

Turmeric: A Golden Herb with Health-Promoting Components

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Abstract

Turmeric (*Curcuma longa*) belongs to the Zingiberaceae family and is an herbaceous plant. It is well mentioned in literature due to its health prominent components: curcuminoids as well as essential oils and since ages it has been used for culinary and medicinal purposes. This herb is getting popular among researchers owing to the wide spectrum of its biological properties such as anti-cancerous, antibacterial, anti-inflammatory, anti-aging, antioxidant, and many more. Earlier researchers focused only on curcumin but this comprehensive article mentions other components that are equally important from a research point of view.

Keywords: Turmeric, curcuminoids, non-curcuminoids, essential oils.

Introduction

Turmeric is a rhizomatous herbaceous plant belonging to the ginger family: Zingiberaceae, which is a native crop of South Asia but now it is cultivated throughout the world. India is one of the main known producers and exporters of turmeric rhizome and its powder. India contributes 90% of total production and 80% is utilized in India. It is well known as "Golden spice", which has been used as a spice, coloring, and flavoring agent since ancient times (Sultan et al., 2014). Turmeric is gaining more attention because it comprises two major classes of secondary metabolites viz curcuminoids, a non-volatile component; and the volatile turmeric essential oil. It has been used as a traditional home-made medicine for centuries to treat numerous illnesses, including disorders related to respiration, hypertension, wounds, digestive disorders, body aches, skin diseases, infectious diseases, and many more. Moreover, turmeric is attributed to several therapeutic activities such as antioxidant, anti-inflammatory, antimicrobial, antiangiogenic, antimutagenic, and antiplatelet aggregation (Dosoky et al., 2018; Choi et al., 2019).

Nutritional profile

There are many nutritional components present in turmeric: carbohydrates, proteins; minerals such as potassium, calcium, magnesium, and phosphorus, followed by fatty acids containing oleic acid, myristic acid, linoleic acid, and vitamins such as niacin, riboflavin, and thiamine. The curcuminoids belong to the class diarylheptanoids which are further classified into three sub compounds such as curcumin, bisdemethoxycurcumin, and demethoxycurcumin. Curcuminoids are the reason behind the bright yellow color of turmeric, whereas the aromatic and spicy flavor of turmeric is contributed by the volatile essential oil extract of the turmeric (Abubakar et al., 2022). A brief profile of turmeric is shown in figure 1

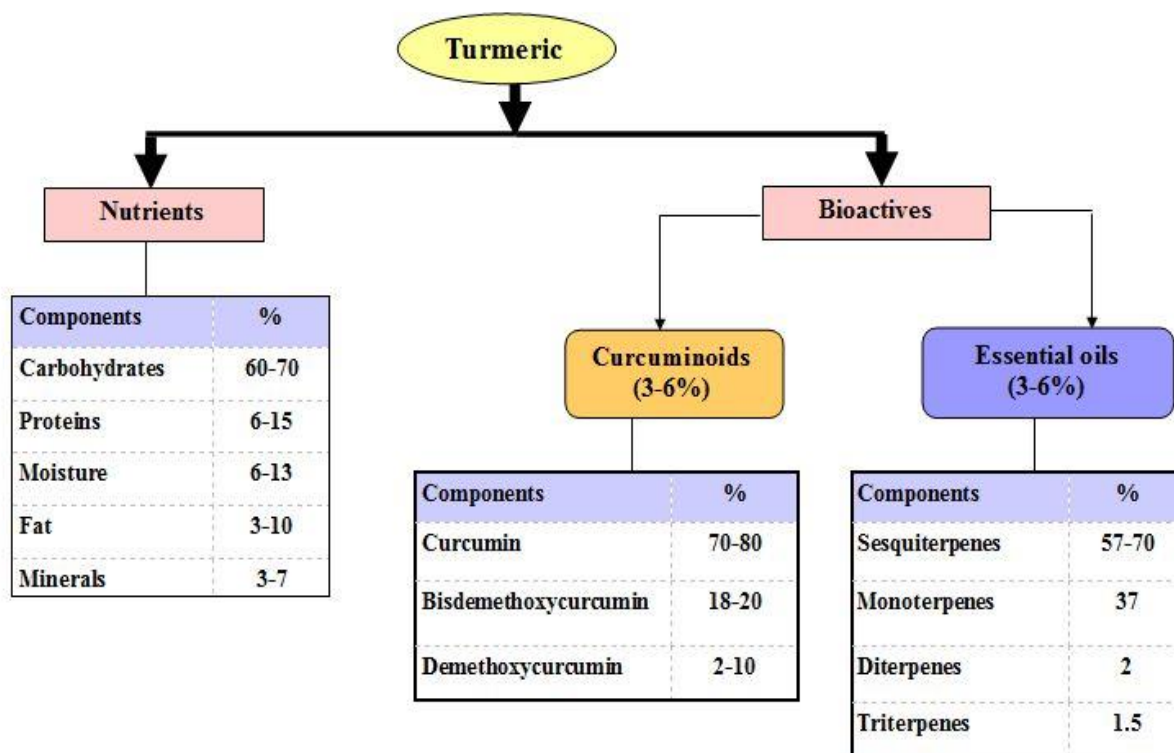


Figure 1. Profile of turmeric

Curcuminoids

The primary phytochemical ingredient of turmeric commonly known as curcuminoids, is the reason for its popularity among scientists. Curcuminoids are non-volatile phenolic compounds; concentration varies from 3-6% depending on cultivar, soil, and climatic circumstances (Delfiya et al., 2015). Curcuminoids are made up of three chemically related compounds: curcumin {1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione},



