



A Critical Review on Health Promoting Benefits of Sana Makki (Senna Alexandrina)

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Abstract

A plant with a long history of therapeutic usage is senna alexandrina, occasionally referred to be senna or Alexandrian senna. This paper thoroughly examines Senna alexandrina's many pharmacological traits and therapeutic uses, emphasizing its relevance in both conventional and contemporary medicine. The plant is a crucial component in many herbal laxatives due to its active components, especially anthraquinone glycosides, which have strong laxative effects. Recent study has shown its potential to manage a variety of health issues in addition to its well-established usefulness in relieving constipation. Currently with the discovery of modern drugs and their significance, natural products-based drugs are also looked for their potency in treating various microbial and other infections. Senna alexandrina is an evergreen shrub grown throughout the year. It has antimicrobial and anti-inflammatory properties. It is commercially grown in Pakistan, India, Sudan, and Egypt. It has been used in Indian conventional-medicine for its good pharmacological effects. The objectives of current review are to discuss the chemical components, uses and potential effects on human health of senna plant. This paper provides a thorough examination of Senna alexandrina's medical significance, highlighting the plant's numerous therapeutic uses. Understanding the scientific underpinnings of the plant's conventional application is essential for optimizing its advantages and reducing any possible hazards as interest in natural medicines rises.

Key words: Senna Alexandrina, History, Phytochemistry, Beneficial Impact on human health.

Introduction

Medicinal herbs have an essential role in illness treatment in economically depressed areas of the world. Some of these therapeutic herbs, like mint and basil, undergone extensive research. However, several therapeutic plants, like *Asparagus aethiopicus* L. and *Citrullus colocynthis* L., and Senna Alexendrina have received little attention, particularly in terms of their phytochemical composition and bioactivity. Senna alexandrina Mill., commonly known as Alexandrian Senna, is a multiple character's medicinal plant that belongs to the Caesalpiniaceae and is found in the climatic zones (Tropical and sub-tropical) of the world (Asian region, Africa, and Mexico) Săvulescu et al, (2018). India, Sudan, Egypt, Pakistan, China, and Korea are among the countries where commercial production is practiced. It's commonly utilized in traditional medicine for a various benefit. All parts of these plants have good pharmacological effects. The leaves, pods, and fruits of the senna plant are all valuable. Senna's pharmacological properties include purgative, antipyretic, laxative, and diuretic effects (Osunga et al., 2023). *S. alexandrina* is a tiny shrub that grows to be approximately 2 feet tall and yields the best and most desirable form of the drug. The plant body consist of upright stem, plain, and pale green, branches are long and spread each having four or five-inch-long leaflets, lanceolate or obovate, and have a thick goeoy, sweetish flavor, with yellow tiny flowers. The pods generally contain six seed and oblong in shape, measured about 2 inches long by 7/8 inch wide (Bhumarkar et al., 2021).

India, Sudan, and Egypt are the three primary manufacturers and exporters of senna leaves and pods products. With a cultivated area of around 22,000 hectares, and total production of 12,744,070 kg (28,095,865 lbs) during 2016-17. India became largest Senna A producer in the region Goraya and Ved (2017); TRADESTAT (2018). India imports more than 70% to the major parts of the world that includes Asian, European, and USA states. Pakistan is endowed with abundant natural resources, different biological zones, and a flora that includes over 6000 plant species. Medicinal plants are naturally grown in various ecological regions around Pakistan, and some species are also cultivated on a modest basis. Temperatures range below zero in the mountains to 50 degrees in the plains of the south. In Pakistan, more than 6000 plant species have been identified, with more than 1000 of them being used as medicinal and fragrant plants. Senna is grown for medical purposes in Pakistan, and its pods and seeds are used to treat blood detoxification and gastrointestinal distress Ahmed (2015).

