

Editorial Article

Andrographis Paniculata, A Promising Medicinal Plant Fighting Against SARS-CoV-2

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Andrographis paniculata (Green chiretta) (Figure 1), a medicinal plant, known as “Indian echinacea” is an herb used in traditional Chinese medicine and ayurveda. *Andrographis paniculata* is native to India and Sri Lanka but is naturalized in many tropical countries, such as Thailand, Malaysia, Java, and Borneo where it grows isolated patches on roadside, near drain, in between wall cracks, lowlands, hillside, coastlines, and other cultivated or disturbed areas, such as wastelands. It is a bitter-tasting herb rich in compounds known as andrographolides, a major bioactive phytoconstituent found in various parts of *Andrographis paniculata*, particularly in the leaves [1-5] that is hypothesized to have antiviral, anti-inflammatory, and antioxidant properties. The chemical name of andrographolide is 3 α , 14, 15, 18-tetrahydroxy-5 β , 9 β H, 10 α -labda-8, 12-dien-16-oic acid γ -lactone with its molecular formula and weight are C₂₀H₃₀O₅ and 350.4 (C 68.54 %, H 8.63 %, and O 22.83 %), respectively [1-5].

This herb is said to act as a natural immune-booster [6]. Other major bioactive compounds are flavonoids, polyphenols, and diterpenoids [7]. *Andrographis paniculata* is commonly known as the “King of bitters”. In Thailand, it is known as “Fah-Thalai-Jone”. In China, it is known as “Chuan-Xin-Lian”. In India, it is known as “Kalmegh”. In Japan, it is known as “Senshinren”. In Malaysia, it is known as “Hempedu bumi”. In Scandinavian countries, it is known as “green chiretta” [8]. In mice, the extract



and purified andrographolide were reported to stimulate an innate immune response [9]. In murine immature dendritic cells with experimental autoimmune encephalomyelitis, andrographolide inhibited NF-kappa B activation [10]. In murine-T cells stimulated with concanavalin A in vitro, andrographolide reduces IFN- γ and IL-2 production [11]. Furthermore, in macrophages stimulated by lipopolysaccharide, andrographolide inhibits the production of IL-12 and TNF- α [12]. Andrographis paniculata, 25 $\mu\text{g}/\text{mL}$ of ethanolic extract and 5 $\mu\text{g}/\text{mL}$ of andrographolide effectively exhibits the expression of Epstein-Barr virus (EBV) lytic protein, Rta, Zta, and EA-D, during the viral lytic cycle in P3HR1 cells [13]. A previous study demonstrated that Andrographis paniculata has the most inhibitory effects against dengue type 1-infected Vero E6 cells [14]. Andrographis paniculata also has antibacterial, antimalarial, insect-larvicidal and -ovicidal, renoprotective, hepatoprotective, antihyperglycemic, hypolipidemic, antifertility, antioxidant, anti-inflammatory, anticancer, anti-platelet aggregation, anti-NF-kappa B (NF-kB) transcription, and antipyretic and anti-analgesic effects [15]. Pre- and post-treatments of the extract of Andrographis paniculata after surgical procedures and operations, particularly angioplasty procedures, significantly prevent the blood vessel constriction, demonstrated by an increase of blood-clotting time, hence reducing the risk of subsequent closing blood vessels [16]. Several previous studies demonstrated antidiarrheal [17] and anti-HIV effects of Andrographis paniculata [18].

A previous study on 152 Thai adults with pharyngotonsillitis demonstrated that Andrographis paniculata at a dose of 6 g/day for 7 days relieved the symptoms of sore throat and fever similar to the efficiency of acetaminophen [19]. A previous study conducted by Ca'ceres and colleagues demonstrated that 4-days treatment of Andrographis paniculata extract SHA-10 decreased the intensity of the symptoms of sore throat (OR = 2.3; 95 % CI : 1.69-3.14), sleeplessness (OR = 1.71; 95 % CI : 1.38-2.11), and tiredness (OR = 1.28; 95 % CI : 1.07-1.53), compared with control group [20]. A previous study in mice challenged with ADP (700 mg/kg) can markedly lowering the mortality rate from 90 % to 60 % that were treated with andrographolide concentrations of 22 $\mu\text{g}/\text{kg}$ and 55 $\mu\text{g}/\text{kg}$, respectively, confirming the effects of andrographolide on prevention of thromboembolism [21]. Andrographis paniculata is most widely used to treat cold and flu symptoms and is also used to treat other diseases and symptoms, such as human immunodeficiency-virus infection (HIV)/acquired immunodeficiency syndrome (AIDS), infections, parasitic infestations, sinus infections, cancer, rheumatoid arthritis, hepatic problems, cardiac diseases, anorexia, allergies, ulcers, and skin diseases. Nevertheless, there is not enough scientific evidence to support the use of Andrographis paniculata for most of these health benefits. Some preliminary studies demonstrated that Andrographis paniculata may offer the health benefits, such as upper respiratory tract infections and ulcerative colitis [22].



Andrographis paniculata may trigger adverse side effects like fatigue, headache, nausea, diarrhea, and allergic reaction. *Andrographis paniculata* should not be administered intravenously due to possible acute renal injury. Individuals using some medications, such as anti-hypertensive medicines, chemotherapy drugs, blood-thinning drugs, etc. should consult a clinician before using *Andrographis paniculata*. Little is known about the safety of using *Andrographis paniculata*. There is no single recommended dose of *Andrographis paniculata* due to various dose studies. Some previous studies revealed that for relief of sore throat, a dose of 3-6 grams *Andrographis paniculata* was used once a day. For ulcerative colitis, *Andrographis paniculata* extract, 1,200-1,800 milligrams was used once a day for eight weeks. For common cold, a combination product (4-5.6 milligrams *Andrographolide* and 400 milligrams Siberian ginseng) was used three times daily, whereas another previous study demonstrated using *Andrographis* extract (KalmCold) 200 milligrams once a day for 5 days [22].

Recently, some Asian countries claimed that *Andrographis paniculata* may kill the COVID-19 and they will initiate studies on this issue in 2020 as soon as possible. Meanwhile a joint research team of the Shanghai Institute of Materia Medica and Shanghai Tech University conducted a research and demonstrated that Chinese herbal medicines, such as *Radix Sophorae Tonkinensis* and *Rhizoma Polygoni Cuspidati* may contain ingredients against COVID-19. Until now, it has been difficult to get the polymerase complex that contains multiple proteins to function in a test tube [18]. A recent study in Thailand conducted by Sa-ngiamsuntorn et al in human lung epithelial cells demonstrated that *Andrographis paniculata* extract and its major component *andrographolide* expressed anti-SARS-CoV-2 (COVID-19) activity at 25TCID₅₀ in SARS-CoV-2 infected Calu-3 cells by significant inhibition of the production of infectious virions with the IC₅₀ of 0.036 µg/mL and 0.034 µM, respectively [23].

In conclusion, various experimental and clinical pharmacological actions of *andrographolide* include anti-inflammatory, anti-hyperglycemic, anti-hypoglycemic, anti-cancer, antioxidant, anti-viral, particularly SARS-CoV-2 (COVID-19) and HIV. Favorable cytotoxicity profiles and potent anti-SARS-CoV-2 activities promote further development of *Andrographis paniculata* extract and *andrographolide* for monotherapy or in effectively combined drug regimens against SARS-CoV-2 (COVID-19).



Figure 1: *Andrographis paniculata* (Green chiretta)
(Source: indiamart.com)

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