

Biological Properties & Medical Importance of *Cassia fistula*: A Mini Review [†]

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Abstract: Medicinal plant species contain variety of chemical substances with high medical potential making these plant species valuable as biomedical sources. This plant is a deciduous plant also known as “Yellow Shower”. The plant *Cassia fistula* is considered for its biological importance in traditional medication system. This plant is full of different bioactive phytochemicals. In Ayurveda, the plant has also attained the medicinal importance. Pharmacological properties like antioxidant, antimicrobial, anti-inflammatory, anti-diabetic, antitumor, hepatoprotective and many more are exhibited by the plant *Cassia fistula*.

Keywords: Biological activities; phytochemicals; medicinal system

1. Introduction

In Indian history, various medicinal systems have been used and also lead to better results. Besides the practice of chemical drugs and medicines, mostly traditional and natural sources from medicinal plants are preferred for the betterment of human health [1]. From the ages till now-a-days, many dreadful diseases are growing up and are resulting to a great loss for humankind and so accepting those challenges; science has been developed and been developing various methods to treat such diseases (Safwat et al., 2018). Natural resources play significant role in treating infectious health problems which causes major infections in humans as well as in animals. Continuously, traditional medicines have been in trend and hence found a valuable place in pharmacological sciences (Bhalodia et al., 2012). One of the natural resources found with wide range of medicinal benefits is plant of *Cassia fistula*. *Cassia fistula* is a deciduous—flowering plant which is well known for its medicinal importance and nutritional value. This plant is commonly known as “AMALTAS” (Pawar Aarti V. 2017; Maqsood, Munir & Dr. Shahid, 2020). Leguminosae family in kingdom Plantae, especially plant of *Cassia fistula* was introduced with many medicinal benefits (R. C. Agrawal et al., 2012). Traditionally, *Cassia fistula* was used by medical specialists or practitioners for the treatment of numerous diseases like as for various skin diseases, liver problems, tuberculous glands, pruritus, hematemesis and diabetes, etc (Pawar Aarti V., 2017). In the virtue of various medicinal plants; *Cassia fistula* is contemplated as an enormous root of pharmacological molarities; and the composite materials are used to fight for many home remedies against various infectious diseases (Safwat et al., 2018). Due to its medicinal benefits, *Cassia fistula* is termed as ‘Aragvadha’ that stands for ‘disease killer’ (Sharma, Kumar & Jaitak, 2020). Different parts of *Cassia fistula* tree show unique biological activities. It has been observed that flowers of *Cassia fistula* show antifungal and antibacterial activities, dried pulp of *Cassia fistula* shows anti-inflammatory activity. Similarly, seeds of *Cassia fistula* are taken in the investigation of anti-tumor and anticancer activities (Maqsood, Munir & Dr. Shahid, 2020). Juice of *Cassia fistula*

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leaves has bioactivities which treat skin diseases (Jothy, Zakaria, Chen, Lau, Latha & Sasidharan, 2011). The medicinal behavior of *Cassia fistula* plant provides beneficial results to public health and somehow improves the lifespan of organisms (Bahorun et al., 2005). The different parts of this plant are full of variety of functional groups and phytochemicals. So, it has been concluded that the plant of *Cassia fistula* has a wide range of bioactive potentials and shows antibacterial, antifungal, antiviral, antitussive, antitumor, anticancer, anti-inflammation, antioxidant, anti-feedant, anti-diabetic, anti-hyperglycemic, antineoplastic, nephro-protective and many more pharmacological properties (Md. Irshad et al., 2014). This semi wild plant *Cassia fistula* is abundant in various regions of different countries. The pharmacological profile of this plant shows a better slope in the observed medicinal graph. Each phase of *Cassia fistula* works upon ailments in a unique way. Mostly; the constituents were preferred to be used in the form of their respective extracts, but the parts of plant also provide bioactive nature in the powders, pulps, oils, mucilage or adhesives, juices, and sometimes raw leaves and flowers were administered orally to give health benefits. Each therapeutic agent or drugs available; shows some of the side effects or bad impacts. The over dosage and unbalanced utilization of *Cassia fistula* too exhibits side effects up to lower extent (Jothy et al., 2011).