Plants can be grown in a variety of climates, from the drier to temperate to tropical. Such plants are grown preferably a sandy loam that is deep, well-drained, and somewhat fertile, as well as full sun. Salinity inhibits germination, while older plants are salt-tolerant. *Senna alexandrina* can't stand being wet all the time or being irrigated heavily. The plant is often produced as an agricultural product, but it can be allowed to stand for another 2 to 3 years to continue producing. It provides flowers and fruits across the year (BHAKSHU et al., 2023). The soil and water factors have a significant impact on yields. Under rain-fed circumstances, the average annual output in India is around 700 kg of leaves and 100 kg of pods per hectare. The production of leaves and pods under irrigation is around 1400 kg/ha and 150 kg/ha, respectively. Despite the fact that sennoside content is higher when plants are stressed, reasonable irrigation and fertilization lead to higher leaf and total sennoside yields Grubben and Denton (2004).

Biological names:

1. *Cassia acutifolia* Delile
2. *Cassia Senna* L.
3. *Senna angustifolia* (Vahl) Batka
4. Alexandrian Senna (English)

Climate and Soil

This plant may grow up to 1m tall on lowland areas in subtropical climate. It falls its foliage as the winter weather arrives. The plant grows best in well-drained, sandy loam lateritic soils with a pH of 7–8.5, however rich farms and irrigated crops promote faster growth and larger yields. It requires a climate that is consistently warm and dry. Even brief retention of water in fields might result in crop loss.

Botany

It is an annual crop that stays in the field for 110–130 days. The plant possesses compound leaves composed of 5–8 pairs of slightly stalked oval-lanceolate leaflets (2.5cm 1.5cm) and develops a flush of flowering stems in both axillary and subterminal positions 60–70 days after seeding. The blooms are big and bright yellow in color, and after 90 days, they

produce medium-sized pods (3.5cm–6.5cm 1.5cm). There are 5–8 yellowish, flat seeds in each. It is mostly a self-pollinated crop; however, insects may cause significant outcrossing (20%).

Table 1. Taxonomic classification

Kingdom	Plantae-plants, planta, vegetal plants
Subkingdom	Viridiplantae- green plants
Infrakingdom	Streptophyta–land plants
Superdivision	Embryophyta
Division	Tracheophyte – vascular plants, tracheophytes
Subdivision	Spermatophytina – spermatophytes, seed plants, phanerogames
Class	Magnoliopsida
Superorder	Rosanae
Order	Fabales
Family	Fabaceae – peas, legumes
Genus	Senna Mill

Integrated Taxonomic Information System – Report (2007-2010)

Types of senna

The genus senna has 500 species, including 26 members of the genus cassia containing anthracene derivatives in the free form or glycosides. Because of its laxative action and availability in considerable numbers, *Cassia angustifolia* (Indian senna) and *Cassia acutifolia* (Alexandrian senna) are official in several pharmacopoeias. *Cassia fistula*, *Cassia Obovata*, *Cassia dentate*, *Cassia sofara*, *Cassia sieberiana*, *Cassia podocarpa*, and *Cassia alata* are the other species with proven laxative action.

History and tradition

Arabian physicians initially utilized senna for therapeutic purposes in the 9th century A.D. It's been used as a cathartic in traditional Arabic and European medicine for a long time. For its powerful gastrointestinal action, the leaves were steeped and the tea was administered. Because it's frequently impossible to keep track of the amount of active chemicals in tea, an unanticipated result can result. As a result, standardized commercial dose forms have been created, and these concentrates are now accessible in over-the-counter laxatives as liquids, powders, and tablets. The plant's name is derived from the Arabic word "sena" and the Hebrew word "cassia," which means "peeled back," referring to its peelable bark (Naz et al., 2020). *C. angustifolia* was discovered growing wild in and around Makkah, the historic and blessed city in the center of the former province Hijaz. According to "Magic and Medicine of Plants," in the 9th century CE, Caliph Harun al-Rashid summoned Mesue the Elder, a prominent Christian Arab physician. Mesue brought Senna plants, that are native to North and East Africa, and they successfully treated the Caliph's constipation. Senna became used as a laxative in Baghdad following Mesue the Elder's arrival. Senna's laxative properties were recognized by Native Americans, who employed it to treat fevers instead Ahmad et al, (2010).

