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Review

Potential bioactive property of *Polygonum minus* Huds (kesum) review

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In recent years, the bioactive properties of medicinal plants have been attracting the attention of scientists. *Polygonum minus* Huds is a traditional Malaysian plant that has been used in the treatment of digestive disorders. Several researchers have reported that *P. minus* Huds contains a high level of antioxidants, flavonoid and phenolic compounds which contain several bioactive properties. To explain the mechanism underlying these activities, researchers have attempted to determine the chemical composition of this plant. The aim of the current study is to represent previous studies that have been conducted on *P. minus* Huds.

Key words: *Polygonum minus* Huds, antioxidant, cytotoxicity, antimicrobial, Anti ulcer, phytochemistry.

INTRODUCTION

Polygonum minus Huds originated from Southeast Asia countries namely Malaysia, Thailand, Vietnam and Indonesia. It grows wild in damp areas near the river banks, ditches and lakes. It survives well on cool and hilly area. It is a plant belonging to the family Polygonaceae. The local name in Malaysia is kesum (Burkill, 1966). This plant has a kind of sweet and pleasant aroma and is commonly used amongst the Malaysian population as a flavoring ingredient. Traditionally it has been used to treat digestive disorders and dandruff. To treat digestive problem, the leaves boiled with water is then drank and to treat dandruff problem the extracted oil mixed with some water is applied to the scalp (Zakaria and Mohd, 2010). It is also used in the perfume industry because of its volatile oil (Bunawan et al., 2011). Recently, several reports have emphasized that *P. minus* Huds is a highly potent phenolic compound displaying free radical scavenging activity, which is why scientists have become very interested in determining its phytochemical composition. The objective of this study is to summarize the previous research that has focused on *P. minus* Huds (Figure 1).

ANTIOXIDANT ACTIVITY

Nowadays, most research is concentrated on natural antioxidants from plant extracts in curing a variety of ailments. *P. minus* Huds is a Malaysian medicinal plant that has proven to be a potent natural antioxidant resource. Several reports have speculated that *P. minus* Huds promotes high levels of free radical scavenging activity and reducing power using different extracting solvents. Water extraction of *P. minus* Huds has shown better antioxidant properties compare to other selected local herbs such as ulam raja (*Cosmos caudatus*), selom (*Oenanthe javanica*), pegaga (*Centella asiatica*) and

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Figure 1. Polygonum minus Huds plant. Kingdom / Plantae. Division / Magnoliophyta. Class / Magnoliopsida. Subclass /Caryophyllidae. Order /Polygonales. Family / Polygonaceae. Genus /Polygonum. Species /P. minus.

curry leaves (*Murraya koenigii)* and there is no significant difference P<0.05 with synthetic antioxidant butylhydroxytoluene (BHT) (Faujan et al., 2007). In the case of methanolic extract (Huda-Faujan et al., 2010) *P. minus* Huds showed no significant difference P<0.05 with butylhydroxyanisole (BHA) and is superior to (BHT) in reducing Fe (III) to Fe (II) P <0.05. Further, *P. minus* Huds was extracted by using aqueous and ethanol in which ethanol extract showed better antioxidant activity than aqueous extract (Qader et al., 2011) and there is no significant differences P<0.05 synthetic antioxidant gallic acid. It has been clearly shown that different solvents affect the quantity of antioxidant (Othman et al., 2007). Also it has been clearly shown that *P. minus* Huds in boiling water extract exhibited better antioxidation by using total phenolic compound (TPC) and 2,2-diphenyl-1-picrylhydrazyl free radical (DPPH) assay than water extract (Sumazian et al., 2010). On the other hand, Maizura et al. (2011) extracted three Malaysian plants by using juice extractor without adding any additional solvent. These extracts were assayed for antioxidant activity using total phenolic compound (TPC), 2, 2-diphenyl-1-picrylhydrazyl free radical (DPPH) and ferric reducing antioxidant power (FRAP). Among these plants *P. minus* Huds promotes the highest antioxidant property. It has been hypothesized that high antioxidant of *P. minus* Huds is positively correlated with high levels of phenolic compound (Gorinstein et al., 2007; Scalzo et al., 2005).

