia tinctorum* L. on platelets in vitro and ex vivo. *J. Ethnopharmacol.* 2019, 241, 111971. [CrossRef]

252. Xiong, Y.; Yang, Y.; Xiong, W.; Yao, Y.; Wu, H.; Zhang, M. Network pharmacology-based research on the active component and mechanism of the antihypertensive effect of *Rubia cordifolia* L. *J. Cell. Biochem.* 2019, 120, 12461–12472. [CrossRef]

253. Shang, A.; Cao, S.-Y.; Xu, X.-Y.; Gan, R.-Y.; Tang, G.-Y.; Corke, H.; Mavumengwana, V.; Li, H.-B. Bioactive compounds and biological functions of garlic (*Allium sativum* L.). *Foods* 2019, 8, 246. [CrossRef]
254. Martins, N.; Petropoulos, S.A.; Ferreira, I.C. Chemical composition and bioactive compounds of garlic (Allium sativum L.) as affected by pre- and post-harvest conditions: A review. *Food Chem.* 2016, 211, 41–50. [CrossRef]

255. Kim, S.; Kim, D.-B.; Jin, W.; Park, J.; Yoon, W.; Lee, Y.; Kim, S.; Lee, S.; Kim, S.; Lee, O.-H.; et al. Comparative studies of bioactive organosulphur compounds and antioxidant activities in garlic (Allium sativum L.), elephant garlic (Allium ampeloprasum L.) and onion (Allium cepa L.). *Nat. Prod. Res.* 2017, 32, 1193–1197. [CrossRef] [PubMed]

256. Chavan, R.D.; Shinde, P.; Girkar, K.; Madage, R.; Chowdhary, A. Assessment of anti-influenza activity and hemagglutination inhibition of plumbago indica and Allium sativum extracts. *Pharmacogn. Res.* 2016, 8, 105–111. [CrossRef] [PubMed]

257. Tayel, A.A.; El-Sedfy, M.A.; Ibrahim, A.I.; Moussa, S.H. Application of Quercus infectoria extract as a natural antimicrobial agent for chicken egg decontamination. *Rev. Argent. Microbiol.* 2018, 50, 391–397. [CrossRef] [PubMed]

258. Ahmed, A.; Salih, F.A. Quercus infectoria gall extracts reduce quorum sensing-controlled virulence factors production and biofilm formation in Pseudomonas aeruginosa recovered from burn wounds. *BMC Complement. Altern. Med.* 2019, 19, 177. [CrossRef]

259. Motamedi, H.; Azizi, A.; Ahmadi, M. Nutritive value of treated Quercus infectoria gall extracts reduced quorum sensing-controlled virulence factors production and biofilm formation in Klebsiella pneumoniae for ruminant feeding in vitro. *J. Appl. Microbiol.* 2019, 127, 1339–1348. [CrossRef]

260. Kheirandish, F.; Delfan, B.; Mahmoudvand, H.; Moradi, N.; Ezatpour, B.; Ebrahimzadeh, F.; Rashidipour, M. Antileishmanial, antioxidant, and cytotoxic activities of Quercus infectoria Olivier extract. *Biomed. Pharmacother.* 2016, 82, 208–215. [CrossRef]

261. Qaderi, M.M.; Cavers, P.B.; Bernards, M.A. Isolation and structural characterization of a water-soluble germination inhibitor from Scotch thistle (Onopordum acanthium) cypselas. *J. Chem. Ecol.* 2003, 29, 2425–2438. [CrossRef]

262. Tung, N.H.; Kwon, H.-J.; Kim, J.-H.; Ra, J.C.; Ding, Y.; Kim, J.A.; Kim, Y. Anti-influenza diarylheptanoids from the bark of Alnus japonica. *Bioorg. Med. Chem. Lett.* 2010, 20, 1000–1003. [CrossRef]

263. Won, T.H.; Song, I.-H.; Kim, K.-H.; Yang, W.-Y.; Lee, S.K.; Oh, D.-C.; Oh, W.K.; Oh, K.-B.; Shin, J. Bioactive metabolites from the fruits of Psoralea corylifolia. *J. Nat. Prod.* 2015, 78, 666–673. [CrossRef]

264. Schneiderová, K.; Šlapetová, T.; Hrabal, R.; Dvorakova, H.; Prochazkova, P.; Novotna, J.; Urbanova, M.; Cvačka, J.; Smejkal, K. Tomentomimulol and mimulone B: Two new C geranylated flavonoids from Paulownia tomentosa fruits. *Nat. Prod. Res.* 2013, 27, 613–618. [CrossRef]

265. Tian, C.; Zhang, Z.; Wang, H.; Guo, Y.; Zhao, J.; Liu, M. Extraction technology, component analysis, and in vitro antioxidant and antibacterial activities of total flavonoids and fatty acids from Tribulus terrestris L. fruits. *Biomed. Chromatogr.* 2019, 33, e4474. [CrossRef] [PubMed]

