Orthosiphon stamineus Benth. As A Potential Herbal Medicine (Mini-Review)

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ABSTRACTCat's whiskers plant (*Orthosiphon stamineus*) is an herbal plant that has been commonly used mainly in several countries and is often consumed in tea as Javanese tea diuretic properties. Java tea has also been introduced to Japan and Europe. *O. Stamineus* has many biological activities such as antioxidant, edema, hepatitis, hypertension, and many more. The activity is related to various contents in it, especially polymethoxylated flavonoids sinensetin and eupatorin, which are the essential components. Many studies on *O. Stamineus*, such as metabolite isolation, pharmacological studies, phytochemicals, and the amount's measurement. This paper is a comprehensive review that discusses several aspects such as propagation, distribution, diversity, traditional uses, the biological activity of *O. stamineus*. Also, this paper summarizes phytochemical aspects in terms of the quality and quantity of the cat's whiskers and the method used, which are very potential to be used as a traditional medicine in the future.

Keyword: *Orthosiphon stamineus* , aristatus, cat's whiskers, java tea, qualitative and quantitative, phytochemical, component

1. Introduction

The prevention of diseases that are carried out using products originating from nature such as from marine sources, plants, or animals as health supplements, revitalization, and prevention agents is on the rise (Pariyani et al., 2015). Herbal

Products have been widely used globally, and the market has developed rapidly in recent years (Purwantiningsih & Hussin, 2014). Indonesia is rich in traditional medicines and natural medicines, traditionally used as traditional medicinal herbs. Traditional medicine using medicinal plants is expected to be utilized in the development of public health. The government promotes treatment using natural materials (back to nature) (Wijayakusuma, 1999).

In Indonesia, the Cat's whiskers plant (*Orthosiphon stamineus*) is one of the plants known as a medicinal plant family. It belongs with the Lamiaceae family and widely used to treat several diseases, such as hypertension, influenza, edema, diabetes mellitus, hepatitis, and rheumatism (Sumaryono et al. 1991; Tezuka et al., 2000). Cat's Whiskers leaves have been used for a long time in various kidney diseases. Tea made from the cat's whiskers' leaves is used to reduce gout and kidney stones (Mat-Salleh et al., 2002; Ohashi, 2000). This research shows that Javanese tea can be an antioxidant (Cai et al., 2018; Xue et al., 2016; Ameer et al., 2012). Phyto-products from the Cat's Whiskers plant contain derivatives of caffeic acid (rosmarinic acid, cycoric acid) and polymoxylated flavonoids (sinensetin, eupatorin) (Olah et al., 2017).

This cat's whiskers plant can be used as an herbal remedy considering its diverse contents and uses. Therefore, this journal contains a review made to provide information on the content of *O. Stamineus* qualitative and quantitatively based on the research that has been done.

2. Methodology

This review journal was created using the systematic review method based on literature searches from several journals, presidium, or books related to cat whiskers. Some online sites that are used in library search include PubMed (Medline) and Since Direct.

3. Traditional Use

The *O. Stamineus* by local communities in Indonesia has been used as a diuretic or urinary remedy to cure diabetes mellitus (Mohamed et al., 2012). The plant is used as alternative medicine in Malaysia and has also been sold as a dietary supplement in recent years (Wiart, 2002). *O. Stamineus* is consumed as a herbal tea in many European countries to promote health due to its high antioxidant properties (Indubala J., 2000). The leaf has been introduced to Europe and Japan as a health tea that acts as diuretics (Beaux et al., 1999; Englert & Harnischfeger, 1992; Masuda & Nakatani, 1992).

4. Pharmacology Activities

Cat whiskers have shown several biological activities, including anti-inflammatory (Awale et al., 2003), antimicrobial, antifungal (Hossain et al., 2008), hypotensive (Matsubara et al., 1999) cytotoxic (Tezuka et al., 2000 hypoglycemic, diuretic, saluretic (Dharmaraj et al. 2006) and antioxidant (Akowuah et al., 2004),). In the current study, an attempt was made to understand the antibacterial and anticancer properties of the leaf extracts of *O. stamineus* (Aneesh et al., 2014).

4.1. Exhibit Cytotoxic Activity

The MeOH extract of this plant's aerial part against colon cancer cells (Stampoulis et al., 1999). Research shows the efficacy of *Orthosiphon stamineus* leaf ethyl acetate extract against colon cancer cells and pathogenic bacteria (Aneesh Nair et al. 2014)

4.2. Antiangiogenic Activity

The cat whiskers extract significantly inhibits migration and formation of human umbilical vein endothelial cell tubes (HUVECs). The orthosiphon extract also suppresses VEGF induced phosphorylation, which VEGF induces on VEGF-2 receptors) in HUVEC (Ahamed et al., 2012)

4.3. Antioxidant

O. stamineus has phenolic compounds with stronger antioxidants activity than flavonoids (Zalukhu, 2018). It also can protect the intestine from oxidative stress (Cai et al., 2018).

