

## Oral Supplement of Ferulic Acid from *Parthenium* sp. to Treat UV Induced Skin Damage

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### Abstract

Our skin is daily exposed to UV rays from the sun and other sources that cause extensive generation of Reactive Oxygen Species (ROS). These can react with DNA, protein, fatty acids and saccharides causing oxidative damage. These processes can cause photo aging and skin cancer development. Oral supplements of Ferulic acid (FA) can be made which can act against the Reactive Oxygen Species (ROS) produced in the process. Though Ferulic acid can be extracted from a wide range of sources, we chose *Parthenium* sp. because it is economic and easily available [1].

**Keywords:** UV Rays; Reactive Oxygen Species; Ferulic Acid; *Parthenium*; DNA

### Introduction

Around 13 million people in the world are affected by UV induced skin damage. Till now there has been a lot of products in the market to treat this but most often they are quite expensive. Hence, while looking for an alternative approach, a very powerful anti-oxidant, Ferulic acid can be used to act against this condition.

Ferulic Acid (also known as 4-hydroxy-3-methoxycinnamic acid), is a low molecular weight compound. It is usually found both in free and covalently bound form and provides rigidity to the cell wall. It is usually present in a variety of sources like bamboo, rice bran etc. but we chose *Parthenium hysterophorus* as our source for extraction [2].

It is considered as a very poisonous weed but due to its high abundance all over the globe, low economic value and growth under harsh conditions it acts as a perfect source. Though topical solutions of Ferulic Acid are being used gradually, oral supplements of Ferulic Acid from *Parthenium* sp. can be produced which may prove to have an efficient mode of action.

