Description of *Chromolaena odorata* L. R.M King and H. Robinson as medicinal plant: A Review

Meutia Zahara\(^*\)
\[^{1}\]Department of Biology, Islamic Faculty, University Muhammadiyah Aceh. Banda Aceh 23245. Indonesia
\[^{*}\]Corresponding author: teeya_razali@yahoo.co.id

Abstract. *Chromolaena odorata* L. belongs to *Asteraceae* family (sunflower family) is an important and serious perennial herb in the world, while this weed also acts as medicinal plant. Several parts of this plant widely used to treat wound, burns, skin infections as well as to possess anticancer, antidiabetic, anti-hepatotoxic, anti-inflammatory, antimicrobial, and antioxidant properties. Native to North America and has been introduced to Asia, West Africa and Australia. Siam weed is one of common name of *Chromolaena odorata* L. grown as medical herbs and ornamental plant. The medicinal values of *Chromolaena odorata* L. lie in their phytochemicals component, the dried leaf of *Chromolaena odorata* contained flavonoid aglycones (flavanones, flavonols, flavones) including acacetin, chalcones, eupatilin, luteolin, naringenin, kaempferol, quercetin, quercetagetin, and sinensetin, terpenes and terpenoids, essential oils, and other phenolic compounds, which produce define physiological action in our body. Therefore, this review study provides detail information on general description of *Chromolaena odorata* L. as medicinal plant.

1. Introduction

*Chromolaena odorata* is one of herbs belongs to *Asteraceae*, sunflower Family, synonyms to *Eupatorium odoratum* act as a traditional medicinal plant. Several parts of this plant widely used to treat wound, burns, skin infections as well as to possess anticancer, antidiabetic, anti-hepatotoxic, anti-inflammatory, antimicrobial, and antioxidant properties [1]. This flowering shrub native to North America, from Florida and Texas to Mexico and the Caribbean [2], has been introduced to Asia, West Africa and Australia. Siam weed is one of common name of *Chromolaena odorata* L. grown as medical herbs and ornamental plant. In Indonesia, this plant is one of the important traditional medicines, crushing the young leaves and resulting liquid used to treat skin wounds [3]. *Chromolaena odorata* L. also considered as a serious weed in plantation crops in the world such as palm oil plant, coconut, rubber and citrus. It is consisted high allelopathic and suppresses neighbouring vegetation. During the dry season the stem dry and readily burn, but the stumps remain alive and grow very rapidly and cover in the succeeding rainy season [4,5]. This weed affects particularly small farms, production in agricultural sectors and as well as natural ecosystems. It can quickly invade cleared lands and crops resulted in low yield and income [5]. *Chromolaena odorata*, one of the wound healing plants that investigated for its diverse health benefits [1].

*Chromolaena odorarata* L. found throughout the world especially in the pacific region under different names; Siam weed, devil weed, French weed, hagonoy, co hoy, in Indonesia known as Ki Rinyuh and si koko [8,4]. The mentioned herb is an important weed plant that extend its territory from America to Asian countries like Indonesia, India, China, Bangladesh, Thailand and other [14,15]. *Chromolaena odorata* L. is being use traditionally as medicinal properties, especially for external uses.
as in wound skin, skin infections, and inflammation [8]. In Indonesia, most of the people used this plant to cure stomachs problem or dyspepsia, reducing the cholesterol and hypertension, vertigo, diet and mainly for external uses as well.

2. General Information
Chromolaena odorata L. belongs to the Asteraceae family. Common names of Chromolaena odorata; Eupatorium affine Hook & Arn., Eupatorium brachiatum Wikstrom, Eupatorium clematitidis DC., Eupatorium conyzoides M. Vahl., Eupatorium divergens Less., Eupatorium floribundum Kunth, Eupatorium graciliflorum DC., Eupatorium odoratum L., Eupatorium sabeanum Buckley., Eupatorium stigmatosum Meyen & Walp., Osmia conyzoides (Vahl) Sch.-Bip., Osmia divergens (Less) Schults-Bip., Osmia floribunda (Kunth) Schultz-Bip., Osmia graciliflora (DC) Sch.Bip., Osmia odorata (L) Schultz-Bip. [3]