Cassia fistula belongs to Leguminosae family of Plantae kingdom also called as 'AMALTAS' in several regions and is an ornamental tree with its beautiful yellow flowers also known as 'Golden shower' due to its appearance. *Cassia fistula* is a semi-wild plant (Pawar Aarti V., 2017; Jothy, Zakaria, Chen, Lau, Latha, Shin & Sasidharan, 2011) which grows throughout many countries mainly on roadside (Rana, Saklani & Gaurav, 2017). The plant grows up to 20–30 m high and leaves are attached in the form of pinnate. The root, bark, and flowers respectively of *Cassia fistula* are brownish—red, brown, and bright yellow in color (Pawar Aarti V., 2017; Rana, Saklani, & Gaurav, 2017). The wood of this plant has high shelf—life and are very strong. Flowers of *Cassia fistula* are of glowing yellow in color and are 40 cm long and this is the reason why *Cassia fistula* is called "Golden Shower".

2. Biological Properties of *Cassia fistula*

Cassia fistula is a plant full of properties which leads to numerous medicinal benefits shown in Figure 1. In this review paper, we have discussed the biological activities of *Cassia fistula* which are dealing with the current major problems of human health. In present scenario, the health problems like skin infections, cancers, diabetes are in major role of medicinal challenges. This plant provides a greener route to come up with natural and non-toxic ideas in the medicinal system. This review paper considers the bioactive plant '*Cassia fistula*' and highlights it's all medicinal or biological activities.

2.1. Antioxidant Activity

Each part of this medicinal plant plays an interesting role in treating many dreadful diseases. Previous literatures reported the biological properties in different styles. This plant possesses strong antioxidant activity due to the presence of high phenolic content. Due to its antioxidant activity, this plant is implemented to treat skin infections, wound dressings, and also used in many cosmetic industries as anti-ageing agents. Studies performed by K. Pradeep et al. (2007) reported that the juice extracted from *Cassia fistula* leaves acts as a dressing agent in the diseases like ringworm, inflammation, to relief irritations and even though in jaundice. Methanolic along with ethanolic extract of *Cassia fistula* leaves is considered good for antioxidant nature as compared with other parts of *Cassia fistula* plant (i.e., stem, bark, flowers, fruits, pulp) (Vyas & Patel, 2016). In a previous study, a few techniques were performed on the leaf extracts of selected plants having medical importance and found that a medicinal plant named as *Cassia fistula* exhibits antioxidant activity. Amongst the selected plants, leaf extract of *Cassia fistula* shows second highest position with approx. 90% of antioxidant activity. The phenolic contents of leaf

extract deals with peroxidation process of lipids. This reveals the antioxidant behavior of *Cassia fistula* leaves (Suresh Kumar et al., 2008). Jayachitra et al. in 2014, performed antioxidant activity by DPPH scavenging of leaf extract silver nanoparticles and found the effective concentration to be 60µg/mL. The flowers of this plant play an important role in treating skin problems due to their tremendous tendency of antioxidant. *Cassia fistula* flowers in methanolic extract shows antioxidant activity through DPPH scavenging and evaluated the percentage antioxidant activity approximately 84%. The antioxidant behavior of flower extract in aqueous medium gives results in favor of anti-diabetic bioactivity (Khan et al., 2011). The bark extract of *Cassia fistula* plant shows higher scavenging than leaves extracts. Approximately, 90% of bark extract in methanol exhibits antioxidant behavior hence it has been estimated that the antioxidant activity is excellent in the bark of the *Cassia fistula* plant. The percentage profile of phenolic content in the bark extract was found in the range of 60–70% this value leads to the excellence antioxidant activity of bark (Rishi Kumar Shukla et al., 2013).

