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Pharmacological Activities of Three Kinds "Kayu kuning": *Arcangelisia flava, Fibraurea tinctoria* and *Coscinium fenestratum* – an Short Review

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Abstract

The literature-based review was constructed discussing three types of yellow woods plant from Indonesia, including *Arcangelisia flava*, *Fibraurea tinctoria*, and *Coscinium fenestratum*. Yellow wood plants are widely used as traditional medicine due to its activities that were pharmacologically studied. Those activities include antiplasmodial, cytotoxic, antioxidant, toxicity, antidiabetic, anticolestroleia, antihypertensive to liver activity, and health-behavior changes in experimental animals.

Keywords: review, pharmacologically studies, *Arcangelisia flava*, *Fibraurea tinctoria*, *Coscinium fenestratum*

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■ Introduction

Indonesia widely uses plants as a source of natural-based medicines [1], one of which is a Kayu kuning or yellow wood plant or yellow root, namely *Arcangelisia flava*, *Fibraurea tinctoria*, and *Coscinium fenestratum* [2]. All three of these plants exhibit antimalarial effects with excellent IC_{50} in inhibiting the growth of *P. falciparum* [3]. Researchers also found that the effects did not worked synergically toward the liver due to inhibition of the cytochrome P3A4 by chloroform extract and chloroform insoluble fraction from *F. tinctoria* plants with IC_{50} 3.4 µg/mL [4] and 5.1 µg /mL [5]. In contrast, the methanol extract of *C. fenestratum* (60 mg/kgBB) showed a hepatoprotective effect for 90 days on the induction of carbon tetrachloride [6] With a variety of the impact that corresponds, and some other effects are also the opposite of these three types of plants, the activities that were tested pharmacologically will be further discussed.

■ Discussion

The taxonomy and morphology of Kayu kuning.

Arcangelisia flava

Kingdom	:	*Plantae*
Order	:	*Tracheophyta*
Subclass	:	*Magnoliopsida*
Suborder	:	*Ranunculales*
Family	:	*Menispermaceae*
Genus	:	*Arcangelisia*
Species	:	*Arcangelisia flava (L.) Merr.*

This plant exhibits a bright yellow wood color, and the leaves grow upwards with an almost round leaf shape [7]. These wild plants can be found on rocky beaches or on the edge of forests [8] (Figure 1).

Fibraurea tinctoria

Kingdom	:	*Plantae*
Order	:	*Tracheophyta*
Subclass	:	*Magnoliopsida*
Suborder	:	*Ranunculales*
Family	:	*Menispermaceae*
Genus	:	*fibraurea Lour*
Species	:	*Fibraurea tinctoria Lour*

Figure 1. Arcangelisia flava (Source : BKSDA Samboja, 2016)

This is a woody plant, with trees that can grow up to 40 m in diameter. This plant exhibits yellow stems and twigs. The oval-shaped leaves resemble betel leaves but do not exhibit a distinctive aroma [9] (Figure 2).

Coscinium fenestratum

Kingdom	:	*Plantae*
Order	:	*Tracheophyta*
Subclass	:	*Magnoliopsida*
Suborder	:	*Ranunculales*
Family	:	*Menispermaceae*
Genus	:	*Coscinium Colebra*
Species	:	*Coscinium fenesstratum (Gaertn.)*

This plant can grow very tall, with a stem diameter of up to 10 cm, in addition to being yellow on the inside and brown on the outside [10]. The shape of the leaves in this plant is like an elongated betel leaf (Figure 3).

The traditional utilization of Kayu kuning

The recorded traditional utilization of kayu kuning plants is recorded below (Table 1).

Figure 2. Fibraurea tinctoria (Source : BKSDA Samboja, 2016)

Figure 3. Coscinium fenestratum (Source : BKSDA Samboja, 2016)