- Kingdom: Plantae
- Subkingdom: Tracheobionta
- Superdivision: Spermatophyta
- Division: Magnoliophyta
- Class: Magnoliopsida
- Subclass: Asteridae
- Order: Asterales
- Family: Asteraceae
- Genus: Chromolaena
- Species: Chromolaena odorata (L) [3]

Chromolaena odorata L. has a short life cycle approximately ten years maximum. It is an herbaceous perennial forms dense tangled bush up to 2 min in height. It occasionally reaches its maximum height of 6 m (as climber on other vegetation). The paired of branches grow freely through the main stem. The older stem in the base are brown and woody, while the tips are soft and green. The root formation is fibrous and does not penetrate beyond 20-30 cm in most soil. The flowers are white or pale bluish-lilac, and form covering the whole surface (figure 1) [3,6,7]. The leaves are arrowhead-shaped, 50–120 mm in length and 30–70 mm in wide. They grow in opposite pairs along the stems and branches (figure 1). As the species name ‘odorata’ suggests, the leaves emit a pungent odour when crushed [6]. The seeds of Siam weed are small (3-5mm long, ~1mm wide, and weigh about 2.5mg seed⁻¹) [3].

Siam weed is a perennial species, as it lives for more than one year (table 1.) and very well adapted to the wet–dry tropical climate [6]. Chromolaena odorata L. is a perennial scrambling shrub with straight, pithy, brittle stems which readily branch, bear three-veined, ovate-triangular leaves placed oppositely and with a shallow (figure 1), fibrous root system [16]. Within the native range, C. odorata shows the variability of morphology in term of flower color, leaf shape and hairiness, smell of the crushed leaves and its architecture. In some part of regions, its shows several forms and intermediate, while in others appears homogenous and this variability presently remains unexplained [17].
Siam weed grows on a wide range of soils and in a range of vegetation types, such as in forests (rainfall 1500mm per year), grassland and arid bushveld (rainfall less than 500mm per year) [3]. The range of relative humidity should be around 60-70% for good growth of this herbs, at values higher than 80% the growth performance was bad [13]. A research showed that *Chromolaena odorata* L. seedling grew very well at 30°C and much better on mulched soil at 25°C, whereas in a heavy shade this medicinal plant will not seed. This phenomenon has a negative relationship with tree canopy cover and appears to be the most abundant on the edge of the forested area [14, 3].

Table 1. General growth pattern of *Chromolaena odorata* L. [6]

| Growth          | Jan | Feb | Mar | Apr | May | June | Jul | Aug | Sept | Oct | Nov | Dec |
|-----------------|-----|-----|-----|-----|-----|------|-----|-----|------|-----|-----|-----|
| Flowering       |     |     |     |     |     |      |     |     |      |     |     |     |
| Seed formation  |     |     |     |     |     |      |     |     |      |     |     |     |
| Seed drop       |     |     |     |     |     |      |     |     |      |     |     |     |
| Dieback         |     |     |     |     |     |      |     |     |      |     |     |     |
| Regrowth        |     |     |     |     |     |      |     |     |      |     |     |     |
| Germination     |     |     |     |     |     |      |     |     |      |     |     |     |

The leaves are in oval form with 6-10 cm long and 3-6 cm width, the bottom part is wider and more pointed in the tip. The edge of the leaves is jagged and facing the base and leaves position are face to face to others. The wreath is located at the end branch (terminal), consists of 20-30 flowers with bluish color for young flower and brown for mature flower (figure 1) [4]. The flower is blooming during the dry season, inflorescence simultaneously happens within 3-4 weeks. The seed ripe then the plants will dry out; seed break out and it carried by wind. During early rainy season, the stem pieces, branches and the base of the stem sprout again, the falling seed starting to germinate and next two months sprout and shoots dominates the area. The observation that have been done by Yadav and Tripathi showed that plant density reaches 36 adults per m² and no less than 1300 sprouts, even though plant already mature, it’s still have the potential to produces bud [4].

