BLACK TURMERIC:

THE DARK ELIXIR

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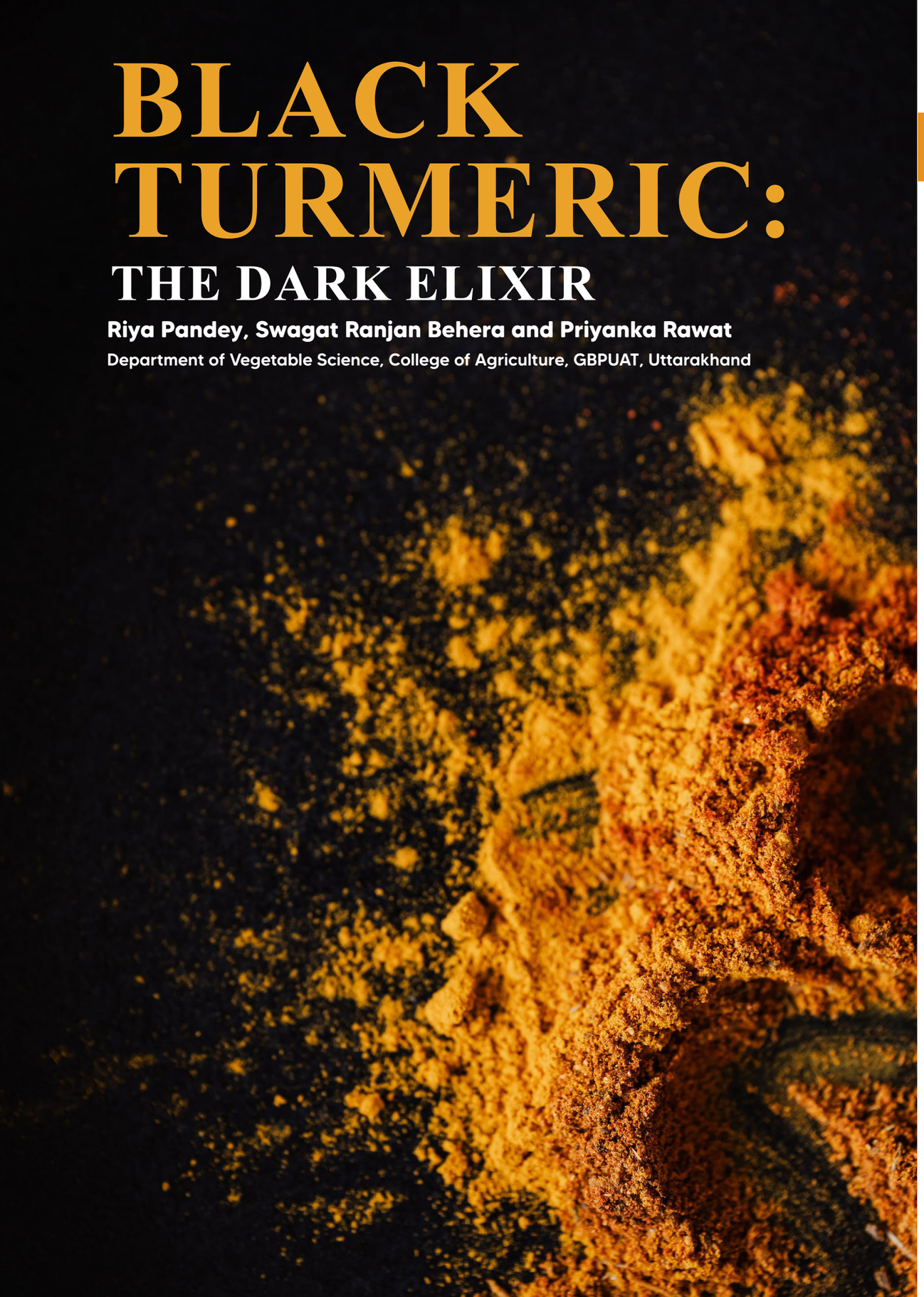

INTRODUCTION

Black turmeric (*Curcuma caesia*) is a perennial herb belonging to the Zingiberaceae family. This turmeric species is also known as "Kali Haldi" in Hindi, "*Yaingangamuba*" in Manipuri, "*Borangshaga*" in the Monpa community (North east India) and "*BeiAchomba*" in the Sherdukpen community of Arunachal Pradesh. It is characterized by its distinctive dark purple to black rhizomes, which set it apart from the more common yellow turmeric (*Curcuma longa*). Native to the Indian subcontinent, black turmeric has a long history of traditional use in Ayurvedic and traditional medicine systems. This article explores the botanical characteristics, phytochemical composition, traditional uses, medicinal properties, and potential health benefits of black turmeric. It also discusses the challenges associated with its cultivation and conservation efforts.

