



The Genus *Ormocarpum*- A miracle herb with biomedical properties – A systematic review

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Abstract

Background: *Ormocarpum* genus is a medicinal herb which has lots of varieties of species of biological importance towards human health. *Ormocarpum Cochinchinense* (OC) is one of the species of *Ormocarpum* genus which has been used in the treatment of bone fractures. There is very little evidence in the literature about the biomedical properties and the phytochemicals that are present in the herb and the genus *Ormocarpum*. This review was written with the intention to summarize all the properties and medicinal applications of the herb *Ormocarpum*.

Objective: To summarize the medicinal properties of the herb *Ormocarpum* genus and *Ormocarpum Cochinchinense*.

Methods: A literature search was done in 2 databases, Google Scholar and Pubmed Search engine. The search descriptors that were used were *Ormocarpum*, *Ormocarpum* OR Phytochemicals OR Phytochemical AND *Ormocarpum* and Bone repair OR Bone healing.

Results: 17 articles met the eligibility criteria. Out of 25 varieties in the genus *Ormocarpum*, only 5 species of the genus *Ormocarpum*, information related to pharmacological actions, biological activity and phytochemicals are available in the published literature.

Conclusion: *Ormocarpum* genus has species of herbs that are used mainly for antioxidant, antimicrobial, and anticancer activities. Out of all the species only *Ormocarpum Cochinchinense*, *Ormocarpum Sennoides* and *Ormocarpum trichocarpum* are used in the treatment of Bone fractures. Scientific exploration like randomized clinical trials of the genus *Ormocarpum* is needed to claim the traditional pharmacological benefits of the herb.

Key words: *Ormocarpum Cochinchinense*, Phytocompounds, Bone Repair, Bone healing

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Introduction

Ormocarpum genus is belongs to family Fabaceae-Papilionoideae. This genus has more than 25 varieties of species. The species that are available in literature are *Ormocarpum Cochinchinense* (Lour.) Merr (OC), *Ormocarpum Sennoides* (OS) which has 2 subspecies – (*Zanzibaricum* and *Hispidium*), *Ormocarpum Kirkii* S.moore, *Ormocarpum Keninse* Gillet and *Ormocarpum trichacarpum* (Taub.) Engl.^{1,2} The genus *Ormocarpum* is known for the rich natural source of phytoconstituents in the herb. The parts of the plant mainly used for medicinal uses are bark, stem, root, and leaves. *Ormocarpum Cochinchinense* is a miracle herb which is used in the treatment of bone fractures by traditional bone setters. There is very little evidence in the literature about the genus *Ormocarpum*. The secondary metabolites that are present in the *Ormocarpum* are – Flavonoids, Biflavanoids, Phenols, Phytosterols and Coumarins.^{3,4} There is a wide range of pharmacological actions of the herb like antiplasmodial, Inhibition of acetylcholinesterase enzyme was one of the

properties of the Fabaceae species and also has anti-inflammatory, antimicrobial, antioxidant, antiparasitic, cytotoxic, hepatoprotective and immunomodulatory activities.⁵

These medicinal plants are used in the treatment of headaches, gastric disturbances, sexually transmitted diseases, and antimicrobial effects.⁶ Though there are 25 varieties of the genus *Ormocarpum* only a few species' biological applications are available in the literature.⁷ The main intention of the review is to summarize the biological, phytochemical and properties of the genus *Ormocarpum*.

Materials and Methods

The PRISMA (Preferred Reporting Items for Systematic Reviews and Metanalysis) method was used to find all the relevant studies to be included in the systematic review. 2 electronic databases – PubMed/Medline and Google Scholar- were searched. The descriptors that were used in PubMed/Medline were searched in Title and Abstract with search terms -((((Ormocarpum[Title/Abstract])) OR (phytochemicals[Title/Abstract])) OR (Phytochemical[Title/Abstract])) AND (ormocarpum[Title/Abstract] AND bone repair[Title/Abstract] OR Bone healing[Title/Abstract]). In Google Scholar, articles were searched for the term *Ormocarpum* to get all relevant articles that contained the word *Ormocarpum*. For the past five years, from 2018 to 2023, only English-language studies were included. The final search was conducted on June 29, 2023. Up until June 2023, all pertinent full-text papers were included in the systematic review.

