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Review

A review of *Acalypha indica* L. (Euphorbiaceae) as traditional medicinal plant and its therapeutic potential

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ABSTRACT

Ethnopharmacological relevance: *Acalypha indica* is an herbal plant that grows in wet, temperate and tropical region, primarily along the earth's equator line. This plant is considered by most people as a weed and can easily be found in these regions. Although this plant is a weed, *Acalypha indica* has been acknowledged by local people as a useful source of medicine for several therapeutic treatments. They consume parts of the plant for many therapeutics purposes such as anthelmintic, anti-ulcer, bronchitis, asthma, wound healing, anti-bacterial and other applications. As this review was being conducted, most of the reports related to ethnomedicinal practices were from Asian and African regions.

The aim of the review: The aim of this review is to summarize the current studies on ethnomedicinal practices, phytochemistry, pharmacological studies and a potential study of *Acalypha indica* in different locations around the world. This review updates related information regarding the potential therapeutic treatments and also discusses the toxicity issue of *Acalypha indica*.

Materials and methods: This review was performed through a systematic search related to *Acalypha indica* including the ethnomedicinal practices, phytochemistry and pharmacological studies around the world. The data was collected from online journals, magazines, and books, all of which were published in English, Malay and Indonesian. Search engine websites such as Google, Google Scholar, PubMed, Science Direct, Researchgate and other online collections were utilized in this review to obtain information.

Results: The links between ethnomedicinal practices and scientific studies have been discussed with a fair justification. Several pharmacological properties exhibited certain potentials based on the obtained results that came from different related studies. Based on literature studies, *Acalypha indica* has the capability to serve as anthelmintic, anti-inflammation, anti-bacterial, anti-cancer, anti-diabetes, anti-hyperlipidemic, anti-obesity, anti-venom, hepatoprotective, hypoxia, and wound healing medicine. For the traditional practices, the authors also mentioned several benefits of consuming the raw plant and decoction.

Conclusion: This review summarizes the current studies of *Acalypha indica* collected from many regions. This review hopefully will provide a useful and basic knowledge platform for anyone interested in gaining information regarding *Acalypha indica*.

1. Introduction

Before modern drugs began to take shape in the medical care industry, people were highly dependent on natural resources for treatment. This type of treatment, also known as conventional treatment, was the main source of medical treatment during this time (Rao, 1996). However, civilization has changed and with it has come the introduction of more advanced methods, leading the next generations

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Fig. 1. Location of *Acalypha indica*.

to tend to choose modern treatment over conventional treatments. The knowledge and information related to conventional treatments are gradually vanishing since the previous generations are getting older and dying without successors. This knowledge is passed to the next generation, through observation and oral teaching (Nasir, 2012). Therefore, it is crucial to have proper documentation from the extant practitioners since conventional treatments are an alternative path to treat human diseases (Martin, 1995). Conventional or traditional medicinal practices based on natural plants have been recognized by the World Health Organization as reliable medicinal sources for therapeutic activities (WHO, 2002). The medicinal plants are available around settlements, spreading alongside roads, backyards, and house compounds. They can either be collected wild or some people can be found growing them around their house for personal use.

Acalypha indica is a traditional plant, well-known by older generations in many countries, particularly in Asia and Africa. It grows well in most parts of northeast, west, and south of Africa including Ethiopia, Somalia and other regions as shown in Fig. 1 (Aboubaker et al., 2013; Dineshkumar et al., 2010; Discoverlife, 2015; Kankanamalage et al., 2014; Marwah et al., 2007; Masih et al., 2011; NaturalMedicineFacts.info, 2017; Ranju et al., 2011; Schmelzer, 2007; Sivasankari et al., 2014). The plant can also be found in most wet, temperate and tropical countries in Asia, Europe and both South and North American regions. It grows as a weed in backyards, bushes, alongside roads and other places (Chopra et al., 1956; Dineshkumar et al., 2010). Most international manuscripts on *Acalypha indica* were published from Indian region because this plant has a close connection with Ayurveda medicinal practices executed by older Indian generations (Lingaraju et al., 2013; Senthilkumar et al., 2006; Sivasankari et al., 2014).