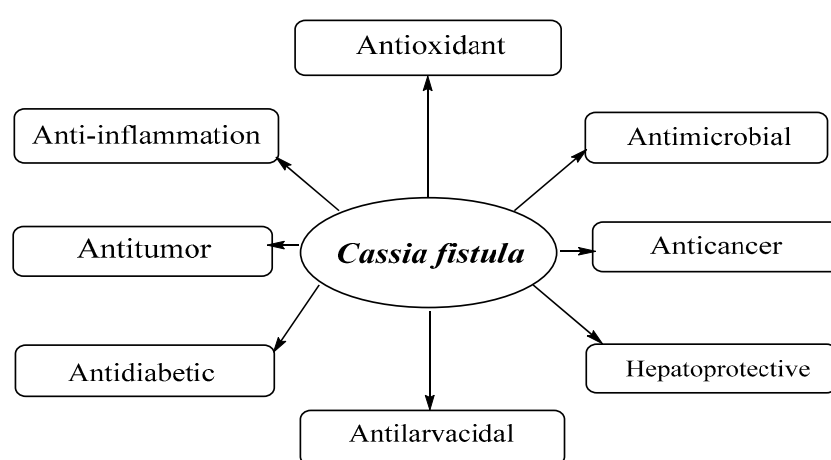


Figure 1. Biological properties of *Cassia fistula* plant.

2.2. Anti-Diabetic Activity

As it has been noticed from previous studies, *Cassia fistula* flowers and its extract exhibit antifungal, antibacterial, antioxidant, anti-aging, and anticancer properties (R.R. Remya et al., 2015). *Cassia fistula* flowers extract shows antidiabetic activity. The antioxidant behavior of flower extract in aqueous medium gives results in favor of anti-diabetic bioactivity (Khan et al., 2011). This anti-diabetic behavior is examined by G. Manonmani et al. (2005) in the rats bearing diabetes. Also, they reported a treatment of 15 days which was performed on the alloxan diabetic rats with aqueous flower extract (10%) and consequently found that it exhibits antidiabetic activity for diabetic rats. Ali et al., in 2012, prepared the ethyl alcohol extract of *Cassia fistula* bark and further performed anti-diabetic study. The different doses of ethanolic extract of *Cassia fistula* bark were comparatively studied with the standard drugs and consequently found a positive result. Hence, this clears the picture of anti-diabetic behavior of *Cassia fistula* bark with ethanolic extract in different doses (Ali et al., 2012).

2.3. Antimicrobial Activity

The extract of *Cassia fistula* leaves shows better results in its purified form. Also, it has been suggested in various studies that the extract of *Cassia fistula* leaves; not only works upon the pathogenic bacteria also it stops the further growth of infectious bacteria (Arulpandi & Sangeetha, 2012). The hydro-alcohol extract of *Cassia fistula* leaves was reported to exhibit antimicrobial activity against bacteria and fungi (Bhalodia & Shukla, 2011). The hydro-alcoholic extract of leaves consists of flavonoids, steroids, carbohydrates, proteins and amino acids which have tendency to work against bacteria and fungi. Bhalodia &

Shukla (2011) performed a test for the antimicrobial activity of *Cassia fistula* leaves, some drugs (like Ampicillin or Norfloxacin) were taken as reference drug with the help of which the bioactive tendency was measured. Bioactive drugs like norfloxacin, ampicillin, and chloramphenicol were taken as standard drugs to cure infections in urinary area, pneumonia infections, and typhoid respectively. An extract was then prepared by using fresh leaves of *Cassia fistula* and petroleum ether along with an amount of hydro alcohol and kept for the test of antimicrobial behavior against various bacteria and fungi (Bhalodia & Shukla, 2011). Seeds were also found to exhibit antimicrobial activity (Lachumy, Zuraini & Sasidharan, 2010) regarding some of the bacteria, fungi, viruses. Powdered form of seed extract was preferred to test against bacteria, fungi and other micro-organisms. The extract was then prepared in a good content of methyl alcohol and filtered as well as dried. Again, the dried mixture was dissolved in methyl alcohol and results in the formation of methanolic seed extract of *Cassia fistula*. Some of the microorganisms were selectively studied were *Bacillus thuringiensis*, *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus*, *Candida albican*, *salmonella*, *micrococcus*, *aspergillus niger*. The MIC values regarding the above-mentioned microorganisms evaluated were very low. This shows that the inhibitory concentration of tested microorganisms with methanolic extract enhances the activity of seed extract. As consequence of this, methanolic extract of *Cassia fistula* seed possesses antimicrobial activity and helps in the treatment and curing health issues of mankind. The antimicrobial activity depends on the dose value of *Cassia fistula* seed extract in alcoholic solution (Kumar, Chauhan, Padh, & Rajini, 2006)

