Review Article

Candidate Anti-COVID-19 Medicinal Plants from Ethiopia: A Review of Plants Traditionally Used to Treat Viral Diseases

Dires Tegen,1 Kindalem Dessie,1 and Destaw Damtie2

1South Gondar Zone, Dera Woreda Education Office, Dera, Ethiopia
2Bahir Dar University, College of Sciences, Department of Biology, Bahir Dar, Ethiopia

Correspondence should be addressed to Destaw Damtie; zegades96@gmail.com

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1. Background
Emerging viral infections are among the major global public health concerns. The pandemic COVID-19 is a contagious respiratory and vascular disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). There are no medicines that can treat SARS-CoV-2 except the vaccines. Therefore, searching for plant-originated therapeutics for the treatment of COVID-19 is required. Consequently, reviewing medicinal plants used to treat different viral infections is mandatory. This review article aims to review the ethnobotanical knowledge of medicinal plants traditionally used to treat different viral diseases by the Ethiopian people and suggests those plants as candidates to fight COVID-19.

2. Methods
Articles written in English were searched from online public databases using searching terms like “Traditional Medicine,” “Ethnobotanical study,” “Active components,” “Antiviral activities,” and “Ethiopia.” Ethnobotanical data were analyzed using the Excel statistical software program.

3. Result
From the 46 articles reviewed, a total of 111 plant species were claimed to treat viral infections. Fifty-six (50.4%) of the plant species had reported to have antiviral active components that are promising to treat COVID-19. Lycorine, gingerol shogaol, resveratrol, rhoifolin, oleanolic acid, kaempferol, rosmarinic acid, almond oil, ursolic acid, hederagenin, nigellidine, α-hederin, apigenin, nobiletin, tangeretin, chalcone, hesperidin, epigallocatechin gallate, allicin, diallyl trisulfide, ajoene, aloenin, artesiminin, glucobrassicin, curcumin, piperine, flavonoids, anthraquinone, hydroxychloroquine, and jensenone were some of them.

4. Conclusion
The Ethiopian traditional knowledge applies a lot of medicinal plants to treat different viral infections. Reports of the chemical components of many of them confirm that they can be promising to fight COVID-19.

1. Introduction
Viral diseases are responsible for the global morbidity and mortality of human beings [1]. The pandemic COVID-19 is among such viral outbreaks challenging the healthcare systems around the world [2]. From 31 December 2019 to 31 October 2020, this pandemic resulted in 45,667,780 cases and 1,189,499 deaths globally and 95,789 cases and 1,464 deaths in Ethiopia [3]. However, no specific medications and drugs are known to treat this viral disease. Consequently, reports show that people from different countries use medicinal plants for the prevention and treatment of COVID-19, although not confirmed by the World Health Organization (WHO) for safety issues [4]. Because they contain various active components, medicinal plants can be alternatives to prevent and combat COVID-19 [5].

Plant secondary metabolites like lycorine [6], gingerol shogaol [7], resveratrol rhoifolin [8], oleanolic acid [9], kaempferol [10], rosmarinic acid [11], almond oil [12], ursolic acid [11], hederagenin, nigellidine, and α-hederin [11, 13], apigenin, ethyl cholate, nobiletin, tangeretin, chalcone, and hesperidin [10, 14, 15], epigallocatechin gallate [16], allicin, diallyl trisulfide ajoene, and apigenin [14, 17], aloenin [18], artesiminin [6, 19], glucobrassicin [10, 11], apigenin [11], curcumin [20], piperine [12], flavonoids, anthraquinone, and hydroxychloroquine [21], and jensenone [22] are reported to have antiviral activities. The mechanism of action of these secondary metabolites may be
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2. Methods

2.1. Study Design and Setting. The location of Ethiopia is in the horn of Africa. Its boundaries are Eritrea to the North, Djibouti and Somalia to the East, Sudan and South Sudan to the West, and Kenya to the South. The current UN report shows that the Ethiopian population is estimated to be 115,855,859. Ethiopia’s population is equivalent to 1.47% of the world’s population. Around 21.3% of the population is urban community. The population density in Ethiopia is 115/km² (298 people/mi²) [33]. The total land area is 1,104,300 km² [34].

2.2. Search Strategies. The authors explored articles from PubMed, ScienceDirect, and Web of Science search engines using the following core search terms and phrases: “Traditional Medicine,” “Ethnobotanical study,” “Active components,” “Antiviral activities,” and “Ethiopia.” We used the search terms separately and in combination with Boolean operators like “OR” or “AND.” Besides, we searched for gray literature through the review of available references. Searching for relevant literature included in this systematic review was conducted from September 2020 to October 2020.

2.3. Inclusion and Exclusion Criteria. Studies that were written in the English language, reporting about the antiviral activity of traditional medicines, phytochemical analysis of medicinal plants, and candidate anti-COVID-19 medicinal plants in Ethiopia, Africa, China, Europe, and Western countries, were retrieved and included in this study. However, we excluded studies that did not contain antiviral medicinal plants.

2.4. Data Extraction. All authors contributed to the data extraction protocol preparation and evaluation. The data extraction protocol consists of the scientific, family, and local names, parts used, preparation methods, administration routes, diseases treated, and references.

2.5. Data Analysis. Ethnobotanical data were entered in an Excel spreadsheet and analyzed using Excel statistical software program. We tabulated and compiled quantitative data using descriptive statistics to identify the number and percentage of species and families of antiviral plants and expressed them in tables.

3. Results and Discussion

3.1. Search Results. From the total of 260 articles retrieved, only 46 (17.7%) of the studies met the eligibility criteria (Figure 1).

3.2. Identified Plants with Antiviral Activities. From the 46 articles reviewed, 111 plant species claimed to treat eleven viral infections. The most frequently reported viral diseases to be treated by the 111 plants were rabies (reported 36 times), hepatitis (30 times), common cold (26 times), herpes zoster (17 times), influenza (10 times), Herpes simplex virus (8 times), Wart (6 times), HIV-1 (5 times), Bursal viral diseases (once), flu (once), and Smallpox (once) (Table 1).

3.3. Taxonomic Diversity of Medicinal Plants Used for the Treatment of Viral Diseases in Ethiopia. We reviewed 162 plants which were grouped under 111 species and 57 families (Table 2). Among the families, Fabaceae was represented by 8 (7.2%) species, Solanaeae and Lamiaceae by 6 (5.4%) species each, Euphorbiaceae and Asteraceae by 5 (4.5%) species each, and Meliaceae, Vitaceae, Apiaceae, Anacardiaceae, Moraceae, Oleaceae, Cucurbitaceae, Rutaceae, and Acanthaceae by 3 (2.7%) species each, and the

due to their greater binding affinity for SARS-CoV-2 6LU7 and 6Y2E proteases and inhibition of SARS-CoV-2 M protease (Mpro) and Spike (S) glycoprotein [6–22].

Globally, millions of people rely on medicinal plants not only for their primary healthcare systems but also for income generation and livelihood improvement [23]. Moreover, at least 25% and 50% of the pharmacopeia are derived from plant products and are originated from natural products, respectively [24]. Nowadays, traditional healers from different habitats and geographical locations are showing new candidate combinations for the treatment of viral infections such as SARS-CoV-2 [5].

