Revista Brasileira de Farmacognosia 26 (2016) 385–391

Brazilian Journal of Pharmacognosy
REVISTA BRASILEIRA DE FARMACOGNOSIA
www.elsevier.com/locate/bjp

Review

Several aspects of *Zingiber zerumbet*: a review

Adriana Y. Koga, Flávio L. Beltrame, Airton V. Pereira*

Department of Pharmaceutical Sciences, Universidade Estadual de Ponta Grossa, Ponta Grossa, PR, Brazil

ARTICLE INFO

Article history:
Received 10 November 2015
Accepted 7 January 2016
Available online 3 March 2016

Keywords:
Zingiberaceae
Phytochemistry
Terpenes
Flavonoids
Toxicity

ABSTRACT

Zingiber zerumbet (L.) Roscoe ex Sm., Zingiberaceae, is a perennial, aromatic and tuberose plant that grows in humid locations. Also known as bitter ginger, *Z. zerumbet* is traditionally found throughout Asia, where it is widely used in foods, beverages and for ornamental purposes. The viscous juice present in the inflorescence of the plant is rich in surfactants and is also known as "ginger shampoo". The rhizome can be macerated in ethanol and used as a tonic and a stimulant. In Brazil *Z. zerumbet* is found in the Amazon region, in Taruma-mirim and Puraquequara (rural areas of Manaus, Amazon, Brazil). The main chemical compounds found in *Z. zerumbet* are terpenes and polyphenols. Zerumbone, a sesquiterpene, is the principal bioactive compound of *Z. zerumbet* and it is widely studied for its medicinal properties. The extracts and isolated metabolites of *Z. zerumbet* have exhibited the following properties: anti-inflammatory, antioxidant, antidiabetic, anticancer, antimicrobial, analgesic and antiviral. The National Institute of Amazon Research in Brazil is currently conducting studies using extracts from this plant to obtain compounds active in tumor models. The aim of this review is to provide a overview about the main aspects related with pharmacognosy and pharmacology of *Z. zerumbet* published in the literature over the last decade.

© 2016 Sociedade Brasileira de Farmacognosia. Published by Elsevier Editora Ltda. All rights reserved.

Introduction

Zingiberaceae includes approximately 53 genera and more than 1200 species, which are distributed across south and southeast Asia (Kress et al., 2002; Khatun et al., 2003). The members of this family, such as *Zingiber officinale* (ginger), *Curcuma longa* (turmeric), *Zingiber zerumbet* (bitter ginger) and *Elettaria cardamomum* (cardamom), are used in folk medicine, agriculture, as food condiments, and for ornamental purposes (Filho et al., 2000; Jamal et al., 2006; Andreo and Jorge, 2011).

The genus *Zingiber* contains approximately 85 species (Chaveerach et al., 2007). The main species of ginger consumed in Brazil is *Z. officinale* Roscoe, whose bioactive compounds gingerol, shogaol and other gingerones confer its characteristic flavor, aroma and anti-inflammatory properties. For these reasons it is mainly used in medicines and for culinary purposes (Elpo and Negrelle, 2004; Andreo and Jorge, 2011). The city of Morretes in the state of Paraná is the largest producer of ginger in Brazil (Elpo et al., 2008).

Z. zerumbet (L.) Roscoe ex Sm. is widely cultivated in tropical and subtropical regions around the world (Baby et al., 2009; Al-Zubairi et al., 2010; Eid et al., 2011). This species is traditionally known as Asian ginger or bitter ginger. In Brazil, it is mainly found in the regions of Taruamã-Mirim and Puraquequara, which are rural areas of Manaus in the state of Amazonas.

The studies on chemical profiles of *Z. officinale* and *Z. zerumbet* has provided some differences between the two species. Limonene occurs exclusively in *Z. zerumbet*, while citronellal is present only in *Z. officinale* (Jiang et al., 2006).

Interest in the therapeutic potential of *Z. zerumbet* has resulted in several studies regarding its chemical composition. Research has shown that bitter ginger yields a complex mixture of terpenes, with a predominance of sesquiterpenes (Yu et al., 2008a).