3. Medicinal Importance

This tree is full of bioactive properties like antibacterial, antimicrobial, antifungal, anti-inflammatory, antitumor, anticancer, antioxidant, anti-yeast and many skin related bioactivities (Vyas & Patel, 2016). The phytochemicals which are present in the *Cassia fistula* plant are subjected as carbohydrates, proteins, amino acids, flavonoids, tannins, anthraquinone and its derivatives, glycosides, terpenoids, sugars, alkaloids, saponins, Rhein, mucilage and many more (Vyas & Patel, 2016; Maqsood, Munir & Dr. Shahid, 2020; Sharma, Kumar & Jaitak, 2020). As it has been already in our knowledge, this plant of *Cassia fistula* is rich in factors like ease of availability, good biodegradability, good economical nature, and most importantly its less toxic behavior. Due to presence of these factors, *Cassia fistula* is used in numerous food industries at large scale. As already we have discussed about the properties of *Cassia fistula* seeds, and extraction of gum from the seeds; it has also been observed that the gum or mucilage that were obtained from the seeds of *Cassia fistula* were applicable in maintaining and balancing the quality and lifetime of food or edible products. From commercial or economical point of view; it has been concluded that natural gum from *Cassia fistula* seeds are applicable in enhancing and preservation of food products in various food industries. It has been noticed that this characteristic of *Cassia fistula* was seemed due to its antioxidant biological property (A. Saha et al., 2017).

4. Applications

It has been observed that the therapeutic use of *Cassia fistula* is not new to our knowledge but is used as the base of herbal medicines from ancient periods. Keeping in mind this glory of medicinal plant *Cassia fistula*; numerous applications are listed below. A flowchart in Figure 2 also highlights the applications of this beneficial plant.

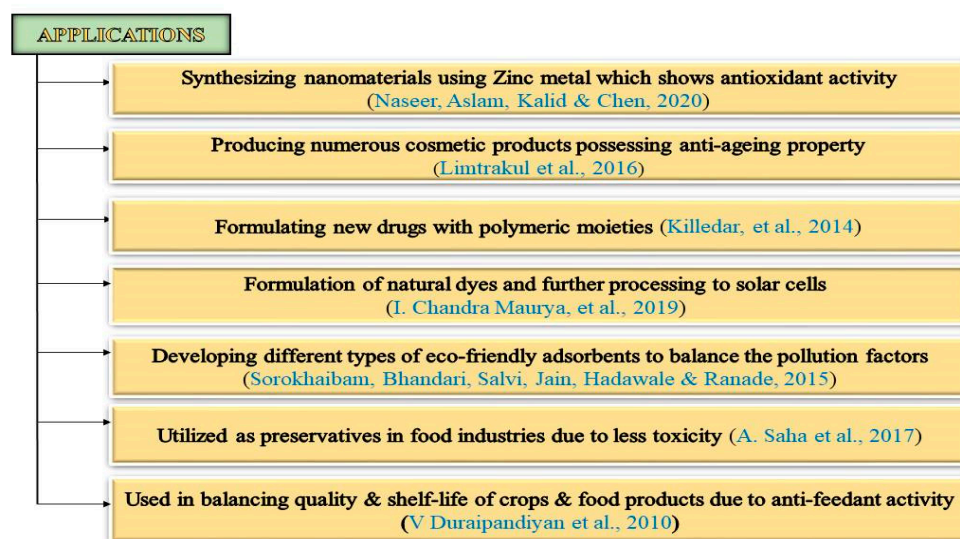


Figure 2. Applications of *Cassia fistula* plant.

5. Conclusions

Central metabolites as well as secondary metabolites of *Cassia fistula* were categorized in accordance to their respective extracts. And further the prepared extracts were tested against various microorganisms and long-term diseases. The studies result in the enhancement of the human health and gives superior results. Also, this study concludes that *Cassia fistula* plant shows excellent pharmacological activities and the therapeutic values have also been predicted. Along with this bioactive behavior; this paper gives information about the less amount of toxicity in *Cassia fistula* plant. Applications of this plant have been highlighted in different streams which provide tendency to this plant to clear and further make many routes in pharmacological sciences.

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