Food, medicinal, pharmacological, and economic values of *Cassia fistula* L.

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Abstract: Several wild plants have been used for several purposes by indigenous people since time immemorial. Some of them are cultivated, and some are collected from the forest. These are commonly used in human nutrition, as medicines, and for economic purposes. They are known to be excellent sources of nutrients such as carbohydrates, proteins, fats, vitamins and minerals, dietary fibres, and diverse secondary metabolites. Among the wild plants, *Cassia fistula* is one of them. It is used as food (a flower), medicine (all plant parts), and has economic values. It is planted as an ornamental plant along the roadside due to its beautiful flowers. Medicinally, these plants have various pharmacological compounds that cure several ailments. Keeping this in view, an attempt has been made to gather the food, medicinal, and pharmacological values along with their role in upgrading the livelihood of local communities through field and literature surveys. The results revealed that all plant parts are used for various purposes, and their cultivation and conservation are needed for sustainable utilisation and development.

Keywords: Edible flower, indigenous people, medicinal uses, livelihood

Introduction: About 30,000 plants have been considered edible, but very few of them are used to fulfil human food requirements (Demasi et al. 2021).

There are still many wild plants available in our forest that are underutilised and not explored. Among them, wild edible flowers have been highlighted among researchers, nutritionists, and chefs all around the world due to their high amounts of nutrition and minerals (Santos and Reis 2021; Garcia et al. 2021), along with medicinal, pharmaceutical, and economic values. Consuming flowers is a legacy of many cultures that have been using flowers in their food traditions for centuries. The use of flowers in natural medicine is also an ancient practise (Ceccanti et al. 2018; Santos and Reis 2021). Many tribal communities live near forests and depend on forest products for food and livelihood. WEF are one of the major non-timber forest products (NTFPs) collected by the tribal communities in different seasons, and they still play a vital role in the subsistence of many traditional communities, while they are receiving increasing recognition for tackling food security and nutrition (Leon-Lobos et al. 2022). WEF can provide consumers with a more diverse range of nutritionally high-quality compounds. They can be a source of energy, fibre, and micronutrients and offer a large spectrum of phytochemicals such as phenols, tannins, flavones, terpenoids, polysaccharides, steroids, saponins, and alkaloids (Camara et al. 2016; Datta et al. 2019). But with modernization and settled agriculture, this knowledge is becoming lost, a trend that may lead to decreased diversity of indigenous diets and poorer nutrition (Dwabe and Mearns 2011). Among the WEF, the flowers of *Cassia fistula* are widely used as an edible flower in many tribal communities. It is a deciduous tree that is widely spread all over India. It is common throughout the Gangetic Valley, Central India, and South India. It is planted as an ornamental plant along the roadside due to its beautiful flowers. Medicinally, these plants have various pharmacological compounds to cure disease. It is used as an infusion, decoction, or powder, either alone or in combination with other medicinal plants, to treat various diseases and disorders (Hanif et al. 2007; Chauhan et al. 2011). Keeping in mind the importance of *C. fistula* and the fact that its flowers are consumed as food by tribal communities, an attempt has been made to document its food, medicinal, pharmacological, and economic values.

Morphology: It is a tree of family Fabaceae and native to the Indian subcontinent. It is a deciduous plant found in tropical forests. It can grow up to 10 - 18 m tall. Leaves are compounded with oval-pointed leaflets. Flowers are yellow and hang in clusters about 40 cm. Due to its flowers, it is commonly known as an ornamental plant. Fruit is a legume that is dark brown

and 30-60cm long. Fruits are filled with a sticky pulp and 40-100 hard brown seeds. Pods are cylindric, deep brown or nearly black when ripe, smooth, and indehiscent (Danish et al. 2011; Kumar et al. 2017; Plate 1).

Vernacular names: *C. fistula* commonly known as Amaltas. It has many vernacular names. Details are listed in Table 1.

Table 1: Vernacular names of *C. fistula*

Language	**Local Name**
Bengali	Bundaralati, Sonalu, Soondali, Sondal
English	Golden Shower
Gujurati	Garmala
Hindi	Sonhali, Amaltas
Kannada	Kakkemara
Marathi	Bahasa
Odia	Sunaari
Punjabi	Girdnalee
Sanskrit	Nripadruma
Santali	Bandar Lati
Tamil	Shrakkonnai
Telugu	Kondrakayi
Urdu	Amaltaas

Food values: This medicinal plant has various nutritional values. Young leaves are edible. In India, some tribes of Odisha and Assam use flowers and flower buds as vegetable. The leaves are used to collect by the tribal communities during the month of February to June and cook as leafy vegetable. It is also food plants of wild animals like *Bos gaurus* (Haleem and Iiyas 2018; Kumar and Kumar 2023).

Ethnomedicinal values: In India, many plants and their parts are used to formulate traditional medicine to treat various diseases. *C. fistula* is one of them that is very well known in Ayurvedic, Unani, and Chinese traditional medicines. Extract of *C. fistula* is used in different health relieving conditions like asthma, leprosy, ringworm, heart-related disorders, and fever (Sanjeet et al. 2012; Khobragade et al. 2023).