Phytochemistry:

Senna contains anthraquinonoid compounds (sennoside (A, B, C and D), flavonoid, saccharide, naphthalene derivatives, phytosterols, essential oils, naphthalene derivatives, saccharide, essential oils, flavonoids, tannins, wax, resins, mineral salts and mucilage (Gerard and Stephen, 2010). The active elements in both senna leaf and fruit are dianthrone glycosides (hydroxyanthracene glycosides). There are also insignificant amounts of rhein 8-glucosides, aloemodin Bruneton (1995). The leaves of this species comprise pharmacologically active compounds, kaempferol, tinnevellin glycoside, aloe emodin, D-3-O-methylinositol, apigenin-6,8-di-C-glycoside and emodin-8-O-beta-D-glucopyranoside (Wu et al., 2007)

Quercimeritrin, rutin and scutellarein, are the main phenolic constituents of the plant (Ahmed et al., 2016). Peels of *Senna alexandrina* have some vital elements i.e., iron 0.23% and very small rate of nickel (ni) and zinc (zn) by 0.01% chromium (cr) 0.10%, magnesium (mn) are determined by using x-ray fluorescence abdallh (2019).

Leaves of senna comprise of anthraquinone byproducts in both free and mixed forms. Senna has dianthrone glycosides in it (1.5 percent to 3 percent). Sennoside A and B, two crystalline glucosides, have been discovered in the leaves and pods. Sennosides A and B (rhein dianthrone), as well as sennosides C and D (rhein dianthrone) (rhein aloemodin heterodianthrone). There are a number of notable sennosides found, and each one seems to add to the laxative action. In tiny proportions, the herb also includes free anthraquinones such as rhein, aloemodin, chrysophanol, and their glycosides Abdallah (2019). Isorhamnetin and kaempferol are examples of flavonols found. 6-hydroxymusizinin and tinnevellin are two glycosides that have been discovered. Chrysophanic acid, 2-hydroxybenzoic acid, saponin, resin, mannitol, sodium potassium tartrate, and trace quantities of essential oil are among the other ingredients in senna. Senna is primarily used in Eastern and Western nations to alleviate constipation. The plant has around 10% granules, which is mainly composed of galactose, arabinose, rhamnose, and galacturonic acid, and contains 2% polysaccharides. Mannose, fructose, glucose, pinitol, and sucrose are examples of other carbohydrates. Isorhamnetin and kaempferol are two flavonols found in senna abdallah (2019).

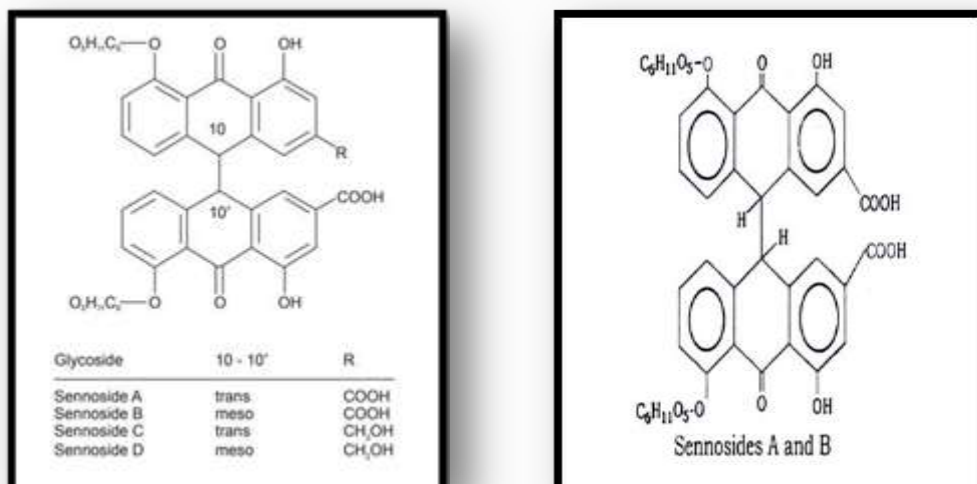


Fig. 1. Important constituent of Senna

Uses:

