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FORMULATION AND EVALUATION OF ANTIARTHRITIC HERBAL CHOCOLATE: A REVIEW

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Abstract

Anti arthritic Herbal chocolate it is selected by medicinal herbs with proven anti inflammatory and antioxidant property such as Turmeric (Curcuma Longa), Ginger (Zingiber officinale), Ashwagandha (Withania Somnifera) they are rich in flavonoids.They can enhance therapeutic efficacy through the synergestic antioxidant activity while improve patient safety to pleasant or good taste of chocolate. It is easy to chew and absorb easily in every humans. The formulated chocolate show significant inhibition of protein denaturation indicates potent antiarthritic potential. The formulations are evaluated by stability invitro antiarthritic acting protein denaturation and membrane stabilization assays.It is derived from the cocoa mixed fat. Sesame is herbal drug having some medicinal properties like anti arthritis property, antioxidant property. It can prevent rheumatoid arthritis Sesame used to improve the blood pressure and this sesame we have to formulate the chocolate for the extraction process. So, it is patient friendly and approach for manage the arthritis.

***Keywords*:** Sesame, antioxidant property, flavonoids, chocolate, ayurveda.

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Introduction

Pharmacognosy is a branch of science that deals with the systemic "study of structural, physical, chemical and biological characters of crude drugs" obtained from natural origin like plant, animal, minerals and marine sources. Along with their history, cultivation, collection, preparation for the market and preservation. In simply phamacognosy literally means to "acquire the knowledge about drugs". Sesame (Sesamum Indicum)is the one of oil seed crops cultivated from 3000-4000 yrs for high nutrition and oil, belonging to family Pedaliaceae. It is grown in areas Asia, Africa and South America regions. These seeds are flat, oval and small with colours from white, yellow to black. It is Queen of oil seeds rich in oil (45-60%), Protein (20%) and contain Some nutrients and also some antioxidants such as sesamol, sesamolin. The oil is highly stable and primarly oleic and linoleic acid make it beneficial for heart health and prevent rancidity. It is also as china's four major oil crops and first discovered in ancient sites of Pakistan. In this seeds the major producers are India, Myanmar, and China. It is used in Ayurveda and folk medicines for the antioxidant, Skin nourishing properties [1]. It is highly demanded crop used for confectioneries, cosmetics and Pharmaceuticals. This sesame is making valuable crop for both therapeutic and nutritional applications. This analysis not only focuses the Phytochemical and Pharmacological properties of sesame, it is also focus the economic -Phytological and nutritional value of the sesame. Pharmacognosy is an important branch of pharmaceutical science that focuses on studying natural drugs obtained from plants, animals, minerals, and marine sources. It helps in understanding how these natural substances can be used for preparing medicines. It deals with various aspects such as: Identification: Recognizing natural drugs by their appearance, structure, and characteristics. Cultivation and Collection: Learning how medicinal plants are grown, harvested, and collected properly. Processing and Preservation: Studying how drugs are dried, stored, and protected to maintain their quality. Chemical Study Identifying the active chemical constituents present in natural sources that produce therapeutic effects. Biological and Pharmacological Study: Understanding how these drugs work in the body to treat diseases. Pharmacognosy also connects traditional herbal knowledge with modern scientific research. Many modern medicines, like morphine (from opium) and quinine (from cinchona bark), were discovered through pharmacognosy studies.In simple words, pharmacognosy teaches us how natural substances are used to develop safe and effective medicines. It plays a key role in discovering new drugs and improving healthcare through nature's resources.In

this we can study the chemical, botanical and therapeutic properties of sesame seeds and also utilizationfor formulation of products. We can extract sesame oil and bioactive compounds.To estimate quality, Stability and efficacy of the sesame formulations. It can identify and explain botanical characteristics of the sesame [2].