Siam weed is growing and breeding very fast, so can form a tight community and get in the way growth of other plants through the competition. *C. odorata* can grow up to 1000-2800 m above sea level [18] in Indonesia mostly found in the lowlands (0-500 m above sea level) as rubber and coconut
plantations [4]. The plant height of *C. odorata* can reach up to 5 m and even more [19]. The young stem shows green color with soft structure and becomes brown with hard structure (woody) when it is old. The branches system is tight, reduces sunlight to the bottom part, and inhibits the growth of other plant species including grass. This weed grows very fast and dominates the area very quick [4].

3. Phytochemical content and health benefits

The medicinal values of *Chromolaena odorata* lie in their phytochemicals component (table 2.) such as tannins, alkaloid, flavonoids and other phenolic compounds, which produce a physiological action in our body [20]. The dried leaf of *Chromolaena odorata* contained ash (11%), crude fat (11%), fibre (15%), moisture (15%), crude protein (18%), and carbohydrate (31%). The active phytochemical substances are: (1) flavonoid aglycones (flavanones, flavonols, flavones) including acacetin, chalcones, eupatilin, luteolin, naringenin, kaempferol, quercetin, quercetagetin, and sinensetin, (2) terpenes and terpenoids, (3) essential oils, (4) alkaloids including pyrrolizidine, (5) saponins and tannins, (6) phenolic acids including ferulic acid, protocatechuic acid, (7) phytosterol compound including chromomeric acid [1]. While the fresh *Chromolaena odorata* contained moisture (59.50%), total ash (2.50%), crude protein (6.56%), crude lipid (0.10%), carbohydrate (20.58%), fibre (10.76%) and total metabolize energy (109.46 kcal/100g) [12].

| Phytochemical                  | Status |
|-------------------------------|--------|
| Alkaloids                     | +      |
| Cyanogenic glycosides         | +      |
| Flavonoids                    |        |
| Z Aurone                      | +      |
| Z Chalcone                    | +      |
| Z Flavone                     | +      |
| Z Flavonol                    | +      |
| Phytates                      | ++     |
| Saponins                      | +++    |
| Tannins                       | ++     |

Key: + = slightly present; ++ = moderately present; +++ = highly present

*Chromolaena odorata* is popularly uses for traditional wound healing; moreover, the leave aqueous extract have been used for the treatment of soft-tissue burns or skin infections [1]. 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. Also used for a variety of ailments in many tropical countries for a long time, especially to stop bleeding. Numerous studies have demonstrated that Siam weed extract (SWE) accelerates haemostasis and wound healing [1,9].

For malaria treatment, the leaves of *Chromolaena odorata* L ingredient with lemon grass and guava leave. Other traditional medicinal uses include include anti-diarrheal, astrangent, antispasmodic, antihypertensive, anti-inflammatory, diuretic, tonic, antipyretic and heart tonic and also cough remedy [1,10,11]. The fresh leaves and extract of *C. odorata* are a traditional herbal treatment in some developing countries for burns, soft tissue wounds and skin infections. A formulation prepared from the aqueous extract of the leaves has been licensed for clinical use in Vietnam [10].

In Ghana and Benin, the infusion from fresh *Chromolaena odorata* L leaves is used to treat malaria and internal haemorrhage. In Thailand, the leaves are used to cataplasm to stem external haemorrhage. In Guatemala, microbiological investigations carried out in alcoholic extracts of *Chromolaena odorata* L extracts indicated the antimicrobial activities [21].
4. Conclusions

*Chromolaena odorata* L. is native to North America and now spread to all over the world. It can reach up to 6 m in height. Synonym to *Eupatorium odoratum*, and some others common name; Siam weed, devil weed, French weed, hagonoy, co hoy, in Indonesia known as Ki Rinyuh and si koko. *C. odorata* is being used traditionally as medicinal properties, especially for external uses as in wound skin, skin infections, inflammation, a therapeutic agent for a variety of diseases, such as wound healing, anti-inflammatory, analgesic, antipyretic, diuretic, and antimicrobial, anti-mycobacterial and many more. More researches needed to find a formula to make a marketable medicine from *Chromolaena odorata* L. for easier to use without crashing the leaves, especially for external uses.

Acknowledgements

The author would like to thank the University Muhammadiyah Aceh for providing the financial support for the conferences. The author also would like to acknowledge all the family members during the writing process of the manuscript.