In folk medicine Senna was functional for curing different ailments as it shows Anthelmintic, Anti-dysenteric, Anti-hepatotoxic, Anti-leukemic, Anti-herpetic, Anti-hepatotoxic

Anti-spasmodic, Antibacterial (staphylococci and *Bacillus Coli*), antiviral El-Morsy (2013) , antifungal (*Microsporium audouini*, etc.), neuroprotective properties Borrelli et al, (2000) and hepatoprotective . It also had carminative, cathartic, expectorant, mutagenic, trypsin inhibitory, purgative, vermifuge Duke et al, (2008), diuretic, colon cleansing, and body detoxification effects Balasankar et al, (2013).

Senna's dried leaf is used as a purgative. In cases of constipation or stomach distention, 1-2 g of the leaf powder is given with hot water. Sarivadyasava oil, Pancasakara churna, Nimbadi churna, Kasisadi ghrita, Maha vishgarbha thailam, Kohl, and Correctol Herbal Tea, Senna concentration, Senokot, Spolax, Periderm granules, Virechni, Ex-lax mild, Herblax, and Dulcolax pills are among the many commercial herbal Anonymous (2003).

Role in oxidative stress:

S. alexandrina, sometimes known as Alexandrian senna, is a multifunctional medicinal herb with laxative properties Săvulescu et al, (2018). Senna may be a potential antihyperglycemic drug for the treatment of diabetes mellitus, particularly type 2 diabetes, according to studies on its antidiabetic and hypoglycemic effects. In various animal models, extracts from various sections of the senna plant revealed significant hypoglycemic effects. Sennoside-A, sennoside-B, and saponin are anthraquinone glycosides that have antihyperglycemic properties. Singh (2013). Rutin and other flavonols have been shown to have anti-diabetic properties. Senna extract contains large amounts of these glycosides, saponin and rutin (Delfan et al, (2016); Ghorbani, (2017).

S. alexandrina Mill. is also utilized to decrease blood lipid levels in some areas of Iran. Senna aqueous extract improves metabolic irregularities and oxidative stress associated with diabetes in rats, as well as reducing chronic hyperglycemia-related problems Osman et al, (2017). Different solvent extracts of *S. alexandrina* Mill. Can inhibit these enzymes in vitro investigations on the anti-diabetic benefits of senna Boaduo et al, (2014). However, few studies have been conducted to determine the effect of *S. alexandrina* supplementation on hepatic steatosis, hyperlipidemia, and oxidative stress caused by a high-fat diet.

Anti-fungal activity of Senna

Senna is well-known for its ability to fight fungal infections and DNA from E.coli bacteria. Sennosides, a chemical component, disrupt the digestive system and cause diarrhea. Senna has an effect on E. coli cells, produces DNA cuts, and works against fungal infections. Ramchander and Middha (2017).

Anti-inflammatory effect:

Wang et al, (2020) reported that Senna A is generally used for its prominent role in digestive irregularities and anti-inflammatory, free radicals scavenging qualities, with many qualities regarding protection against carcinogenic heavy metals, which is abundant and common cause of hepatotoxicity such as cadmium still not known, according to study conducted by researchers. Over the course of four weeks, they investigated the induced liver damage in rats caused by cadmium chloride (CdCl₂) and treated with S. alexandrina extract (SAE). Four groups were made and three of them treated differently keeping one group as control. Treatments are SAE+CdCl₂, SAE 100 mg/kg, CdCl₂, 0.6 mg/kg. Cadmium levels in hepatic tissue, total bilirubin levels and blood transaminase were all measured as indications of proper performance of liver.

