

Development and Optimization of Cassia Tora Powder: A Study on Processing, Preservation, and Nutraceutical Potential

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ABSTRACT

Leaves of Cassia tora are an annual plant that grows in a natural area and is widely seen in India. This plant is utilised medicinally, as are its many sections. The leaves assist the body in keeping cholesterol levels within acceptable ranges. Leaves are a prevalent weed throughout all of India. There are several plant sections that are said to provide therapeutic benefits. Emodin, more Antraquinone, and xanthenes have reportedly been found in the plant's seeds. The leaves and seeds are considered to be expectorant, acrid, laxative, ant periodic, anthelmintic, ophthalmic, liver tonic, and heart tonic in Ayurveda. Leprosy, ringworm, flatulence, colic, dyspepsia, constipation, cough, bronchitis, and heart diseases can all benefit from the leaves. For the exterior treatment of eczema and dermatomycosis, fresh leaves crushed and macerated in alcohol or vinegar is applied. Fever is treated using a decoction of the fruit of Cassia Tora leaves. The plant has nerve-soothing properties since it suppresses the kapha and vata doshas. It treats internal infections and is eaten when there is a worm infestation. Leaves of Cassia tora have moderate laxative, heart tonic, and liver-stimulating properties. The plant aids the body in keeping cholesterol levels within acceptable ranges. Its paste is applied topically to cure skin conditions and to eradicate chronic illnesses. Cassia Tora leaves are beneficial for treating haemorrhoids and piles, as well as for easing the pain associated with defecation. Its powder helps to relieve indigestion, strengthen the heart muscles, and cleanse the blood. Its leaf juice is used to treat allergies, rashes, and skin conditions. Additionally, it serves as an antidote for a variety of poisonings. Cassia Tora leaves and seeds can be used to treat a variety of conditions, including cardiac disc disease, dyspepsia, colic, flatulence, constipation, coughing, and bronchitis. The seeds of Cassia torrea are highly prized in traditional Chinese medicine. Cassia tora leaf seeds are considered to be effective ophthalmic, laxatives, expectorants, and anthelmintic remedies in Ayurveda. It is mostly made up of derivatives of emodin, fixed oil, anthraquinonoid, chrysophanol, and rhein. Because the fruit from which the seeds are extracted is chilly in nature, Cassia Tora leaves seeds aid in the body's cooling down process. These seeds are used as aperients and purgatives, and they help relieve constipation by causing the intestines to relax. For Chakvad leaves, the word "potherb" is regularly in use. It is used as an organic insecticide in Indian organic or natural agriculture. It was noted that the leaves of Cassia tora contain chrysophanic acid-9-anthrone, a major fungicide.

Key-words: *Cassia Tora* Leaves, Physico-Chemical Properties, Leaves, skin problem, *bhaji* and Antidiabetic etc.

INTRODUCTION

Cassia tora, commonly known as Senna tora, is a member of the Fabaceae family and is recognized for its multifaceted applications in traditional medicine, agriculture, and as a potential source of bioactive compounds. Traditionally utilized in Ayurvedic and Chinese medicine, C. tora is noted for its laxative properties and is employed in the treatment of various ailments, including digestive disorders, skin conditions, and inflammatory diseases (Singh et al., 2016; Gupta et al., 2018). The plant's phytochemical composition includes flavonoids, anthraquinones, and glycosides, which contribute to its medicinal efficacy (Kumar et al., 2017; Jahan et al., 2020). Additionally, C. tora has garnered attention for its potential antioxidant, antimicrobial, and anti-diabetic properties, as highlighted in various studies (Patel et al., 2015; Verma et al., 2019; Khan et al., 2021). The seeds

and leaves of *C. tora* are particularly rich in bioactive compounds, with research indicating their capacity to scavenge free radicals and modulate metabolic pathways (Rai et al., 2021; Ali et al., 2022; Choudhary et al., 2023). Furthermore, agronomically, *C. tora* is considered a cover crop and is employed in soil improvement and pest management strategies (Chatterjee et al., 2021; Mehta et al., 2023; Singh & Sharma, 2022). Its cultivation practices are relatively simple, making it accessible for smallholder farmers and contributing to its sustainability as a crop (Nair et al., 2020; Das et al., 2022). The socio-economic significance of *C. tora* is also notable, as it provides income opportunities for rural communities (Bansal et al., 2021; Roy et al., 2023). As interest in natural products continues to rise, the study of *C. tora* opens new avenues for research in pharmacognosy, agriculture, and sustainable development (Kaur et al., 2020; Mehta & Jain, 2024). This introduction provides a foundational understanding of *C. tora*'s significance across various domains, highlighting the need for further exploration of its potential benefits and applications in modern science and industry.