demethoxycurcumin {1-(4-hydroxyphenyl)-7-(4-hydroxy-3methoxyphenyl)-1,6-heptadiene-3,5-dione} and bis-demethoxycurcumin {1,7-bis(4-hydroxyphenyl)-1,6-heptadiene3,5-dione}. The composition varies from Curcumin (70-80%), Demethoxycurcumin (18-20%), and Bis-demethoxycurcumin (2-10%). These compounds are less soluble in aqueous media at acidic and neutral pH due to the chemical structures of these curcuminoids, but soluble in organic solvents such as methanol, ethanol, dimethyl sulfoxide, and acetone. These three curcuminoids along with other components impart a distinctive yellow color to the turmeric. Curcuminoids and their derivatives have been shown to possess a wide range of biological activities (Amalraj et al., 2017; Kotra et al., 2019).

Essential oils / non-Curcuminoids

Volatile essential oil fraction of turmeric extracts is called non-curcuminoids. *Curcuma longa* rhizomes have been found to contain 3-6% essential oil. Around 185 terpene compounds have been found in turmeric. The terpenes also known as terpenoids, which further classified into four groups i.e. monoterpenes, sesquiterpenes, diterpenes, and triterpenes. Where sesquiterpenes make up 57-70% of the total essential oil and monoterpene makes up 37% whereas diterpenes and triterpenes make up the rest. Turmeric oil contains 109 sesquiterpenes and 68 monoterpenes which comprise several sub compounds including elemans, bisabolanes, and germacrans. Bisabolanes were detected in the greatest number among these sesquiterpenes. Turmerones are sesquiterpenes that are found in abundance in turmeric oil. They are further divided into three sub-categories: α -turmerone, ar-turmerone, and β -turmerone. They are thermally labile substances that degrade fast when exposed to ambient air and temperature and get converted to their most stable compound, namely, ar-turmerone. Turmerone composition varies from ar-turmerone being higher amount is found in a range of 12.2-45.51% followed by α -turmerones 12.6-44.5% and β -turmerones 7.35-16%. These compositions vary with the geographic location and variety of the turmeric (Hwang et al., 2016; Oyemitan et al., 2017).

Health benefits

Turmeric is one of the most popular medicinal herbs, with a wide range of pharmacological activities such as antioxidant, anti-protozoal, anti-venom activities, anti-microbial, anti-malarial, anti-inflammatory, anti-proliferative, anti-angiogenic, anti-tumor and anti-aging properties (Ibanez and Blazquez, 2020) as depicted in figure 2.

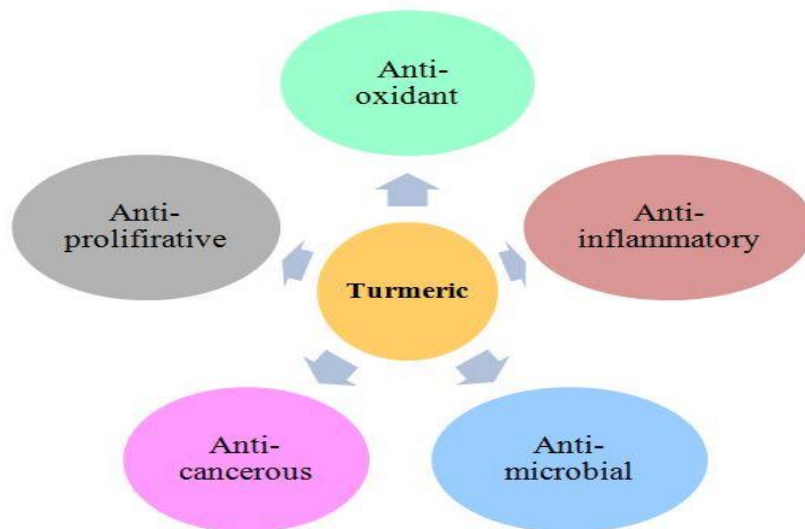


Figure 2. Health properties of Turmeric

Conclusion

Turmeric is a rich source of health-promoting components not only curcuminoids but also volatile essential oil, which is also known as curcumin-free components. Among curcuminoids, curcumin is well known for its yellow color and non-curcuminoids are famous for their volatile nature. Whole turmeric imparts therapeutic effects. Turmeric's versatility and wide-ranging applications make it an indispensable carrier for pharmaceutical applications owing to its rich source of not only curcuminoids but non-curcuminoid fractions as well.

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