Oxidative stress indices [malondialdehyde (MDA), nitrate/nitrite (NO), and glutathione (GSH)], antioxidant molecules [catalase (CAT), superoxide dismutase (SOD) and nuclear factor erythroid 2-related factor 2 (Nrf2), glutathione-derived enzymes, (TNF- α) (IL-1 β) and histological changes to the liver were observed. Prior to CdCl₂, SAE treatment reduced cadmium accumulation in liver tissue and blood liver function markers. Pre-treatment of the extract reduced the histological changes in the liver produced by CdCl₂ exposure and inhibited oxidative, inflammatory, and apoptotic effects. By boosting Nrf2 expression, against hepatotoxicity caused by cadmium chloride extract of Senna A can be used.

Role in curing constipation:

Constipation is a medical condition in which the patient experiences difficult or painful defecation. S. Alexandrina is one of the most efficient medicinal plants for constipation and intestinal disorders, according to studies Parsaei et al, (2016).

Most individuals with chronic constipation would rather take over-the-counter laxatives than seek medical advice. Senna alexandrina, at a dose of 12 g/day, is a regularly used treatment for chronic constipation. Nimrouzi and Zarshenas (2019). The European Medicines Agency acknowledged well-established usage of senna formulations under two conditions in its evaluation report. To begin, senna is recommended for the treatment of occasional constipation over a short period of time. Second, bowel preparation is strongly suggested before clinical procedures for bowel cleansing Werner and Merz (2007).

Skin Health

Senna foliage contain essential oils and tannins that assist to reduce skin irritation. They have a significant antibacterial action and may be turned into a compress that can be administered to wounds and burns. Acetone and ethanol chemicals found in Senna help combat acne-causing bacteria. Senna also helps to reduce sebum production while increasing cell renewal and collagen synthesis Balasankar et al, (2013).

Colon Cleanse

Senna is frequently used to cleanse the intestines prior to diagnostic procedures such as colonoscopies. Cleansing the colon is thought to improve nutrient absorption and overall colon health Singh (1992).

Anti-Parasitic

Senna can also be used as a vermifuge to kill parasites and remove worms from the digestive tract. It works much better when coupled with other anthelmintic herbs (those used to cure roundworms), such as ginger or fennel. Because of Senna's potent effect, these herbs promote regularity and minimize the likelihood of bowel cramping Balasankar et al, (2013).