### Materials

- *Parthenium* Weed
- NaOH
- Rotary Shaker

- Centrifugation Unit
- HCl
- Ethyl Acetate
- Acetonitrile/Water

### Methodology

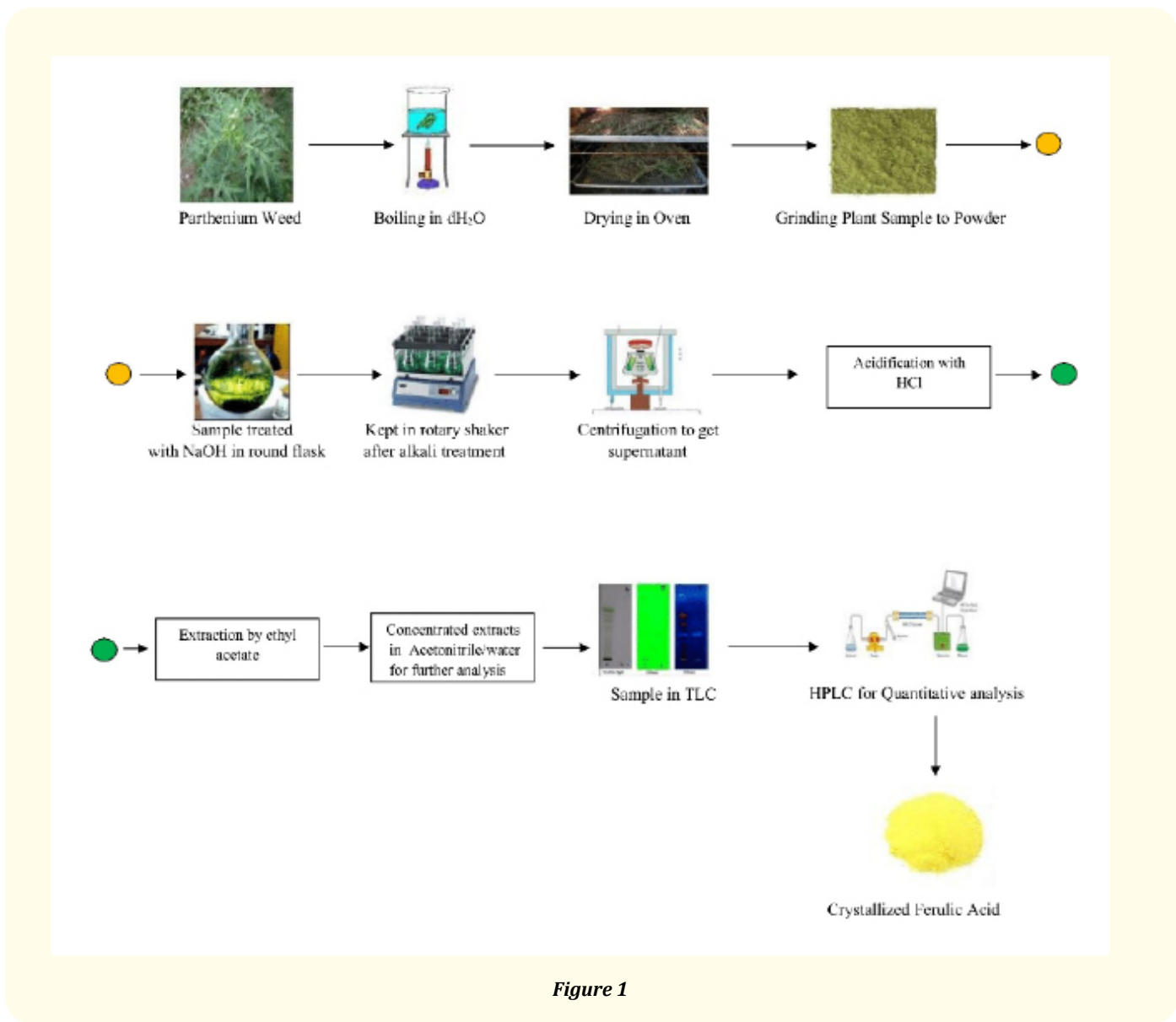


Figure 1

Mechanism of action

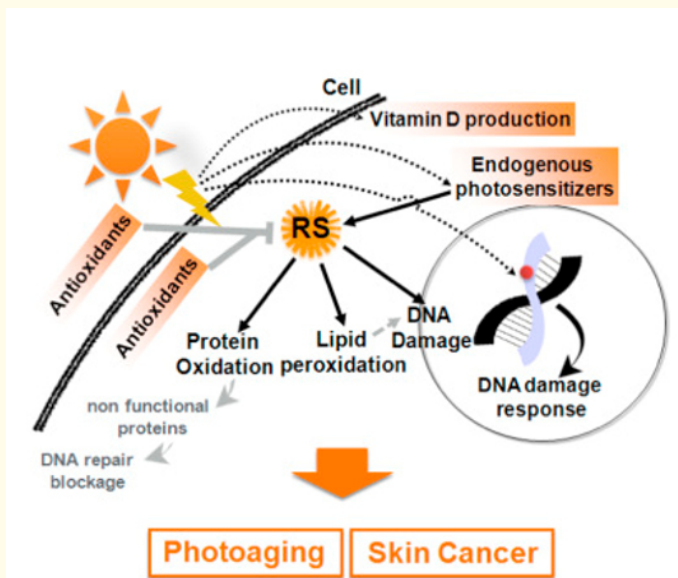


Figure 2: Action of UV on skin.

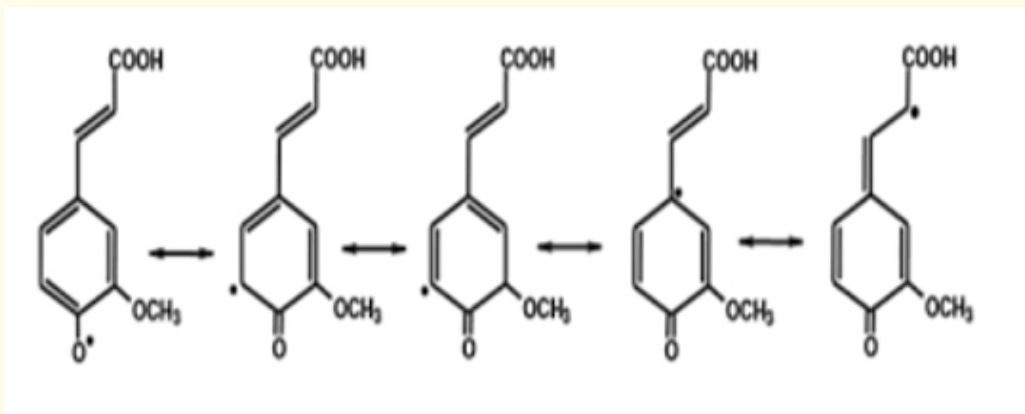


Figure 3: Action of ferulic acid as an antioxidant.

