



REVIEW

Cotinus coggygia Scop.: An overview of its chemical constituents, pharmacological and toxicological potential



Sanja Matić ^{a,*}, Snežana Stanić ^a, Mirjana Mihailović ^b, Desanka Bogojević ^b

^a Department of Biology and Ecology, Faculty of Science, University of Kragujevac, Radoja Domanovića 12, Serbia

^b Department of Molecular Biology, Institute for Biological Research, University of Belgrade, Bulevar despota Stefana 142, Serbia

Received 7 January 2015; revised 11 May 2015; accepted 17 May 2015

Available online 22 May 2015

KEYWORDS

Cotinus coggygia;
Bioactive metabolites;
Bioactivities;
Pharmacological properties

Abstract The Anacardiaceae Lindl. family comprises of many species which are used in nutrition and in traditional folk medicine for the treatment of several human diseases. *Cotinus coggygia* Scop. commonly known as “smoke tree”, is a commercial ornamental plant with high medicinal usages, belongs to the family Anacardiaceae. The present review provides a comprehensive report of empirical investigations on important pharmacological activities and phytochemical screening of essential oils and extracts. Relevant information was collected from scientific journals, books, and reports via library and electronic search using Medline, PubMed, Google Scholar, ScienceDirect, Web of Science, and Scopus. The plant has been extensively investigated in a broad range of studies to provide scientific evidence for folklore claims or to find new therapeutic uses. Numerous activities namely antioxidative, antibacterial, antifungal, antiviral, anticancer, antigenotoxic, hepatoprotective and anti-inflammatory have been demonstrated for all parts of these plants by *in vivo* and *in vitro* studies. Essential oils and extracts showed various pharmacological and biological properties which make them an effective remedy for various kinds of illnesses. Considering data from the literature, it could be demonstrated that *C. coggygia* possesses diverse bioactive properties and immense utilization in medicine, health care, cosmetics and as health supplements.

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* Corresponding author. Tel.: +381 34 336 223; fax: +381 34 335 040.

E-mail address: sanjamatic@kg.ac.rs (S. Matić).

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1. Introduction

Plants and natural products have been used in many parts of the world as traditional treatments for many conditions and have less deleterious side effects than corresponding synthetic drugs with the side effects which can be even more dangerous than the diseases they claim to cure. In rural areas of the developing countries, they continue to be used as the primary source of medicine (Ballabh and Chaurasia, 2007; Chitme et al., 2003).

Natural products produced as secondary metabolites by higher plants have proven to be an abundant source of biologically active compounds that can be the basis for the development of new chemicals for pharmaceuticals. Plants contain a diverse group of highly valuable and available resource of secondary metabolites, such as tannins, terpenoids, alkaloids, and flavonoids, which have been found to have important pharmacological properties (Georgiev et al., 2014; Kashani et al., 2012; Ngule et al., 2013). In general, the plant essential oils and extracts of many plant species are considered as non-phytotoxic compounds and have been examined for a number of biological activities so far, and their antimicrobial, anti-inflammatory, antioxidant, antimutagenic, and cancer preventive effect have been partially described (Giriraju and Yunus, 2013; Kchaou et al., 2014; Matić et al., 2013).

Cotinus coggygia, also known as the “smoke tree”, is one of the two species constituting a small genus of the family Anacardiaceae, viz., *C. coggygia* Scop. (syn.: *Rhus cotinus* L.) and *Cotinus obovatus* Raf., the American smoketree. It has a wide distribution from southern Europe, the Mediterranean, Moldova and the Caucasus to central China and the Himalayas (Novaković et al., 2007). This plant is usually either considered as large shrubs or small trees. It has glaucous, simple, ovate or obovate leaves, 3–8 cm long. The flowers are pentamerous, pale yellow or yellow–green, hermaphrodite or some of them abortive, with long peduncles, in terminal loose inflorescences (Davis et al., 1982; Tutin, 1968).

This plant has been used in folk medicine throughout the world and the medicinal properties have been investigated. *C. coggygia* is an important source of essential oils and extract with a wide range of health-promoting properties. A number

of publications have reported the biological activities of extracts and essential oils from *C. coggygia* Scop. To the best of our knowledge, no study so far has been performed to summarize all the reported data on *C. coggygia* and respective biological properties. For this reason, the present review mainly focused on the botanical description, phytochemistry and pharmacological properties of extracts and essential oil from plant *C. coggygia*.

2. Botanical description and traditional uses

Anacardiaceae Lindl. is an economically important family of 82 genera and over 700 species. This family is distributed in the tropics of Africa, Asia and America with a smaller number of species occurring in subtropical and temperate areas (Wannan, 2006). Members of the family are well known for its cultivated edible fruits and seeds, dermatitis causing taxa (e.g., *Comocladia*, *Metopium*, *Semecarpus*, *Toxicodendron*), medicinal compounds, valuable timber, and lacquer plants (*Toxicodendron* and *Gluta* spp.). Many Anacardiaceae species are also valued for their horticultural appeal. Specimens of *Cotinus*, *Rhus*, *Schinus*, *Searsia*, *Pistacia chinensis* Bunge, *P. mexicana* Kunth, *Smodingium*, and *Toxicodendron* are planted for their beautiful inflorescences, infructescences, evergreen foliage, and/or fall foliage. Some of the products of Anacardiaceae, including mangos (*Mangifera indica* L. and other species), pistachios (*Pistacia vera* L.), cashews (*Anacardium occidentale* L.), and pink peppercorns (*Schinus terebinthifolia* L.), are enjoyed worldwide while other notables such as the pantropical *Spondias* and the Neotropical fruits are restricted to localized cultivation and consumption and are not generally transported far distances to larger markets (Pell, 2004).

Plants of the family Anacardiaceae have a long history of use by various peoples for medicinal and other purposes. Different parts of this plant have been subjected to pharmacological evaluation for their potential antiseptic, anti-inflammatory, antimicrobial, hepatoprotective (Matić et al., 2011a), antihemorrhagic agent in wound-healing (Demirci et al., 2003), as well as for countering diarrhea, paradontosis, and gastric and duodenal ulcers (Ivanova et al., 2005). There are

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