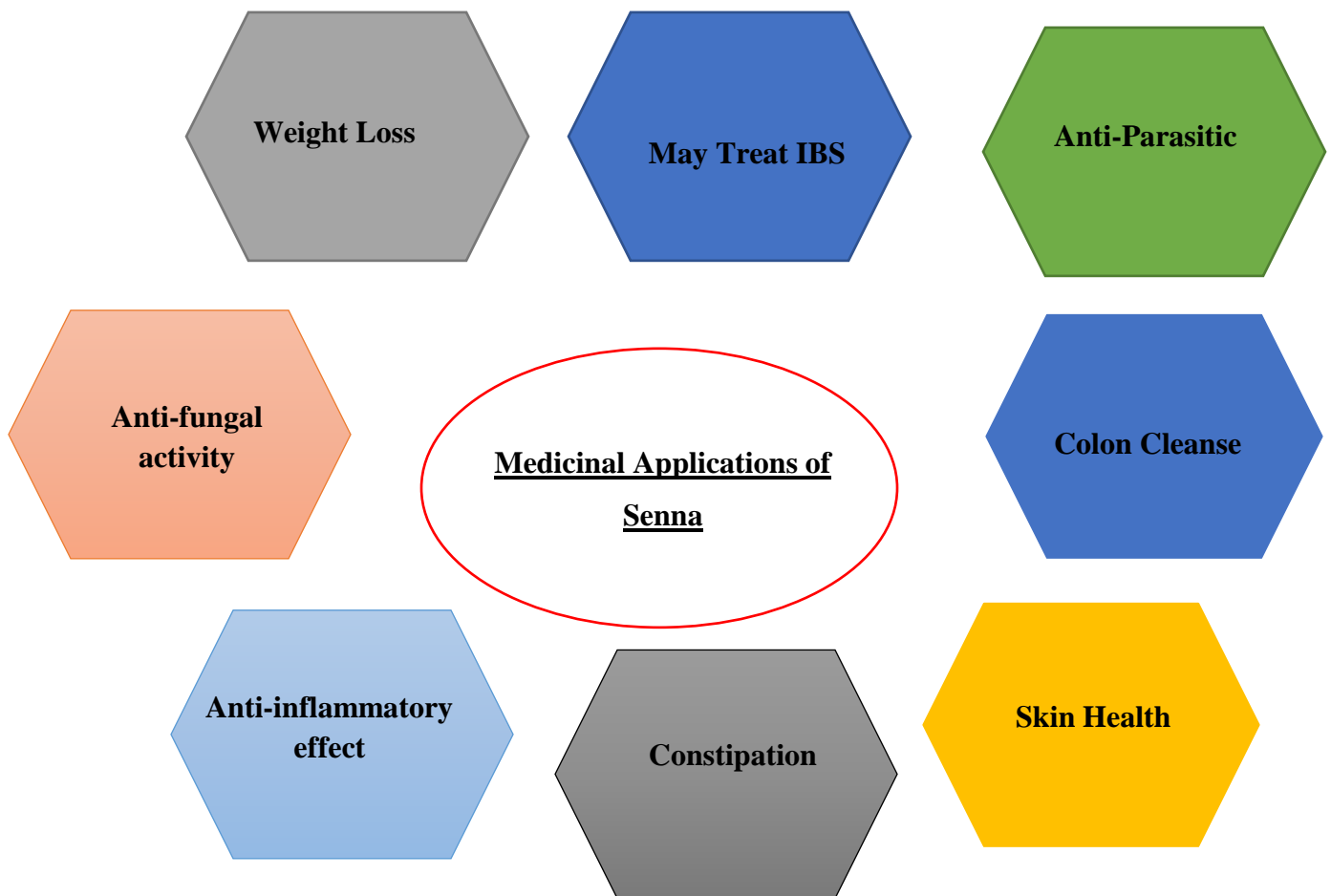
Treat Irritable Bowel Syndrome (IBS)

Irritable Bowel Syndrome (IBS) or IBD (Irritable Bowel Disease) is known as linear stomach pain. It is characterized by irregular bowel movements (diarrhea, constipation, or both). The ache usually starts after eating and goes away after a bowel motion. Bloating, mucous discharge, and a sense of inadequate emptying are all signs of IBS. Senna may help manage the

symptoms of irritable bowel syndrome due to its laxative properties (IBS). The exact mechanism by which senna accomplishes this is unknown, but some experts think that because the plant causes colon spasms, it may force the feces to migrate out Balasankar et al, (2013).

Weight Loss

Senna weight loss usually entails using the medication for longer than the suggested two weeks and potentially taking more than the 17.2 mg daily dosage. Senna consumption refers to the overuse of this plant, which might result in significant consequences. According to Drugs.com, an anorexia nervosa patient consumed up to 100 senna pills each day. When you take more than the prescribed amount, you risk getting nephrocalcinosis, or too much calcium in the kidneys, finger clubbing, a malformation of the fingers, and osteoarthropathy, a bone and joint condition, as this patient did Balasankar et al, (2013).



Food application:

The EU's consumption history has been developed. As a result, the plant's leaves and fruits aren't considered unique in food supplements because of their pungent smell and bitter taste. (EU Food Catalogue (2019)).

Conclusion:

Overall review study conclude that *S. Alexandrina* showed immense diversity regarding their metabolites such as phenolic contents, antioxidants, anti-fungal, antibacterial behavior. For the sack of disease control *S.Makki* can play major role in pharmaceutical industry to use as a source of natural products. Further research and investigation are required to unravel further significance and clinical investigation of this important medicinal plant. Although different significant mechanism should be described to grow pharmaceutically important plant efficiently.

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