Results and Discussion

At the molecular level, UV irradiation causes DNA damage such as cyclobutane pyrimidine dimers and (6 - 4) photoproducts, which are usually repaired by nucleotide excision repair (NER). Chronic exposure to UV irradiation leads to photoaging, immunosuppression and ul-

timely photocarcinogenesis. Photocarcinogenesis involves the accumulation of genetic changes, as well as immune system modulation and ultimately leads to the development of skin cancers. In the clinic, artificial lamps emitting UVB (280 - 320 nm) and UVA (320 - 400 nm) radiation in combination with chemical drugs are used in the therapy of many skin diseases including psoriasis and vitiligo. Although such therapy is beneficial, it is accompanied with undesirable side effects. Thus, UV radiation is like two sides of the same coin--on one side, it has detrimental effects, and on the other side, it has beneficial effects [3-5].

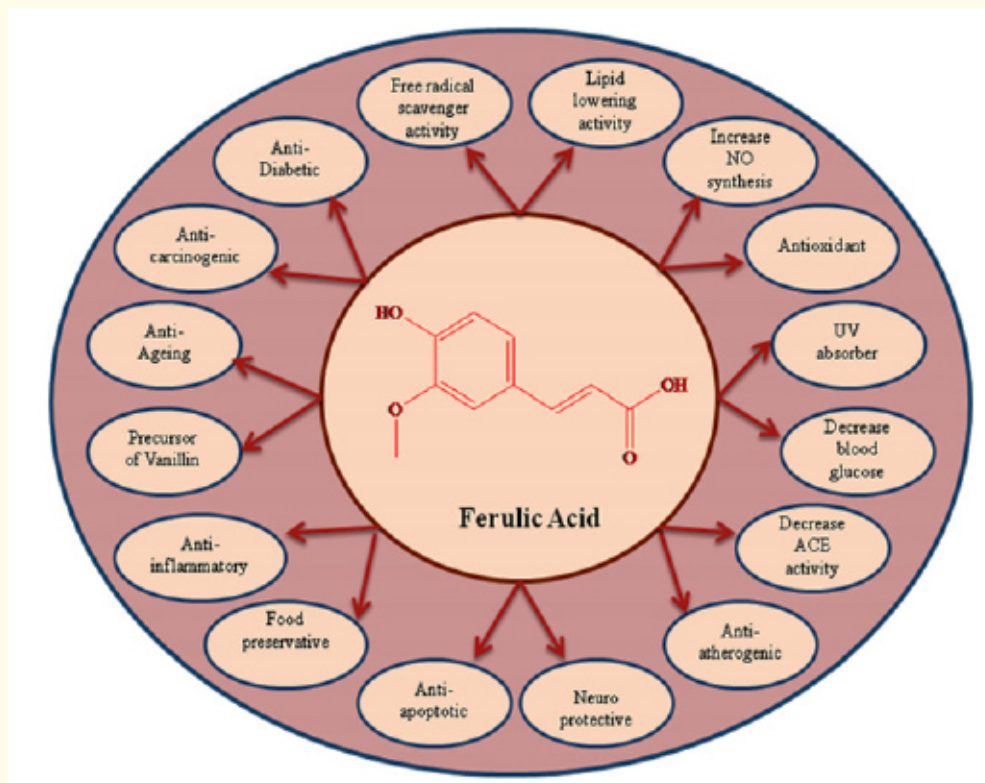
FA is an effective scavenger of free radicals and it has been approved in certain countries as food additive to prevent lipid peroxidation. It effectively scavenges superoxide anion radical and inhibits the lipid peroxidation. It possesses antioxidant property by virtue of its phenolic hydroxyl group in its structure. The hydroxy and phenoxy groups of FA donate electrons to quench the free radicals. The phenolic radical in turn forms a quinone methide intermediate, which is excreted via the bile. The past few decades have been devoted to intense research on antioxidant property of FA. So, the present review deals with the mechanism of antioxidant property of FA and its possible role in therapeutic usage against various diseases [6].

### Significance

- This supplement provides meaningful synergistic protection against oxidative stress in skin [4].
- Anti-oxidant and anti-carcinogenic effect against hyper-pigmentation during radiation therapy to treat cancer.
- Use of *Parthenium* sp. as the source for FA, helps in reduction of environmental stress caused by this poisonous weed.
- Oral supplement can work better than topical ones as FA can stay longer in blood. FA obtained from *Parthenium* sp. is very cost effective as compared to other sources.



**Figure 4:** Hyperpigmentation due to radiation therapy.



**Figure 5:** Properties of ferulic acid.

## Conclusion

Oral supplements of Ferulic Acid obtained from *Parthenium* sp. has the potential to treat UV induced skin damage, hyperpigmentation and several skin cancers. Further, because of the source from which it is obtained, it can be extremely cost effective.

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