From a commercial point of view, *Z. zerumbet* is a medicinal plant with great potential for cultivation that does not require high costs. In Brazil, the National Institute of Amazonian Research, in partnership with Biozer company, has developed products using bitter ginger such as yogurt with a property that enhances the functions of the gastrointestinal tract (Pinheiro and Castro, 2005).

Traditional uses

It is widely recognized that popular knowledge about the use of medicinal plants in the treatment of several diseases needs to be confirmed. The traditional use of medicinal plants contributes to the spread of this knowledge and serves as a basis for scientific research seeking evidence of such pharmacological activities (Deb et al., 2011).

* Corresponding author.
E-mail: airtonvp@uepg.br (A.V. Pereira).

http://dx.doi.org/10.1016/j.bjp.2016.01.006
0102-695X/© 2016 Sociedade Brasileira de Farmacognosia. Published by Elsevier Editora Ltda. All rights reserved.

In *Z. zerumbet* the rhizome is the part that is most used for medicinal purposes (Norulaini et al., 2009). These folk medicines are generally prepared by maceration and infusion of fresh rhizome, but tinctures, poultices and even the plant *in natura* are other therapeutic uses (Tushar et al., 2010). *Z. zerumbet* has a wide spectrum of traditional uses, as well as biological and pharmacological properties. The cone-shaped flowers are long-lasting and are employed in craft arrangements for ornamental purposes (Devi et al., 2014). The rhizome is used as a tonic and as a stimulant (Sakinah et al., 2007). The rhizome serves as a seasoning in foods, while the floral buds are consumed as vegetables (Sirirugsa, 1999).

The rhizome of ginger has been extensively used with remarkable therapeutic effects for the treatment of inflammation, diarrhea, stomach cramps, bacterial infections, fever, flatulence, allergies and poisoning (Tewtrakul and Subhadhirasakul, 2007; Okamoto et al., 2011; Prakash et al., 2011b; Sidahmed et al., 2015). Powdered rhizome is used to treat ear infections, toothache and, in the form of tea, to treat stomach disease (Ghosh et al., 2011). The leaves are also used in therapies for joint pain. The juice of cooked rhizome was reported to be effective in combating worms in children (Somchit and Shukriyah, 2003; Ibrahim et al., 2007). The creamy substance present in the mature inflorescence, is rich in surfactants and serves as a natural shampoo (Yu et al., 2008b).

Botanical description

Z. zerumbet is a perennial tuberous plant that can be found naturally as scattered plants in damp and shady parts of lowlands or mountain slopes. It is often found near rivers, waterfalls and other water sources (Nalawade et al., 2003; Tzeng et al., 2013). This species reproduces asexually by multiplying rhizome fragments (Kavitha and Thomas, 2008).

This plant is characterized by the presence of stems approximately 1–2 m tall, which are erect, oblique, round and covered by sheaths of flat leaves. The leaves and inflorescences grow from a thick rhizome or underground stem. The sheets are thin and are approximately 25–35 cm long, with a central raised midrib which strongly raised on the lower surface. The sheets are arranged alternately along the stem (Yob et al., 2011). The inflorescence, which is green when young, becomes red when old and reaches 6–12 cm in height. It is supported on a separate pseudostem from the leaves by a narrow overlap that forms an open pouch, from which the flowers arise. An important botanical feature of *Z. zerumbet* is that the yarn is connected to a long curved beak. The fruit is white, glabrous, thin-walled and is approximately 1.5 cm long. The seeds are ellipsoids and black. The rhizome is perennial, thick, aromatic and yellow (Yob et al., 2011).

Chemical composition

Z. zerumbet is a rich source of different classes of compounds that belong to a wide variety of chemical metabolites, such as polyphenols, alkaloids and terpenes (Matthes et al., 1980; Jang et al., 2004; Jang and Seo, 2005; Chung et al., 2007; Chang et al., 2012c).

