



Review on Cardiac Therapeutic Activity of the Plant *Crataegus Oxyacantha*

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ABSTRACT

According to Greek herbalist Dioscorides, It gained even more popularity among herbalists in Europe and America. It is currently used to treat various functional heart disorders as a cardi tonic. Recent studies have confirmed and validated historical observations by demonstrating the wide range of beneficial effects of Crataegus extracts on heart function. The adaxial surface of Crataegus laevigata is dark green or brownish-green, while the abaxial surface is lighter greyish-green and exhibits a prominent, dense, reticulate venation. While the leaves of Crataegus azarolus and Crataegus nigra are densely pubescent, those of Crataegus laevigata, Crataegus monogyna, and Crataegus pentagyna are glabrous or only have isolated trichomes. The primary components of the leaves and flowers are: - flavonoids, which are mainly flavones and flavonols in the form of glycosides flavan compounds, such as oligo- and polymeric procyanidins, (+)-catechin, and (-)-epicatechin, triterpenic acids, such as oleanic, urolic, and crataegolic acids, amines, such as ethylamine, acetylcholine, and phenethylamine, organic acids, such as chlorogenic acid and caffeic acid.

Keywords: Crataegus oxyacantha, pinnatisect, crataegolic acids, oleanic, urolic.

Introduction

Mostly found between latitudes 30E and 50E N, the genus Crataegus comprises a complex group of trees and shrubs that are native to northern temperate zones. Hawthorns generally do not form large trees or function as canopy dominants in forests, despite the fact that most species can grow to tree-sized proportions. While some species can reach heights of 12 meters, others are distinctly shrubby. Currently, there are about 250 recognized species, the majority of which are indigenous to the New World and the remaining 50 to the Old World. Included in this list are species that are native to the United States, as well as some that have been introduced, naturalized, and grown for horticultural purposes. The taxonomy of the hawthorn genus has a long history of controversy and misunderstanding. A number of writers make references to possible hybrids among hawthorns in the New World. Hawthorns are used for many different things all over the world. Vitamin levels are similar to those of manzanilla, a plant that is used medicinally in Central America.

Morphological Character

Family	Rosaceae
Scientific Name	<i>Crataegus oxyacantha</i>
English name	European Hawthorn
Trade name	Hawthorn
Parts used	Fruit, leaf, and flowers

Table 1: Morphological Character of Crataegus.

Figure 1: Picture of *Crataegus oxyacantha*

Species	Compound Identified	Methodological and Analytical Approach
<i>Crataegus oxyacantha</i>	Epicatechin, epicatechin gallate (ECG), rutin, caffeic and caffeoyl acids	HPLC-DAD and LC-MS/MS
<i>Crataegus oxyacantha</i>	Naringenin, epicatechin, quercetin-3-O- β -glucoside, and quercetin	Nuclear magnetic resonance (NMR) spectroscopy
<i>Crataegus oxyacantha</i>	Rutin and Quercetin	HPLC
<i>Crataegus pinnatifida</i>	Crataequinone A	Nuclear magnetic resonance (NMR) spectroscopy and electronic circular dichroism (ECD)
<i>Crataegus songarica</i>	Quercetin 3-O-galactoside and kaempferol-3-O-glucoside	HPLC-DAD-ESI/MS
<i>Crataegus pinnatifida</i>	Pinnatifidanin BVI	Nuclear magnetic resonance (NMR) spectroscopy

Figure 2: Identified compounds from hawthorn.