History of Pharmacognosy

The history of pharmacognosy is very rich and extends from ancient traditions to modern scientific discoveries. It represents the evolution of human knowledge about natural medicines and their healing powers. Pharmacognosy originated from the simple observation that certain plants, animals, and minerals could relieve pain and cure diseases. In the early ages, primitive humans used herbs and natural products by trial and error while searching for food. Over time, they began to recognize which plants were useful and which were poisonous [3]. This marked the beginning of medicinal knowledge, which was passed orally from one generation to another before being written down. The pre-historic era laid the foundation for herbal medicine. People used crude methods to prepare remedies, such as chewing leaves, boiling roots, and applying plant juices to wounds. Gradually, as civilizations developed, this knowledge was recorded in written form. The written history of pharmacognosy began in ancient civilizations such as Mesopotamia and Egypt. The Egyptians recorded their medical practices in the Ebers Papyrus (around 1600 B.C.), which mentioned more than 800 prescriptions and 700 drugs. This shows how early societies had already begun to study and document the properties of natural medicines.The Unani system of medicine, developed by Arabian scholars, further advanced the use of medicinal plants [4]. One of the most famous contributors, Ibn Sina (Avicenna), who lived between 980–1037 A.D., wrote the Kitab al-Shifa ("Book of Healing"), which included detailed information on herbs and diseases. The Ayurvedic system in India also played a major role in the history of pharmacognosy. It is one of the world's oldest medical systems, described in ancient Sanskrit texts such as Charaka Samhita, Sushruta Samhita, and Ashtanga Samhita. The word Ayurveda means "Science of Life," combining knowledge of the body, mind, and spirit to maintain health. In the Oriental system, countries like China, Japan, and Tibet developed their own herbal traditions. The Chinese emperor Shen Nung is known as the "Father of Chinese Medicine." He investigated hundreds of medicinal plants and wrote Pen T'sao, one of the earliest herbal records, which listed useful herbs and their healing properties. The Greek system also made a huge contribution to pharmacognosy. Hippocrates, known as the "Father of Medicine," promoted the use of natural remedies like honey, vinegar, and herbs. Aristotle, the "Father of Biology," described over 500 medicinal plants and emphasized studying nature scientifically. Theophrastus, a student of Aristotle and known as the "Father of Botany," gave the scientific basis for using plants as medicine [5].

During the 18th and 19th centuries, pharmacognosy entered the modern era, known as the "age of pure compounds." Scientists began isolating active ingredients from plants. Important discoveries included morphine from opium (1806), nicotine (1828), quinine and caffeine (1820), strychnine (1817), and cocaine (1855). In the 20th century, researchers isolated hormones and vitamins from animal sources, and Alexander Fleming discovered penicillin in 1928, which revolutionized medicine. Today, pharmacognosy continues to grow as an important science combining traditional knowledge with modern analytical techniques. It helps identify, isolate, and standardize natural compounds for safe and effective drug development. Thus, the history of pharmacognosy reflects humanity's long journey from using simple herbs to creating modern medicines derived from nature [6].

Herbal Therapy for the Treatment of Arthritis

Herbal medicines have been used since ancient times for the treatment of various diseases, and it is no exaggeration to state that their use is as old as humankind itself. These natural remedies have evolved from the accumulated therapeutic knowledge and experience of physicians practicing traditional systems of medicine over centuries. In recent years, researchers have shown renewed interest in plant-derived medicines, largely because many modern synthetic drugs are associated with undesirable side effects or high costs [7].

Nature provides an abundant source of medicinal plants distributed across the globe, offering valuable therapeutic agents for disease prevention and treatment [8]. According to the World Health Organization (WHO), nearly 80% of the world's population relies on herbal medicines for their primary healthcare needs. From the dawn of civilization, herbal remedies have played a vital role in maintaining human health.

The pharmacological activity of these plants is attributed to their bioactive chemical constituents, which exert specific physiological effects on the body. In India, herbal medicines have long been an integral part of officially recognized alternative systems of healthcare such as Ayurveda, Unani, Siddha, Homeopathy, and Naturopathy. The country is home to more than 2,500 plant species used as herbal medicaments, and for over 3,000 years, these plants have served either directly as folk remedies or indirectly in the formulation of modern pharmaceuticals [9].

Therefore, the study and documentation of traditional medicinal plants can lead to the discovery of new, effective, and affordable drugs. In this review, we have attempted to highlight Ayurvedic strategies employed in the treatment of rheumatoid arthritis (RA), emphasizing their potential to provide effective relief with minimal side effects.

Polyherbal Formulations for Arthritis [10]. Analgesics and non-steroidal anti-inflammatory drugs (NSAIDs) are widely used to alleviate pain and inflammation in both acute and chronic cases of rheumatoid arthritis (RA.. Although conventional therapies for RA are available, their long-term use is often associated with adverse effects and irreversible organ damage. Therefore, new therapeutic approaches have been developed to achieve an optimal balance between efficacy and safety.

In recent years, researchers have focused on developing safer and more effective medications derived from natural and oriental sources. Among these, polyherbal formulations-combinations of multiple herbal extracts-have gained attention for their potential to enhance therapeutic efficacy while minimizing side effects.

Rheum off Gold is a well-known polyherbal formulation commonly prescribed by Ayurvedic practitioners for the management of arthritis. Its anti-arthritic potential was demonstrated in Wistar rats using the Complete Freund's Adjuvant (CFA)-induced arthritis model. The treatment produced a significant reduction in arthritis index, paw thickness, and inflammatory biomarkers such as C-reactive protein, serum rheumatoid factor, and erythrocyte sedimentation rate (ESR), comparable to the effects of dexamethasone. These findings indicate that *Rheum off Gold* possesses notable anti-arthritic activity [11].