Photography:-

Cassia species are wild crop and grown in most parts of India as a weed. It is an annual foetid herb, 30-90cm high. Leaves are green in colour, pinnate, up to 6-8cm long, leaflets are in 3 pairs, distinctly petiole, opposite (Carvajal .(1977) conical at one end ovate along and base oblique. Flowers are pale yellow in colour usually in nearly sessile pairs in the axils of the leaves with fine petals, upper one are very crowded. Pods are subtraced or 4 angled, very slender, 6-12 inch long, incompletely septet, membranous with numerous brown along rhombohedra seeds.

Photochemistry:-

Photochemical screening of the plants extracts employing TLC indicated that these extracts as well as callas extracts contains glycoside, flavonoids and anthrone, anthracnose derivatives. It contains 1-2% volatile Cassia oil which is mainly responsible for the spicy armo taste. The primary chemical constituents of it, which include cinnamaldehyde, gum, tannis, mannitol, coumarins and essential oils (aldehydes, eugenol and pinene); it also contains sugar resins and mucilage among other constituents (Lonergan 1969)

Table 1: Chemical present in *Cassia tora* leaves

S.No	Chemical name	Percent(%)
1.	Palmitate	20.8%
2.	Stearate	6.4%
3.	Oleate	5.7%
4.	Linoleate	13.1%
5.	Linolenate	26.0%

Source – Kumar *et al.* (2013)

Roots:-

Eight compounds were isolated from ethyl acetate fraction of *Cassia tora obtusifolia*, which are betulinic acid, chrysophanol, physicians, stigma sterol, I – hydroxyl 7-methoxy-3-methyl-anthraquinone, 8-0-methylchrysophanol, 1-0-methylchrysophanol and aloe-enwdin.

Seed:-

Seed contains anthraquinones and brassinosteroids. The seeds yield a gum (7.65%) which is the most efficient suspending agent for calomel, kaolin and tale (Sharma, 2002).

Leaves:-

The leaves showed mainly the presence of Anthraquinone glycosides and Flavonoids. The Anthraquinone glycoside includes rhein, emodice, physicians, chrysophanaol (Marker). Obustin, chryro-obustin, chryro-obustin 2-0-beta-D glycoside, obtusifolin and chryro-obtusifolin 2-0-beta-D-glucoside (Dekock 1979).

BOTANICAL DESCRIPTION: -

Cassia tora is a small annual herb or under shrub growing as common weed in Asian countries. It is found as a weed through India, universally in wild state in Himachal Pradesh, Bihar, and Orissa (Gatehouse, 2002). Constitutes an Ayurvedic preparation “Dadhughnavati” which is one of the successful antifungal formulations. The herb 1.2 m in light leaves compound, propionate leaflets 3-pairs. Flowers bright yellow usual in pair axillar. Pods long, slender, oblique sepatate 15.25 cm long. Seeds rhombohedral green (Arshi et al., 2002)

MEDICINAL PROPERTIES AND USES:-

According to Ayurveda the leaves and seeds are acrid, laxative ant periodic, anthelmintic, ophthalmic, liver tonic, cardio tonic and expectorant. The leaves and seeds are useful in leprosy, ringworm, flatulence, colic, dyspepsia, constipation, cough, bronchitis, cardiac disorders.



Fig. 1: *Cassia tora* leaves

Objectives:

- ✓ To analyse the various properties of *Cassia tora* leaves.
- ✓ Value addition in *Cassia tora* leaves.
- ✓ Physico-chemical Analysis of the final product

MATERIALS AND METHODS

Methodology

The study on development of value added product from *Cassia tora* leaves full of protein and fiber. To make it perishable following materials are added to enhance the taste of *Cassia tora* leaves.