Using traditional medicine has a long history in Ethiopia. About 80% of the Ethiopian population is still dependent on the use of folk medicine [25–27], due to its cultural acceptability, economic affordability, and efficacy against certain types of diseases compared to modern medicine [28]. However, the plants and the associated indigenous knowledge in the country are gradually declining because of environmental degradation, deforestation, lack of documentation, and potential acculturation [29].

Common cold, influenza, and COVID-19 share common characteristics. All of them affect the respiratory tract and have modes of transmission: direct contact, droplets, and fomites. Cough, sneezes, fever, shortness of breath, sore throat, and headache are among the common symptoms of these diseases [30]. Traditional healers from Ethiopia use medicines of plant origin to treat viral infections like the common cold, rabies, influenza, herpes simplex, herpes zoster, and hepatitis. Due to their fewer side effects, better patient tolerance, and relatively low cost, the use of medicinal plants is a common practice by the Ethiopian people.

Due to its ecological and cultural diversity, Ethiopia is a rich source of herbal medicine [31]. Plant extracts contain a lot of active components, so they have a wide range of activities against microorganisms. That is, they act on multiple active sites of the pathogen [32]. Therefore, a medicinal plant used to treat one viral infection may serve to fight other viral infections. This review, therefore, focuses on the identification of medicinal plants used by traditional healers of Ethiopia to treat viral diseases and extrapolates this knowledge for the fight of COVID-19.
remaining 43 families were represented by 1 to 2 species (Table 2).

Solanaceae was represented by n = 12, 7.41% plants, followed by Euphorbiaceae (by n = 11, 6.8% plants), Fabaceae and Lamiaceae (by n = 9, 5.6% plants each), Alliaceae and Phytolaccaceae (by n = 8, 4.9% plants each), Acanthaceae (by n = 7, 4.3% plants), Myrtaceae and Zingiberaceae (by n = 6, 3.7% plants each), Asteraceae and Moraceae (by n = 5, 3.09% plants each), and the remaining 43 families by 1 to 4 plants (Table 2).

3.4. Medicinal Plants with Antiviral Active Components.
A range of active compounds with potential antiviral agents for future drug development has been identified from plants [77]. People in Ethiopia use different medicinal plants to treat different viral infections even without knowing their active components (Table 1). However, different literature shows that 56 (50.4%) of the plants reviewed contained components with antiviral activity (Table 3).

Flavonoids are secondary metabolites with antiviral properties [99]. The Ethiopian medicinal plants Acacia abyssinica, Acacia etbaica, and Acacia nigra [5], Moringa borziana [21], Acanthus polystachyus [78], Azadirachta indica [81], and Osyris quadripartite [91] were reported to contain flavonoids.

Reports show that tannins block virus attachment, entry, and cell-to-cell spread by binding to viral glycoproteins on viruses and the surfaces of infected cells [100]. The Ethiopian medicinal plants Acacia abyssinica, Acacia etbaica, and Acacia nigra [5] and Acanthus polystachyus [78] are reported to have tannins so that they can be good candidates to fight COVID-19.

Many terpenoids of plant origin have antiviral activities against severe acute respiratory syndrome coronavirus [101]. Medicinal plants reviewed in the present study may possess terpenoids. Studies among some of these medicinal plants show that they possess these secondary metabolites. Some of the medicinal plants with terpenoid active components were Acacia abyssinica, Acacia etbaica, and Acacia nigra [5] and Osyris quadripartite [91].

Polyphenols have demonstrated potent antiviral activities. For example, the polyphenol in green tea controls viruses such as hepatitis C, chikungunya, hepatitis B, herpes simplex virus type 1, influenza A, vaccinia, adenovirus, reovirus, vesicular stomatitis, and Zika (ZIKV) [102]. Acacia abyssinica, Acacia etbaica, and Acacia nigra [5], Acanthus polystachyus [78], and Azadirachta indica [81] of the present review contained polyphenols in their extracts.

Acanthus polystachyus [78] contained saponins that possess various biological activities, including antiviral action [103]. Ocimum basilicum, Ocimum lamiifolium,
| No. | Scientific name | Family | Local name          | Parts used and preparation method                                                                 | RA          | DT          | Ref. |
|-----|-----------------|--------|---------------------|---------------------------------------------------------------------------------------------------|-------------|-------------|------|
| 1   | *Acacia abyssinica* Hochst. ex Benth. | Fabaceae | Memona (Tig) | Crush the bark and apply on the affected part                                                      | Dermal      | H. zoster   | [35] |
| 2   | *Acacia etbaica* Schweinf. | Fabaceae | Seraw (Amh) | Crushed bark                                                                                     | Oral        | Wart        | [36] |
| 3   | *Acacia nigra* | Fabaceae | Tikur grar (Amh) | Crush or pound and squeeze the leaf and apply on allergic skin                                    | Dermal      | H. zoster   | [37] |
| 4   | *Acanthus polystachyus* | Acanthaceae | Kucheshile (Amh) | Crush the root and pound and give with water                                                      | Oral        | Rabies      | [36, 38] |
| 5   | *Acokanthera schimperi* (A. DC.) Schweinf. | Apocynaceae | Meriz (Amh) | Crushed rhizomes are pounded and eaten with honey (i) Crush the bulb and drink with water (ii) Bulb is pounded and mixed with meat soup and used as a drink (i) Crushed rhizomes are pounded and eaten with honey (ii) Bulb is pounded and mixed with meat soup and used as a drink (i) Crushed rhizomes are pounded and eaten with honey (ii) Bulb is pounded and mixed with meat soup and used as a drink | Oral        | Influenza virus | [36, 38] |
| 6   | *Allium sativum* | Alliaceae | Nechsenkret (Amh) | Eat the part of the bulb with other foods Crush the bulb and drink with water (i) Crushed rhizomes are pounded and eaten with honey (ii) Crush the bulb and drink with water (i) Crushed rhizomes are pounded and eaten with honey (ii) Crushed rhizomes are pounded and eaten with honey (iii) Cloves ground up and mixed with honey, take first thing in the morning on an empty stomach | Oral        | Rabies      | [35] |
| 7   | *Allium cepa* | Alliaceae | QeY shikurt (Amh) | Leaf of *A. macrocarpa* is powdered and mixed with honey | Oral        | HSV         | [44] |
| 8   | *Aloe macrocarpa* Tod. | Aloeaceae | Eret (Amh) | Crush the fruit and leaf of *Amaranthus hybridus* (i) Crush the leaf (ii) Crush the root and give with water | Oral        | Wart        | [45] |
| 9   | *Amaranthus hybridus* Linn. | Amaranthaceae | Tenbelel (Amh) | Crushed and powdered leaf | Nasal, oral | Influenza | [36] |
| 10  | *Artemisia afra* Jack. ex Willd. and *Artemisia annua* L. | Asteraceae | Chikugn (Amh) | Crush and powdered leaf | Oral        | Smallpox    | [40] |
| 11  | *Azadirachta indica* A. Juss. *Bersama abyssinica* Boyle | Meliaceae | Neem (Amh) | Leaves | Oral | HIV-1 | [46] |
| 12  | *Brassica carinata* A. Br. Herb | Brassicaceae | Gomen (Amh) | Bark/leaves/roots The dried leaf was powdered and mixed with water then drunk | Oral        | Rabies, HIV-1 | [47] |
| 13  | *Brucea antidysenterica* J. F. Mill | Simaroubaceae | Waginos (Aballo)(Amh) | Crushed and powdered leaf | Oral        | C. cold     | [48] |

