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The potential of herbal medicine from Kalimantan, Indonesia, to stimulate human immunity during the COVID-19 pandemic: A brief overview

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Abstract

The COVID-19 pandemic has occurred for more than a year. In the present, it is important to look for COVID-19 drugs to cure COVID-19 sufferers. However, increasing stamina or immunity is more important for everyone to prevent viruses or diseases from entering the body. Herbal remedies that are easy to find and easy to consume are an option to increase immunity. There are three herbal remedies that function to increase body immunity from Kalimantan, Indonesia, especially origin on Dipterocarps forest ecosystem, *i.e.*, Pasak Bumi (*Eurycoma longifolia* Jack.), Akar Kuning (*Coscinium fenestratum* (Gaertn.) Colebr.) and Bawang Dayak (*Eleutherine bulbosa* (L.) Merr). The three medicinal plants are easily found in traditional markets and online shopping, and their function to increase the body's immunity.

1. Introduction

1.1 Potency of herbal medicine for body immunity

COVID-19 has become pandemic more than one year. Until now, the treatment of COVID-19 is still developing, it is necessary to look for alternative medicines (Yavuz and Ünal, 2020). It is crucial to search antiviral drugs from plants and other natural resources to end the COVID-19 pandemic immediately (Sytar *et al*., 2021).

Antiviral drugs used after symptom onset to reduce infectiousness to others by reducing viral shedding in the respiratory secretions of patients (Mitjà and Clotet, 2020). There are several potential antiviral mechanisms for COVID-19, *i.e.*, fusion inhibitors, protease inhibitors, neuraminidase inhibitors, and M2 ion channel protein blockers (Frediansyah *et al*., 2021).

Besides looking for a cure for COVID-19, other steps that can take are using dietary therapy and herbal medicine to prevent COVID-19 (Panyod *et al*., 2020). Herbal medications can be used as another possibility treatment for COVID-19, to enhance the infection status of the respiratory and hepatobiliary systems, and research studies showed the antiviral effect (Kwoon *et al*., 2020). Herbal medicine has the potential to be used in increasing the body's immunity to prevent COVID-19 (Khanna *et al*., 2020). Herbal medicine had high potency as a reliable support for COVID-19 therapy (Grigore *et al*., 2020).

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Increasing body immunity is very important to prevent the entry of viruses and diseases into the body. Therefore, it is necessary to carry out an inventory of herbal medicines that can increase the body's immunity that is easily found and easily consumed from the local area.

2. Potency of herbal medicine origin Kalimantan, Indonesia for body immunity

COVID-19 can attack all levels of society (Djalante *et al*., 2020), from the lower to the upper layers of society. A lot of people need herbal medicine to maintain body immunity (Babich *et al*., 2020). Herbal medicine must be easy to obtain, low prices and easy to consume (Builders, 2018). There are various kinds of herbal medicines, especially those derived from plants that are easily found in the Kalimantan, Indonesia, especially from Dipterocarp forest ecosystem. There are medicinal plants that function to maintain immunity when the COVID-19 outbreak occurs, *i.e.*, Pasak Bumi (*Eurycoma longifolia* Jack.), Akar Kuning (*Coscinium fenestratum* (Gaertn.) Colebr., and Bawang Dayak (*Eleutherine bulbosa* (L.) Merr).

2.1 Pasak Bumi (*Eurycoma longifolia* Jack.)

Panjaitandan Zulfan (2015) revised with Panjaitan and Zulfan (2015) stated that one of the traditional medicinal plants from Indonesian forests is Pasak Bumi (*Eurycoma longifolia* Jack.). Pasak Bumi (*E. longifolia*) is a shrubby tree; leaves are pinnate in shape and green colour, in sandy soil (Rehman *et al*., 2016). Inflorescences are axillary panicles, pubescent with many small pedicellat evalvate flowers with 5-6 flower lobes (Lee *et al*., 2016).

The part of Pasak Bumi that is used traditionally is the root. However, advanced research was demonstrated that leaves also have been known to have potential as herbal medicine. In Kalimantan,

Pasak Bumi is easily found in traditional markets and online shopping in several simplicial forms. Observation result of Pasak Bumi products on the market can be seen in the following Table 1.