Process

Pre-treatment of *Cassia tora* leaves

1. Wash *Cassia tora* leaves thoroughly to remove dirt.
2. Sorting and cutting leaves.
3. All other materials like tomatoes and onions are washed and cut thoroughly.

Process preparation flowchart of *Cassia tora* leaves powder:

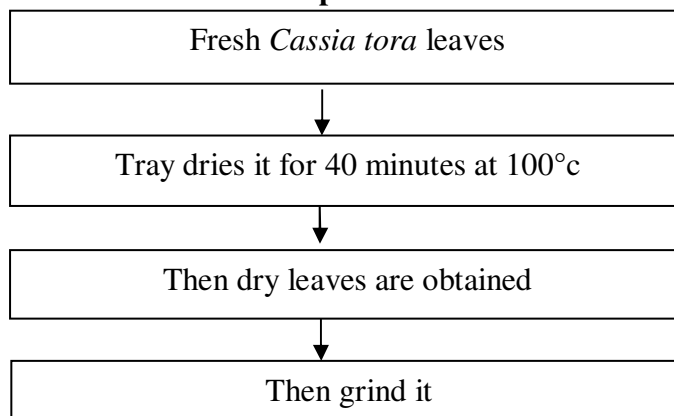


Fig. 2: *Cassia Tora* leaves powder

Process of making *Cassia tora* powder

1. Take 1kg of *Cassia tora* leaves.
2. Clean and wash *Cassia tora* leaves thoroughly.
3. Put leaves inside the tray dryer and dry it for 40 minutes at 100°C.
4. After leaves get dry grind it in a grinder to obtain fine particles.



Fig. 2: Tray dryer



Fig. 3: Cassia Tora leaves inside Tray dryer

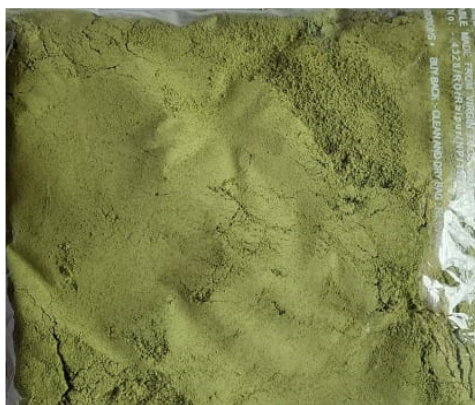


Fig. 4: Powder of *Cassia tora* leaves

RESULTS AND DISCUSSIONS

The research aimed to evaluate the effectiveness of the processing and preservation techniques for *Cassia tora* leaves, particularly focusing on the creation of a powdered product. Several critical parameters were analyzed, including texture, taste, appearance, rehydration capacity, and storage stability. These parameters provide insights into the product's suitability for consumption, medicinal use, and long-term storage.

TEXTURE OF CASSIA TORA POWDER

The assessment of the texture of *Cassia Tora* powder yielded an average score of 8.73, indicating a generally favorable perception among panelists. Many praised its smoothness and fine granulation, essential attributes for culinary and medicinal applications. However, some panelists provided scores of 7, suggesting areas for improvement, such as potential grittiness or inconsistency in granulation. This variability highlights the subjective nature of texture perception, which can be influenced by individual preferences. A finer, more homogeneous powder may enhance its competitiveness in the market, particularly in culinary uses where texture impacts incorporation into recipes, and in medicinal formulations where it can affect the bioavailability of active compounds. Future research should focus on quantitative texture analysis and processing techniques to optimize the powder's quality. By addressing the factors behind the lower scores and expanding studies to include diverse consumer preferences, the market appeal of *Cassia Tora* powder can be significantly enhanced. Overall, the results indicate a strong foundation for further exploration and potential improvements in the texture of this herbal powder.