Plate 1: Vegetative parts of *Cassia fistula*

The fruits are also used to treat throat disorders, inflammation, liver complications, chest problems, asthma, and rheumatism. In traditional Thai medicine, ripened fruits are used as a highly effective moderate laxative medicine prepared by boiling them in water and filtering the extract using a sieve. The extracted part is converted into small pellets by evaporating the excess water from the filtrate (Agarwal and Paridhavi 2005). Leaves are used to relieve pain, skin irritation, and swelling. Seeds are insect repellents and are also used as medicine for treating gastritis, diarrhoea, and biliousness and improving appetite. Large doses of leaves and bark can cause vomiting, nausea, abdominal pain, and cramps (Pawar et al. 2017). Roots are treated for flu and colds and are also used in the treatment of skin disorders, syphilis, and tuberculosis. The stem, bark, and fruits of this plant help to eliminate toxins from the blood. Ashes from burnt pods mixed with a little salt are used with honey and taken 3–4 times to relieve cough (Gupta 2010). The juice of leaves is used to treat skin diseases. The heated pods are applied to swellings on the neck to cure colds (Nadkarni 2009). The root is used in cardiac disorders, biliousness, rheumatic conditions, haemorrhages, wounds, ulcers, boils, and various skin diseases (Agarwal and Paridhavi 2005).

Pharmacological values: It is a plant with numerous medicinal benefits. Around the world, various studies have reported that this plant provides different pharmacological properties like antioxidant, antimicrobial, anti-inflammatory, antidiabetic, CNS activities, leukotriene inhibition activity, antitumor, hepatoprotective, antitussive, antibacterial, antifungal, hepatoprotective activity, wound healing activity, laxative activity, antipyretic, larvicidal, and ovicidal activity, among others (Danish et al. 2011; Mwangi et al. 2021; Figure 1).

Bioactive compounds: Extracts of this plant have been rich with their secondary metabolite composition. The seeds are rich in glycerides with linoleic, oleic, stearic, and palmitic acids as major fatty acids together with traces of caprylic and myristic acids. A major carbohydrate reported from the seeds is galactomannan (Srividhya et al. 2017). It has been reported that the stem bark of *C. fistula* is also a potential source of lupeol, ß-sitosterol and hexacosanol (Sen and Shukla 1968). The flower's pollen showed a protein composition with appreciable amounts of free amino acids such as phenylalanine, methionine, glutamic acid and proline. Carbohydrate, lipid and free amino acid contents (Manonmani et al. 2005). Fruits are rich source

of potassium, calcium, iron and manganese and aspartic acid, glutamic acid and lysine in the pulp (Castro-Lopez et al. 2018; Bahorun et al. 2005; Sanoria et al. 2020).

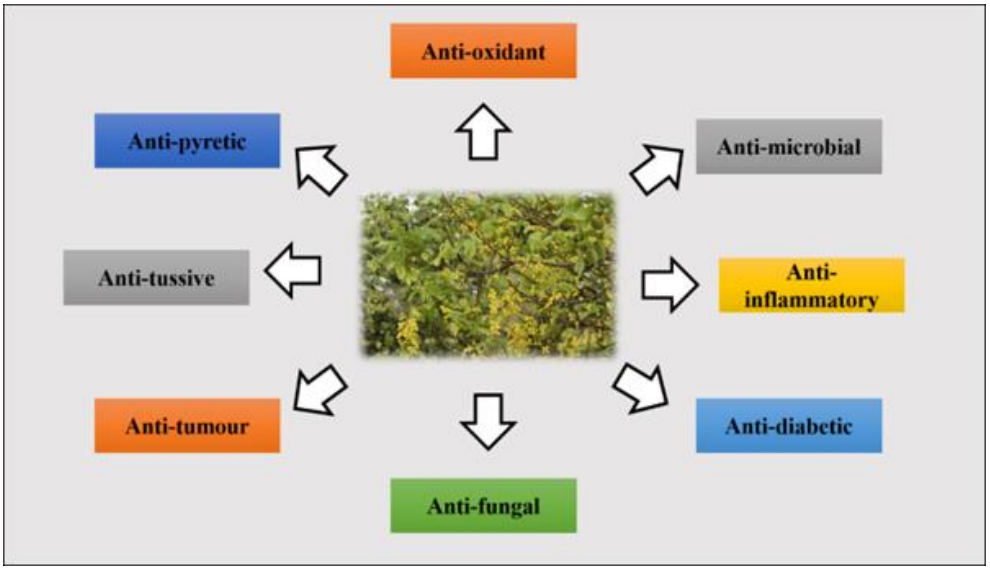


Figure 1: Pharmacological values of Cassia fistula L.

Economic values: The flower of *C. fistula* is not more commercialised; it is still underutilized. The flowers are commonly available for the tribal communities, as this plant is widely available in forests and cultivated in home gardens. The plant is also commonly available in rural areas as a revenue tree on road sides, but people have very little idea about its edibility. Some parts of this plant are used for commercial purposes in both local and international markets. This plant is used for ornamental purposes, and wood is used as fuel, so the seeds are available in the local market or online for up to Rs. 400. The extract of *C. fistula, which* is used in various medicines in Ayurveda, costs around Rs. 2200 in the online market. In the international market, qualitative fruits cost about 5000 rupees per 500 g. It is also used as a drug in homoeopathic medicine and costs under Rs. 100 per 30 ml.

Conclusion: *C. fistula* is an important medicinal plant with pharmacological properties and food values. This plant is commonly used in every part of the world in various ways. But the flowers are still unexplored as edible flowers. *C. fistula is* so rich in essential metabolites such as palmitic acid, linolenic acid, oleic acid, phenols, flavonoids, arginine, phenylalanine, valine, lysine,

isoleucine, and minerals such as K, Ca, Mg, and P, which have all proven to play different roles in the management of diseases. More information on the medicinal and nutritional values of the leaves and the detection of more bioactive compounds and isolating them could be a major step towards understanding this nutraceutical and could help in mitigating the food scarcity and health problems of the world.

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