References

[1] Sirinthipaporn A and Jiraungkoorskul W 2017 Wound healing property review of Siam Weed, *Chromolaena odorata L. Pharmacogn Rev.* 11(21) pp 35-38
[2] “Chromolaena odorata” Flora of North America.
[3] Cakraborty A K, Ramblha S and Patil U K 2011 *Chromolaena odorata (L.) : An Overview. Journal of Pharmacy Research* 4 (3) pp 573-576
[4] Prawiradiputra B R 2007 Ki Rinyuh (Chromolaena odorata (L) R M King dan H Robinson: Gulma padang rumput yang merugikan *Wartazoa* Vol. 17 No 1
[5] Muniappan R and Bamba J 2000 Biological control of *Chromolaena odorata*: success and failures *Proceeding of the X international Symposium on Biological Control of Weed* pp 81-85 USA
[6] CRC Weed Management 2003 Siam Weed or *Chromolaena-Chromolaena odorata L.*
[7] Cruttwell R, McFadyen and Skarratt B 1996 Potential distribution of *Chromolaena odorata* (siam weed) in Australia, Africa and Oceania Agriculture *Ecosystems and Environment* 59 (1-2) pp 89-96
[8] Vaisakh M N and Pandey A 2012 Pharmacognostic study of leaves of *Chromolaena odorata* UNM *International Journal of Pharmaceutical Research and Development* (IJPRD)
[9] Akah P A 1990 Mechanism of hemostatic activity of Eupatorium odoratum *International Journal of Crude Drug Research* vol. 28 no. 4 pp 253–256
[10] Vaisakh M N and Pandey A 2012 The invasive weed with healing properties: A review on *Chromolaena odorata* International *Journal of Pharmaceutical Science and Research* 3:80–3.
[11] Vital P G and Windell L R 2009 Antimicrobial activity and cytotoxicity of *Chromolaena odorata* (L. f) King and Robinson and *Uncaria perrottetii* (A. Rich) Merr. Extracts *Journal of Medicinal Plants Research* 3(7); pp. 511-518
[12] Ngozi I G, Jude I C and Catherine I C 2009 Chemical profile of *Chromolaena odorata* L. (King and Robinson) leaves *Pakistan Journal of Nutrition* 8 (5) pp 521-524
[13] Ambica S R and Jayachandra The problem of Chromolaena weed *Newsletter on Biocontrol and Management of Chromolaena odorata L.*
[14] Luwun P 2002 Control of invasive *Chromolaena odorata;* An evaluation in some land use types in KwaZulu Natal-South Africa, Thesis submitted to *International Institute for Geo-information Science and Earth Observation.*
[15] Warea O 2004 *Chromolaena* (Siam weed) Pest Advisory *leaflet No. 43/Secretariat of the Pacific Community*
[16] Zachariades C, Day Muniappan M, Reddy R G V P 2009 *Chromolaena odorata* L. King and Robinson (Asteraceae) DOI: 10.1017/CBO9780511576348.008 · Source: OAI
[17] Zachariades C, Von Senger I, Barker N P 2004 Evidence for a northern Caribbean origin for the southern African biotype of *Chromolaena odorata In Proceedings of the Sixth International
Workshop on Biological Control and Management of Chromolaena, ed. M. D. Day and R. E. McFadyen. ACIAR Technical Reports 55 Canberra Australia: ACIAR, pp. 25–27.

[18] FAO 2006 Alien invasive species; Impacts of forest and forestry–A review

[19] Department of Natural Resources, Mines and Water 2006 Siam weed declared no. 1 Natural resources mined and water Pers series Queensland Australia

[20] Akinmoladun A C, Ibukun E O, Dan-Ologe I A 2007 Phytochemicals constituents and antioxidant properties of Chromolaene odorata Scientific Research and Essay Vol 2(6) pp. 191-194

[21] Tonzibo Z F, Wognin E, Chalchat J C, and Guessan Y T N Chemical investigations of Chromolaena odorata L. King Robinson from Ivory Coast Journal of essential oils –Bearing Plants 10 (2) pp. 94-100