Table 1. The traditional utilization of Kayu kuning

Used	Species	Part(s)	Source
Fever, post-delivery recovery, hepatitis, digestive issue, and malaria	*A. flava*	shoot and root	[2]
Diarrhea, nyctalopia, and hepatitis	*A. flava*	(not defined)	[11]
Diabetes mellitus, kidney deseas, and eczema	*A. flava*	(not defined)	[12]
Sexual contagious disease	*F. tinctoria*	Root	[13]
Food poisoning and paralyze	*F. tinctoria*	Stem	[13]
Snakes' venom antidote	*F. tinctoria*	Root, stem	[13]
Eye diseases, diarrhea, disentery, intestines inflammations, vaginomycosis, furunculosis, and burnt wound	*F. tinctoria*	All parts of plant	[13]
Malaria	*F. tinctoria*	(not defined)	[13]
Polyps and nose inflammation, headache	*F. tinctoria*	Stem	[13]
Insect and snakes' venom antidote	*F. tinctoria*	Bark	[13]
Eye disease, reumatism, hipertension, sinus, fever, cancer, headache, and snake venom antidote	*F. tinctoria*	Root, Bark	[13]
Food poisoning	*F. tinctoria*	Root, Stem	[13]
Diarrhea and hepatitis	*F. tinctoria*	Root, Stem	[14]
Hipocalemic, hipotensi, laxative, antidiabetic, digestive problems, hepatitis, fever, snakes' venom antidote, antiseptic, and inflammation.	*C. fenestratum*	Stem	[15], [16]

Pharmacological activities of Kayu kuning

Kayu kuning or yellow wood plants demonstrate efficacy that has been tested pharmacologically. Some of the results of the study are as follows:

Antimicrobial

Ethanol extract of *A. flava* root can inhibit *Bacillus cereus* ATCC 14579 and *Staphylococcus aureus* ATCC 25923, indicated by the clear zone formation of 9.6 mm at a dose of 10 mg/mL and 17.2 mm at a dose of 5 mg/mL, respectively [17]

Chloroform, n-hexane, and ethyl acetate extracts of *A. flava* can inhibit *Aeromonas hydrophilia* with clear zones of 17.25, 13.18, and 11.16 mm at a dose of 20 mg/mL, respectively [18]. The ethanol extract of *A. flava* vines of the branches resulted inactivity to *S. aureus* with a MIC value of 0.25 µg/mL [19]. The 96% methanol extract of the leaves provides antibacterial activity against *Pseudomonas florescens* ATCC 49642 with MIC values 14.17 µg/mL [20].

Dichloromethane extract: methanol (1: 1) leaves and stems of *F. tinctoria* can inhibit *Bacillus cereus* with 10 mm inhibition zone diameters at 400 µg/disc, MIC 25 µg/mL, and MBC > 100 µg/mL. This extract also demonstrates the ability to inhibit the growth of *S. aureus* with inhibition zone diameters of 10 mm at a dose of 400 µg/disc, MIC 50 µg/mL, and MBC > 100 µg/mL [21].

The methanol extract of *C. fenestratum* stems can inhibit *Nisseria gonorrhoeae* ATCC 49226 with MIC values of 47.39 µg/mL [22].

Antifungal

The water extract of *A. flava* plant stem can inhibit the growth of *Candida albicans* with a MIC value of 10 mg/mL and a MFC of 4%. This extract also showed inhibitory effects on *Trichophyton mentographytes* with a MIC value of 10 mg/mL and MFC of 5% [8].

Antiplasmodial

Plant extracts of *A. flava* and *F. tinctoria* demonstrate the ability to inhibit the growth of Plasmodium, which is shown in Table 2 [23].

Cytotoxic

A.flava and *F.tinctoria* also contain cytoxic properties, in addition to antiplasmodial properties (Table 3).

Antiploriferation

The methanol extract and water fraction of *F. tinctoria* demonstrate the ability to inhibit the proliferation of Human Colon Cancer HT-29 cells with IC50 values of 17.12 and 9.29 µg/mL, respectively. The methanol extract and plant water fraction also demonstrate the ability to inhibit the proliferation of human skin fibroblasts with IC50 values of both > 100 µg/mL [25].

Table 2. The activity of antiplasmodial properties A. flava and F. tinctoria

Species	Used part	Extract	Activity	
			IC_{50} (µg/mL)	% inhibition at 10 mg/mL
A. flava	Stem	Ethanol 80%	0.7	94 %
A. flava	Stem	Methylene chloride	0.4	98%
A. flava	Stem	Methanol fraction	0.9	98%
F. tinctoria	Root	Methanol fraction	1.0	94%
F. tinctoria	Root	Methylene chloride	0.7	96%
F. tinctoria	Root	Methanol	1.1	97%
F. tinctoria	Stem	Methanol	0.7	94%
F. tinctoria	Stem	Methylene chloride	0.5	97%
F. tinctoria	Stem	Methanol fraction	1.1	97%

