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A recent review on phytochemical constituents and medicinal properties of kesum (*Polygonum minus* Huds.)

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PEER REVIEW

Peer reviewer

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Comments

This review acts as a valuable note of information regarding the chemical composition and pharmacological uses of *P. minus*. It is providing simple yet efficient data on the topics it covered which is useful for laying ways to newer and intensive researches on *P. minus*.
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ABSTRACT

Medicinal plants and herbal preparations are gaining renowned interest in scientific communities nowadays due to their reliable pharmacological actions and affordability to common people which makes them effective in control of various diseases. *Polygonum minus* (Polygonaceae) locally known as kesum is an aromatic plant commonly used in Malay delicacies. The plant is having potential applications due to its high volatile oil constituents in perfumes and powerful antioxidant activity. It has been used traditionally to treat various ailments including dandruff. The research has been carried out by various researchers using different *in vitro* and *in vivo* models for biological evaluations to support these claims. This review paper may help upcoming research activities on *Polygonum minus* by giving up to date information on the phytochemical constituents and medicinal properties of kesum to a possible extent with relevant data.

KEYWORDS

Malay herbs, Polygonaceae, Pharmacological properties, Phytochemical constituents, Pigmy knot weed

1. Introduction

Polygonum minus (*P. minus*) is commonly known as pigmy knot weed in English and kesum in Malay[1] which belongs to the family Polygonaceae. This plant has sweet and nice aroma hence commonly used as flavoring ingredient in preparation of ulam (salad), laksa and several other Malay food delicacies. The plant is found in Southeast Asian countries namely Malaysia, Indonesia, Thailand (Phak pai) and Vietnam. The plant produces essential oil containing high levels of aliphatic aldehydes (72.54%)[2]; and it has been recognized by the Malaysian government as an essential oil-producing crop in the Herbal Product Blueprint[3]. The plant is found growing wild especially in damp areas such as the side ditches or nearby rivers and lakes. *P. minus* is a slender, creeping shrub and can reach up to a height of 1.0 m in lowland and up to 1.5 m in the highlands. The leaves are narrow and lanceolate,

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5-7 cm long and 0.5-2.0 cm wide (Figure 1), dark green in color and very aromatic and arranged in alternate manner on the stem. The stem is cylindrical, dark green with a little reddish color with short internodes and nodal segments of simple roots[4]. Inflorosence is apical, flowers are small white purple-colored 1.5 to 2.0 mm long and lenticular black or dark brown coloured fruits.

Figure 1. Image of *P. minus* along with inflorescence enlarged.

Traditionally *P. minus* has been used in herbal medicine as a cure for digestive disorders and dandruff in Malaysia despite of its regular uses as food flavoring agent and appetizer in Malays cuisine. The essential oil extracted from *P. minus* leaves is applied to hair to remove dandruff, used in aroma therapy[5] and in the perfume industry[4]. *P. minus* has also been reported to possess several pharmacological properties like antimicrobial activity[6], cytotoxic activity against HeLa (human cervical carcinoma)[7], antioxidant activity[8] and anticancer activity[9,10]. The aim of this paper is to review the recent reports on phytochemical constituents and medicinal properties of *P. minus* which may help future researchers working with this plant.

2. Phytochemical constituents

Plant-produced chemical compounds or phytochemicals like alkaloids, glycosides, flavonoids, volatile oils, tannins, resins have been used in a wide range of commercial and industrial applications such as flavors, aromas and fragrances, enzymes, preservatives, cosmetics, bio based fuels and plastics, natural pigments and bioactive compounds. The research on phytochemicals and use of phytochemicals is increasing more because of the harmful side effects of the synthetic compounds. Various reports have been published regarding the phytochemical content

Table 1

Phytochemical constituents of *P. minus* reported from plant and *in vitro* cell cultures.

Name of plant material	Name of phytochemical constituents
Leaves	Gallic acid, rutin, coumaric acid, quercetin
Roots	Nonane (1.65), heptane (1.11), octadecanal (3.08), β-caryophyllene (17.57), trans-α-bergamotene (2.13), β-farnesene (2.84), α-caryophyllene (9.50), p-benzoquinone (1.85), phenol (2.73), α-panasinsen (1.82), pentanoic acid (1.47), octane (1.42), heptane (0.44), undecane (0.52), 1,2 benzenedicarboxylic acid (0.52), nonane (0.44)
Callus	2-furanmethanol (0.35), 2 (5H)-furanone (1.75), 2-hydroxy-2-cyclopenten-1-one (6.67), 2,4-dihydroxy-2,5-dimethyl-3(2H)-furan-3-one (0.20), 2H-pyran-2,6 (3H)-dione (0.26), 2-hydroxy-gamma-butyrolactone (3.08), 2,5-dimethyl-4-hydroxy-3 (2H)-furanone (1.93), 2,5-furandicarboxaldehyde (0.98), 2,3-dihydro-3,5-dihydroxy-6-methyl 4H-pyran-4-one (1.66), (S)-(+)-2 ʢ,3 ʢ-dideoxyribonolactone (0.882), 5-(hydroxymethyl)-furancarboxaldehyde (18.51), 3-deoxy-D-mannoic lactone (19.44)
Essential oil	2-hexenal (0.001), cis-3-hexenal (0.022), decanal (23.121), 1-decanol (2.090), 1-dodecanol (1.380), undecanal (0.990), dodecanal (38.635), 1-dodecanal (4.785), tetradecanal (1.506), hexadecanal (0.004), cyclodecanol (5.691), undecane (2.286), nonane (0.062), nonanal (0.010), 3-carene (1.202), camphene (0.009), sabinene (0.013), 2-butyltetrahydrofuran (0.004), 1-cyclopropylpentane (0.005), isobornyl formate (0.071), α-copaene (0.024), octylcyclopropane (0.001), (z,e)-α-farnesene (0.928), α-cedrene (0.012), (e)-β-caryophyllene (0.212), α-bergamotene (0.801), γ-gurjunene (0.095), α-humulene (2.293), trans-β-farnesene (0.907),2-isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,7-octahydronaphthalene (0.697), α-curcumene (0.080), valencene (0.806), alloaromadendrene (0.039), β-bisabolene (0.014), α-zingiberene (0.013), α-panasinsene (0.563), δ-cadinene (0.025), patchulane (0.004), nerolidol (0.075), caryophyllene oxide (1.513), ocimene (0.055), dehydro-cyclolongifolene oxide (0.544), acoradiene (0.079), 1,3,6,10-dodecatetraene (0.117), 4,4 dimethyltetracyclo [6.3.2.0(2,5). (1,8)] tridecan-9-ol (0.122), drimenol (0.574), phytol (0.003)

*with in brackets is peak percentage of the compound.