Antimicrobial activity

Antiviral activity was carried out on 61 ethanolic extracts of Malaysian medicinal plants (Ali et al., 1996), and among these plants, *P. minus* Huds was reported to have antiviral activity against both *"herpes simplex"-jenis* 1 *(HSV-1)* and *dan "vesicular stomatitis" (VSV).* It has proven to be a strong antiviral against *(HSV-1)* and displays weak activity against *(VSV).* Musa et al. (2008) showed that *P. minus* Huds had no significant activity against 10 isolated pathogenic fish bacteria. However it has been reported that *P. minus* Huds responds high inhibition zones against *H. pylori* using petroleum ether, methanol and chloroform extract solvent whereas no inhibition zone was speculated in aqueous extract (Uyub et al., 2010). Further, it has been clearly demonstrated that *P. minus* Huds and *C. caudatus* Kunth were slightly more effective than control substances in preventing microbial growth in refrigerated duck meatballs (Faridah, 2008).

Antifungal activities of the 15 selected Malaysian plants, including *P. minus* Huds*,* were carried out against *Colletotrichum gloeosporioides* isolated from mango. Different extracting solvents were used, and methanolic extract of *P. minus* Huds showed effective inhibition of radical growth as compared to chloroform and acetone (Johnny et al., 2011). *P. minus* also mixed with a little kerosene in which used as a paste is applied on the skin to get rid of the fungal infections (Ong and Nordiana, 1999).

Plant pathogenesis

The botanical formulation “Polymin 40 EC” from the chloroform extracts of *P. minus* was developed by Devi and Marimuthu, (2011). The formulation was developed by using recommended quantities of emulsifying agent (Unitox 30X and Unitox 60Y), stabilizing agent (Epichlorohydrin) and solvent (Cyclohexanone). Different doses of P-40 on seed infection, germination and vigour of tomato were evaluated and 2% P-40 was found to increase the germination and vigour but reduced the seed infection to a significant extent.

Cytotoxicity and genotoxicity

P. minus Huds was evaluated for cytotoxicity. Ali and co workers (Ali et al., 1996), showed that *P. minus* Huds demonstrated cytotoxicity (CD_{50}: 0.1 mg/ml) against HeLa cells. In addition, it has been assessed against normal lung fibroblast cell line Hs888Lu and the results did not present any inhibition percentage of cell viability in both ethanol and aqueous extract solvent (Qader et al., 2011).