BOTANICAL CHARACTERISTICS

a. **Rhizomes:** The rhizomes of black turmeric are its most distinctive feature, the inner part of the rhizome being dark purple to bluish black in colour. They are not commonly consumed as such due to their hot, sharp, sour and earthy taste. They sometimes carry a subtle turpentine-like flavour mixed with bitterness.

b. **Leaves:** The leaves are broad, lance-shaped and arranged alternately on long petioles in a group of 10 to 25. They are typically green, with deep a deep ferruginous purple cloud down in the middle, that penetrates to the lower surface. The upper surface of the leaves has a slightly hairy texture.

c. **Inflorescence:** Black turmeric produces spikes of small, fragrant flowers with a pale pink or white coloration.

d. **Fruits:** The fruits are capsule-like and contain numerous seeds.

Fig. 1: Rhizomes of black turmeric

Fig. 2: Leaves of black turmeric

Fig. 3: Inflorescence of black turmeric

Plate 1: Botanical parts of black turmeric plant

PHYTOCHEMICAL COMPOSITION

The unique colour of black turmeric rhizomes is attributed to the presence of anthocyanins, particularly cyanidin. These anthocyanins are responsible for the dark purple to black pigmentation and also contribute to the plant's antioxidant properties. Besides anthocyanins, black turmeric contains other phytochemical compounds, including:

a. **Curcuminoids:** While black turmeric is not as well-known for its curcumin content as yellow turmeric, it does contain curcuminoids, which are known for their potential health benefits. This variety is known for containing the highest concentration of curcumin of any turmeric species.

b. **Essential oils:** The rhizomes contain essential oils with a complex aroma, often used in perfumery and traditional medicines.

c. **Starch:** The rhizomes are rich in starch, making them an energy source.

Fig. 4: Black turmeric plants

TRADITIONAL USES

Black turmeric has a rich history of traditional uses across various cultures:

- **Ayurveda:** In Ayurvedic medicine, black turmeric is believed to possess medicinal properties and is used for its anti-inflammatory, antimicrobial and analgesic effects. Crushed rhizome paste is applied to cut or injury to control bleeding and quick healing. The rhizome of black turmeric can be consumed during inflammation of tonsils. Its roots are grounded into powder and used with water to treat gastric disorder. Mizo people eat matured raw rhizome to get relief from stomach disorder. The Khampti tribes of Arunachal Pradesh apply fresh rhizome paste on snake and scorpion bites. Ground form of fresh rhizome is used in skin ailments. The Chothe tribe of Manipur use its rhizome in pox, wound and tumours. The Adi tribes of Arunachal Pradesh use a decoction of fresh rhizome as anti-diarrhoeal agent (*Soni et al.,* 2023).
- **Culinary:** In some Indian cuisines, black turmeric is used as a natural food colouring agent. However, its culinary use is less common compared to yellow turmeric. Black turmeric can also be a nutritional supplement, added in small quantities to not overpower the dish. The rhizomes are preferred by health-conscious people for smoothies and juices because they may be used fresh or powdered. To mask the bitter flavour of the rhizomes, stronger-flavoured items like lemon and ginger should be added to beverages when using this turmeric. Cucumber, kale and tropical fruits can also be added for a sweeter flavour. This turmeric can be kept in a sealed container for 4 to 6 months in a cool, dry and dark location, such the refrigerator.
- **Rituals and ceremonies:** Black turmeric holds cultural and religious significance in various rituals and ceremonies in India, particularly in the state of Assam. This turmeric has a strong connection to Kali, the Hindu Goddess of power, life and death, who is also a representation of Mother Nature. The rhizome of black turmeric is widely utilised in the Kali Puja for the Goddess because the flesh of the spice has a blue hue that is suggestive of the Goddess's skin colour. Black turmeric is often offered as a sacrifice on shrines and altars for the Goddess. Rhizomes of black turmeric are carried in pockets as a demon-dispelling remedy in some communities of Madhya Pradesh.

MEDICINAL PROPERTIES

Black turmeric is believed to possess several medicinal properties, although scientific research on its pharmacological effects is limited compared to its yellow counterpart. Some potential medicinal properties of black turmeric include:

i. Anti-inflammatory: The presence of curcuminoids and anthocyanins suggests potential anti-inflammatory properties, which may be beneficial for conditions characterized by inflammation.

ii. Antioxidant: The anthocyanins and other phytochemicals in black turmeric have antioxidant properties, which can help combat oxidative stress and reduce the risk of chronic diseases.

iii. Antimicrobial: Traditional medicine systems use black turmeric for its antimicrobial effects, which may help in managing infections. The essential oil obtained from the rhizome is found to possess antimicrobial activities against bacteria, Bacillus subtilis and B. cereus, and fungus, Saccharomyces cerevisiae (*Paw et al.*, 2020).

iv. Analgesic: It is traditionally used as a pain reliever and may have analgesic properties.

v. Digestive aid: Some traditional uses include using black turmeric to alleviate digestive discomfort.

vi. Aphrodisiac: In traditional systems, it is considered an aphrodisiac and is used to address sexual health issues.