Floral Characteristics

- Flowers are 5.0-5.7 mm long, white. Calyx is woolly-hairy at base having 5-lobbed.
- Lobes are sub-acute.
- Stamens are many.
- Carpels are adnate to the calyx tube, and tips pubescent.
- Fruits are glabrous, scarlet red, and fleshy

Figure 3: Picture of *Crataegus oxyacantha* flower

Cultivation

Nurseries use both asexual and sexual propagation methods to produce hawthorns. The sexual propagation of hawthorns through seeds is crucial in horticulture as it yields a large number of rootstocks to which superior clonal scions, which are typically cultivars, are budded (Bush et al., 1991; Dirr et al., 1987). This is especially important for the quick establishment of clonal orchards of desirable hawthorn species (like those with potential pomological interest), for which there is a dearth of scion material and little understanding of vegetative propagation using stem cuttings. One example of such a species is the western mayhaw (Bush and others, 1991). Brinkman (1974) advised that seeds be sown in early fall (as opposed to spring) to meet any potential needs for cold stratification if nurseries do not employ controlled seed pretreatment regimes (such as stored refrigerated conditions). For many hawthorns, this may be a sufficient generalization; however, it is crucial to remember the aforementioned exceptions for those species (such as those from warm temperate climates) that will germinate either through creative seed pretreatment methods like fermentation or in shorter amounts of time without the laborious waiting periods associated with cold stratification.

Distribution

In Europe, these little trees are cultivated as hedge plants, primarily found in temperate regions, such as China, Western Asia, North Africa, India, and North America. It was brought to Tasmania and other parts of Australia in the 1800s by British settlers as a hedge plant, and it is currently a wild plant in Tasmania, Victoria, the Adelaide Hills, and the New South Wales tablelands. Many Australian states have designated *Crataegus* as a noxious weed due to its aggressive settler nature, which makes it tenacious and challenging to eradicate. It can be found in Kashmir and Himachal Pradesh in India, in the temperate Himalayas, between 1800 and 3000 meters above sea level.