(a)

(b)

Figure 1: Pasak Bumi (*Eurycoma longifolia* Jack.). (a) Pasak Bumi planted in pot for urban farming. (b) Pasak Bumi root. Photo by A. Fernandes

Table 1: Pasak Bumi products on the market

Market types	Product type	Price
Traditional	Root	50,000-60,000 IDR / kg
market	root cut	60,000-100,000 IDR / kg
	root powder	100,000-150,000 IDR / kg
On line	Root cut	80,000-150,000 IDR / kg
shopping	Root shaving	100,000-150,000 IDR / kg
	root powder	125,000-200,000 IDR / kg
	Root powder capsule	50,000-100,000 IDR / box @ 50-100 capsules
	Root tea	15,000-50,000 IDR / box @ 10-20 tea bags
	Root glass	50,000-150,000 IDR / glass

Pasak Bumi (*Eurycoma longifolia* Jack.) had bitter taste (Abubakar *et al.*, 2017). Pasak Bumi is sold in traditional markets and online stores in the form of dry roots that can be stored for a long time. Root storage requires a large space, so that it is made in the form of shavings or powder so as to save storage space. Buyers who do not like the bitter taste can choose a capsule form.

Pasak Bumi from Kalimantan forest is to increase body immunity that fight pathogen (Chabib *et al.*, 2018). Pasak Bumi root extract has high antioxidant properties and contains alkaloids, flavonoids, steroids, terpenoids and tannins (Triawanti *et al.*, 2020).

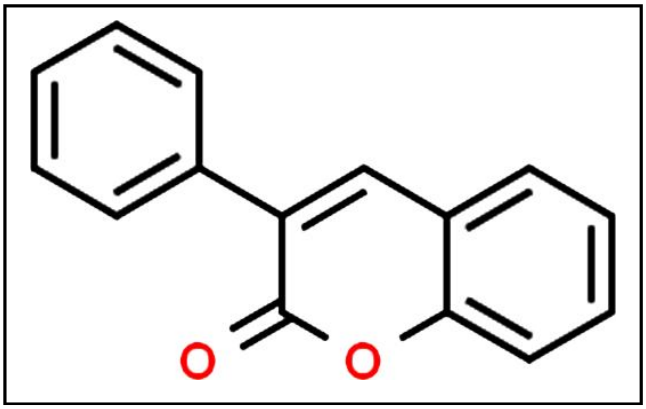

Figure 2: 2H-1-Benzopyran-2-one, 3-phenyl.

Major alkaloids found on root and stem organs were 3-Methyl-1-oxo-2,3-dihydro-1H-pyrazolo [4,3-c][1,10] phenanthroline, and major terpenoid in root included 2H-1-Benzopyran-2-one, 3-phenyl- (coumarin derivate), while in stem was Stigmasterol. (Rahmaia *et al.* 2011). 1-benzopyran-2-one is coumarin nucleus (Asif, 2015). 2H-1-benzopyran-2-ones structure as coumarinderivates have been reported for antiviral, antioxidant, anti-inflammatory and other activity (Al-Majedy *et al.*, 2016). Coumarin also serves as comparative immune-modulation (Abyshev and Nguyen, 2017). Phenanthrolines and its derivates have antiviral, antibacterial and antimicrobials properties (Čongrádyová *et al.*, 2014). Penanthroline has methyl structure which is toxic to viruses (Margiotta *et al.*, 2001). Stigmasterol as sterol has immune modulating activity (Navarro *et al.*, 2001).

2.2 Akar Kuning (*Coscinium fenestratum* (Gaertn.) Colebr.)

Root and stem of Akar Kuning (*Coscinium fenestratum* (Gaertn.) Colebr.) are medicinal plants in Kalimantan (Rinaldi *et al.*, 2017). Akar Kuning (*C. fenestratum*) is woody climbing shrubs, cylindrical stem, yellowish-brown bark and yellowish woody tissue (Danapur *et al.*, 2020). Leaves simple, alternate, broadly ovate, rounded, truncate or shallowly cordate at base, 10-32 × 8-22 cm, 5-7 main nerves, with 2 pairs of distal lateral nerves (Tushar *et al.*, 2008). The part of Akar Kuning used for treatment is the liana stem.

(a)

(b)

Figure 3: Akar Kuning (*Coscinium fenestratum* (Gaertn.) Colebr.). (a) Leaves, (b) Liana stem and powder. Photo by Noorcahyati.