Table 1: The medicinal plants used to treat viral diseases in different parts of Ethiopia.
| No. | Scientific name                  | Family      | Local name       | Parts used and preparation method                                                                 | RA      | DT          | Ref.               |
|-----|----------------------------------|-------------|------------------|----------------------------------------------------------------------------------------------------|---------|-------------|--------------------|
| 16  | *Calpurnia aurea* (Ait.) Benth.  | Fabaceae    | Digita (Amh)     | Squeeze the whole part of the plant and bake with teff flour and give for 3 days (together with Croton macrostachyus and Rumex nervosus). Crush the seeds of *Calpurnia aurea* and mix with water. | Oral    | Rabies      | [50]               |
| 17  | *Camellia sinensis*              | Theaceae    | Shay kitel (Amh) | Drink the leaves with tea. Pounded being mixed with the leaf of V. sinalicum, O. quadripartita, C. aurea (concoction), then bandage on the wound. | Oral    | Rabies      | [52, 53]          |
| 18  | *Capsicum annuum* L.             | Solanaceae  | Berbere (Amh)    | Fresh fruit and leaf pounded and crushed, add water. | Oral    | Rabies      | [37]               |
| 19  | *Carica papaya* L.               | Caricaceae  | Papaya (Amh)     | The root is powdered and mixed with food. The roots crushed and pounded, then boiled and drink 2-3 cups of coffee in the morning. | Oral    | Rabies      | [37, 44]          |
| 20  | *Carissa edulis* Vahl.           | Apocynaceae | Agam (Amh)       | A quarter of a fingersized root is ground, mixed with water, filtered, and taken orally. | Oral    | Rabies      | [39]               |
| 21  | *Cayratia ibuensis* (Hook.f.) Suess. | Vitaceae | Udusalim Rumiyi (Oro) | Squeezing fruit (juice). Burn leaves in oven with leaves of Dodonaea angustifolia, grind, mix with butter and apply on the affected part. Dry and mix leaves with dried leaves of *Calpurnia aurea* and Datura stramonium, grind, add butter, and spread the paste on the affected part. (i) Crush the root and boiled with water (Decoction). | Oral    | Rabies, hepatitis | [35, 37] |
| 22  | *Centella asiatica* L.           | Apiaceae    | Yeait joro (Amh) | Squeezed fruit (juice). Burn leaves in oven with leaves of Dodonaea angustifolia, grind, mix with butter and apply on the affected part. Dry and mix leaves with dried leaves of *Calpurnia aurea* and Datura stramonium, grind, add butter, and spread the paste on the affected part. (i) Crush the root and boiled with water (Decoction). | Oral    | Rabies, hepatitis | [35, 37] |
| 23  | *Citrus aurantium* L.            | Rutaceae    | Bahir Lome (Amh) | Boil the leaf, decant then drink the juice. | Oral    | Rabies      | [38]               |
| 24  | *Citrus limon* (L.) Burm. f.     | Rutaceae    | Lome (Amh)       | Boil the leaf, decant then drink the juice. | Oral    | Rabies      | [38]               |
| 25  | *Clematis hirsute* Perr. & Guill. | Ranunculaceae | Hareg (Tig)      | Boil the leaf, decant then drink the juice. | Oral    | Rabies      | [38]               |
| 26  | *Clutia abyssinica* Jaub. & Spach. | Euphorbiaceae | Tewshealalito (Tig) Fiyle feji (Amh) | Boil the leaf, decant then drink the juice. | Oral    | Rabies      | [38]               |
| 27  | *Coffea arabica* L.              | Rubiaceae   | Bunna (Amh)      | Boil the leaf, decant then drink the juice. | Oral    | Rabies      | [38]               |
| No. | Scientific name               | Family               | Local name          | Parts used and preparation method                                                                                                                                                                                                 | RA          | DT          | Ref.      |
|-----|-------------------------------|----------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-----------|
| 28  | *Combretum collinum*          | Combretaceae         | Abalo (Amh)         | The seed of *Combretum collinum* with the seed of *Solanum dasyphyllum* are crushed together powdered, mixed with "tella" and drunk for 3 days                                                                                      | Oral        | Rabies     | [50]      |
| 29  | *Coriandrum sativum*          | Apiaceae             | Dimblal (Amh)       | —                                                                                                                                  | —           | —           | Potential anti-COVID-19 [56] |
| 30  | *Cordia africana*             | Boraginaceae         | Wanza (Amh)         | Boiled with sorghum (decoction) and drinking                                                                                                                                     | Oral        | Hepatitis  | [37]      |
| 31  | *Crinum abyscinicum* Hochst. ex A. Rich. | Amaryllidaceae | Yejib shinkurt (Amh) | Bulb of *Crinum abyscinicum* is used to treat rabies                                                                                                                               | Oral        | Rabies     | [57]      |
| 32  | *Crotalaria incana* L.        | Fabaceae             | Atarii Kuruphee (Oro) | Sap from the whole part of the plant is directly creamed on affected area (i) Shoots are crushed with water, filtered and the solution is taken orally (for hepatitis) (ii) The fresh root bark is crushed, pounded, mixed with water, and given orally (for rabies) Crushed fresh root with water fermented for 3 days is taken with honey early morning before breakfast orally until the cure | Dermal      | Hepatitis  | [41]      |
| 33  | *Croton macrostachyus* Del.   | Euphorbiaceae        | Bisana (Amh)        | —                                                                                                                                  | Oral        | Hepatitis, rabies [39, 44, 51] |
| 34  | *Cucumis ficifolius* A. Rich. | Cucurbitaceae        | Yemidir Embuay (Amh) | Fresh leaf boiled with water and given orally                                                                                                                                    | Oral        | Rabies     | [49]      |
| 35  | *Cucurbita pepo L.*           | Cucurbitaceae        | Hamham (Tig)        | —                                                                                                                                  | Oral        | Influenza  | [44]      |
| 36  | *Curcuma longa*               | Zingiberaceae        | Erd (Amh)           | Bark (root) of *Cussonia ostinii*, leaf *Asplenium monathes* and the leaf of *Calpurnia subdecandra* were pounded together, and 2 cups were given to cattle                                           | —           | HBV, HCV   | [58]      |
| 37  | *Cussonia ostinii* Chiov.     | Araliaceae           | Harfattu (Oro)      | The root was boiled with milk and filtered and the filtrate was taken in an empty stomach full of a coffee cup daily for 3 consecutive days                                                                 | Orally      | Hepatitis  | [41]      |
| 38  | *Cyphostemma adenocaula* (A. Rich.) | Vitaceae             | Asserkush (Amh)     | Leafy stem is squeezed and its drop prepared with butter                                                                                                                           | Orally      | Rabies     | [50]      |
| 39  | *Datura stramonium* L.        | Solanaceae           | Atsefaris (Amh)     | Leafy stem is squeezed and its drop prepared with butter                                                                                                                           | Dermal      | Wart       | [35]      |
|     |                               |                      |                     | Crushed and homogenized leaves drunk with water                                                                                                                                     | Dermal      | Wart       | [36]      |
| No. | Scientific name                  | Family            | Local name              | Parts used and preparation method                                                                 | RA          | DT          | Ref.   |