266. Hawkins, J.; Baker, C.; Cherry, L.; Dunne, E. Black elderberry (Sambucus nigra) supplementation effectively treats upper respiratory symptoms: A meta-analysis of randomized, controlled clinical trials. *Complement. Ther. Med.* 2019, 42, 361–365. [CrossRef] [PubMed]

267. Shahsavandi, S.; Ebrahimi, M.M.; Farahani, A.H. Interfering with lipid raft association: A mechanism to control influenza virus infection by Sambucus nigra. *Iran. J. Pharm. Res.* 2017, 16, 1147–1154. [PubMed]

268. Zhang, S.; Guo, S.-L.; Wang, Q.-B.; Liu, Y.; Shen, H.-W.; Wang, Z.-Y. Effects of fungi fraction on growth and anti-oxidative activity of Eleutherococcus senticosus. *China J. Chin. Mater. Med.* 2019, 44, 1517–1523. [CrossRef]

269. Li, T.; Ferns, K.; Yan, Z.-Q.; Yin, S.-Y.; Kou, J.-J.; Li, D.; Zeng, Z.; Yin, L.; Wang, X.; Bao, H.-X.; et al. Acanthopanax senticosus: Photochemistry and anticancer potential. *Am. J. Chin. Med.* 2016, 44, 1543–1558. [CrossRef]

270. Jin, L.; Schmiech, M.; El Gaafary, M.; Zhang, X.; Syrovets, T.; Simmet, T. A comparative study on root and bark extracts of Eleutherococcus senticosus and their effects on human macrophages. *Phytotherapy Res.* 2020, 68, 153181. [CrossRef]

271. Zhou, H.; Xing, J.; Liu, S.; Song, F.; Caib, Z.; Pi, Z.; Liu, Z.; Liu, S. Screening and determination for potential α-glucosidase inhibitors from leaves of Acanthopanax senticosus harms by using UF-LC/MS and ESI-MSn. *Phytochem. Anal.* 2011, 23, 315–323. [CrossRef]
272. Wang, L.; Zhang, R.-M.; Liu, G.-Y.; Wei, B.-L.; Wang, Y.; Cai, H.-Y.; Li, F.-S.; Xu, Y.-L.; Zheng, S.-P.; Wang, G. Chinese herbs in treatment of influenza: A randomized, double-blind, placebo-controlled trial. *Respir. Med.* 2010, 104, 1362–1369. [CrossRef]

273. Jia, Q.; Zhu, R.; Tian, Y.; Chen, B.; Li, R.; Li, L.; Wang, L.; Che, Y.; Zhao, D.; Mo, F.; et al. *Salvia miltiorrhiza* in diabetes: A review of its pharmacology, phytochemistry, and safety. *Phytomedicine* 2019, 58, 152871. [CrossRef]

274. Wang, L.; Ma, R.; Liu, C.; Liu, H.; Zhu, R.; Guo, S.; Tang, M.; Li, Y.; Niu, J.; Fu, M.; et al. *Salvia miltiorrhiza*: A potential red light to the development of cardiovascular diseases. *Curr. Pharm. Des.* 2017, 23, 1077–1097. [CrossRef]

275. Rahuman, A.A.; Bagavan, A.; Kamaraj, C.; Vadivelu, M.; Zahir, A.A.; Elango, G.; Pandiyran, G.; Kamaraj, C. Evaluation of indigenous plant extracts against larvae of culex quinquefasciatus say (diptera: Culicidae). *Parasitol. Res.* 2008, 104, 637–643. [CrossRef]

276. Vlachojannis, J.; Erne, P.; Zimmermann, B.; Chrubasik-Hausmann, S. The impact of cocoa flavanols on cardiovascular health. *Phytother. Res.* 2016, 30, 1641–1657. [CrossRef] [PubMed]

277. Wickramasuriya, A.M.; Dunwell, J.M. Cacao biotechnology: Current status and future prospects. *Plant Biotechnol. J.* 2017, 16, 4–17. [CrossRef] [PubMed]

278. Wirngo, F.E.; Lambert, M.N.; Jeppesen, P.B. The physiological effects of dandelion (*Taraxacum officinale*) in type 2 diabetes. *Rev. Diabet. Stud.* 2016, 13, 113–131. [CrossRef] [PubMed]

279. Schütz, K.; Carle, R.; Schieber, A. *Taraxacum*—A review on its phytochemical and pharmacological profile. *J. Ethnopharmacol.* 2006, 107, 313–323. [CrossRef]

280. Wang, K.C.; Chang, J.S.; Chiang, L.C.; Lin, C.C. *Cimicifuga foetida* L. inhibited human respiratory syncytial virus in HEp-2 and A549 cell lines. *Am. J. Chin. Med.* 2012, 40, 151–162. [CrossRef]

282. El Sayed, K.A. Natural products as antiviral agents. *Stud. Nat. Prod. Chem.* 2000, 24, 473–572. [CrossRef]

283. Wyde, P.R.; Ambrose, M.W.; Meyerson, L.R.; Gilbert, B.E. The antiviral activity of SP-303, a natural polyphenolic polymer, against respiratory syncytial and parainfluenza type 3 viruses in cotton rats. *Antivir. Res.* 1993, 20, 145–154. [CrossRef]