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ROSE HIP SEED OIL ACTS AS AN ANTI-INFLAMMATORY AGENT

***Dr. Dhrubo Jyoti Sen, Subhanjana Guha, Anirbita Ghosh, Barnamoni Saha, Souradip Mandal and Dr. Beduin Mahanti**

Department of Pharmaceutical Chemistry, School of Pharmacy, Techno India University, Salt-Lake City, Sector-V, Kolkata-700091, West Bengal, India.

***Corresponding Author: Dr. Dhrubo Jyoti Sen**
Department of Pharmaceutical Chemistry, School of Pharmacy, Techno India University, Salt-Lake City, Sector-V, Kolkata-700091, West Bengal, India.

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ABSTRACT

Rose hip seed oil is extracted from the seeds of the wild rose bush (Rosa moschata or Rosa rubiginosa) or from Rosa canina, Rosa moschata or Rosa rubiginosa are found to grow in the regions of Southern Andes while the Rosa canina species mainly grown in regions of Europe and South Africa. Unlike rose oil, which is extracted from rose petals, rosehip oil is pressed from the seeds of the rose plant. The fruits and seeds of the rosehip have been used in folk medicine for a long time. The rose hip seed oil is rich in polyunsaturated fatty acids, linoleic acid (54.05%), linolenic acid (19.37%), and phytosterols, mainly β-sitosterol (82.1%). It also contains phytochemicals such as phenolic compounds (2554 µg/g), carotenoids (2.92 µg/g), and ascorbic acid (1798 µg/g). It also contains anthocyanin and vitamin E, an antioxidant known for its anti-inflammatory effects. Thus, it has been tested that the rose hip seed oil can be quite beneficial as an anti-inflammatory agent. Besides, they can combat against the common cold, infectious diseases, gastrointestinal disorders, urinary tract diseases as well. Benefits from of this kind of therapy are not unexpected, since natural products have always been an ample source of new medical compounds.

KEYWORDS: Rose hip seed, Linoleic acid, Omega-3-fatty acid, Linolenic acid, Omega -6-fatty acid, anti-inflammatory, antioxidants.

INTRODUCTION

Rose hip seed oil is produced from the seeds of the rose bush of the species *Rosa moschata* or *Rosa rubiginosa* (found in Southern Andes) or from *Rosa canina* (found in South Africa and some regions of Europe). It has been tested to possess anti-inflammatory properties and are rich in polyunsaturated fatty acids like linoleic acid, omega-3-fatty acid, linolenic acid, omega-6-fatty acid and valuable antioxidants like carotenoids, tocopherols (mainly β-sitosterol) and ascorbic acid. Due to its phytochemical composition, rose hip is an interesting therapeutic option for those disorders which involve oxidative stress and/or a pro-inflammatory status.[1]

Figure-1: Rose hip seed & oil.

Omega-3-fatty acid in rosehip seed oil

- Rose hip oil contains an abundant amount of linoleic acid (54.05%), which (α-linolenic acid: ALA) in turn is the precursor of omega 3 fatty acids.
- Rosehip Oil is extremely high in unsaturated essential fatty acids including Omega 3 fatty acids and Omega 6 and it is important to have a balanced

omega 3 fatty acids and Omega 6 fatty acids intake to stay away from chronic diseases.

- This oil is extremely high in omega oils which our body cannot make but should be supplied to the body as part in the form of a healthy diet or applied topically.[2]

Biochemistry

- Omega−3 fatty acids (also called Omega-3 oils, ω−3 fatty acids or n−3 fatty acids) are polyunsaturated fatty acids (PUFAs).

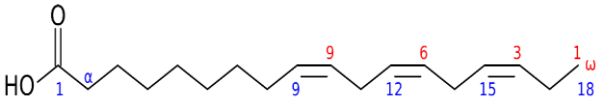


Figure-2: α-linolenic acid.

- It is grouped into three types of fats, such as ALA (Alpha Linoleic acid), which is mostly present in plant oils, EPA (eicosapentaenoic acid), DHA (docosahexaenoic acid).

How does it work?

- A tentative evidence had been found out suggesting the role of omega 3 fatty acids in prevention of inflammations. Recently, the functional role of omega-3 fatty acids in pain regulation has been the focus of many studies including those investigating the inhibitory effect of omega-3 fatty acids on inflammatory pain associated with rheumatoid arthritis.[3]
- Because omega-3 fatty acids inhibit the production of inflammatory cytokines, they may regulate pain via an anti-inflammatory mechanism. Rose hip oil shows its efficacy in curing Rheumatoid arthritis too.
- The recommended ratio of omega-6-fatty acids to omega-3-fatty acids ranges from 1:1 to 4:1. Higher percentage of polyunsaturated fatty acids and the ratio of linolenic acid to linoleic acid may make rosehip-seed oil a valuable source for omega fatty acids.

