

# *Piper sarmentosum* Roxb. : A Mini Review of Ethnobotany, Phytochemistry and Pharmacology

## Botanical Aspects of *Piper Sarmentosum*

The *Piper* species are one of the well-presented genera, mostly grown as woody perennial climbers. They are rarely found as shrubs with enlarged or puffy nodes and stipules. The leaves of various *Piper* species are naturally aromatic and have a pungent smell. The flowers are very tiny, usually arranged in spikes, without perianth [1]. *Piper* species could also be identified by its pulpy fruit, consisting of 2 to 6 stamens, and one-celled ovary with orthotropic ovule, which means it, is growing straight so that the micropyle is at the end opposite the stalk. *Piper sarmentosum* is a wild growing herb with long creeping stems.

The leaves are alternate and heart-shaped. Young leaves usually have a waxy surface and is light green in color. It produces small, white flowers in the form of spikes, which are located at the terminal or leaf opposite the spikes [2]. The flower has a unisexual ovary. The fruits are big, sweet tasting when ripe, turn black on maturity, dry, and have several rounded bulges. The plant has a pungent odor. In addition, the *P. sarmentosum* species has good ornamental value, which is popular in urban landscape gardens as ground covering shrubs with a root and sprouts at each node and can be grown in pots as bushes by pruning the creeping branches. The bushy, abundant procumbent branches are about 40-50 cm in height and the fruiting season is between October and December [3]. In Malaysia, the plant grows wild; however, it also grows as a weed in villages and places with plenty of shade.

## Biology

*Piper sarmentosum* is easy to grow. It is propagated through vegetative cuttings where it spreads from the fragments and rhizomes that have a root and sprout at each node [4] and the discarded cuttings are quick to develop roots. The plant grows in a humid, warm spot in the shade, and grows well in rich and damp soil in secondary forest, near sea level at 1000m and requires good drainage.

## Distribution

It has been estimated that there are 1200 species of *Piper* distributed throughout the pantropical and Neotropical regions of the world of which more than 400 species have been recorded in the Malaysia region [5]. This species is widely cultivated in tropical and subtropical countries [6].

## Importance

*Piper sarmentosum* is popular due to its culinary and medicinal properties. *Piper sarmentosum* has been used traditionally in different parts of the world to cure many diseases and ailments [7]. The plant contains constituents like alkaloids (amide, pyrones, flavonoids), as reported by Tuntiwachwuttikul et al. [8]. It has also been reported to possess pharmacological properties

### Mini Review

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like anti-cancer [9], hypoglycemic [10], anti-tuberculosis [11], antioxidant [12] and antimalarial [13]. A result from a recent study also provided experimental evidence for the application of *P. sarmentosum* in botanical pesticides [14]. Due to all these properties, the plant has great potential to be commercialized as a medicinal plant in South-East Asia, particularly Malaysia.

## Ethnomedicinal uses and report on uses of *P. sarmentosum* in traditional medicine

Today, herbal medicine has become popular all over the world. Many people use herbal remedies in their daily life, especially in developing countries, because of the absence of harmful or unfavorable effects and their cost effectiveness [15]. *Piper* species are widely distributed in the tropical and subtropical regions of the world and have numerous applications in different traditional medicines. For instance, in ancient Chinese medicine, many species are used to treat inflammatory diseases [16]. In the southern part of Thailand, the water mixture of the whole plant of *P. sarmentosum* is used to treat patients with diabetic disease [10] and the crude extract is also reported to help in reducing the blood glucose level of onset diabetic patients [17]. *Piper sarmentosum* has also been used as a carminative and to relieve coughs and muscle pain [18], while the fruits and leaves are used as an expectorant [19].