|-----|---------------------------------|-------------------|-------------------------|--------------------------------------------------------------------------------------------------|-------------|-------------|--------|
| 40  | *Diplolophium africanum* Turcz. | Apiaceae          | Zegerawta (Amh)         | Dried leaves of the plant and *Calpurnia aurea* and *Clutia abyssinica* are ground, mix powder with butter, and apply on the affected part | Dermal      | H. zoster   | [35]   |
|     | *Dipsacus pinnatifidus* Steud.  | Dipsacaceae       | Fereze ng/kelem (Amh)   | Pound the root and give with water                                                               | Orally      | Rabies      | [38]   |
| 41  |                                  |                   |                         | Dry the leaf of the plant alone or mix with the leaf of *Clematis hirsuta* on a hot stove, grind, add butter and rub the affected part | Dermal      | H. zoster   | [35]   |
| 42  | *Dodonaea angustifolia* L.f.    | Sapindaceae       | Kitkita (Amh)           | Pound the leaf and give with water                                                               | Orally      | Rabies      | [49]   |
| 43  | *Dorstenia barnimiana* Schweinf. | Moraceae          | Work Bemeda (Amh)       | Root powder with shimmied milk or nug is taken orally early morning until a cure                  | Orally      | Rabies      | [49]   |
| 44  | *Dregea rubicunda* Schum.       | Asclepiadaceae    | Kuandira (Amh)          | Crush and drink with milk                                                                       | Orally      | Rabies      | [38]   |
| 45  | *Dregea schimperi* (Decne.) Bullock. | Asclepiadaceae    | Shanqoq (Tig)           | Crush and drink the fluid                                                                       | Orally      | Rabies      | [35]   |
| 46  | *Echinops amplexicaulis* Oliv.  | Asteraceae        | Kosorrru Hare (Oro)     | The root of *Echinops amplexicaulis* is dried, powdered, and mixed with water                    | Orally      | Hepatitis   | [41]   |
| 47  | *Ekebergia capensis*            | Meliaceae         | . . .                    | The leaf of *Ekebergia capensis* is crushed and add water                                        | Orally      | C. cold     | [36]   |
| 48  | *Eucalyptus globulus* Labill.   | Myrtaceae         | Nech bahirzaf (Amh)     | Boil and fumigate with the fume                                                                    | Nasal, oral, and dermal | C. cold     | [36]   |
|     |                                 |                   |                         | (i) Leaf of *Eucalyptus globulus* is chopped and boiled; the steam bath is taken by humans; vapor inhaled orally and nasally | Nasal, orally | Influenza   | [35, 40–42, 45] |
|     |                                 |                   |                         | (ii) Boil *Eucalyptus* and Damakasse in water and inhale                                           |             |             |        |
|     |                                 |                   |                         | (iii) Leaf of *E. globulus* is boiled in water                                                    |             |             |        |
| 49  | *Euphorbia abyssinica* G.F.Gmel. | Euphorbiaceae     | Kulkual (Amh)           | Stems are burned on fire and fumigated                                                             | Dermal      | Hepatitis   | [39]   |
|     |                                 |                   |                         | Mix the latex of *Euphorbia abyssinica* with milk and drink it                                    | Orally      | Rabies      | [38]   |
| No. | Scientific name             | Family       | Local name | Parts used and preparation method                                                                                                                                                                                                 | RA       | DT          | Ref.        |
|-----|----------------------------|--------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|-------------|
| 50  | *Ficus sycomorus* L.       | Moraceae     | Sholla (Amh) | (i) The sap of *Ficus sycomorus* is creamed directly on the skin (for hepatitis) (ii) The bark of *Ficus sycomorus* and root of *Prunus africana* are powdered together and backed with teff flour and eaten (for rabies) The stem bark and the latex are mixed with *Phytolacca dodecandra* (leaf) and given 1 teaspoon drink orally Hepatitis, rabies [41, 45] |
| 51  | *Ficus* sp.                | Moraceae     | Warka (Amh) | Oral Rabies [51]                                                                                                                                                                                                                   |          |             |             |
| 52  | *Gnidia stenophylla* Gilg. | Trymalaceae  | Kataricha (Oro) | The decoction of the root is taken with goat milk A bunch of leaves was collected from 7 different sites, mixed with 10 tin cans of water, stored for 7 days, and washed for 7 consecutive days Pounded being mixed with the leaf of *V. sinaiticum*, *O. quadripartita*, *C. aurea*, *S. uliginosa*, *D. stramonium*, and *P. schmperi* Dermal H. zoster [55] |
| 53  | *Hypoestes forskaoolii* (Vahl) R.Br. | Acanthaceae | Girbia (Tig) | Dermal H. zoster [60]                                                                                                                                                                                                                 |          |             |             |
| 54  | *Jasminum abyssinicum* Hochst. | Oleaceae     | Tembele (Amh) | Crush the seed of *Jatropha curcas* mixed with water (i) Root and leaf of *Justica schimperiana* are pounded together and mixed with water and 2-3 cups of tella are used as a drink (ii) Seed of *J. Schimperiana* is crushed and mixed with water and filtered (iii) The *Justicia schimperiana* and *Brueca antidysenterica* leaves are used to treat rabies Sniff unprocessed or after rubbing Oral Rabies [36, 41, 45, 59, 61] |
| 55  | *Jatropha curcas* L.       | Euphorbiaceae | Yesudan-gulo (Amh) | Orally Rabies [51]                                                                                                                                                                                                                  |          |             |             |
| 56  | *Justicia schimperiana* (Hochst. ex Nees) T. Anders | Acanthaceae | Smiza (Amh) | Oral Rabies [36, 41, 45, 59, 61]                                                                                                                                                                                                     |          |             |             |
| No. | Scientific name | Family       | Local name | Parts used and preparation method                                                                 | RA      | DT       | Ref.     |
|-----|-----------------|--------------|------------|--------------------------------------------------------------------------------------------------|---------|---------|----------|
| 57  | Laggera integrifolia Sch. Bip. ex A. Rich | Asteraceae  | Gimmie (Amh) | (i) Juice of seven shoot meristems that can be mixed with fresh water and drink a cup of the mixture (ii) Juvenile leaf of Justicia schimperiana boiled with milk (decoction) | Orally  | Hepatitis | [37, 62] |
| 58  | Lens culinaris Medic. | Fabaceae    | Misir (Amh) | The leaf is inhaled sometimes through the nose. Dry seeds are ground, powder is soaked in water, and cream is smeared on the affected part | Nasal   | C. cold  | [63]     |
| 59  | Lippia abyssinica | Lamiaceae   | Koseret (Amh) | Roots are ground, mixed with milk, and solution drunk for five days. | Orally  | Rabies   | [39]     |
| 60  | Lobelia rhynchopterum Hems. | Lobeliaceae | Jibara (Amh) | Fresh fruit put in the fire and eaten when getting hot in order to get relief from the common cold | Oral    | C. cold  | [48]     |