Terpenes

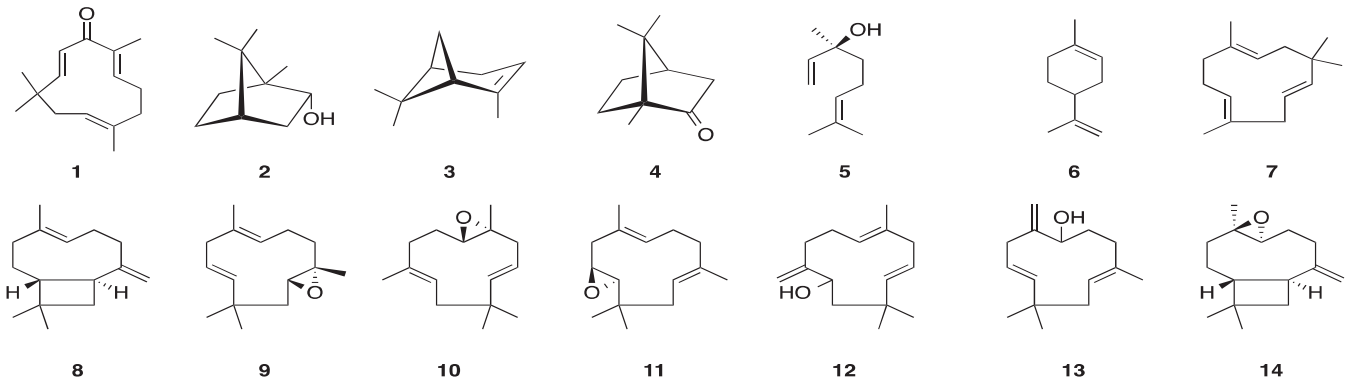
Dev (1960) isolated zerumbone (**1**) from essential oil of *Z. zerumbet* and determined its structure, while Ramaswami and Bhattacharyya (1962) identified humulene monoxide and humulene dioxide. Nigam and Levi (1963) studied the compounds present in eight essential oil fractions and obtained borneol (**2**), α-pinene (**3**), camphor (**4**), linalool (**5**), zerumbone (**1**), limonene (**6**), α-humulene (**7**) and β-caryophyllene (**8**).

Damodaran and Dev (1968a,b,c) characterized the following sesquiterpenes: humulene epoxide I (**9**), II (**10**) and III (**11**), humulenol I (**12**) and II (**13**) and caryophyllene oxide (**14**).

Dai et al. (2013) identified the presence of 46 compounds in the essential oil extracted from the rhizome of *Z. zerumbet*. The most abundant components were monoterpenes (76.1%): camphene (**15**) (16.3%), sabinene (**16**) (14.6%), citral (**17**) (26.1%), zingiberene (**18**) (7.2%) and lavandulyl acetate (**19**) (6.7%). In the aforementioned study, the essential oil showed a low zerumbone content (1.2%). Zerumbone (**1**) is a monocyclic sesquiterpene with three double bonds, two of which are coupled with carbonyl grouping and the other is isolated (Songsiang et al., 2010; Kitayama, 2011; Kumar et al., 2013). Rout et al. (2009) performed a quantitative analysis of zerumbone in different parts of *Z. zerumbet*. The highest values were found in the rhizome, followed by the roots. Bhuiyan et al. (2009) evaluated the essential oil of *Z. zerumbet* using GC-MS and identified the terpenes α-pinene (**3**), camphor (**4**), linalool (**5**), zerumbone (**1**), limonene (**6**), camphene (**15**), α-caryophyllene, 3-carene (**20**), 4-terpineol (**21**) and eucalyptol (**22**).

Sulaiman et al. (2010) isolated and also quantified the compounds present in the essential oil. The sesquiterpenes were the major components, followed by monoterpenes. Zerumbone (**1**) (36.12%) was the most abundant compound, followed by humulene (10.03%). The following monoterpenes were identified and quantified using GC–MS: borneol (**2**) (4.78%), α-pinene (**3**) (3.71%), camphor (**4**) (4.18%), linalool (**5**) (1.06%), camphene (**15**) (14.29%), eucalyptol (**22**) (3.85%), γ-terpinene (**23**) (2.00%) and β-phellandrene (**24**) (1.63%).

Yu et al. (2008a) found that 85.81% of the compounds in the essential oil were sesquiterpenes, confirming the aforementioned study. The oil was characterized by the presence of zerumbone (**1**) (48.13%) and α-humulene (**7**) (17.23%). Other sesquiterpenoids were also isolated but in lower concentrations. Batubara et al.



Download English Version:

https://daneshyari.com/en/article/2577608

Download Persian Version:

https://daneshyari.com/article/2577608

Daneshyari.com