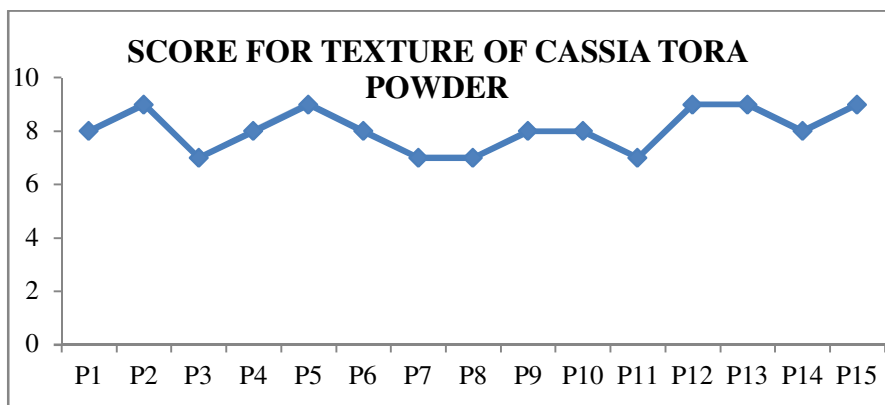


Fig 5: Score for Texture of Cassia Tora Powder

TASTE OF CASSIA TORA POWDER

The evaluation of the taste of Cassia Tora powder revealed a range of scores, culminating in an average score of 5.53. The panelists' feedback indicated a mixed reception, with scores ranging from 3 to 8. While panelist P4 rated the taste an 8, suggesting that some found it pleasant and acceptable, many scores were notably lower, with several panelists giving scores of 5 or below, reflecting a lack of appeal for others. The presence of lower scores may suggest that the taste profile of Cassia Tora powder could be perceived as bitter or earthy, which might not align with the preferences of all consumers. This variability in taste perception underscores the importance of individual palates and highlights a potential area for improvement. To enhance the appeal of Cassia Tora powder, future research could focus on modifying its flavor through processing methods or combining it with other ingredients to create a more palatable profile. Overall, the results indicate that while there is some acceptance of the taste, significant work remains to better align it with consumer preferences.

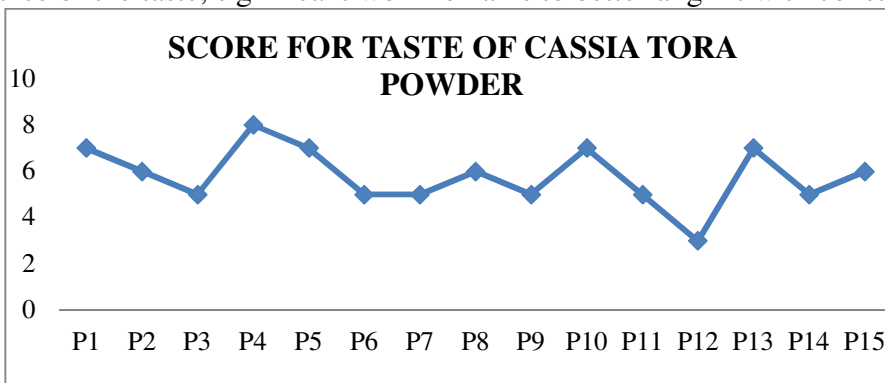


Fig 6: Score for Taste of Cassia Tora Powder

APPEARANCE OF CASSIA TORA POWDER

The assessment of the appearance of Cassia Tora powder yielded highly favorable results, with an average score of 8.27. Panelists consistently rated the powder well, with the majority awarding scores of 8 or 9, indicating a strong appreciation for its visual attributes. The bright color and fine texture likely contributed to these high ratings, as they suggest freshness and quality, which are important factors in consumer acceptance. Notably, only a few panelists rated the appearance as 7, reflecting minimal dissent among the group. The overall positive reception highlights the powder's aesthetic appeal, suggesting that it could attract consumers looking for high-quality herbal products. However, to maintain and enhance this positive perception, ongoing quality control and consistency in production are essential. Future research might explore the impact of packaging and presentation on consumer choices, further leveraging the appealing appearance of Cassia Tora powder in the marketplace.