Table 3. The activity of cytotoxic of A. flava and F. tinctoria

Species	Used part	Extract	Experimental cell	Dosage (µg/mL)	Source
A. flava	Stem	Ethanol 80%	HeLa cell	IC_{50} 21.3	[3]
A. flava	Stem	Methylene chloride	HeLa cell	IC_{50} 8.8	[3]
A. flava	Stem	Methanol	HeLa cell	IC_{50} 40.7	[3]
A. flava	Stem	Ethanol 80%	*MRC5*	IC_{50} 155.0	[3]
A. flava	Stem	Methylene chloride	*MRC6*	IC_{50} 56.5	[3]
A. flava	Stem	Methanol	*MRC7*	IC_{50} 147.7	[3]
A. flava	Stem	Ethanol	HeLa cell	IC_{50} 467	[24]
A. flava	Leaf	Ethanol	HeLa cell	IC_{50} 136	[24]
A. flava	Leaf	Ethanol	*WiDr* Cell line	IC_{50} 213	[24]
F. tinctoria	Stem	Petroleum ether	*MRC7*	IC_{50} >50	[14]
F. tinctoria	Stem	Chloroform	*MRC7*	IC_{50} 11.2	[14]
F. tinctoria	Stem	Methanol	*MRC7*	IC_{50} >50	[14]
F. tinctoria	Stem	Distilled water	*MRC7*	IC_{50} >50	[14]
F. tinctoria	Stem	Ethanol	HeLa cell	IC_{50} 70.6	[3]
F. tinctoria	Stem	Methylene chloride	HeLa cell	IC_{50} 53.4	[3]
F. tinctoria	Stem	Methanol	HeLa cell	IC_{50} 99.9	[3]
F. tinctoria	Stem	Ethanol	*MRC5*	IC_{50} 70.6	[3]
F. tinctoria	Stem	Methylene chloride	*MRC5*	IC_{50} 99.8	[3]
F. tinctoria	Stem	Methanol	*MRC5*	IC_{50} 335.3	[3]

Antioxidant

Petroleum ether, chloroform, methanol, and water extracts of *F. tinctoria* demonstrate the ability to reduce DPPH radicals with EC50 values > 100, 78.8, 83.6, and > 100 µg/mL [14]

Anti-hypertension

A 50% ethanol stem extract of *C. fenestratum* shows antihypertensive activity in experimental dogs, which were anesthetized under normal blood pressure conditions. Extracts at doses of 5–40 mg/kg given intravenously reduce blood pressure by 20%–83% with effects lasting for 160 minutes [27].

Anti-hypercholestrolemia

The methanol extract of *A. flava* stem demonstrates the ability to reduce total cholesterol by 25.49 mg/dL, total triglycerides by 5.5 mg/dL, and LDL by 9.14 mg/dL, in addition to increasing HDL values by 14.8 mg/dL in a dose of 500 mg/kg. This activity was obtained from testing on rat animals induced by high-fat and fructose foods for 45 days [28]

Anti-diabetes

The ethanol extract of *F. tinctoria* stem demonstrates the ability to reduce plasma glucose concentration in the oral condition of maltose-loaded normal mice at a dose of 250 mg/kg BW [29]

Analgesic

The methanol extract of C. fenestratum stem demonstrates the analgesic effect at a dose of 8 mg/kg BW. This effect is reported from the response of experimental Swiss albino mice to induce the tail flick method (response to snapping the tail) using heat as a pain inducer. The ability to withstand pain was demonstrated by experimental animals for 3.30 minutes after 60 minutes of extract administration [30]

Hepatoprotector and Hepatotoxic

Chloroform extract and a non-polar portion of *F. tinctoria* chloroform showed inhibition of the cytochrome P3A4 enzyme with IC values of 3.4 µg/mL [5] and 5.1 µg/mL [4]. Conversely, the methanol extract of *C. fenestratum* at a dose of 60 mg/kg BW showed a protective effect on the liver of mice by reducing the free radicals produced by carbon tetrachoria for hepatotoxic conditions [6]

■ Conclusion

Arcangelisia flava, Fibraurea tinctoria and Coscinium fenestratum have various properties for the treatment and maintaining health, that have proven their biological activity in various research methods.

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