| 61  | Lycopersicon esculentum (L.) Mill. | Solanaceae  | Timaatima (Oro) | —                                                                 | Oral    | —       | —        |
| 62  | Mangifera indica Millettia ferruginea (Hochst.) Bak. | Anacardiaceae | Mango (Amh) | Bark/leaves                                                                                   | Oral    | C. cold, HSV-1/2 | [46] |
| 63  | Myrica salicifolia Hochst. ex A. Rich. | Myricaceae  | Muz (Amh) | Crush, powder, then sniff Nicandra physalodes (L.) Gaertn roots are pounded and mixed with cold water; 2–4 cups of tella are used as a drink | Nasal   | C. cold  | [38]     |
| 64  | Myrica spp. | Myricaceae  | Shinet (Amh) | —                                                                 | Oral    | —       | SARS-CoV-2, influenza [64, 65] |
| 65  | Myrica salicifolia Hochst. ex A. Rich. | Myricaceae  | Shinet (Amh) | —                                                                 | Oral    | —       | —        |
| 66  | Nicandra physalodes (L.) Gaertn | Solanaceae  | Hawwixii (Oro) | —                                                                 | Oral    | Hepatitis | [41]     |
| 67  | Nicotiana tabacum | Solanaceae  | Tamiba (Had) | Dry leaves are pounded and powdered, then drunk or smelled through the nose of humans. Fried seeds wrapped in a piece of cloth and sniffed three times daily, wrap in small leaf, stick up nose. | Nasal   | C. cold  | [43]     |
| 68  | Nigella sativa | Ranunculaceae | Tikur Azmud (Amh) | —                                                                 | Orally  | C. cold  | [40, 62] |
| 69  | Ocimum basilicum L. Herb | Lamiaceae  | Bessobla (Amh) | Fresh leaves together with the root of Aloe macrocarpus concocted together and drink the solution | Oral    | Flu, CVB1 | [48]     |
| No. | Scientific name          | Family       | Local name        | Parts used and preparation method                                                                 | RA       | DT              | Ref.   |
|-----|--------------------------|--------------|-------------------|---------------------------------------------------------------------------------------------------|----------|-----------------|--------|
| 71  | *Ocimum lamifolium* Hochst. ex Benth. | Lamiaceae    | Damakassie (Amh)  | Crushed and mixed/concocted/with coffee and take (i) Squeeze leaves and drink the juice with coffee, or apply the rubbed leaves into the nose | Orally   | C. cold         | [59]   |
| 72  | *Ocimum urticifolium* Roth. | Lamiaceae    | Dama kesie (Amh)  | Boil with tea and drink Boiled, adding salt for the night and isolate the residue (decoction) The leaf is heated slightly, rubbed by the hands, and then inhaled through nostrils then 2 spoonsful powder is mixed with a cup of water, drink for 3 consecutive days Pounded being mixed with the leaf of *C. annuum, V. sinesis, C. aurea, J. abyssinicum* (concoction) | Orally   | C. cold         | [38]   |
| 73  | *Olea europaea* subsp. cuspidate | Oleaceae     | Weyra (Amh)       | Smoking and fumigating the house Smoking, oral | Smoking, oral | C. cold         | [36, 38] |
| 74  | *Olinia rochetiana* A. Juss | Oliniaceae   | Noole (Sid)       | Dried and pounded Dried and pounded then 2 spoonsful powder is mixed with a cup of water, drink for 3 consecutive days | Nasal    | Viral common cold | [66]   |
| 75  | *Osyris quadripartita* Decn. | Santalaceae  | Keret (Amh)       | Orally Hepatitis | Orally Hepatitis | [37]   |
| 76  | *Otostegia integrifolia* Benth. | Lamiaceae    | Tunjut (Amh)      | (i) Root is crushed and pounded, mixed with water; one-third of the tella cup is given to humans (liver problem); *Phytolacca dodecandra* root is crushed and pounded, mixed with water; one-third of a cup is given to humans (ii) Dried root of *Phytolacca dodecandra* powder and one-two cups of domestic alcohol (malakia) are taken orally (for rabies) (iii) Chopped root and leaves mixed with honey are given orally (for rabies) (iv) Fresh root of *Phytolacca dodecandra* is pounded, mixed with water, one arake glass of the solution is given for 7–10 days (for humans) | Oral     | (i) Liver problem (hepatitis), (ii) Rabies | [41, 42, 48, 70] |
| 77  | *Piper nigrum* | Piperaceae   | Kundo berbere (Amh) | — | — | VSV, PIV, CVB3 | [67]   |
| 78  | *Phaseolus vulgaris* | Fabaceae     | Bakela (Amh)      | — | — | HIV-1, RSV, and HSV-1 | [68, 69] |
| 79  | *Phytolacca dodecandra* | Phytolaccaceae | Endod (Amh)       | Oral (i) Liver problem (hepatitis), (ii) Rabies | Oral     | (i) Liver problem (hepatitis), (ii) Rabies | [41, 42, 48, 70] |
| No. | Scientific name          | Family         | Local name | Parts used and preparation method                                                                                                                                                                                                 | RA     | DT        | Ref. |
|-----|--------------------------|----------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------|------|
| 80  | *Plantago lanceolata* L. | Plantaginaceae | Korxobi (Oro) | (v) Squeeze and apply on the wounded part Juice extracted by pounded fresh root mixed with milk of similar cow and calf Roots are chewed and fluid swallowed; as an antidote, *Guizotia abyssinica* solution is taken orally Juice of crushed fresh root taken with skinned milk Juice of crushed fresh root taken with skinned milk (i) The leaf is squeezed and apply on the affected dermal part (ii) The squeezed leaf is pasted with butter and made to ointment Fresh stem barks boiled and filtered and then drunk in the middle of the night for three days; dry stem bark crushed and pounded then parted on the wound Combined Zigba (*Podocarpus gracilior*) of Dokuma (*Syzygium guineense*, listed next) in a cold maceration; drink on an empty stomach first thing in the morning, this induces vomiting which is thought to help treat Yellelito wofe (hepatitis) The fresh leaves are pounded, kept in a handkerchief, and inhaled | Dermal | H. zoster | [37] |
| 81  | *Podocarpus falcatus*    | Podocarpaceae  | Birbirsa (Oro) | Oral Jaundice (hepatitis) or rabies Combined Zigba (*Podocarpus gracilior*) of Dokuma (*Syzygium guineense*, listed next) in a cold maceration; drink on an empty stomach first thing in the morning, this induces vomiting which is thought to help treat Yellelito wofe (hepatitis) The fresh leaves are pounded, kept in a handkerchief, and inhaled | Oral   | Rabies    | [43] |
| 82  | *Podocarpus gracilior*   | Podocarpaceae  | Zigba (Amh)  | Oral Yellelito wofe (hepatitis) Combined Zigba (*Podocarpus gracilior*) of Dokuma (*Syzygium guineense*, listed next) in a cold maceration; drink on an empty stomach first thing in the morning, this induces vomiting which is thought to help treat Yellelito wofe (hepatitis) The fresh leaves are pounded, kept in a handkerchief, and inhaled | Oral   | Yellelito wofe (hepatitis) | [40] |
| 83  | *Polygala obtusissima* Chod. | Polygalaceae | Calmala (Afa) | Inhalation (nasal) C. cold Combined Zigba (*Podocarpus gracilior*) of Dokuma (*Syzygium guineense*, listed next) in a cold maceration; drink on an empty stomach first thing in the morning, this induces vomiting which is thought to help treat Yellelito wofe (hepatitis) The fresh leaves are pounded, kept in a handkerchief, and inhaled | Inhalation (nasal) | C. cold | [71] |
| 84  | *Prunus dulcis*          | Rosaceae       | Lewuz (Amh)  | Oral HSV-1/ 2 Pounded with tea Pounded being mixed with *J. abyssinicum*, *D. stramonium*, and *S. nigrum* (concoction); wash the entire body first and apply the remedy on the wound Fresh leaves are crushed and mixed with water and one cup of tea is taken for 3 consecutive days | Oral   | HSV-1/ 2 | [72] |
| 85  | *Rhus natalensis*        | Anacardiaceae  | Debobosha (Amh) | Dermal H. zoster Wash the entire body first and apply the remedy on the wound Fresh leaves are crushed and mixed with water and one cup of tea is taken for 3 consecutive days | Dermal | H. zoster | [37] |
| 86  | *Ricinus communis* L.    | Euphorbiacea   | Kabosimbiro (Oro) | Orally Rabies Wash the entire body first and apply the remedy on the wound Fresh leaves are crushed and mixed with water and one cup of tea is taken for 3 consecutive days | Orally | Rabies    | [50] |
Table 1: Continued.