P. minus Huds was also assessed for genotoxicity, it

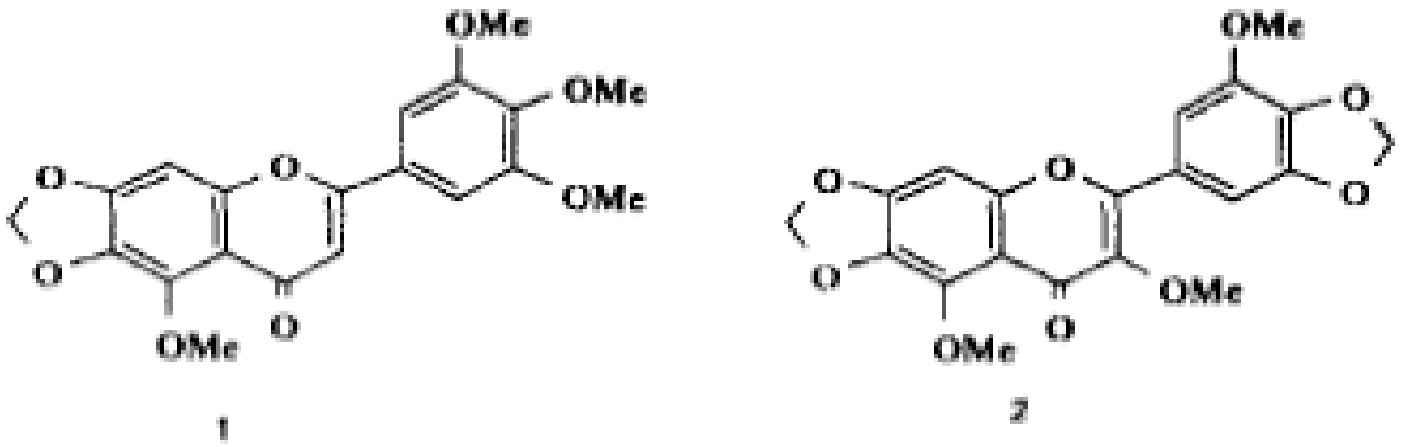

Figure 2. Chemical structure of two newly components isolated from the ether extract of *P. minus* (1) flavone: 6, 7-methylenedioxy- 5, 3',4',5' tetramethoxyflavone and (2) a methyl flavonol: 6,7-4',5'-dimethylenedioxy-3,5,3'-trimethoxyflavone (Urones et al., 1990).

has been demonstrated that there is a significant relation between antioxidant activity in plant extracts and genotoxic effects on human lymphocytes. Wan-Ibrahim et al. (2010) evaluated 20 Malaysian medicinal plants involving *P. minus* for antioxidant activity and genotoxic effects on human lymphocytes and they proved that aqueous extract of *P. minus* is harmless. Hence, daily consumption of this plant certainly is beneficial.

ANTIULCER ACTIVITY

Aqueous extract of *P. minus* Huds was assessed for its ulcer prevention properties against an ethanol induction model (Wasman et al., 2010). The results showed significant inhibition of ulcerous areas in rats pretreated with *P. minus* Huds in a concentration dependent manner. And there were no significant differences $P<0.05$ with omeprazol.

Phytochemical composition

P. minus Huds is one of the Malaysian plants that scientists are interested in determining the phytochemical composition. Urones et al. (1990) have isolated two newly components from the ether extract of *P. minus* (1) flavone: 6,7-methylenedioxy- 5,3',4',5' tetramethoxyflavone and (2) a methyl flavonol: 6,7-4',5'-dimethylenedioxy-3,5,3'-trimethoxyflavone (Urones et al., 1990). *P. minus* Huds has been designated by the Malaysian government in the Herbal Product Blueprint as an essential oil producing crop (Wan Hassan, 2006). Yaacob (Yaacob, 1987) investigated ten essential chemical oil compounds from the *P. minus* Huds leaf: decanal (24.36%) and dodecanal (48.18%) are the two main aldehydes that contribute to the flavor of *P. minus* Huds. Apart from decanal and dodecanal, he also demonstrated that *P. minus* Huds contains 1-decanol (2.49%), 1-dodecanol (2.44%), undecanal (1.77%), tetradecanal (1.42%), 1-undecanol (1.41%), nonanal (0.86%), 1-nonanol (0.76%), and β-caryophyllene (0.18%). Further analysis has been conducted on *P. minus* Huds essential oil by using Gas Chromatography-Time-of-Flight Mass Spectrometry (GCxGC-TOF MS). Significantly, 48 compounds have been identified (Baharum et al., 2010) (Figure 2).

CONCLUSION

Since *P. minus* Huds presents high scavenging activity, high flavinoid and total phenolic content, bioactive property against virus, bacteria and fungus, cytotoxicity and antiulcer activity, it might be considered as a natural medicinal resource. It is recommended that additional pharmacological activities be undertaken, such as wound healing, to confirm its potential as a natural curative drug, as well as *P. minus* Huds will be fractionated to identify the exact active compound underlying each bioactive capability.

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