POTENTIAL HEALTH BENEFITS

While black turmeric shows promise in traditional medicine, further scientific research is needed to establish its potential health benefits conclusively. Some areas of interest for research include:

A. Anti-cancer properties: The antioxidant and anti-inflammatory properties of black turmeric suggest a potential role in cancer prevention and treatment, but this requires extensive study. As per some research studies, a bioactive compound "curcuzederone", extracted from the chloroform fraction of the rhizome of black turmeric, mainly possesses anti-cancer activities. The hexane rhizome extract of the plant holds anti-cancer properties, which inhibits Hep G2 cancer cell lines. It has been proved from flow cytometry and western blotting that the extract ceases cell arrest at the G2/M phase, thereby resulting in "programmed cell death".

B. Anti-diabetic effects: Some studies have indicated that curcuminoids, found in black turmeric, may help regulate blood sugar levels.

C. Neuroprotective effects: Curcuminoids have been studied for their potential in neuroprotection and the management of neurodegenerative diseases. The anti-inflammatory property of black turmeric inhibits inflammation of neurons and is, thus, used in curing diabetic neuropathy.

D. Wound healing: The antimicrobial and anti-inflammatory properties of black turmeric may aid in wound healing.

E. Skin health: Some traditional uses of black turmeric relate to skin health and its antioxidant properties may benefit skin care.

Fig. 5:
Black turmeric powder

Fig. 6:
Black turmeric-infused honey

Fig. 7:
Dried black turmeric roots

Plate 2: Commercially available black turmeric products

CHALLENGES IN CULTIVATION AND CONSERVATION

Cultivating black turmeric presents several challenges, viz.

i. Low yield: Black turmeric typically has lower rhizome yields (fresh rhizome yield: 50-60 q/acre) compared to yellow turmeric (fresh rhizome yield: 80-100 q/acre), making it less economically viable for large-scale cultivation.
ii. Market demand: Despite its rich cultural heritage and potential health benefits, black turmeric struggles to gain traction in global markets. Here are some of the factors contributing to limited market demand of black turmeric:
    - Lack of awareness: One of the primary reasons for the limited market demand for black turmeric is a lack of awareness among consumers, especially in regions outside of its native habitat. Many people are more familiar with yellow turmeric due to its widespread culinary use and extensive marketing.
    - Colour preference: In culinary applications, the vibrant colour of yellow turmeric is often preferred, especially in dishes like curry. The dark colour of black turmeric can be seen as less appealing for certain culinary uses, impacting its marketability.
    - Competition with yellow turmeric: Yellow turmeric, with its well-established market presence and reputation for health benefits, poses tough competition for black turmeric.
    - Limited processing and product development: Consumers may opt for the more familiar and readily available yellow variety. Compared to yellow turmeric, there are fewer processed products and commercial offerings based on black turmeric. Limited product diversity can restrict its market potential.
    - Lack of marketing and promotion: Insufficient marketing and promotion efforts for black turmeric also contribute to its limited market demand. It is essential to educate consumers about its unique qualities and potential health benefits.

In addition to cultivation challenges, black turmeric faces conservation concerns due to overharvesting from the wild for its rhizomes and habitat destruction and has, therefore, been labelled "endangered". Sustainable cultivation practices and conservation efforts are necessary to ensure the long-term viability of this culturally and medicinally important plant.

CONCLUSION

In conclusion, black turmeric holds promise as a valuable addition to traditional medicine and potentially, as a source of natural remedies. It has been less studied and its pharmacological and medicinal properties are not explored properly. The plant rhizome with various bioactive principles has wide scope in treating various diseases. Therefore, there is an urgent need to conduct studies and research on the phytochemical composition and other medicinal benefits of rhizomes and leaves of the plant. Advanced breeding methods, like in vitro propagation, if employed to grow plants using various growth promoters, can help conserve this medicinal plant. Moreover, the local growers should be encouraged to cultivate and conserve the germplasm of the rare species for prolonged use. As scientific interest in its properties grows, it is imperative to strike a balance between preserving its cultural heritage and promoting sustainable cultivation and conservation practices for the benefit of both human health and biodiversity.