

1 Introduction

P.N. Ravindran and K. Nirmal Babu

Ginger is one of the most important and most widely used spices worldwide. Due to its universal appeal, ginger has spread to most tropical and subtropical countries from the China–India region, where ginger cultivation was prevalent probably from the days of unrecorded history. In ancient times ginger was more valued for its medicinal properties and played an important role in primary health care in ancient India and China. In European medicine ginger was also among the most highly valued of all mild carminatives and it was a component of many pharmaceutical preparations.

(Ginger, botanically known as *Zingiber officinale* Rosc., belongs to the family Zingiberaceae and in the natural order Scitamineae (Zingiberales of Cronquist, 1981). The Latin term *Zingiber* was derived from the ancient Tamil root, *ingiver*, meaning ginger rhizome.) The term *ingiver* spread to ancient Greece and Rome through the Arab traders, and from there to Western Europe. The present-day names for ginger in most of the Western languages were derived from this. Examples are *ingefaer* (Danish), *Gember* (Dutch), ginger (English), *Zingibro* (Esperanto), *harilik ingver* (Estonian), *inkivaari* (Finnish), *gingembre* (French), and *ingver* (German) (Table 1.1). Some authors earlier thought that the term *Zingiber* was derived from the Sanskrit term *singavera* (Watt, 1872; Rosengarten, 1969; Purseglove et al., 1982), meaning antler-like or horn-shaped, indicating the shape of the rhizome. It is improbable because the Sanskrit language was not popular in the region in those days. Ginger was exported from the ancient Malabar Coast on the southwest coast of peninsular India, and the Arab traders might have used only the prevalent local Tamil name for trading the commodity. Mahindru (1982) was of the opinion that the original word for ginger was in all probability a pre-Dravidian one, and that it is found with minor variations in about 20 languages extending from China and the islands of the Pacific Ocean to England. In certain languages there are separate terms for fresh ginger and dried ginger, which indicate the importance of both commodities as well as the fact that they are put to uses that are often distinct and different (Table 1.2).

Fluckiger and Hanbury (1874) mentioned that, as early as the second century A.D., in Rome ginger was one among the very few items on which duty was levied at Alexandria, the port of entry. In subsequent periods, including the Middle Ages, ginger was on the list of privileged goods in the European trade and duty was levied for its trade. In England it must have been well known even prior to the Norman Conquest, for it is frequently named in the Anglo-Saxon beech-books of the eleventh century as well as in the Welsh "Physician of Myddvai" (Parry, 1969). During the thirteenth and fourteenth centuries, next to pepper, ginger was the commonest and most precious of spices, costing nearly seven shillings per pound, or about the price of a sheep. The merchants of Italy during the thirteenth and fourteenth centuries knew three kinds of ginger: *belledi*, *colombino*, and

2 *Ginger: The Genus Zingiber*

Table 1.1 Names of ginger in various languages

Language	Common name
Pharm.	Rhizoma Zingiberis
Arabic	Zanjabil
Assamese	Ada
Bengali	Ada
Brazilian	Mangaratia
Burmese	Gin, Gyin sein, Khyen-seing, Ginsi-kyaw
Chinese	Jeung, Sang keong, San geung, Chiang, Jiang, Keong, Shen jiang, Gan jinang, Shengjiang
Czech	Zázvor
Danish	Ingefær
Dutch	Gember, Djahe
English	Ginger
Esperanto	Zingibro
Estonian	Harilik ingver
Ewe	Nkrawusa, Nkrama, Nkrabo, Agumetakui
Fante	Akakadur, Tsintsimir, Tsintsimin
Farsi	Jamveel, Zanjabil
Finnish	Inkivääri
French	Gingembre
Ga-Dangme	Kakaotshofa, Odzahui
German	Ingwer
Gujarati	Adhu (fresh), Sunth, Shuntya (dried)
Hausa	Chitta, Afu
Hebrew	Zangvil
Hindi	Adi, Adrak (fresh), Sonth (dried)
Hmong	Kai
Hungarian	Gyömbér
Icelandic	Engifer
Indonesian	Jahé, Aliah, Jae, Lia
Italian	Zenzero, Zenzevero
Japanese	Shouga; Myoga (<i>Z. mioga</i>), Kankyo, Shoukyo, Kinkyō
Kannada	Alla (fresh), Sunthi (dried)
Kashmiri	Sho-ont
Khmer	Khnehey, Khnhei phlung
Laotian	Khing
Malay	Halia, Atuja, Jahi, Keong phee, Kong Keung
Malayalam	Inchi (fresh), Chukku (dried)
Marathi	Alha, Aale (fresh), Sunth, Shuntya (dried)
Norwegian	Ingefær
Nzema	Sinziminli
Oriya	Ada, Adraka
Persian	Shangabir, Zangabi
Polish	Imbir
Portuguese	Gengibre
Romanian	Ghimbir

Russian	Imbir
Sanskrit	Adraka (fresh), Shunthi (dried), Shringaveran, Sringaaran, Nagara
Scandinavian	Ingefær
Singhalese	Inguru
Spanish	Jengibre
Swahili	Tangawizi
Swedish	Ingefära
Tagalog	Luya
Tamil	Ingee, ingiver, chukku (dried)
Telugu	Allam
Thai	Kinkh, Khing-daen
Tibetan	Gamug, Sga smug, Sman-sga
Turkish	Zencefil
Twi	Akakaduru, Kakaduru
Urdu	Adraka
Vietnamese	Gung, Sinh khuong

