

CHAPTER

6

STERILISATION METHOD OF RED GINGER

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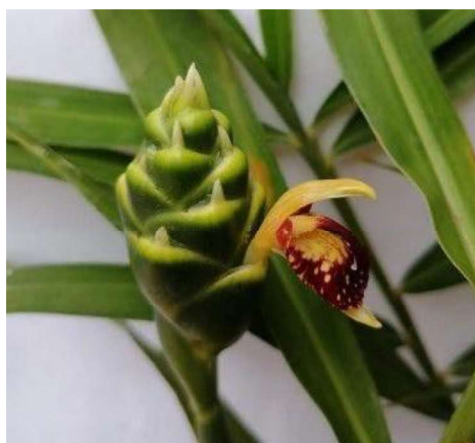
6.1 INTRODUCTION

Zingiber officinale var *rubrum* (red ginger or “halia bara”) was first grown in Asia, such as Indonesia and Malaysia (Supu et al., 2020). However, it is now grown in the west and other tropical areas such as Africa and India because of its extensive therapeutic properties (Rinanda et al., 2018). Red ginger comes from the Zingiberaceae (Table 6.1), a flowering plant family made up of about 50 genera with about 1600 known species of aromatic perennial herbs with creeping horizontal or tuberous rhizomes distributed throughout tropical Africa, Asia, and the Americas (Christenhusz & Byng, 2016).

Red ginger is an annual plant that can grow up to 50–100 cm tall. The red ginger leaves are lanceolate, with 5–25 cm in length and 1.5–2.0 cm in width. The tips of the leaves are pointed and gripping the stem with a long sheath. The branches grow perpendicularly and are rounded, flat, and unbranched. Red ginger has compounded and ovoid flowers with 10–25 cm long stalk (Theilade, 1996). The purple flower crown measured 2.0–2.5 cm (Supu et al., 2020). The petals of the small flower are in a tubular shape and jagged three (Figure 6.1). The rhizome is fleshy thick and reddish–brown and red in rhizome skin. Rhizomes range in diameter between 4.20 cm and 4.26 cm, height between 5.26 cm and 10.40 cm, and length between 12.33 cm and 12.60 cm (Wiedhayati, 2016).

Table 6.1 Taxonomy of *Zingiber officinale* var. *rubrum* (Supu et al., 2020)

Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Zingiberales
Family	Zingiberaceae
Genus	<i>Zingiber</i>
Species	<i>Zingiber officinale</i>
Variety	<i>Zingiber officinale</i> var. <i>rubrum</i>

**Figure 6.1** Flower of *Zingiber officinale* var. *rubrum*

Red ginger is rarely used in cooking due to its extensive essential oils, giving it a more pungent scent and taste than other ginger types (Wiedhayati, 2016). Different types of ginger include big white ginger (*Zingiber officinale* var. *officinale*) and small white ginger (*Zingiber officinale* var. *amarum*) (Supu et al., 2020). The three variations are differentiated based on size, rhizome colour, and chemical contents. These three types are utilised for various cooking, spices, herbs, seasoning and flavouring agents, and medicinal industries.

6.1.1 Pharmacological Activities

Zingiber officinale var. *rubrum* is thought to have a potential medicinal value and offer relatively safe herbal treatment with few and minor adverse effects. Red ginger provides carminative (fart releasing), seizure reliever,

anti-hardening of blood vessels, sweat laxative, anti-inflammatory, anti-microbial and parasitic, anti-pyretic, and anti-rheumatism (Sukarnih et al., 2021). It stimulates the release of gastric juice and bile (Hapsoh & Hasanah, 2017). Other than that, much research has shown that red ginger has antihyperalgesic (Fajrin et al., 2019) and antioxidant (Ghasemzadeh et al., 2015), antibiofilm (Rinanda et al., 2018), and antifungal properties (Evy Prastiyanto et al., 2021).

Researchers studied the antihyperalgesic potential of *Zingiber officinale* var. *rubrum* in inflammatory and neuropathy-induced chronic pain conditions in mice in previous research published by Fajrin et al. (2019). When given red ginger oil, mice with chronic pain caused by inflammation and neuropathy have antihyperalgesic effects, which occur by prolonging the latency time of the thermal stimulus. Camphene, the compound most abundant in red ginger oil, is believed to be responsible for this action as the gas chromatography-mass spectrometry (GC-MS) analysis found that camphene, a monoterpene compound, was the most highly abundant component in red ginger oil. The study has shown that red ginger oil could be adapted as an antihyperalgesic agent based on its effects (Fajrin et al., 2019).

The anticancer activities of ginger extracts optimised for and unoptimised for use against HeLa cells was investigated by Ghasemzadeh et al. (2015). According to preliminary testing, rhizomes extract showed remarkable anticancer activity against HeLa cancer cells at a 40 µg/mL concentration with inhibition rates of 51.8% and 62.3%, respectively, for unoptimised and optimised extracts.

Rinanda et al. (2018) explored red ginger essential oil (*Zingiber officinale* var. *rubrum*) and its anti-biofilm capacity against *Candida albicans*. As red ginger essential oil concentration increased, it continued to inhibit biofilm formation at a greater level, starting from concentrations of 0.5%. In contrast, as essential oils concentrations increased, so did biofilm degradation activity, which began at the lowest concentration (0.125%) and continued to increase as the concentration increased. It is thought that the anti-biofilm effect of essential oils such as those from red ginger is due to secondary metabolite compounds like terpenoids.