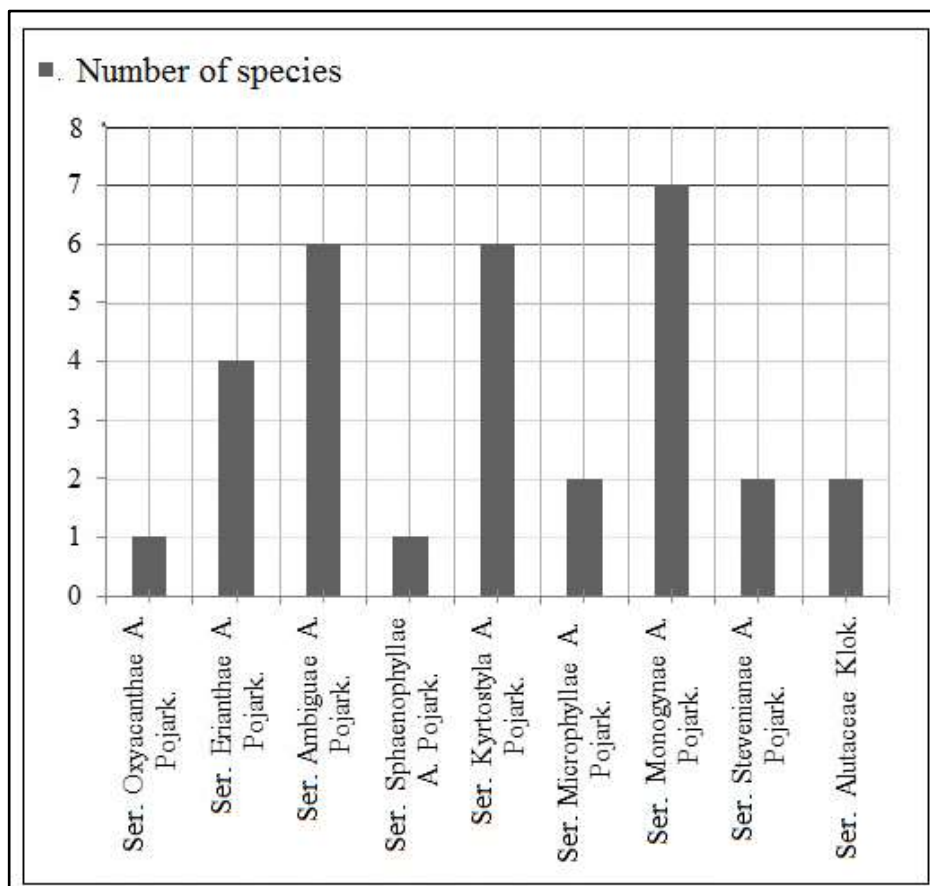


Figure 4: Distribution of *Crataegus oxyacantha*

Chemical Constituents

- Plant contains total flavonoid content in leaf, flower, fruit, pulp, and bark range from 0.48 to 1.65% and total phenolic content varies from 3.31 to 5.46%.
- The antioxidant potential (percent inhibition of DPPH free radical by 1 mg/ml of plant material) was maximum in bark (81.5%) followed by flower, leaf, pulp and fruit (14%). It also contains saponins, glycosides, flavonoids, ascorbic acid, condensed tannins, and amines.

- The therapeutic properties of *C. oxyacantha* are attributed to the flavonoids, triterpenic acids, and biogenic amines in it.

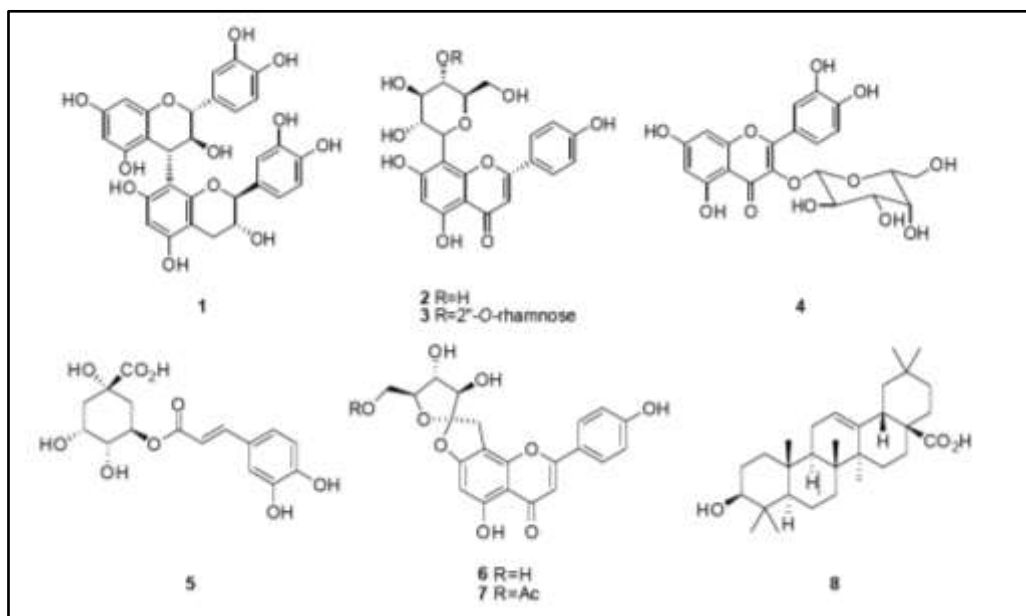


Figure 5: Chemical constituents structure.

Therapeutic uses

- It is thought to be helpful for arrhythmias, angina, coronary circulation issues, and congestive heart failure. It is used to treat hyper- and hypotension, atherosclerosis, hyperlipidemia, and Buerger's disease, and to raise cardiac output that has been decreased due to pulmonary disease. It also functions as a diuretic, sedative, astringent, anxiolytic, and antispasmodic. Hawthorn preparations are applied topically to treat frostbite, sores, and itching. For heart conditions of nerve origin, fresh fruit is beneficial.
- Extract of *C. oxyacantha* shoot possesses strong negative chronotropic, positive inotropic, and coronary dilatory effects. Leaf is used to treat hypertension.
- C. oxyacantha* also possesses antioxidant properties.
- The phenolic extract of its flower has antioxidative properties.