Screening and Eligibility for Records

Following the screening of study titles and abstracts, the eligibility of all potentially pertinent studies was assessed in the entire text in accordance with predetermined inclusion and exclusion criteria. Only studies which mentioned the applications of the herb *Ormocarpum* was selected and summarized in this review.

Inclusion criteria

All the full-text articles that were published in the English language within the specified time period of 5 years that contained *Ormocarpum* word in the title or abstract with studies that describe the use of *Ormocarpum* species herb in biological and pharmacological applications.

Exclusion criteria

Plants other than *Ormocarpum* species, other languages, conference proceedings, book series, chapters, letters to editors and not accessible articles were excluded. The researchers independently assessed eligibility and differences were settled by consensus.

Results

A total of 390 articles were located for preliminary evaluation using manual and electronic database searches. Of 390 articles, 2 were obtained from PubMed/Medline and 388 from the Google Scholar search engine. A total of 385 articles were subjected to a full-text review after the removal of duplicates (n=5). 368 were excluded and the reasons for excluding articles are listed in Figure 1. Inclusion and exclusion criteria were met by 17 articles.

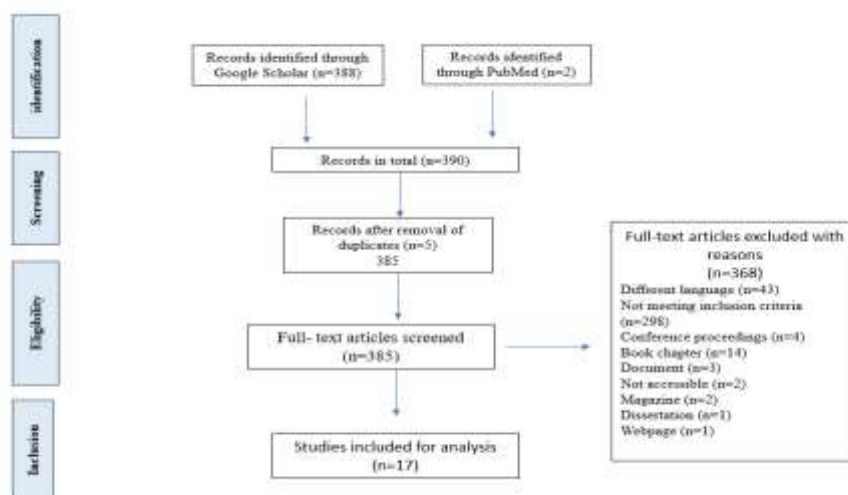


Figure 1: Prisma Flow chart

Table 1: Biological uses of the *Ormocarpum* herb

Sl no	Plant species	Parts used	Biological uses
1.	<i>Ormocarpum Kirkii</i> S.moore	Dry leaves,root	Antifungal, headache, reduce edema, fever, stomach pain, malaria, antibacterial, rheumatism
2.	<i>Ormocarpum keninse</i> Gillet	-	Not reported
3.	<i>Ormocarpum trichocarpum</i> (Taub.) Engl	Stem bark, leaves	To stop bleeding in pregnancy, ringworm infections, Sexually transmitted diseases, paralysis, stroke, diarrhea, tuberculosis, antibacterial, antifungal, antiplasmodial, bone setting
4.	<i>Ormocarpum Cochinchinense</i> (lour.)Merr	Leaves, root	Bone fractures, Lumbago, nervous pain, paralysis, In-vitro antioxidant and In-vitro anti-inflammatory activities
5.	<i>Ormocarpum Sennoides</i>	Leaves	Prenatal care, sexually transmitted diseases, convulsions, burns, bone fractures, bone implant material with osteogenic effects in animal model study, antibacterial, antioxidant and anticancer activities