Omega-6-fatty acid in rosehip seed oil

- The Rose Hip plant has been grown for centuries as a source of food and oil and for medicinal uses. Rose Hips are known to contain high levels of Vitamin C, about 12-14% oil which is rich in **Essential Fatty Acids**, making Rose Hip seed oil a valuable ingredient in both food and skin care.
- It contains about **40% omega 6 linoleic Acid** and about **30% omega 3 alpha linolenic Acid**. Both of these Essential Fatty acids play a key role in maintaining healthy body function and skin tissue.

Biochemistry

- **Linoleic acid** (18:2, *n*−6), the shortest-chained omega-6 fatty acid is an essential fatty acid because the human body cannot synthesize it.

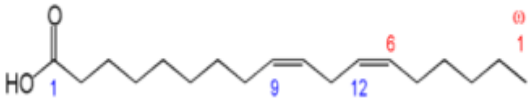
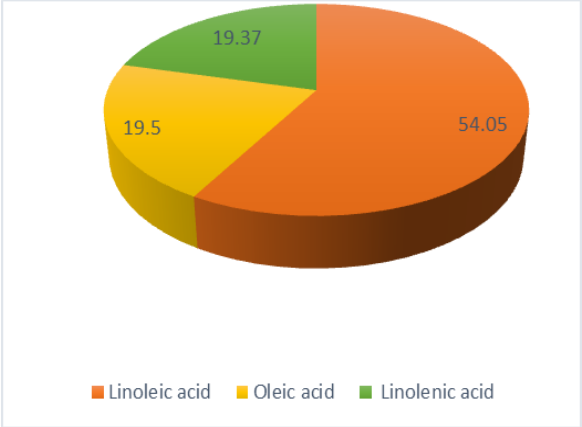


Figure-3: Linoleic acid.

- The chemical structure of linoleic acid, a common omega-6 fatty acid found in many nuts and vegetable oils.
- Closely related omega-3 and omega-6 fatty acids act as competing substrates for the same enzymes. This outlines the importance of the proportion of omega-3 to omega-6 fatty acids in a diet.
- Omega-6 fatty acids are precursors to endocannabinoids, lipoxins**,** and specific eicosanoids.
- Omega-6 fatty acid supplements comes from specific omega-6 fatty acids or plant oils containing omega-6 fatty acids.
- Omega-3 and omega-6 fatty acids are essential, they must be in the proper proportion for optimal nutrition. Western diets typically contain a ratio of 10 to 15 times more omega-6 fatty acids.
- They are '**essential**' which makes them beneficial in healthy amounts and in the right balance. But in high amounts, they can also can result in excess **inflammation** which makes them potentially disadvantageous and even disease-promoting.[4]

How does it work?

- Omega-6 fatty acids are found everywhere in the body. They help with the function of all cells.
- Humans are thought to have evolved with a diet of a 1-to-1 ratio of omega-6 to omega-3 and the optimal ratio is thought to be 4:1.
- A ratio of 2–3 omega-6 to omega-3 helped reduce inflammation in patients with rheumatoid arthritis·
- A high proportion of omega-6 to omega-3 fat in the diet shifts the physiological state in the tissues toward the pathogenesis of many diseases: prothrombotic, proinflammatory and proconstrictive.
- Chronic excessive production of omega-6 eicosanoids is correlated with arthritis, inflammation, and cancer. Many of the medications used to treat and manage these conditions work by blocking the effects of the COX-2 enzyme.
- A high omega-6 fatty acid diet inhibits the anti-inflammatory and inflammation-resolving effect of the omega-3 fatty acids. Thus, the interaction of omega-3 and omega-6 fatty acids and their lipid mediators in the context of inflammation is complex and still not properly understood.[5]



Bar Chart-1: Percentage of the main fatty acids present.

Linoleic acid in rosehip seed oil

- Rose hip seed oil contains a fairly high amount of linoleic acid and low amounts of oleic acid. Research has shown that the skin surface lipids of acne-prone individuals are predominantly composed of oleic acid and deficient in linoleic acid structure.
- Oils with a high linoleic acid content will also go off pretty quickly. The antioxidants in rosehip oil help keep it from going rancid quite as quickly, but most linoleic acid-rich oils will only have a 3-6 months shelf life (***Trilogy Rosehip Oil Antioxidant)***, since it has antioxidants in it, actually has an incredible shelf life of 3 years.
- Rosehip oil isn't the highest in linoleic acid, it's got one of the best ratios of linoleic to oleic acid.
- Linoleic acid, also known as the precursor of omega-6 fatty acid.

