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Chapter

Introductory Chapter: Studies on Ginger

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1. Introduction

Ginger (*Zingiber officinale* Roscoe), as a bulbous plant, has been cultivated for a very long time. It is believed that ginger is native to southern China, Southeast Asia, and India. It was introduced to the Mediterranean in the first century, Japan in the third century, England in the eleventh century, and America in 1585 [1]. It is now widely cultivated in tropical and subtropical regions of the world but mostly in Asia and Africa. The total harvest area of ginger in the world is more than 21,000 hac with a total production of more than 200,000 tons and an average yield of 10,000 kg per hac. Ginger is mainly used as spice and flavour agent for food. The characteristic fragrance and flavour of ginger are the result of volatile oils, primarily consisting of zingerone, shogaols and gingerols as the major pungent compound. A lot of studies have been carried out to discover the miracle of this plant. The book will cover the history of ginger in cultivation, therapeutic benefits, modern cultivation and production, varieties and breeding.

2. Botanical character

The leafy stems of ginger grow about a metre high. The leaves are 6–12 inches (15–30 cm) long, elongate, alternate in two vertical rows and arise from sheaths enwrapping the stem. The flowers are in dense cone-like spikes about 1-inch thick and 2–3 inches long that are composed of overlapping green bracts, which may be edged with yellow. Each bract encloses a single, small, yellow-green and purple flower. The consumed portion of the ginger plant is the rhizome, often called "ginger root", although it is not an actual root. The rhizome is the horizontal stem of the plant that sends out the roots [2].

3. The history of ginger cultivation

Ginger, an herbaceous perennial plant of the family Zingiberaceae, probably native to southeastern Asia [3], or its aromatic, pungent rhizome, is used as a spice, flavouring, food and medicine. Its generic name *Zingiber* is derived from the Greek zingiberis, which comes from the Sanskrit name of the spice, singabera. Its use in India and China has been known from ancient times, and by the first century, traders had taken ginger into the Mediterranean region. By the eleventh century, it was well-known in England. The Spaniards brought it to the West Indies and Mexico soon after the conquest, and by 1547 ginger was being exported from Santiago to Spain [4].

4. Ginger is mainly used as spice and flavouring agent for food

Ginger is well-known as spice and flavouring agent for food [5]. Ginger is used in cooking, in various forms such as immature ginger, mature fresh ginger, dry ginger, ginger oil, ginger oleoresin, dry-soluble ginger, ginger paste and ginger emulsion. It is rich in secondary metabolites, namely, the oleoresins, contributing widely the pungency and flavours. Ginger (*Zingiber officinale* Rosc.), which belongs to the family Zingiberaceae, is an important tropical horticultural plant and an important spice crop used in various medicinal and culinary preparations [6]. Besides, ginger is very popular in the food industry as an additive to ginger ale, candies, pastries and cakes [7]. Its uses, of course, aren't confined to food preparation.

5. Ginger consumption is known for its health benefits

Ginger is an excellent source of several bioactive phenolics, including non-volatile pungent compounds such as gingerols, paradols, shogaols and zingerones. Ginger is also used in traditional oriental medicine (Ayurvedic, Chinese and Unani systems of medicine) since antiquity (>2500 years) to treat different diseases that include rheumatoid arthritis, sprains and muscular aches, sore throats, nausea, constipation and indigestion, fever, infectious diseases and helminthiasis [8, 9]. It is particularly valued in medicine as a carminative and stimulant to the gastrointestinal tract. Ginger consumption is known for its health benefits and widely known to be used in Ayurvedic formulations and Chinese medicine. It is stimulative in nature and helps in relieving indigestion, stomach ache, diarrhoea and nausea. It is widely used to cure common cold, cough and congestion. Clinical studies have demonstrated it to be antiemetic, antiulcer, anti-platelet, anti-inflammatory and antioxidant in nature [10, 11]. Ginger has many uses as home remedies and can be used to help arthritis, diarrhoea, flu, headache, heart and menstrual problems, diabetes, stomach upset and motion sickness. Wide studies have been taken up involving ginger to cure complex diseases such as cancers to the chronic conditions of migraines.

6. Germplasm and varieties

There are many genetic resources which were collected and preserved in the word. Zingiberis family includes about 50 genera and 1300 species of ginger which are known to exist worldwide [12–15]. They occur in different parts of the world, namely, Japan, Australia, Haiti, Bangladesh, Jamaica, Sri Lanka and Nigeria. However, most of the varieties used in commercial production were reported from India and China [16, 17]. Several cultivars of ginger are grown in different ginger-growing areas in India, and they are generally named after the localities where they are grown [3]. Some of the prominent indigenous cultivars of ginger grown in India are Himachal, Maran, Kuruppampady, Wayanad, Varadha, etc. Exotic cultivars such as Rio de Janeiro have also become very popular among cultivars [3]. Maran, Nadia, Karakkal and Rigodi are suited for high dry ginger. Varieties like Ernadn Chrnad, China and Rio de Janeiro provide high oleoresin content. Sleve local, Narasapattam and Himachal are suited for high volatile oil. Rio de Janeiro, China, Wayanad, Maran and Varadha are suited for green ginger. The production of many very popular varieties used in China is exporting to other countries [18, 19]. The most famous varieties includes Laiwu ginger, Tongling ginger, Pinghu ginger, Laifeng ginger, etc. Due to vegetatively propagated characteristic, in vitro techniques, namely, micropropagation techniques [20], somatic embryogenesis [21], somatic hybridization[21], germplasm conservation, transgenics and mutation breeding, are mostly used [21, 22].

7. Production and disease arrangement during the cultivation

Ginger crop is affected by insect pests, pathogenic and non-pathogenic diseases [23] and severely by various pathogenic diseases of viral, bacterial, fungal and nematode origin, which reduces its potential yields drastically [24]. Among the various diseases, soft rot, yellows, *Phyllosticta* leaf spot, storage rot, bacterial wilt, mosaic and chlorotic fleck are important. Therefore, the selection of healthy seed rhizomes has been found as an effective control measure for the disease. Efficacy of a variety of chemicals has been evaluated for the management of this disease by different workers, and they have found very promising effect of different chemicals against the disease.

8. Biological management is a prosperous way to control ginger diseases

Application of a mixture of biological bacteria could be very promising to increase rhizome production [25–28]. By using resistant or less susceptible cultivars of ginger, the disease can be managed to a great extent [17].

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