Pharmacogn. Rev.
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REVIEW ARTICLE

Wound Healing Property Review of Siam Weed, *Chromolaena odorata*

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ABSTRACT

Chromolaena odorata (Family: *Asteraceae*) synonyms as *Eupatorium odoratum* is a traditional medicinal plant that is widely used for its wound healing property. In particular, the several parts of this herb have been used to treat wounds, burns, and skin infections. Furthermore, it has also been shown to possess anticancer, antidiabetic, anti-hepatotoxic, anti-inflammatory, antimicrobial, and antioxidant properties. Its phytochemical components are alkaloids, flavonoids, flavanone, essential oils, phenolics, saponins, tannins, and terpenoids. The other important constituents of this plant are Eupolin, chromomoric acid, quercetagetin, and quercetin, all of which contribute to its remedial properties. Published information on the wound healing property of *C. odorata* was gathered by the use of different scientific websites such as Google Scholar, Science Direct, PubMed, and Web of Knowledge to provide an up-to-date review showing its importance.

Key words: Antioxidant, *Chromolaena odorata*, healing property, plant, traditional medicine, wound

WOUND HEALING PLANTS

The ancient history of wound healing treatments in several countries was reported; for example, Tirunelveli Hills in Southern India;[1] Northern Himalaya Range, Abbottabad district, Pakistan;[2] several districts in Bangladesh;[3] Kpando area of Volta Region in Ghana;[4] and Kuruma tribes, Wayanad districts of Kerala, India.[5] The natural or biological products are studied for wound and burn healing agents in many countries such as India, China, and Thailand.[6] Because of poor hygienic status, wound infection is still one of the most common diseases in developing countries.[7] Some examples of wound healing plants include korphad, *Aloe vera*;[8] Madeira vines, *Anredera diffusa*;[9] jungle geranium, *Ixora coccinea*;[10] Indian mulberry, *Morinda pubescens*;[11] simple-leaf chaste tree, *Vitex trifolia*; and peacock chaste tree, *Vitex altissima*.[12] The present review provided an up-to-date information about the properties of *Chromolaena odorata*, one of the wound healing plants that is being investigated for its diverse health benefits.

PLANT DESCRIPTION OF *CHROMOLAENA ODORATA*

C. odorata or Siam weed has a minimum 10-year life span. *C. odorata* is a scrambling perennial shrub which grows 2–3 m in height with straight, pithy, brittle stems that branch readily. The arrowhead-shaped leaves are 6–12 cm in length and 3–7 cm in width, with three veins in a pitchfork appearance. The leaves grow in opposite pairs along the stems and branches. There are 15–25 tubular florets per head, each 10 mm long and several colors such as white, purple, pink, or blue. The color of seeds is brown-gray to black and is 4–5 mm long with a pale brown pappus that is 5 or 6 mm long. The roots are narrow and fibrous and generally reach 0.3 km in depth.[13-15] *C. odorata* shows morphological in terms of flower color, leaf shape, odor of the crushed leaves, and plant architecture variable in its native environment.[16]

TAXONOMICAL CLASSIFICATION

The taxonomy of *C. odorata* is in the Kingdom: *Plantae*; Subkingdom: *Viridiplantae*; Infrakingdom: *Streptophyta*; Superdivision: *Embryophyta*; Division: *Tracheophyta*; Subdivision: *Spermatophytina*; Class: *Magnoliopsida*; Superorder: *Asteranae*; Order: *Asterales*; Family: *Asteraceae*; Genus: *Chromolaena*; Species: *C. odorata*.[17] The plant genus *Chromolaena* is a genus of the family *Asteraceae* which comprises over 165 species that are distributed across tropical and subtropical regions. The name is derived from the Greek word meaning "color." Due to its species name "*odorata*," the leaves exhibit a strong odor when they are crushed.

NOMENCLATURE

C. odorata aka *Eupatorium odoratum* is a weedy herb native of Central and South America, which has spread throughout the tropical and subtropical areas.[18,19] It was first introduced to Southeast Asia in the 1920s and Africa in around 1940 as a plantation cover crop and has ever since spread worldwide.[20,21] The vernacular names of *C. odorata*

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Access this article online

Quick Response Code:

Website: www.phcogrev.com

DOI: 10.4103/phrev.phrev_53_16

Cite this article as: Sirinthipaporn A, Jiraungkoorskul W. Wound healing property review of siam weed, *Chromolaena odorata*. Phcog Rev 2017;11:35-8.

include sunflower family, Christmas bush, Jack in the bush, communist weed, Siam weed, devil weed (English); sekou toure, acheampong, jabinde, matapa, mighbe (African); herbe du Laos (French); Siam kraut (German); kesengesil (Guam); bagh dhoka, tivra gandha (Hindi); rumput belalang, rumput putih, rumput golkar (Indonesian); pokok kapal terbang, rumput jepun, rumput Siam (Malayalam); ropani, seekhrasarpi (Sanskrit); cariaquillo Santa Maria (Spanish); agonoi, hagonoy, huluhagonoi (Tagalog); sab suea (Thai); and co hoi (Vietnamese).[21,22]