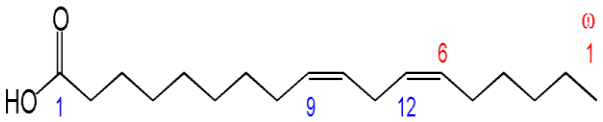


Figure-4: Linoleic acid.

- It's unsaturated, which means it tends to stay liquid at lower temperatures. Other unsaturated fatty acids include oleic, alpha-linolenic, gamma-linolenic and ricinoleic acids. There are also saturated fatty acids (lauric, myristic, palmitic, stearic) which are more common in solid fats.[6]
- The first step in the metabolism of linoleic acid is performed by Δ^6desaturase, which converts LA into gamma-Linolenic acid (GLA). GLA is converted to dihomo-γ-linolenic acid (DGLA), which in turn is converted to arachidonic acid (AA). One of the possible fates of AA is to be transformed into a group of metabolites called eicosanoids during the inflammatory response and during physical activity. Eicosanoids produced from AA tend to promote (not cause) inflammation and *promote* growth during and after physical activity in healthy humans.

Inflammatory response to dietary linoleic acid depends on *FADS1* genotype

- The effects of linoleic acid on the human body are largely dependent on genes. Linoleic acid is an essential fatty acid. People carrying different variants of the FADS1 gene had a different inflammatory response and different changes in their fasting glucose levels when supplementing their diet by linoleic acid (The FADS1 gene regulates the body's fatty acid metabolism and also plays a role in glucose metabolism).
- The metabolites of linoleic acid can mediate inflammation, which is why a high intake of linoleic acid is regarded as a plausible factor contributing to low-grade inflammatory state.[7]

Linolenic acid in rosehip seed oil

- Linoleic acid (LA) is a polyunsaturated omega-6 fatty acid and is one of two essential fatty acids for humans, who must obtain it through their diet. It is a colorless or white oil that is virtually insoluble in water.

Structure: It is a **carboxylic acid** with an 18-carbon chain and three cis double bonds. The first double bond is located at the third carbon from the methyl end of the fatty **acid** chain, known as the n end. Thus, α-**linolenic acid** is a polyunsaturated n−3 (omega-3) fatty **acid**.

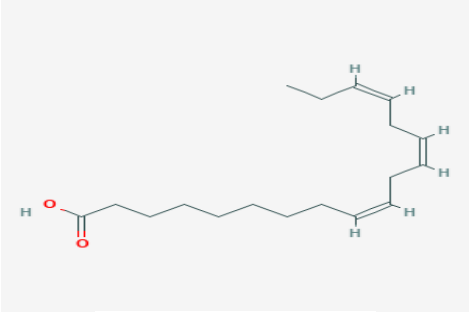


Figure-5: Linolenic acid.

Linolenic acid as anti-inflammatory agents: Rosehip oil contains substantial UFAs [unsaturated fatty acids]. The most abundant fatty acid is linoleic acid (35.9–54.8%), followed by α-linolenic acid (16.6–26.5%), and oleic acid (14.7–22.1%). An appreciable number of lipophilic antioxidants is present, especially the tocopherols and carotenoids. Rose hip oil also contains high level of phenolic acids, especially p-coumaric acid methyl ester, vanillin, and vanillic acid. Due its high composition of UFAs and antioxidants, this oil has relatively high protection against inflammation and oxidative stress. Shabikin et al. has tested the efficacy of topical rose hip seed oil together with an oral fat-soluble vitamin on different inflammatory dermatitis such as eczema, neurodermatitis, and cheilitis, with promising findings of the topical use of rose hip seed oil on these inflammatory dermatoses.[8]

How it works

- Alpha Linolenic Acid or ALA is considered an essential fatty acid because it is required for human health, but cannot be synthesized by humans. It is in fact a plant-derived fatty acid. Humans can synthesize other omega-3 fatty acids from ALA, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). EPA is a precursor of the series-3 prostaglandins, the series-5 leukotrienes and the series-3 thromboxanes. These eicosanoids have anti-inflammatory and anti-atherogenic properties. ALA metabolites may also inhibit the production of the pro-inflammatory eicosanoids, prostaglandin E2 (PGE2) and leukotriene B4 (LTB4), as well as the pro-inflammatory cytokines, tumor necrosis factor-alpha (TNF-alpha) and interleukin-1 beta (IL-1 beta). Omega-3 fatty acids like ALA and its byproducts can modulate the expression of a number of genes, including those involved with fatty acid metabolism and inflammation. They regulate gene expression through their effects on the activity of transcription factors including NF-kappa B and members of the peroxisome proliferator-activated receptor (PPAR) family. Incorporation of ALA and its metabolites in cell membranes can affect membrane fluidity and may play a role in anti-inflammatory activity, inhibition of platelet aggregation and possibly in anti-proliferative actions of ALA. ALA is first metabolized by delta6 desaturase into steridonic acid.[9]