*Piper sarmentosum* leaves and roots aid in relieving headaches when applied to the forehead while the decoction of the plant helps to cure muscle weakness and pain in the bones [20]. In Indonesia, *P. sarmentosum* is used to treat coughs and asthma by chewing the rootlets with betel nut and swallowing the juice. The rootlets are also chewed with nutmeg and ginger to treat pleurisy or with only ginger to treat toothache [20]. In addition, warm leaves coated with coconut oil are applied to ease painful

chests and are also used by rheumatic patients to relieve the pain [21,22]. The plant has been shown to have antiplatelet aggregation [23], antibacterial [24], antiplasmodial activity against *Plasmodium falciparum* and *Plasmodium berghei* [13], antioxidant and superoxide scavenger [12] and an antiprotozoal effect against *Entamoebahistolytica* [25].

In folk medicine, the plant has been applied as a cure for headaches, asthma and joint aches, toothache and to reduce fever in influenza patients [12,20,26]. Based on the use in traditional medicine, this plant has demonstrated anti-inflammatory, antinociceptive and antipyretic activities. The crushed leaves of *P. sarmentosum* are mixed into water and used for bathing to treat kidney stones and difficulty in urination [27].

Wei-quan et al. [28] discovered that essential oil from the leaves of *P. sarmentosum* demonstrated strong repellent and antifeedant effects against larvae and imagoes of the diamondback moth. Three amides, identified as 3-(3',4',5'-trimethoxyphenylpropanoyl) pyrrolidine, 3-(4'-methoxyphenylpropanoyl) pyrrole, N-(3-phenylpropanoyl) pyrrole and a sterol,  $\beta$ -sitosterol are the four compounds yielded from the phytochemical investigations of *P. sarmentosum*, all of which were found to have activity against gram-positive bacteria [29].

### Chemical constituents of plants from Family Piperaceae

Investigations on the phytochemical of *Piper* species demonstrated the isolation of a number of classes of physiologically active compounds, such as amides, alkaloids, flavonoids, pyrones, dihydrochalcones, phenylpropanoids, lignans and neolignans [30].

Previous studies demonstrated that various parts of this plant contain many biologically active compounds, such as guineensine, brachystamide B, brachyamide B, sesamin, 1-piperrettyl pyrrolidine, 3',4',5'-trimethoxycinnamoyl pyrrolidine, ( $\pm$ ) asaricin and methyl piperate [26], asaricin,  $\alpha$ -asarone [31] hydrocinnamic acid,  $\beta$ -sitosterol [32], longifolene,  $\beta$ -caryophyllene, allo-aromadendrene, 9-epi-(E)-caryophyllene,  $\beta$ -asarone, viridiflorene and  $\beta$ -selinene, sarmentine, sarmentosine [33], vitamin C, E and carotenes [34].

Several compounds have been isolated from the fruits and leaves of this plant, which are the aromatic alkene, 1-allyl-2-methoxy-4, 5-methylene-dioxybenzene,  $\beta$ -sitosterol, pyrrole amid, pellitorine, sesaminhors field in, two pyrrolidine, amides and guineensine and brachystamide, all of which showed positive antibacterial activities [8]. In addition, Masuda et al. [31] reported four known phenylpropanoids isolated from the leaves of *P. sarmentosum*; namely, 1-allyl-2,6-dimethoxy-3,4-methylenedioxybenzene, 1-allyl-2,4,5-trimethoxybenzene, 1-(1-E-propenyl)-2,4,5-trimethoxybenzene and 1-allyl-2-methoxy-4,5-methylenedioxybenzene, which exhibited antimicrobial activity against *Escherichia coli* and *Bacillus subtilis*.

Twenty constituents from *Piper* species have been identified in a previous study by methods of TLC, HPLC-DAD and GC-MS. Most of the constituents found were amides with a variety of amine moieties. They were pellitorine, and four higher homologues, piperlonguminine, dihydropiperlonguminine, futoamide, and chingchengenamide; and the retrofractamides A, B and D, piperanine, piperine, piperdardine, sarmentine, pipataline and

benzyl benzoate [16]. In a study conducted by Bokesch et al. [35], a new alkaloid, langkamide, was isolated from the dichloromethane: methanol extract of *P. sarmentosum* roots and stems.