2. Botanical description

2.1. Taxonomy

There are seventeen synonymous names related to this plant species according to theplantlist.com; these include: *Acalypha bailloniana* Müll. Arg.; *Acalypha canescens* Wall.; *Acalypha caroliniana* Blanco; *Acalypha chinensis* Benth.; *Acalypha ciliata* Wall.; *Acalypha cupamenii* Dragend.; *Acalypha decidua* Forssk.; *Acalypha fimbriata* Baill.; *Acalypha indica* var. *bailloniana* (Müll. Arg.) Hutch.; *Acalypha indica* var. indica.; *Acalypha somalensis* Pax; *Acalypha somalium* Müll. Arg.; *Acalypha spicata* Forssk.; *Cupamenis indica* (L.) Raf.; *Ricinocarpus baillonianus* (Müll. Arg.) Kuntze; *Ricinocarpus deciduus* (Forssk.) Kuntze and *Ricinocarpus indicus* (L.) Kuntze. There are two invalid synonymous names for this plant (*Acalypha canescens* Wall. and *Acalypha ciliata* Wall.) and one illegitimate name (*Acalypha caroliniana* Blanco). The accepted name to refer to this plant is *Acalypha indica* L. (The Plant List, 2013). The hierarchical taxonomy list of *Acalypha indica* had been verified by the Integrated Taxonomic Information System and the common name for this species in English is Indian copperleaf (Integrated Taxonomic Information System, 2015). This plant belongs to the Acalypha genus which is classified as the fourth largest genus in Euphorbiaceae family. Most of the plants from this family are used as medicinal herbs in Asian and African regions (Seebaluck et al., 2015).

Acalypha indica is a small annual erect herb plant that grows up to 0.6 m (Stone, 1970), 0.35–0.75 m (Kirtikar and Baman, 1918), 0.3–1.0 m (Takle et al., 2011) and is capable heights of reaching 1.5–2.5 m (Schmelzer, 2007). It is a taproot type plant and its leaves are 2.5–7.5 cm long with 2.0–4.5 cm broad either ovulate or rhombic ovulate shape. The leaves have acute or sub obtuse crenate-serrate, glabrous thin and base cuneate as shown in Fig. 2(A). Their petiolate is usually longer than the blade, slender, and stipulate minute (Kirtikar and Baman, 1918; Stone, 1970). The leaves of the *Acalypha indica* are simple and arranged spirally; 0.02–12.00 cm petiole long; blade broadly ovate to ovate-lanceolate; 2–9 cm × 1–5 cm; base cuneate; apex acute; margins toothed; membranous; sparingly short hairs to almost glabrous is nature on both surfaces; more hairy along the midrib; 5-veined at base and with 4–5 pairs of lateral veins (Schmelzer, 2007). One month after germination, the stem starts to turn woody as it matures. The stem is sparing to densely hairy (Schmelzer, 2007). The branches are numerous, long, ascending, and finely pubescent (Saha and Ahmed, 2011b).

The flower of the *Acalypha indica* is arranged in numerous lax, erect, elongated, auxiliary spikes, and clusters near the summit of the spikes as shown in Fig. 2(B). The female is in white color, scattered, and surrounded by a shortly pedunculate large leafy dentate cuneiform with many nerves bract that is approximately 6–8 mm in diameter (Kirtikar and Baman, 1918). The flowers are sessile on erect axillary spikes longer than the leaf. The male flowers are minute and crowded distally with 8 stamens, while the female flowers are scattered along inflorescence axis, each is subtended by a conspicuous semicopula foliaceous toothed green bract, nearly 7 mm long (Stone, 1970). The