4.4. Diuretic

The aqueous extract of *Orthosiphon*, which is given orally, significantly increases ion excretion in mice to a level comparable to that obtained with furosemide (Englert & Harnischfeger, 1992).

4.5. Anti hypertension

Flavonoid compounds have an ACE inhibitory activity directly related to their ability to bind with zinc ions in the ACE enzyme's active site. OS extracts contain high amounts of flavonoids in addition to RA, TMF, SIN, and EUP. Thus, OS extracts can be applied as ACE inhibitors (Shafaei et al., 2016)

4.6. Antidiabetic

Ethanol extract of 70% cat's whiskers leaves dose of 1.25 g / kg BW has the effectiveness of approaching glibenclamide when given for 14 days (Fauzan, 2017).

4.7. Antimicrobial

Several researchers have recently reported the antimicrobial activity against Vibrio parahaemolyticus, Streptococcus mutants (Chen et al., 1989).

5. Phytochemical Study

Based on several studies, qualitative component testing can use H-NMR, C-NMR, and GC-MS instruments while quantitative measurement using HPLC.

5.1. Qualitative constituent of *O. Stamineus*

Tabel 1. Qualitative constituent of *O. Stamineus*

	Compound	**Library**
Phenolic	Oleanolic acid Pentacyclic triterpenes betulinic acid β-sitosterol Ursolic acid	(Tabana et al., 2016)
	Rosmarinic acid	(Akowuah et al., 2004)
	Cichoric acid 2,3-dicaffeoyltartaric ol.17	(Ameer et al., 2012)
Flavonoid	Eupatorin tetramethoxyflavonone Sinensetin	(Akowuah et al., 2004)
	Salvegenin Tetramethylscutellarein Polymethoxylated flavonoids 3'-hydroxy-5,6,7,4'-tetramethoxyflavones Ladanein Vomifoliol	(Ameer et al., 2012)
	5-hydroxy-6,7,30,40-tetramethoxyflavone Salvigenin 5,6,7,30-tetramethoxy-40-hydroxy-8-C-prenylflavon 6-hydroxy-5,7,40-tri- methoxyflavone	(Hossain et al., 2008)
	Polymethoxylated flavones Tetramethylscutellarein 30-hydroxy- 5,6,7,40-tetramethoxyflavone	(Pietta et al 1998)

5.2. Quantitative constituent of *O. Stamineus*

Tabel 2. Quantitative constituent of *O. Stamineus*

Compound	Source	Amount	Library
Rosmarinic acid	MeOH extract of dried herbal	22.2 µmol/g dry weight	(Sumaryono et al., 1991)
2,3-dicaffeoyltartrate	MeOH extract of dried herbal	7.4 µmol/g dry weight	(Sumaryono et al., 1991)
Sinensetin	MeOH extract of dried herbal	5.3 µmol/g dry weigh	(Sumaryono et al., 1991)
Phenolics	Aceton extract of leaf	0,8435 % ± 0,0015 %	(Rivai et al 2019)
Phenolics	Ethanol extract of leaf	0,8162 % ± 0,0012 %	(Rivai et al 2019)
Flavonoids	Ethanol extraxt of leaf	0,8162 % ± 0,0012 %	(Rivai et al 2019)
Flavonoids	Water extract of leaf	1,4977 % ± 0,0031 %.	(Rivai et al. 2019)
Tannins	Aceton extract of leaf	0,7595 % ± 0,0004 %	(Rivai et al. 2019)
Tannins	Ethanol exract of leaf	0,6146 % ± 0,0006 %	(Rivai et al. 2019)
Phenolics	Water extract of stem	7.817 mg GAE/g ± 0.14	(Zalukhu, 2018)
Phenolics	Ethanol extract of stem	2.267 mg GAE/g ± 0.05	(Zalukhu, 2018)
Phenolics	Water extract of leaf	26.431 mg GAE ± 1.46	(Zalukhu, 2018)
Phenolics	Ethanol extract of leaf	7.838 mg GAE ± 0.72	(Zalukhu, 2018)
Flavonoids	Water extract of stem	1.234 mg GAE ± 0.39	(Zalukhu, 2018)
Flavonoids	Ethanol extract of stem	1.092 mg GAE ± 0.17	(Zalukhu, 2018)
Flavonoids	Water extract of leaf	2.860 mg GAE ± 0.10	(Zalukhu, 2018)
Flavonoids	Ethanol extract of	3.948 mg GAE ± 0.83	(Zalukhu, 2018)

	leaf		
1,1 Dicyclopentylethane	n-hexane extract of leaf	11,009%	(Surahmaida et al. 2019)
D,.alpha.-Tocopherol	The methanol extract of leaf	14,785%	(Surahmaida et al. 2019)
(E)-5,10-secocholest-1(10)-en-3,5-dione	The methanol extract of leaf	10,355%	(Surahmaida et al. 2019)
Stigmasta-5,22-dien-3.ol	Methanol extract of leaf	18,612%	(Surahmaida et al 2019)

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