| No. | Scientific name                | Family          | Local name   | Parts used and preparation method                                                                                                                                                                                                 | RA       | DT       | Ref.               |
|-----|--------------------------------|-----------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|--------------------|
| 87  | *Rosa abyssinica*              | Rosaceae        | Qega (Amh)   | (i) The root is pounded, well-spiced, and mixed with food (ii) Freshly pounded and squeezed leaves of *Ricinus communis* L. with milk for treating patients of rabies                                                                                     | Oral     | Rabies   | [54, 73]          |
| 88  | *Rosmarinus officinalis*       | Lamiaceae       | Tibs kitel (Amh) | —                                                                                                                                                                                                                                 | Oral     | —        | Enteric coronavirus. [74] |
| 89  | *Rumex abyssinicus*            | Polygonaceae    | Mekmoko (Amh) | Root decocted, drunk or chewed                                                                                                                                                                                                       | Oral     | Hepatitis | [40]               |
| 90  | *Rumex crispus*                | Polygonaceae    | Enbacho (Amh) | Roots chewed and juice swallowed Leaf of *Ruta chalepensis* pounded with the bulb of *Allium sativum* mixed with soup and used as a drink Fresh steam is put in the fire and eaten when gets hot to get relief from the common cold | Oral     | Hepatitis | [40]               |
| 91  | *Ruta chalepensis* L.          | Rutaceae        | Tena adam (Amh) | —                                                                                                                                                                                                                                 | Oral     | Influenza | [41]               |
| 92  | *Saccharum officinarum* L. Herb| Poaceae         | Shankora ageda (Amh) | Crushed leaves of *Salix subserrata* Willd. and *Afrocarpus falcatus* (Thunb.) C. N. Page was also used in fresh form, mixed with water and milk, to treat rabies two drops of sesame oil in each nostril each morning are suggested to prevent COVID-19 | Oral     | C. cold  | [48]               |
| 93  | *Salix subserrata* Wild        | Salicaceae      | —            | —                                                                                                                                                                                                                                 | Oral     | Rabies   | [73]               |
| 94  | *Sesamum indicum*              | Pedaliaceae     | Selit (Amh)  | Boz (Amh)                                                                                                                                                                                                                         | Nasal    | COVID-19  | CCRH, 2020         |
| 95  | *Schinus molle*                | Anacardiaceae   | Selit (Amh)  | Crushed leaves of *Schinus molle* Crushed fresh leaves of *Schinus molle* with water Leaves are collected from seven different areas, grounded with *Guizotia abyssinica* seeds, mixed with water and solution have taken orally | Oral     | Cough (C. cold) | [36]            |
| 96  | *Solanecio gigas* (Vatke) C. Jeffrey | Asteraceae    | Boz (Amh)    | —                                                                                                                                                                                                                                 | Orally   | Hepatitis | [39]               |
| 97  | *Sorghum bicolor* (L.) Moench. | Poaceae         | Boz (Amh)    | Boil it in water and wash the body with it                                                                                                                                                                                          | Dermal   | H. zoster | [35]               |
| 98  | *Spinacia oleracea*            | Amaranthaceae   | Keyh leqa (Tig) | —                                                                                                                                                                                                                                 | —        | —        | SARS-CoV-2 [10]     |
| 99  | *Stephania abyssinica* (Dillon & A. Rich.) Walp. | Menispermacae | Kosta (Amh)  | Crushed and given with milk and water                                                                                                                                                                                          | Orally   | Rabies   | [38]               |
| 100 | *Syzygium aromaticum*          | Myrtaceae       | Chewchawit (Amh) | —                                                                                                                                                                                                                                 | —        | HSV-1 and 2 | [9]                |
| 101 | *Trichilia dregeana*           | Meliaceae       | Kirnfu (Amh) | Soaked, cooked, and put on tooth surface                                                                                                                                                                                           | dermal   | Wound Warts | [36]               |
Ocimum urticifolium, and Olea europaea subsp. cuspidate [11], Osyris quadripartite [91], and Acokanthera schimperi [79] contain ursolic acid which is a pentacyclic triterpenoid with potent antiviral activities [104].