Akar Kuning is classified as an endangered (Kashyap *et al.*, 2016) and slow-growing species (Wilson *et al.*, 2011). It must be wise and precise to harvest it. To harvest Akar Kuning, it is best to take the top of the stem, leave it apart from the bottom stem, and do not take the root for the conservation. In Kalimantan, the Akar Kuning is easily found in traditional markets and online shopping in several simplicia forms. Observation result of Akar Kuning products on the market can be seen in the following Table 2.

Table 2: Akar Kuning products on the market

Market types	Product type	Price
Traditional market	Stem cut	60,000-150,000 IDR / kg
On line shopping	Stem cut	100,000-200,000 IDR / kg
	stem cut powder	250,000-300,000 IDR / kg
	stem cut tea	40,000-75,000 IDR / box @ 25 tea bags

Akar Kuning had acrid taste (Nayak *et al.*, 2012). Akar Kuning sold in traditional markets and online stores have low moisture content, so it can be stored for a long time. To make it easier to consume, the online shop also sells Akar Kuning in the form of powder and herbal teas.

The stem of Akar Kuning has antimicrobial and the root is considered to be a bitter tonic (Rai *et al.*, 2013). Akar Kuning is part of traditional medicine that is useful for increasing body immunity which can function as anti-inflammatory and antiviral; for example, for the treatment of cold (Kothalawala *et al.*, 2020).

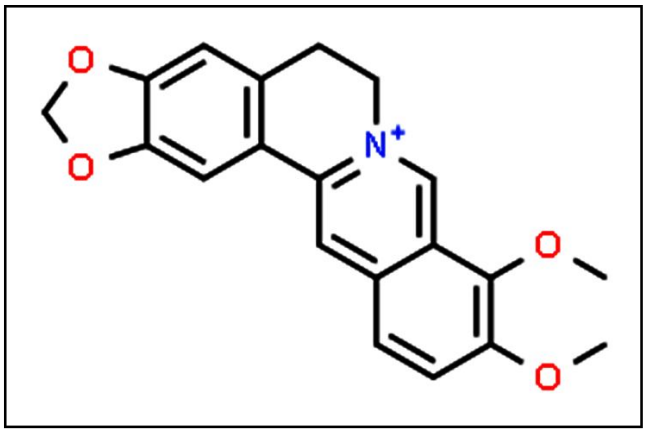

Figure 4: Berberine.

Akar Kuning contains berberine compounds which are classified as alkaloids (Potikanond *et al.*, 2015). Berberine percentage in root tissue around 4.62% and in stem tissue 1.86% (Thriveni *et al.*, 2017). Berberine reduces virus replication and it cantargets specific interactions between the virus and its host, which might be promising agents to fight against the current pandemic SARS-CoV-2 (Warowicka *et al.*, 2020). Berberine has biological activity as immune stimulant (Neag *et al.*, 2018).

2.3 Bawang Dayak (*Eleutherine bulbosa* (L.) Merr)

Bawang Dayak had scientific name, *Eleutherine bulbosa* (L.) Merr, *E. american*, *E. subayphyla*, *E. citriodora*, *E guatemalensis*, *E. latifolia*, *E. longifolia*, *E. plicata* and *E. anomala*. Bawang Dayak has been used for generations as folk medicine in Kalimantan (Harlita *et al.*, 2018). Dayak tribes cultivated Bawang Dayak which had good adaptation capability to grow on various types of climate and soil (Febrinda *et al.*, 2014). Bawang Dayak known as Bawang Tiwai, has bright red underground storage organs of bulb like onion, a pseudo-trunked, green sword-shaped leaves which the base are pointed (Daryono *et al.*, 2013).

(a)

(b)

Figure 5: Bawang Dayak (a) Bawang Dayak underground storage organs of bulb like onion. (b) Bawang Dayak sold in the market. Photo by R. Maharani.

Observation result of Bawang Dayak products on the market can be seen in the following Table 3.