Mechanism of Action

Owing to its abundant flavonoid content, especially the OPCs, *Crataegus* has strong antioxidant properties. The extract from *Crataegus oxyacantha* has been demonstrated to have a cardioprotective effect by lowering oxidative stress in reperfused cardiac tissue and appearing to inhibit apoptosis. Furthermore, *Crataegus* improves coronary blood flow, which improves the heart's ability to utilize oxygen. Additionally, *Crataegus* extracts have a positive inotropic effect on myocyte contraction amplitude.¹⁰ *Crataegus* has a vasodilatory and cardiotropic effect at the same time. It can be used safely and effectively for cardiac conditions for which digitalis is not yet indicated because of these actions. Eleven The flavonoid content of this herb gives its extracts significant collagen-stabilizing effects that improve blood vessel integrity.

Anti-arrhythmic Activity

For its anti-arrhythmic potential, *Crataegus oxyacantha* extract was compared to other well-known cardioactive medications, such as ouabain, adrenaline, milrinone, and propranolol. In contrast to traditional cardiac medications, the extract displayed a distinct activity profile. Its extract demonstrated antiarrhythmic activity and seemed to be able to induce rhythmicity in quiescent cardiomyocytes. The commercial preparations of hawthorn also display comparable chronotropic properties. Additionally, the extract exhibited adverse chronotropic effects and did not result in β -adrenergic receptor blockade.

Myocardial Infraction

Crataegus extract (hawthorn) possesses a positive inotropic effect of amines such as phenethylamine, O-methoxyphenethylamine and tyramine. These amines were the cause of the *Crataegus* extracts' in vitro activity on the papillary muscle of guinea pigs (Wagner & Grevel, 1982). They also increased intracellular calcium, which prolongs the action potential and supports the extracts' inotropic activity (Kocylidiz et al., 2006). In a different study, it was

discovered that an alcoholic extract of *Crataegus oxyacantha* (AEC) preserved the antioxidant status of the mitochondria, reduced the enzymes of the Krebs cycle that isoproterenol induced in the rat heart, and shielded the mitochondria from lipid peroxidative damage.

Congestive Heart Failure

Cardiology makes extensive use of *Crataegus* (Blesken, 1992). In patients with heart failure NYHA class II, the standardized extract of fresh berries from *Crataegus oxyacantha* L. and *Crataegus monogyna* Jacq. (*Crataegisan*®) has demonstrated a strong effect. For eight weeks, three times thirty drops of the extract or a placebo were given orally to 143 patients. According to the findings, patients' heart failure condition significantly improved when receiving long-term therapy with a standardized extract of fresh *Crataegus* berries (Degenring et al., 2003). In a different investigation, the *Crataegus* extract WS 1442 directly affected the platelet-derived growth factor receptor (PDGFR-beta) to prevent balloon catheter-induced intimal hyperplasia in the rat carotid artery. The outcomes suggested that polyphenols may be in charge of reducing post-angioplasty restenosis.

Dosage

During the first two weeks of supplementation, positive effects are typically seen. As a cardiac tonic, *Crataegus* is typically taken over extended periods of time. The concentration of the extract determines the dosage. An extract standardized to contain 1.8 percent vitexin-4 rhamnoside is usually administered at three doses per day at a therapeutic dose of 100–250 mg. Doses of a standardized extract containing 18% OPCs are administered daily in the range of 250–500 mg.

Conclusion

Significant pharmacological activities of the *Crataegus* species, members of the Rosaceae family, were highlighted by the review paper's discussion of the species' medicinal properties.

Pharmacological experiments conducted on animals or in vitro models reveal its potential as an antioxidant, immunostimulant, antidiabetic, cytotoxic, gastroprotective, hepatoprotective, hypotensive, and cardioactive agent. These pharmacological actions may be brought on by the presence of bioflavonoids such as polysaccharides, triterpenes, oligomeric procyanidins, and other active substances.

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