Another plant secondary metabolite with antiviral activity is oleanolic acid [105]. It is reported from Syzygium aromaticum [9], Ocimum basilicum, Ocimum lamifolium, Ocimum urticifolium, and Olea europea subsp cuspidate [11], Osyris quadripartite [91], Acokanthera schimperi [78], Dregea schimperi [88], Euphorbia abyssinica [89], and Phytolacca dodecandra [93]. Oleanolic acid has a binding affinity for SARS-CoV-2 M protease and Spike (S) glycoprotein [106].

Vitamin plant metabolite quercetin inhibits viral entry into target cells via interaction with viral HA protein [107].

Medicinal plants from Ethiopia, Allium cepa [16], Lepidium sativum [22], Azadirachta indica [81], Osyris quadripartite [91], Amaranthus hybridus Linn [80], Clematis hirsute [84], Carissa edulis [90], Ricinus communis [95], and Ruta chalepensis [13], are reported to contain quercetin.

Epigallocatechin-3-O-gallate (EGCG) is known to inhibit a variety of DNA and RNA viruses [108]. It is found in Camellia

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| No. | Scientific name                  | Family      | Local name       | Parts used and preparation method                                                                 | RA          | DT                  | Ref. |
|-----|----------------------------------|-------------|------------------|---------------------------------------------------------------------------------------------------|-------------|---------------------|------|
| 102 | Triumfetta heterocarpa Sprague and Hutch. | Tiliaceae   | Anunu (Oro)     | The crushed fresh root is mixed with water and taken orally without food                         | Orally      | Hepatitis           | [49] |
| 103 | Verbascum sinatricum Benth.       | Scrophulariaceae | Yelam tut (Amh) | Roots are burned on fire and the smoke inhaled                                                  | Nasal       | Hepatitis           | [39] |
| 104 | Vitis vinifera                    | Vitaceae    | Qetetina (Amh)  | Fruits                                                                                           | Oral        | HSV-1, PIV, hepatitis, H. zoster, HSV, cough, HIV | [8]  |
| 105 | Vernonia amygdalina Del.          | Asterolaceae | Weyin fire (Amh) | Leaves/roots                                                                                     | Oral        | Hepatitis           | [46] |
| 106 | Warburgia ugandensis Sprague      | Canellaceae | Befit (Oro)     | The smoke of 2-3 stick vascular part is inhaled to relieve cough                                | Nasal       | Cough (C. cold)     | [55] |
| 107 | Withania somnifera                | Solanaceae  | Giziewa or Kumo (Amh) | —                                                                                              | Oral        | IBDV, HSV-1         | [76] |
|     |                                   |             |                  | Fresh leaf and root will be crushed                                                              | Oral        | Hepatitis           | [36] |
|     |                                   |             |                  | Leaf and root crushed and drunk after boiling, powdered, juiced and drunk for 4 days, squeezed with leaves | Oral        | Cough (C. cold)     | [36] |
| 108 | Ximenia americana L.              | Oleaceae    | Enkuay (Amh)    | The pounded root of Zehneria scabra is concocted with the pounded root of Ricinus communis One feast of the pond is given to cattle and pack animals | Orally      | Rabies              | [49] |
| 109 | Zehneria scabra (L.f.) Sond       | Cucurbitaceae | Qorii Sinbiraa (Oro) | The stem is pounded well and boiled with water and drink 2–5 medium roots crushed and boiled with tea or water and then taken | Oral        | Rabies              | [41] |
| 110 | Zingiber officinale Roscoe.       | Zingiberaceae | Zinjibile (Amh) | Fresh leaves and root are crushed and mixed with water and taken orally                          | Orally, nasal | Influenza           | [36, 37, 45] |
| 111 | Ziziphus abyssinica Hochst. ex A. Rich. | Rhamnaceae | Kurkura (Amh)  | —                                                                                              | Oral        | Cough and c. cold   | [43, 55] |

Notes: H. zoster = herpes zoster; C. cold = common cold; BCV = bovine coronavirus; HSV-1 = herpes simplex virus type 1; CVB1 = Coxsackie B virus type 1; IBDV = infectious bursal disease virus; RA = route of administration; DT = disease treated; Amh = Amharic; Oro = Oromo; Tig = Tigrinya; Afa = Afar; Had = Hadiyya; Sid = Sidaamu-afa.
| No. | Family          | Species per family | Medicinal plants per family |
|-----|-----------------|--------------------|----------------------------|
|     | No. (%) Rank    | No. (%) Rank       |
| 1.  | Fabaceae        | 8 (7.2) 1          | 9 (5.6) 3                  |
| 2.  | Lamiaceae       | 6 (5.4) 2          | 9 (5.6) 3                  |
| 3.  | Alliaceae       | 2 (1.8)            | 8 (4.9) 4                  |
| 4.  | Phytolaccaceae  | 1 (0.9) 9          | 8 (4.9) 4                  |
| 5.  | Acanthaceae     | 3 (2.73) 4         | 7 (4.3) 5                  |
| 6.  | Myrtaceae       | 2 (1.8)            | 6 (3.7) 6                  |
| 7.  | Zingiberaceae   | 2 (1.8)            | 6 (3.7) 6                  |
| 8.  | Asteraceae      | 5 (4.5) 3          | 5 (3.09) 7                 |
| 9.  | Moraceae        | 3 (2.73) 4         | 5 (3.09) 7                 |
| 10. | Anacardiaceae   | 3 (2.73) 4         | 4 (2.5) 8                  |
| 11. | Apiaceae        | 3 (2.73) 4         | 3 (1.85)                   |
| 12. | Cucurbitaceae   | 3 (2.73) 4         | 3 (1.85)                   |
| 13. | Meliaceae       | 3 (2.73) 4         | 3 (1.85)                   |
| 14. | Oleaceae        | 3 (2.73) 4         | 3 (1.85)                   |
| 15. | Rutaceae        | 3 (2.73) 4         | 3 (1.85)                   |
| 16. | Vitaceae        | 3 (2.73) 4         | 3 (1.85)                   |
| 17. | Apocynaceae     | 2 (1.8)            | 3 (1.85)                   |
| 18. | Ranunculaceae   | 2 (1.8)            | 3 (1.85)                   |
| 19. | Amaranthaceae   | 2 (1.8)            | 2 (1.23)                   |
| 20. | Asclepiadaceae  | 2 (1.8)            | 2 (1.23)                   |
| 21. | Poaceae         | 2 (1.8)            | 2 (1.23)                   |
| 22. | Podocarpaceae   | 2 (1.8)            | 2 (1.23)                   |
| 23. | Polygonaceae    | 2 (1.8)            | 2 (1.23)                   |
| 24. | Rosaceae        | 2 (1.8)            | 2 (1.23)                   |
| 25. | Caricaceae      | 1 (0.9) 2          | 2 (1.23)                   |
| 26. | Musaceae        | 1 (0.9) 2          | 2 (1.23)                   |
| 27. | Papaveraceae    | 1 (0.9) 2          | 2 (1.23)                   |
| 28. | Santalaceae     | 1 (0.9) 2          | 2 (1.23)                   |
| 29. | Simaroubaceae   | 1 (0.9) 2          | 2 (1.23)                   |
| 30. | Theaceae        | 1 (0.9) 2          | 2 (1.23)                   |
| 31. | Solanaceae      | 6 (5.4)*2          | 12 (7.41) 1                |
| 32. | Euphorbiaceae   | 5 (4.5)*3          | 11 (6.8) 2                |
| 33. | Aloeaceae       | 1 (0.9) 1          | 1 (0.6)                    |
| 34. | Amaryllidaceae  | 1 (0.9) 1          | 1 (0.6)                    |
| 35. | Araliaceae      | 1 (0.9) 1          | 1 (0.6)                    |
| 36. | Boraginaceae    | 1 (0.9) 1          | 1 (0.6)                    |
| 37. | Brassicaceae    | 1 (0.9) 1          | 1 (0.6)                    |
| 38. | Canellaceae     | 1 (0.9) 1          | 1 (0.6)                    |
| 39. | Combretaceae    | 1 (0.9) 1          | 1 (0.6)                    |
| 40. | Dipsacaceae     | 1 (0.9) 1          | 1 (0.6)                    |
| 41. | Lobeliaceae     | 1 (0.9) 1          | 1 (0.6)                    |
| 42. | Melianthaceae   | 1 (0.9) 1          | 1 (0.6)                    |
| 43. | Menispermaeae   | 1 (0.9) 1          | 1 (0.6)                    |
| 44. | Moringaceae     | 1 (0.9) 1          | 1 (0.6)                    |
| 45. | Myricaceae      | 1 (0.9) 1          | 1 (0.6)                    |
| 46. | Oliniaceae      | 1 (0.9) 1          | 1 (0.6)                    |
| 47. | Pedaliaceae     | 1 (0.9) 1          | 1 (0.6)                    |
| 48. | Piperaceae      | 1 (0.9) 1          | 1 (0.6)                    |
| 49. | Plantaginaceae  | 1 (0.9) 1          | 1 (0.6)                    |
| 50. | Polygalaceae    | 1 (0.9) 1          | 1 (0.6)                    |
| 51. | Rhamnaceae      | 1 (0.9) 1          | 1 (0.6)                    |
| 52. | Rubiaceae       | 1 (0.9) 1          | 1 (0.6)                    |
| 53. | Salicaceae      | 1 (0.9) 1          | 1 (0.6)                    |
| 54. | Sapindaceae     | 1 (0.9) 1          | 1 (0.6)                    |
| 55. | Scrophulariaceae| 1 (0.9) 1          | 1 (0.6)                    |
| 56. | Tiliaceae       | 1 (0.9) 1          | 1 (0.6)                    |
| 57. | Trymalaceae     | 1 (0.9) 1          | 1 (0.6)                    |