Similarly, aUnani polyherbal formulation, *Manjoon Suranjan*, was evaluated for its anti-arthritic efficacy using formaldehyde and CFA-induced arthritis models in rats. The results confirmed its significant anti-arthritic potential.

Another polyherbal preparation, Studdard, was also assessed for anti-arthritic and anti-inflammatory activity in Wistar rats using formaldehyde and adjuvant-induced arthritis models. The formulation, administered orally at doses of 150 mg/kg and 300 mg/kg, showed marked inhibition of inflammation and arthritis progression, supporting its potential as an effective anti-arthritic agent [12].

Crude Drug Details of Sesame

Botanical Name	:	Sesamum Indicum
Kingdom	:	Plantae
Species	:	SesamumIndicum
Family	:	Pedaliaceae
Genus	:	Sesamum
Synonyms	:	Beni, Benne seed, Benni, SesameEtc.,
Class	:	Dicotyledons
Order	:	Lamiales [13]

Morphological Characters

Leaves : 3-10 CM long and 2.5-4CM wide. Shape is a Vate and colour is Green covered with Fine Hairs.

Flowers : Bisexual, Axillaryand Tabular Flowers with White, Pink and Purple colour.

Fruit : 2-5CM long, 4 Compartments are present and Rectangular Capsule.

Seeds : 3-4CM length, colour has White, Black and Brown. Shape is Small, Flat and Oval.

Habit : Annual Herbaceous Plant with 30-150CM height.

Root : Well developed Tap Root System.

Extraction of Sesame Seeds

The main purpose is to minimize loss of nutrients and obtainpure sesame oil. It has various extraction Methods for extraction of sesame oil. Sesame oil can be extracted using different methods. One common technique is the Mechanical Extraction Method, where the sesame seeds are first cleaned, dried, and then crushed using a cold press or expeller machine at a temperature below 60°C. The pressure from the machine breaks the seed cells, releasing the oil. This oil is then filtered to remove solid residues and stored in an airtight container away from sunlight to maintain its quality. Another method is the Hydro Distillation Extraction Method. In this process, 30 grams of sesame powder is mixed with 400 ml of distilled water in a 500 ml glass flask until the powder is fully immersed. The mixture is then heated for 4 to 5 hours (though the document mentions 800°C, which seems incorrect and likely means a lower temperature). After heating, the oil is separated from the mixture using a separating funnel, which helps divide the oil and water since they are immiscible (do not mix).Lastly, the Aqueous Extraction Method involves making the seeds into a powder and soaking them in water or ethanol for 24 to 48 hours. After soaking, the mixture is filtered and concentrated under pressure. The resulting oil can then be used for pharmacological or medical studies [14].

Figure 01: sesame seeds

Materials

Solvent as ether, ethanol, filter paper, Beaker, weighing balance, rotary evaporatoretc.

Methods for Extraction

By Using Mechanical Extraction Method

Clean and dry the sesame seeds thoroughly and crushed by using the machine cold press or expeller machine at temperature below 60° C. So, where the pressure rupture the cells then release oil. The oil is obtain for filtered to remove solid residues. So finally stored in the air tight container and keep away from sunlight.

By Using Hydro Distillation Extraction Method

30g of sesame powder in 500 ml glass flask with 400 ml of distilled water is added until sample is immersed. So, this process continue for 4-5hrs at 800°C temperature after the oil is separated from extract by using the 500 ml separating funnel. So this separating funnel used to separate immiscible liquids [15].

By Using Aqueous Extraction Method

Seeds are making it powder and soak it in ethanol / Water for 24-48hrs. Then the mixture filtered and concentrate under the pressure. So, final product or oil used for the Pharmacological studies.

Formation of Chocolate

Sesame oil	:	5mg
Cocoa Powder	:	20g
Cocoa Butter	:	30g
Sugar	:	10g
Milk powder	:	15g
Vanilla	:	1g
Turmeric	:	3g
Emulsifier	:	1g

Method 1: Firstly clean and dry seeds and roast it, extract the oil by using cold press method, filter it and concentrate the extra to obtain the thick extract. Now melt the cocoa butter at 45-50°C and add cocoa powder and powdered sugar mix it

continuously to make smooth paste and now add milk powder if milk chocolate is preparing. Add seed extract into molten chocolate mixture and stir thoroughly at uniform dispersion. Cool the chocolate gradually at 28-32°C then again heat at 32°C for dark chocolate.Finally pour the chocolate mixture into molds and allow to cool and solidify at room temperature or refrigerator. So, demold the chocolate and wrap it by aluminium foil [16].

Figure 02: Herbal Chocolate

Evaluation Tests /Chemical Test:

1) Test For Carbohydrates :**Benedicts test** : Dissolve sample in water and add benedicts reagent heat the mixture in water bath for 5 minutes and observe colour [17].