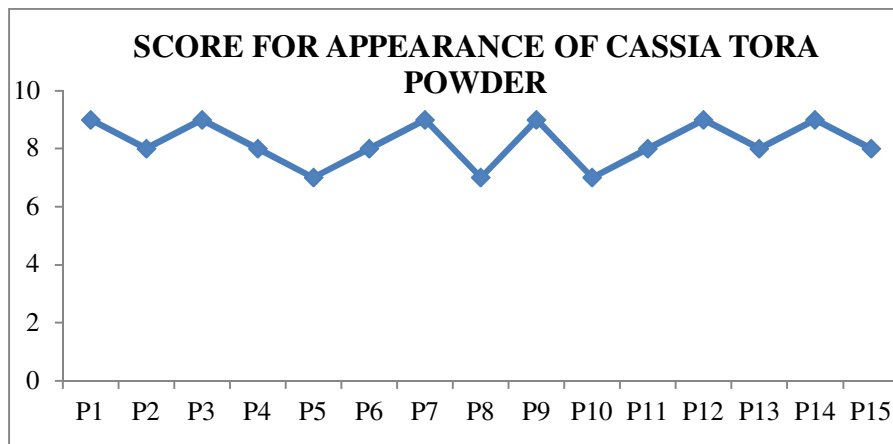
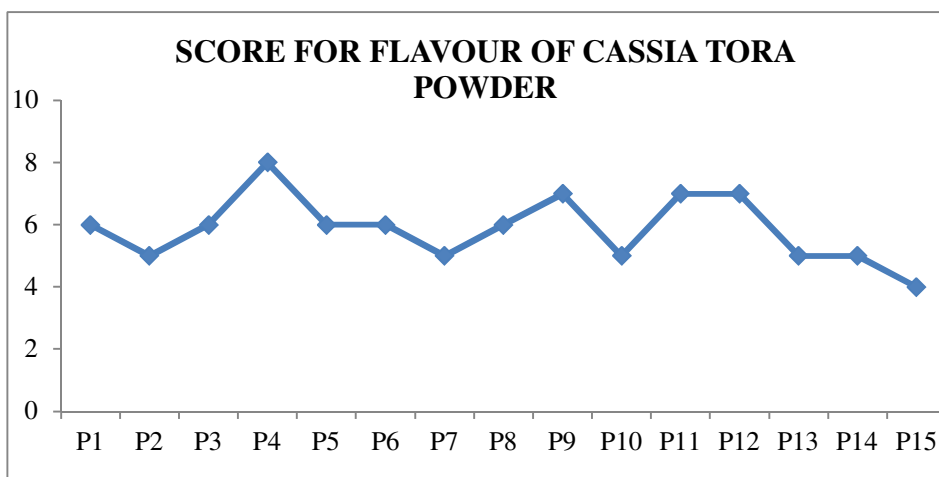


Fig 5: Score for Appearance of Cassia Tora Powder

FLAVOUR OF CASSIA TORA POWDER

The ratings indicate a moderate acceptance of the flavor of Cassia tora leaves among the panelists, with an average score of approximately 5.6. Notably, the highest rating of 8 suggests that some individuals found the flavor quite appealing, potentially due to its unique characteristics or the context in which it was presented (e.g., in a dish or as a standalone ingredient). Conversely, several panelists rated the flavor lower (4s and 5s), indicating that the taste may not be universally appreciated. The variability in ratings can be attributed to personal preferences, previous experiences with similar flavors, or even the preparation method of the leaves. The predominant flavor profile of Cassia tora leaves has been described as mildly bitter and slightly aromatic, which might explain the mixed reactions. Bitter flavors can be polarizing; while some people enjoy the complexity they bring to dishes, others may find them off-putting. Moreover, the usage of Cassia tora leaves in traditional cuisines and its health benefits could play a role in its acceptance. As more consumers become health-conscious and explore various culinary applications, there might be a growing appreciation for these leaves. Future studies could explore different preparation methods (e.g., cooking, drying, or fermenting) to assess their impact on flavor and overall acceptance. Additionally, expanding the sensory analysis to include more detailed flavor attributes, such as aroma, texture, and aftertaste, could provide deeper insights into how Cassia tora leaves are perceived in culinary applications.