Total 111 162
| No. | Scientific name                  | Family            | Local name | Active components                                                                 | References          |
|-----|---------------------------------|-------------------|------------|------------------------------------------------------------------------------------|---------------------|
| 1   | Acacia abyssinica Hochst.ex Benth. | Fabaceae          | Bazra grar (Am) | Flavonoid, tannin, terpenoids, polyphenolic                                        | [5]                 |
| 2   | Acacia etbaica Schweinf.         | Fabaceae          | Seraw (Am)  | Flavonoid, tannin, terpenoids, polyphenolic                                        | [5]                 |
| 3   | Acacia nigra                     | Fabaceae          | Tikur grar (Am) | Flavonoid, tannin, terpenoids, and polyphenolic Tannins, flavonoids, saponins, polyphenols, and antraquinones | [5]                 |
| 4   | Acanthus polystachyus            | Acanthaceae       | Kucheshile (Am) | Oleanolic acid and ursolic acid                                                    | [78]                |
| 5   | Acokanthera schimperi            | Apocynaceae       | Meriz (Am)  | Quercetin and ß sitosterol, polyphenolic flavonoids                                | [81]                |
| 6   | Allium cepa                      | Alliaceae         | QeY shikurt (Am) | Apigenin, ethyl cholate, nobiletin, tangeretin, chalcone, and hesperidin            | [5, 10, 14, 15]     |
| 7   | Allium sativum                   | Alliaceae         | Nechsenkret (Am) | Allicin, diallyl trisulfide ajoene, and apigenin                                  | [14, 17]            |
| 8   | Aloe macrocarpa Tod.             | Aloaceae          | Eret (Am)  | Amaranthine, quercetin, and kaempferol glycosides                                  | [80]                |
| 9   | Amaranthus hybridus Linn.        | Amaranthaceae     | Tenbelel (Am) | Momordica charant, quercetin, and kaempferol glycosides                            | [84]                |
| 10  | Artemisia afra Jack. ex Willd.   | Asteraceae        | Chikugn (Am) | Quercetin and ß sitosterol, polyphenolic flavonoids                                | [81]                |
| 11  | Azadirachta indica               | Meliaceae         | Neem (Am)  | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 12  | Bersama abyssinica               | Meliaceae         | Azamer (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 13  | Brassica carinata A. Br. Herb    | Brassicaceae      | Mommon (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 14  | Camellia sinensis                | Theaceae          | Shay kitel (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 15  | Capsicum annuum L.               | Solanaceae        | Berbere (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 16  | Carissa edulis                   | Apocynaceae       | Agam (Am)  | Quercetin and ß sitosterol, polyphenolic flavonoids                                | [81]                |
| 17  | Citrus limon (L.) Burm. f.       | Rutaceae          | Bahir Lome (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 18  | Clematis hirsute                 | Ranunculaceae     | Hareg (Tg) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 19  | Clitia abyssinica                | Euphorbiaceae     | Tewshealil (Tg) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 20  | Coriandrum sativum              | Apiaceae          | Dimblal (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 21  | Croton abyssinicum              | Euphorbiaceae     | Yejib shinkurt (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 22  | Curcuma longa                    | Zingiberaceae     | Erd (Am)  | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 23  | Dodonia angustifolia             | Sapindaceae       | Kitkita (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 24  | Dorea abyssinica                 | Asclepiadaceae    | Shanwoq (Tig) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 25  | Ekebergia capensis               | Meliaceae         | Sembo (Am)  | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 26  | Eucalyptus globulus              | Myrtaceae         | Nech bahirza (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 27  | Euphoria abyssinica              | Euphorbiaceae     | Kulkual (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 28  | Lepidium sativum                 | Brassicaceae      | Timaatima (Or) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 29  | Lycopersicon esculentum (L.) Mill. | Solanaceae      | Timaatima (Or) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 30  | Moringa borziana Mattei Ave.     | Moringaceae       | Tamergnaw kotel (Shiferaw) (Am) | Flavonoids, anthraquinone, and hydroxychloroquine                  | [21]                |
| 31  | Musa spp.                        | Musaceae          | Muz (Am)  | Flavonoids, anthraquinone, and hydroxychloroquine                                  | [64]                |
| 32  | Nigella sativa                   | Ranunculaceae     | Tikur Azmud (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 33  | Ocimum basilicum L. Herb         | Lamiaceae         | Bessobla (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 34  | Ocimum laurifolium               | Lamiaceae         | Damakassie (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 35  | Ocimum urticifolium Roth         | Lamiaceae         | Dama kesie (Am) | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 36  | Olea europaea subsp. cuspidate   | Oleaceae          | Wepra (Am)  | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
| 37  | Osyris quadrifaria               | Santalaceae       | Keret (Am)  | Kaempferol and quercetin                                                           | [5, 10, 14, 15]     |
*Allium cepa* [16]. Allicin exhibits antiviral, antifungal, and antiparasitic activities [109]. This phytochemical is reported from *Allium sativum* [14, 17], a medicinal plant used to treat viral infections by people in Ethiopia. In vitro and in vivo results show that apigenin exhibits antiviral activities [110]. It is found in *Capsicum annuum* [11], *Citrus aurantium* [5, 10, 14, 15], *Citrus limon* [5, 10, 14, 15], and *Allium cepa* [14, 17]. Reports show that kaempferol has antiviral activities against influenza A virus (H1N1 and H9N2), human immunodeficiency virus (HIV) 1, and JEV [111]. Many medicinal plants used to treat viral infections in Ethiopia such as *Citrus aurantium* L., *Citrus limon* (L.) Burm. f., *Capsicum annuum* L., *Eucalyptus globulus*, *Osyris quadripartite*, *Amaranthus hybridus* Linn., *Clematis hirsute*, *Ricinus communis* L., *Carissa edulis*, *Phaseolus vulgaris* also contain this active component [10, 11, 13, 22, 80, 83, 84, 91, 92, 95].

Lycorine is a compound with broad antiviral activity. It is reported to possess anti-SARS-CoV activity [6]. It is possessed in Ethiopian medicinal plants traditionally used to treat viral infections, for example, in *Crinum abyscinicum* Hochst. ex A. Rich. [57].

### 4. Conclusions

Traditional healers in Ethiopia have knowledge of medicinal plants with potential antiviral activity. Literature shows that the majority of the plants prescribed by traditional healers in Ethiopia have antiviral compounds. Therefore, these medicinal plants should be researched for anti-COVID-19 properties.

### Data Availability

All related data have been presented within the manuscript. The dataset supporting the conclusions of this article is available from the authors on request.

### Conflicts of Interest

The authors declare that they have no conflicts of interest.

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