Fehling's solution: Mix equal volumes of Fehling A and B solution and add sample then heat it and observe colour.

Iodine test: Add some drops of Iodine solution to the sample and observe the colour.

Table 01: Test for Carbohydrates

SL.NO	TEST	OBSERVATION	DETECTION
1	Benedicts Test	Green / yellow	Reducing Sugar
2	Fehling's Test	Brick red ppt	Reducing Sugar
3	Iodine Test	Blue -black colour	Starch

2) Test for Proteins

Biuret Test: Dissolve sample in water, add 2-3 ml of NAH. Now, add 1-2 drops 1% CUSO4 Solution and observe the colour.

Ninhydrin Test: Dissolve sample in water, add Ninhydrin solution and then heat the solution in water for 10 minutes and observe the solution [18].

3)Test For Amino Acids

Sakaguchi Test: Dissolve sample in water and add d- napthol solution and also add NAOBR Solution in drop wise shake it and observe them.

Blooming Test

1)Fat Bloom :When thin layer of fat crystals are formed on surface of the chocolate formulation. Then it cause the chocolate to lose gloss and soft white layer will appeared on it. Finally give finished product. It is caused by recrystallization of cocoa butter to surface [19].

2) Sugar Bloom: Rough and irregular layer are formed by top of chocolate. It is caused moisture absorption, dissolution on the surface and condensation.20When water is evaporated afterwards then sugar recrystallize irregular crystals on the surface. This give the chocolate has unpleasant look.

Medicinal Uses

Anti-Inflammatory And Antiarthritic :It Can Reduce The Inflammation And Oxidative Stress.

Hypo cholesterolemic : It Help To Lowers The Bad Cholesterol And Improve Them.

Antihypertensive: It Can Help In Reducing Blood Pressure And Improve Vascular Elasticity.

Skin And Hair Health: Used To Moisturize The Skin And Prevent The Dandruff.

Anti-Diabetic: It Help To Improve Glucose Metabolism And Sensitivity Of Insulin.

Bone Strength: It can prevent osteoporosis and strengthen the bones.

Industrial Uses:

- **Cosmetics Industry**: The ingredients in lotions, creams, massages have mild odour and smooth texture due to moisturizing and antioxidant.
- **Food Industry**: Used as preservation and antioxidant in food.
- **Paint And Lubricant Industry**: Used in Paints, Varnishes and Lubricants due to its stability and viscosity.
- **Invitro Anti - Arthritic Activity**: Denaturation of protein is main because for the inflammation and arthritis certain agent prevents denaturation and show anti arthritic properties.

Estimation: Prepare the solution, 0.2% BSA solution in tris buffer by maintaining the PH 6.4.Add different concentrations of sesame extracts to the test tubes contain BSA solution, then use diclofenac solution as standard reference drug.Incubate all these test tubes at 37°C for 20 minutes and then heat the test tubes at 70°C for 5 Minutes, due to denaturation after cooling turbidity is measured by using the spectrophotometer and finally collect the all test tubes. 21.22

So, Here ;

$$\text{Percentage Inhibition} = \frac{\text{A control} - \text{Asample}}{\text{A control}} \times 100$$

$$= \frac{Ac - At}{Ac} \times 100$$

Where,

Ac = Absorption of control;

At = Absorption of test sample.

Table 02: Percentage Inhibition

CONCENTRATION	% INHIBITION
100	35.2%
200	46.8%
300	59.5%
400	69.4%

The extraction of sesamum indium L Seed oil show the Phytochemical constituents like carbohydrates, proteins and amino acids are present [23, 24]. The characteristic pungent odor and potent medicinal efficacy of garlic are linked to sulfur-containing compounds such as allicin, alliin, ajoene,

diallyl disulfide (DADS), diallyl trisulfide (DATS), and S-allyl cysteine (SAC) [25].

Conclusion

Sesame Seed oil contain high amount of nutrient natural product with medicinal, nutritional and cosmetic value. It consists of some fatty acids, antioxidants like sesamin, and vitamins like Vite. So, they can contribute antioxidant and antimicrobial activity will strong. It is important for tradition and also modern medicine for managing skin health and cardiovascular conditions and also support the functions of joints. It is also an effective carrier for wound healing activities. So, the sesame seed oil is variable natural remedy and it is a safe, effective, supportable option for promoting the human health and wellness. It has various extraction Methods for extraction of sesame oil. Sesame oil can be extracted using different methods. One common technique is the Mechanical Extraction Method, where the sesame seeds are first cleaned, dried, and then crushed using a cold press or expeller machine at a temperature below 60°C. The pressure from the machine breaks the seed cells, releasing the oil.

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Conflict of Interest

Authors are declared that no conflict of interest.

Inform Consent and Ethical Statement

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Author Contribution

All Authors are contributed equally.

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