It is suggested that more investigations should be performed on the reported compounds from *P. sarmentosum* to elucidate their pharmacological and antimicrobial activities thoroughly as this will help us broaden the scope to identify and develop the candidates for new drug or bio formulations in treating human diseases as well as plant diseases, respectively.

### References

1. Tawan CS, Ipor IB, Fasihuddin BA, Sani H (2002) A brief account on the wild Piper (*Piperaceae*) of the Crocker Range, Sabah. ASEAN Reviews of Biodiversity and Environmental Conservation (ARBE), p. 1–11.
2. Chaveerach A, Mokkamul P, Sudmoon R, Tanee T (2006) Ethnobotany of the genus Piper (*Piperaceae*) in Thailand. Ethnobot Res App 4: 223-231.
3. Karthigeyan K, Sumathi R, Jayanthi J, Diwakar P, Lakra G (2004) Piper sarmentosum Roxb-an addition to the flora of Andaman Islands. Curr Sci 87(2): 140-141.
4. Englberger K (2009) Invasive weeds of Pohnpei: A guide for identification and public awareness. Conservation Society of Pohnpei pp. 29.
5. De Waard PWF, Anunciado IS (1999) *Piper nigrum* L Record from *Proseabase*. In: de Guzman CC & Siemonsma JS (Eds.), PROSEA, Bogor, Indonesia.
6. Amran AA, Zakaria Z, Othman F, Das S, Raj S, et al. (2010) Aqueous extract of *Piper sarmentosum* decreases atherosclerotic lesions in high cholesterolemic experimental rabbits. Lipids Health Dis 9(1): 44-49.
7. Mitra R, Agricola S, Mitchell B, Orbell J, Gray C, et al. (2007) Medicinal plants of Thailand. Asia Pac Biotech News 11(8): 508-518.
8. Tuntiwachwuttikul P, Phansa P, Pootaeng OY, Taylor WC (2006) Chemical constituents of the roots of *Piper sarmentosum*. Chem Pharm Bull 54(2): 149-151.
9. Zainal ASH, Wan OWH, Zainal AZ, Safian MF, Senafi S (2009) Intrinsic anticarcinogenic effects of *Piper sarmentosum* ethanolic extract on a human hepatoma cell line. Cancer Cell Int 9: 6.
10. Peungvicha P, Thirawarapan S, Tamsiririrkkul R, Watanabe H, Prasain KJ, et al. (1998) Hypoglycemic effect of the water extract of *Piper sarmentosum* in rats. J Ethnopharmacol 60(1): 27-32.
11. Hussain K, Ismail Z, Sadikun A, Ibrahim P, Malik A (2008) *In vitro* antiangiogenesis activity of standardized extracts of *Piper sarmentosum* Roxb. Jurnal Riset Kimia 1(2): 146-150.
12. Subramaniam V, Adenan MI, Ahmad AR, Sahdan R (2003) Natural antioxidants: *Piper sarmentosum* (Kadok) and *Morinda elliptica* (Mengkudu). Malays J Nutr 9(1): 41-51.
13. Najib NARN, Furuta T, Takane K, Ali Mohd M (1999) Antimalarial activity of extracts of Malaysian medicinal plants. J Ethnopharmacol 64(3): 249-254.
14. Qin W, Huang S, Li C, Chen S, Peng Z (2010) Biological activity of the essential oil from the leaves of *Piper sarmentosum* Roxb. (*Piperaceae*) and its chemical constituents on *Brontispalongissima* (Gestro) (Coleoptera: Hispididae). Pest Biochem Physiol 96(3): 132-139.
15. Ernst E (1998) Harmless herbs? A review of the recent literature. Am