OVERALL ACCEPTABILITY OF CASSIA TORA POWDER

The evaluation of the overall acceptability of Cassia Tora powder resulted in a positive reception, with an average score of 7.53. Panelists showed a strong preference, with many awarding scores of 8 or 9, indicating a favorable view of the powder's attributes across various sensory dimensions. The highest scores suggest that aspects such as taste, texture, and appearance are generally well-regarded, contributing to its overall appeal. However, the presence of lower scores, particularly a few ratings of 6, indicates that there is still room for improvement in certain areas, possibly related to the taste or texture, which may not have resonated with all

panelists. This variability highlights the need for further refinement in formulation to enhance acceptability among a broader audience. Overall, the encouraging average score suggests that Cassia Tora powder holds potential for consumer markets, but targeted improvements could help maximize its acceptance and success in diverse applications.

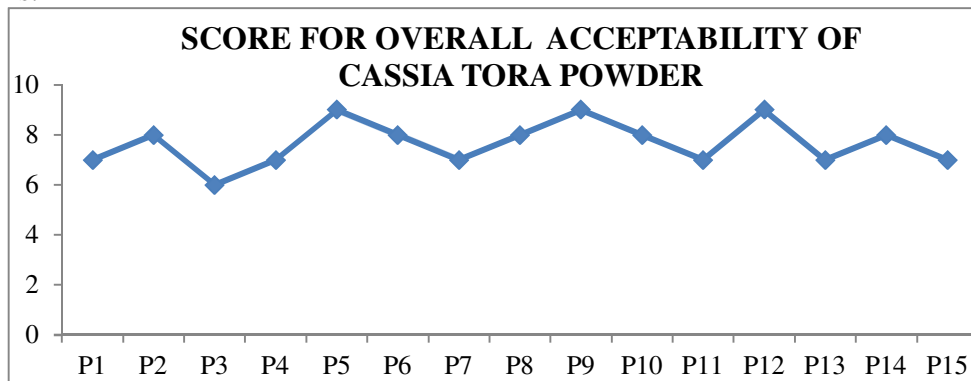


Fig 5: Score for Overall Acceptability of Cassia Tora Powder

Rehydration plot

Table 06: Rehydration Plot

S. No.	Wt. of sample	Soaking time	Water intake
1	2g	10 minutes	8.63g
2	4g	10 minutes	13.12g
3	6g	10 minutes	15g

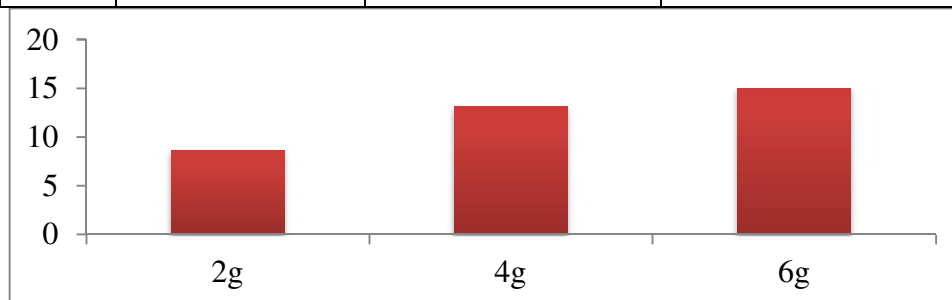


Fig. 7: Graphical representation of rehydration plot

As can be seen, the rehydration method uses dried Cassia tora leaves weighing 2g, 4g, and 6g. The leaves are soaked in water for 10 minutes to recover water, then they are drained and weighed using a weighing scale.

Storage study in different temperature

To identify the storage capacity of *Cassia tora* leave it is place into the refrigerator at different temperature to check its shelf life. And after 5 days we see that it starts rotting the colour changes into brown and started smelling.

Table 08: Temperature Plot of freezing

S.No	Leaves at different temperature	Shelf life (in days)
1	0°C	4
2	2°C	5
3	5°C	5
4	6°C	3