Table 3: Bawang Dayak products on the market

Market types	Product type	Price
Traditional market	Bulbs	20,000-50,000 IDR / bundle
On line shopping	Bulbs	30,000-50,000 IDR / bundle
	Bulbs shaving	50,000-100,000 IDR / kg
	Bulbs powder	100,000-200,000 IDR / kg
	Bulbs tea	20,000-50,000 IDR / box @ 20 tea bags

Based on organoleptic test, Bawang Dayak had bitter taste (Muthia *et al.*, 2021). Based on Table 3, Bawang Dayak sold in traditional markets are fresh so they cannot be stored for a long time. In online shops, Bawang Dayak is sold in the form of shavings, powder and herbal teas which have low water content, so they can be stored longer. The online store still provides fresh forms to be sold to buyers who want to boil fresh Bawang Dayak.

Bawang Dayak contain alkaloids, steroids, flavonoids, glycosides, saponins, triterpenoids, phenolics, tannins and quinones with some biological activities as immunostimulant, anti-inflammation, and others activities (Sesotyaning *et al.*, 2019). Bawang Dayak also had high antioxidant activity (Kuntorini *et al.*, 2016).

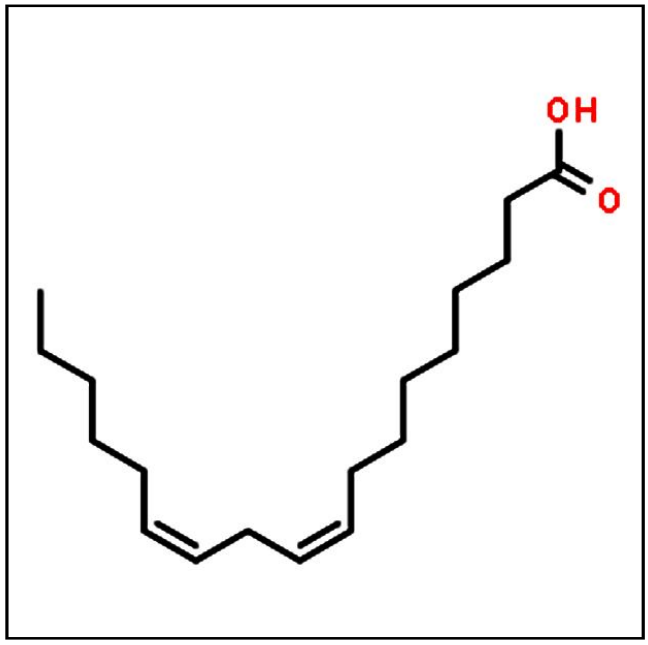

Figure 6: 9, 12-octadecadienoic acid.

GC-MS profile from chloroform extract of Bawang Dayak contains 9, 12-octadecadienoic acid or linoleic acid and 1-(2,3,5,6-tetramethylphenyl) ethanone (Lestari *et al.*, 2019), isoquinolines, xanthones, 2(1H)-Phenanthrenone, naphthalenes, and 2H-1-benzopyran-2-one (Munaeni *et al.*, 2019). Linoleic acid can promote immunity (Di Soto *et al.*, 2018). Bawang Dayak had a potential as antiviral agent, because iso-eleutherine and isoeleutherol inhibited HIV replication, respectively (Insanu *et al.*, 2014). Bawang Dayak contains bioactive naphtoquinone derivatives, which is usually used as antiviral, antimicrobial, antifungal, and antiparasitic agents (Kuntorini and Nugroho, 2010).

3. Conclusion

There are medicinal plants that function to maintain human immunity from Kalimantan, Indonesia, especially from the Dipterocarp forest ecosystem during the COVID-19 pandemic, namely; Pasak Bumi (*Eurycoma longifolia* Jack.), Akar Kuning (*Coscinium fenestratum* (Gaertn.) Colebr.), and Bawang Dayak (*Eleutherine bulbosa* (L.) Merr). These three medicinal plants are easy to find in traditional markets with various standard prices, starting from 20,000 IDR in traditional markets, and starting from 30,000 IDR in online shops. Pasak Bumi and Bawang Dayak are easy to find, while Akar Kuning is classified as endangered species, the harvest is limited, therefore, Akar Kuning needs more efforts to supply market needs. Besides its easy to find in the market, these three medicinal plants are also easy to consume and communities widely believed to have benefits for increasing human immunity. However, this present study provided a brief information of the biological activities of these three medicinal plants as immune stimulants, and others general function probability for active drugs to handling the transmission of COVID-19 pandemic.

Conflict of interest

The authors declare that there are no conflicts of interest relevant to this article.

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