- J Med 104(2): 170-178.
16. Stöhr JR., Xiao PG., Bauer R. (2001). Constituents of Chinese Piper species and their inhibitory activity on prostaglandin and leukotriene biosynthesis *in vitro*. J Ethnopharmacol 75(2-3): 133-139.
  17. Pongmarutai M (1969) Study on antidiabetic action of *Piper rostratum*. Research Abstracts and Text Books 1989.
  18. Apisariyakul A (1984) Investigation of fractions isolated from Thai medicinal plants affecting isolated rat ileum. Proceedings of the Proc. 10th Conference of Science and Technology of Thailand, Chiang Mai, Thailand, pp. 450-451.
  19. Saralamp P, Chuakul W, Tamsiririrkkul R, Clayton T (1996) Medicinal plants in Thailand Volume 1. Amarin Printing and Publishing Public Co., Ltd, Thailand.
  20. Perry LM, Metzger J (1980) Medicinal plants of east and southeast Asia: attributed properties and uses. MIT press, USA.
  21. Pongboonrod S (1976) The medicinal plants in Thailand. Kasembanakit Press, Thailand, pp. 180.
  22. Muhammad Z, Mustafa AM (1994) Traditional Malay Medicinal Plants. Kuala Lumpur, Fajar Bakti Sdn, Malaysia.
  23. Han G, Ma Y, Li C (1992) The studies of natural PAF antagonistic neoglinans from Piper genus and their structure-activity relationships. Beijing Yike Daxue Xuebo 24: 347-350.
  24. Vaghasiya Y, Nair R, Chanda S (2007) Investigation of some Piper species for antibacterial and anti inflammatory property. Int J Pharm 3(5): 400-405.
  25. Sawangjaroen N, Sawangjaroen K, Poonpanang P (2004) Effects of Piper longum fruit, *Piper sarmentosum* root and Quercus infectoria nut gall on caecal amoebiasis in mice. J Ethnopharmacol 91(2-3): 357-360.
  26. Rukachaisirikul T, Siriwatanakit P, Sukcharoenphol K (2004) Chemical constituents and bioactivity of *Piper sarmentosum*. J Ethnopharmacol 93(2): 173-176.
  27. Ong H, Norzalina J (1999) Malay herbal medicine in Gemencheh, Fitoterapia 70(1): 10-14.
  28. Wei quan ZUO, Maoxin Z, Bing L, Zhengqiang P, Wei QQ (2004) Influence of three volatiles from tropical rank grasses on behavior of *Plutellaxylostella*. J South China Agri Univ 25(4): 39-42.
  29. Atiax E, Ahmad F, Sirat H, Arbain D (2010) Antibacterial activity and cytotoxicity screening of Sumatran Kaduk (*Piper sarmentosum* Roxb). Iranian J Pharmacol Ther 10(2): 1-5.
  30. Parmar VS, Jain SC, Bisht KS (1997) Phytochemistry of the genus Piper. Phytochem 46(4): 597-673.
  31. Masuda T, Inazumi A, Yamada Y, Padolina WG, Kikuzaki H, et al. (1991) Antimicrobial phenylpropanoids from *Piper sarmentosum*. Phytochem 30(10): 3227-3228.
  32. Niamsa N, Chantrapromma K (1983) Chemical constituents isolated from *Piper sarmentosum* Roxb. J Sci Technol 5(2): 151-152.
  33. Likhitwitayawuid K, Ruangrunsi N, Lange GL, Decicco CP (1987) Structural elucidation and synthesis of new components isolated from *Piper sarmentosum* (Piperaceae). Tetrahedron 43: 3689-3694.
  34. Chanwitheesuk A, Teerawutgulrag A, Rakariyatham N (2005) Screening of antioxidant activity and antioxidant compounds of some edible plants of Thailand. Food Chem 92(3): 491-497.
  35. Bokesch HR, Gardella RS, Rabe DC, Bottaro DP, Linehan WM, et al. (2011) A new hypoxia inducible factor-2 inhibitory pyrrolinone alkaloid from roots and stems of *Piper sarmentosum*. Chem Pharm Bull 59(9):1178-1179.