PHYTOCHEMICAL SUBSTANCES

The dried leaf of *C. odorata* contained ash (11%), crude fat (11%), fiber (15%), moisture (15%), crude protein (18%), and carbohydrate (31%).[23] Its active phytochemical substances are as follows: (1) flavonoid aglycones (flavanones, flavonols, flavones) including acacetin, chalcones, eupatilin, luteolin, naringenin, kaempferol, quercetin, quercetagetin, and sinensetin;[24-31] (2) terpenes and terpenoids;[32] (3) essential oils;[33-38] (4) alkaloids including pyrrolizidine;[39-41] (5) saponins and tannins;[23] (6) phenolic acids including ferulic acid, protocatechuic acid;[42] (7) phytoprostane compound including chromomoric acid.[43]

TRADITIONAL USES

From review literature regarding the traditional uses, phytochemical properties of *C. odorata* are anti-bacterial,[27,44-47] anticancer,[21,48] anticonvulsant,[49] antidiabetic,[50-52] anti-diarrheal,[53,54] anti-fungal,[55,56] anti-inflammatory,[57-59] antioxidant,[60-65] and antiparasitic,[30,40] hemostatic and wound healing,[15,22,23,66-69] and hepatoprotective activities.[70,71]

WOUND HEALING PROPERTY

The efficiency of healing wounds come from the antioxidant property of the drug or plant which enhances conserving the fibroblast and keratinocyte proliferation on those wounds.[22] *C. odorata* is popularly used for traditional wound healing in Vietnam; moreover, the leave aqueous extract has been used for the treatment of soft-tissue burns or skin infections.[42,60,72,73]

IN VITRO STUDY

Phan *et al.*[72] reported that Eupolin extract increased the proliferation of fibroblasts, endothelial cells, and keratinocytes in wound assay. Stimulation of keratinocyte migration, upregulation of production by keratinocytes of extracellular matrix proteins and basement membrane components, and protection of collagen lattice contraction by fibroblasts were reported. Moreover, Phan *et al.*[74] also reported that Eupolin extract enhanced the expression of many adhesion complexes, for example, laminin-5, laminin-1, collagen IV, and fibronectin by human keratinocytes. Pandith *et al.*[69] reported that *C. odorata* stimulated hemostatic process and wound healing activity by inducing the expression of genes, including heme oxygenase-1, thromboxane synthase, and anti-platelet aggregator matrix metallopeptidase 9 (MM9). This plant can promote fibroblast cell migration and proliferation. Moreover, they found that heme oxygenase-1, the accelerating wound healing enzyme, was increased at the transcriptional and translational levels by *C. odorata* treatment. Thromboxane synthase, a vasoconstrictor, was increased and MMP-9, an anti-platelet aggregator, was decreased when treated with *C. odorata*.

IN VIVO STUDY

According to the study of Mahmood *et al.*,[67] adult male Sprague-Dawley rats with wounds in the posterior neck were divided into four groups for the twice daily application of normal saline, pure unboiled honey, 90% honey in combined with 10% *C. odorata* aqueous leave extract, and solcoseryl jelly. They reported the advantage of honey combined with this extract for the stimulation of wound healing process, decrease scar formation and period of epithelialization, and the rates of wounds sterility. Pandurangan *et al.*[15] investigated the wound healing activity of 2.5%, 7.5%, and 10% w/w of leaves of *C. odorata* extract ointments for 14 days in rats. Their results revealed that varying concentrations of this herb extract in the ointment base was capable of producing significant cutaneous wound dressing activity by inducing wound contraction and wound closure time.

BLEEDING TIME STUDY

Anyasor *et al.*[23] reported the aqueous extract of *C. odorata* (coagulation: 15.18 ± 0.023 min; clotting time 0.26 ± 0.014 min) showed significantly higher hemostatic activity than the ethanolic extract (21 min in coagulation time and clotting 2 min in clotting time). Akomas and Ijioma[75] studied the effect of the oral administration of *C. odorata* in rats for 14 days. This herb significantly lowered bleeding times from 4.5 min in control group to 3.0 and 2.7 min, in low and high doses, respectively. The extract also lowered clotting time from 2.6 min in control group to 1.8 and 1.5 min, respectively. The bleeding and clotting times decreased in animals treated with *C. odorata* extract, suggesting that it remains the good hemostatic property and reduces the bleeding and clotting times by inducing the formation and activation platelets.[75] The results obtained therefore indicates that *C. odorata* promotes wound healing, by stopping of bleeding which may be the first step in the wound healing mechanism.[75]

CONCLUSION

C. odorata exhibits its wound healing property using multiple mechanisms. From the literature reviews, these mechanisms can be summarized as follows: (1) *C. odorata* extract contains many antioxidant compounds that enhance wound healing property.[74] (2) *C. odorata* reduces the bleeding and clotting time may be the first line of action in the physiology of wound healing.[75] (3) *C. odorata* can protect the cells from destruction by inhibiting the inflammatory mediators.[73] (4) *C. odorata* has the antibacterial activities against both Gram-positive and Gram-negative bacteria, suggesting that it may reduce the wound infections.[44] This review article has attempted to compile the new medicinal plant *C. odorata*, to be one of choices in the wound healing treatment.

Acknowledgement

A special thanks to the members of the Fish Research Unit, Department of Pathobiology, Faculty of Science, Mahidol University, for their support. We would like to thank anonymous reviewers and editors of this review article for their perceptive comments and positive criticism in this review article.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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