Discussion

In this review, we have summarized the biological uses of the species of *Ormocarpum*. Though many medicinal herbs are reported in the literature, the information related to the *Ormocarpum* herb is limited. The biological used from the literature search are tabulated in Table 1. The genus *Ormocarpum* has over 25 species. *Ormocarpum Cochinchinense* (OC) is one of the species of herb which has lots of medicinal properties. OC is called Elumbu-ootti (Bone - to join) in Tamil. *O.sennoides* and *O.Cochinchinense* herb are used by traditional bone setters in Indian medicine in the form of paste formed by mixing powdered leaves with honey or milk which can be applied topically over the fracture site or by consuming orally.^{8,9} *Ormocarpum* has a rich source of phytochemicals like flavanoids, phytosterols, triterpenoids and coumarins. The main parts that are used in the *Ormocarpum*

herb for medicinal uses are the stem bark, roots and leaves. Studies done by Somashekar et.al reported that in-vitro anti-oxidant and in-vitro anti-inflammatory properties of *O.Cochinchinense* showed significant anti-oxidant and anti-inflammatory activities when compared to the standard.¹⁰ Phytochemicals analysed by GC-MS (Gas chromatography-Mass Spectroscopy) identified 24 bioactive compounds. The highest concentration compound was phytol with a Retention time (RT) of 61.94. Phytol followed by Phthalic acid and Hexadecanoic acid.¹¹ In-vitro antioxidant activities of endophytic fungi isolated from *O.Cochinchinense* showed a correlation between the phenolic content in the extracts and anti-oxidant activity.¹²

The *Ormocarpum* herb could be used as a source of antioxidant and anti inflammatory agents in the treatment of chronic inflammatory diseases. The effect of ethanolic leaves extract on in-vitro Cell viability on Mouse embryonic fibroblasts (3T3) showed an IC₅₀ value of 58.05 µg/ml. 85% of cell viability was seen in the concentration below 25 µg/ml of the herb OC.¹¹

A bone implant was fabricated in the composition of ethanolic leaves extract of *Ormocarpum senoides*, egg yolk, casein and biphasic calcium phosphate. The bone implant was characterized for physical and mechanical properties in an in-vitro and in-vivo study on an animal model. FTIR and XRD confirmed the peaks for Hydroxyapatite and beta-tricalcium phosphate, and the presence of functional groups like phenols, anthocyanins, tannins and flavonoids. Animal studies on rat models showed evidence of bone formation histologically and radiographically at the 3rd-month post-operative period.⁹ A comparative analysis between in-vitro-grown callus and in-vivo-grown plants of aqueous, methanol and ethyl acetate extract showed phytochemicals that can be used in drug development. The presence of phenolic compounds may be responsible for anti-

oxidant and antimicrobial activities. Methanol extract of *O. Cochinchinense* was reported to have good antibacterial activities.¹³ The chemical compounds called bioactives or phytoprotectants are mainly responsible for the pharmacological actions of medicinal herbs.¹⁴ Plant extracts were successful in the treatment of bone defects. There was the release of anti-inflammatory mediators which accelerated bone healing.¹⁵ Studies also suggested that the use of plant extracts could be an alternative to conventional medicine and could be a novel viewpoint in drug development. Phytoestrogens which are present in plant extracts like flavonoids, lignins, and Isoflavones have pharmacological action like estrogens in healing bone lesions.¹⁶ The effect of the phytochemicals on bone healing could be a synergetic effect or antagonist effect based on the methods of extraction, the solvents used and the geographical distribution of the plants.¹⁷

Conclusion

Ormocarpum genus has a wide variety of pharmacological actions and biological activities. Only 5 species information is available in the literature. The species *Ormocarpum cochinchinense* is a miracle herb with properties of bone healing. There is a need of randomized clinical trials to be conducted to procure evidence to prove the osteogenic potential of the herb. The literature evidence available related to the genus *Ormocarpum* are mainly focused on the phytochemicals and its biological activities, but to the best of my knowledge, there are no documented clinical trials which show evidence of bone formation with detailed information on the dosage of the herb, the scientific reasoning of the potential use in bone formation. The genus *Ormocarpum* requires scientific exploration to claim the traditional benefits of the herb.

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