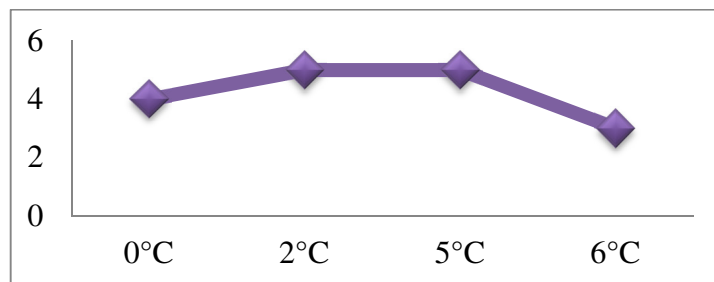


Fig. 9: representation of temperature plot of freezing



Fig. 10: Representing shelf life of leaves

SUMMARY

The research paper focuses on developing and standardizing methods for processing and preserving *Cassia tora*, a plant known for its wide range of medicinal properties and nutritional benefits. *Cassia tora*, traditionally used in both Ayurveda and Chinese medicine, has been recognized for its bioactive compounds such as flavonoids, anthraquinones, and glycosides, which contribute to its medicinal properties. These include antioxidant, antimicrobial, and antidiabetic effects, along with its use in treating conditions like leprosy, ringworm, constipation, and various digestive disorders. Its seeds and leaves are especially valued for their ability to scavenge free radicals and modulate metabolic pathways. The primary aim of the study is to develop value-added products from *Cassia tora* leaves, such as a fine powder, and to analyze the physico-chemical properties of these products. The paper presents a detailed methodology for the preparation of *Cassia tora* powder, starting with the pre-treatment of the leaves, which involves thorough cleaning and drying in a tray dryer at 100°C for 40 minutes. After drying, the leaves are ground to a fine powder. This process ensures the preservation of the plant's essential properties while making it more suitable for culinary and medicinal applications. The physico-chemical analysis of the *Cassia tora* powder is an integral part of the research, examining parameters such as texture, taste, appearance, and overall acceptability. The texture analysis of the powder showed an average score of 8.73, indicating general satisfaction with its smoothness and fine granulation, although some variability was noted, with scores as low as 7 from some panelists due to occasional grittiness. Taste, on the other hand, received a mixed response, with an average score of 5.53. Panelists rated the taste anywhere from 3 to 8, suggesting that while some found the taste acceptable, others found it lacking, possibly due to its bitter or earthy flavor. The appearance of the powder scored highly, with an average rating of 8.27, reflecting the panelists' appreciation of its bright color and fine texture, which are indicative of freshness and quality. Additionally, the paper includes a rehydration study, which evaluates the ability of dried *Cassia tora* leaves to regain water when soaked. The rehydration study showed that dried leaves absorbed a significant amount of water within 10 minutes of soaking, confirming the plant's potential for applications where rehydration is important, such as in culinary uses or medicinal formulations. The storage study provided insights into the shelf life of *Cassia tora* leaves at different temperatures (0°C, 2°C, 5°C, and 6°C). The findings indicated that the leaves began to degrade after 4 to 5 days, depending on the temperature, with noticeable color changes and

unpleasant smells, particularly at temperatures higher than 0°C. This suggests that maintaining the leaves at lower temperatures is crucial for prolonging their shelf life.

CONCLUSION

The research concludes that Cassia tora leaves can be effectively processed into a fine powder using standardized drying and grinding methods. The resulting powder has favorable physico-chemical properties, particularly in terms of texture and appearance, which make it a promising candidate for both culinary and medicinal applications. However, the taste of the powder presents a challenge, as it received mixed reviews from the panelists. This suggests that further research is needed to enhance the flavor profile, either through additional processing steps or by combining the powder with other ingredients to improve palatability. The rehydration study demonstrated that dried Cassia tora leaves have a good capacity to absorb water, which is beneficial for their use in recipes or medicinal preparations where rehydration is required. Moreover, the storage study highlights the importance of proper temperature control in maintaining the quality of the leaves. The leaves showed noticeable signs of deterioration after 4 to 5 days, especially at higher temperatures, suggesting that lower storage temperatures (around 0°C) are more effective for preserving the leaves for longer periods. Overall, the study emphasizes the potential of Cassia tora as a valuable source of bioactive compounds and nutrients. The standardized processing methods presented in the research provide a strong foundation for the development of value-added products, such as powder, which could be marketed for both health and culinary purposes. However, improvements in flavor and storage stability are necessary to increase consumer acceptance and ensure the longevity of the products. The research opens up avenues for further exploration into optimizing the processing techniques and enhancing the sensory properties of Cassia tora-based products, which could significantly contribute to its commercialization as a nutraceutical ingredient.

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