ANTIOXIDANTS PRESENT IN THE ROSEHIP SEED OIL

There are also lipid-soluble antioxidants present in them, such as carotenoids and tocopherols. The carotenoids impart a distinct orange to red colour of rose hips. β-carotene and lycopene are present in appreciable amounts, followed by β-cryptoxanthin, rubixanthin, zeaxanthin and lutein.

Tocopherols, α-, β-, γ-, and δ-isomers, and tocotrienols have vitamin E activity and they are compounds with ability to scavenge free radicals, and even tocopherols can be considered as the most important natural antioxidants. It is proved that these antioxidants have beneficial effects in degenerative inflammatory diseases such as atherosclerosis.

CONCLUSION: Research suggests, Rosehips could provide new ways to combat quite a few inflammatory diseases.[10]

- Experts now believe that rosehip ingredients may combat;
  - Rheumatoid arthritis,
  - Crohn's disease and
  - Heart disease. All these conditions are inflammatory diseases.
- The anti-inflammatory benefits of rosehip oil may make it a good option for people who cannot take nonsteroidal anti-inflammatory drugs (NSAIDs) or other pain medicines.

OSTEOARTHRITIS: A herbal remedy called LitoZin, made from the ground up seeds and shells of hips from the dog rose, *Rosa canina*, had a big impact on pain suffered by osteoarthritis patients. It has been reported a significant reduction in pain after taking the supplement for three weeks. The findings, published in the Scandinavian Journal of Rheumatology last year, followed a Norwegian study which found that restricted movement caused by osteoarthritis was reduced by 40% in patients taking LitoZin. It is three times more effective than standard paracetamol at relieving pain and 40% more effective than Glucosamine. Rosehip oil is a folk remedy for arthritis and joint pain. Studies showed that rosehip powder reduced osteoarthritis pain better than placebo with no adverse side effects.

- RHEUMATOID ARTHRITIS: Different combinations of non-steroidal anti-inflammatory drugs (NSAIDs), disease-modifying anti-rheumatic drugs (DMARDs) and biologic agents are used for the treatment of symptoms. However, new drugs are needed since some patients do not respond successfully and the traditional treatments cause serious side effects in others. Unlike nonsteroidal anti-inflammatory drugs (NSAIDS) and aspirin, rosehip has combats inflammations that do not have ulcerogenic effects and do not inhibit platelets nor influence the coagulation cascade or fibrinolysis.

1. The active anti-inflammatory agent in LitoZin is a patented compound called GOPO which causes reduction in peripheral blood polymorphonuclear leucocytes, neutrophils, monocytes migration as well as reduction in C-reactive Protein.
2. The fatty acids present brings about inhibition of COX-1 and COX-2 and reduction of pro-inflammatory cytokines and chemokines CCL5 (RANTES), IP10 (CXCL) production.
3. The antioxidants present prevents release of macrophages as well as protects against cell apoptosis.

- CROHN'S DISEASE – It is an anti-inflammatory bowel disease and LitoZin is found to treat the symptoms of the Crohn's Disease. Rosehips - which contain a particular type of galactolipid - have a specific anti-inflammatory action. A standardised rosehip powder has been developed to maximise the retention of phytochemicals. This powder has demonstrated antioxidant and anti-inflammatory activity as well as clinical benefits in conditions like inflammatory bowel disease. It has been tested that rosehip seed oil is beneficial in treating inflammatory dermatitis such as eczema, chelitis and neurodermatitis as it is rich in unsaturated fatty acids and antioxidants.

- Obesity can be basically classified as an inflammatory process, since adipocytes dysfunction results in an increased production of pro-inflammatory cytokines. Focusing on the potential benefits of rose hip for obesity prevention, Ninomiya et al. reported the anti-obesity properties of *trans*-tiliroside (kaempferol 3-*O*-(6″-*p*-coumaroyl)-β-glucoside), a glycosidic flavonoid contained in *Rosa canina*. This supplementation contributed to reducing the levels of abdominal visceral fat without any undesirable side effects.

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Subhanjana Guha **Anirbita Ghosh** **Barnamoni Saha** **Souradip Mandal**

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