Compiled from various sources

Table 1.2 Names of fresh and dried ginger in some languages

Language	Plant	Fresh	Dried
Hindi	Adrak	Adrak, Adhruka	South, Saindhi
Bengalese	Ada	Adrok	Sonth
Assamese	Ada	Adrak	Sonth
Punjabi	Ada, Adrak	Aunjbel	Sanjzabil, South
Marathi	Adu, Aale	Alen, Alem, Adrak	Sonth, Sunta, Sunt
Gujarati	Adu, adhu	Adu, Adhu	Sunt
Tamil	Inji	Inji, Ingiver	Chukku
Malayalam	Inchi	Inchi	Chukku
Telugu	Allam	Allam	Sonthe
Kannada	Sunthi	Hasisunthi	Vana sunthi
Burmese	Khyenseing	Ginsin	Ginsi-khaiv
Singapore	Ingru	Ammuingru	Velicha-ingru
Sanskrit	Adraka, Sringavara	Ardrakam	Vishva-bhishakam Nagara, Sunti Mahaushadha.
Arabic	—	Sanjzabile-ratal	Sanjzabile-Yabis
Persian	—	Zanjzabil-tar	Zanjzabil-Khushk

Compiled from various sources

micchino. *Belledi* is an Arabic word meaning "country" and was probably the common ginger. *Colombino* referred probably to Columbum, Kollom, or Qilon, an ancient port on the southern Malabar Coast, and *micchino* denoted the ginger brought from Mecca (which again goes from the Malabar Coast only) (Watt, 1872, Mahindru, 1982). The

literature also indicates that ginger preserved in syrup (called green ginger) was also imported to the Western World during the Middle Ages and was regarded as a delicacy of the choicest kind. In Zanzibar on the east coast of Africa, ginger is regarded as auspicious, which is absolutely necessary to the Savaras tribe for their religious and marriage functions.

Ginger is mentioned in the Koran (76: 15–17): “Round amongst them (the righteous in paradise) is passed vessels of silver and goblets made of glass ... a cup, the admixture of which is ginger.” In the Middle Ages ginger was considered to be so important a spice that the street in Basle where Swiss traders sold spices was named *Imbergasse*, meaning “Ginger Alley” (Rosengarten, 1969). In Henry VIII’s time, ginger was recommended against plague. It was during that time that “gingerbread” became popular, and it became a favourite of Queen Elizabeth I and her court. The legend is that around 2400 B.C. a baker on the Isle of Rhodes near Greece prepared the first gingerbread. Shortly thereafter the recipe found its way to Egypt, where the Egyptians savored its excellent flavor and served it on ceremonial occasions. The Romans distributed ginger bread to all parts of the empire (Farrell, 1985).

During the Middle Ages and until the end of the nineteenth century English tavern keepers used to have ground ginger in constant supply for thirsty customers to sprinkle on top of their beer or ale and then stir into the drink with a red-hot poker (Rosengarten, 1969). The Western herbalists and naturalists knew the great qualities of ginger as confirmed by the well-known British herbalist John Gerard. He writes in his herbal (1577) that “ginger is right good with meat in sauces,” and says that this spice is “of an eating and digesting quality, and is profitable for the stomach, and effectively opposeth itself against all darkness of the sight, answering the qualities of pepper” (Parry, 1969).

Ginger in India

In ancient India, ginger was not significant as a spice, but it was *mahabbeshaj*, *mahaoushadhi*, literally meaning the great cure, the great medicine. For the ancient Indian, ginger was the god-given panacea for a number of ailments. That may be the reason why ginger found a prime place in the ancient Ayurvedic texts of Charaka (*Charaka samhita*) and Susruth (*Susbrutha samhita*). In *Ashtangabridyam* of Vagbhatt (a very important ancient Ayurvedic text), ginger is recommended along with other herbs for the cure of elephantiasis, gout, extenuating the juices, and purifying the skin from all spots arising from scorbutic acidities. Ginger is also recommended when exotic faculties were impaired due to indigestion.

The earliest mention of ginger cultivation is probably by Rabbi Benjamin Tudella, who traveled between 1159 and 1173 A.D., and gave an account of spices grown on the west coast of India. Tudella gives a vivid description of the place and trade in spices as well as cultivation of spices in and around the ancient port of Quilon in the State of Kerala (Mahindru, 1982). Marco Polo (A.D. 1298), in his famous travelogue, writes: “good ginger also grows here and is known by the name of Quilon ginger. Pepper also grows in abundance throughout the country” (translation by Menon, 1929). Another traveler, Friar Odoric (A.D. 1322), writes. “Quilon is at the extremity of pepper forests towards the south. Ginger is grown here, better than anywhere else in the world and in huge quantities.” In those days Calicut, Cochin, Alleppey and Quilon were the ports through which all the spices were traded with the Western World. Nicolo Contai (A.D. 1430)

describes Calicut as the “Spice Emporium of the East.” He described it as a maritime city of 8 miles in circumference, a notable emporium for the whole of India abounding in pepper, aloe, ginger, and a large kind of cinnamon, myrobalans, and zedoary. Linschotten (1596) gives a very interesting account of the spices. He states that ginger grew in many parts of India, but the best and the most exported grew on the coast of Malabar. He described the method of cultivation and preparation that appear to be similar to the present-day practices. Linschotten also wrote about the ginger trade and mentioned that ginger was mainly brought to Portugal and Spain from the West Indies, indicating the fact that the Portuguese were successful in cultivating ginger extensively in Jamaica and the adjoining West Indies Islands. Fluckiger and Hanbury (1874) writes: “it [ginger] was shipped for commercial purposes from the Islands of St. Domingo as early at least as 1585 and from Barbadoes in 1654. Reny (1807) mentions that in 1541, 22053 cwt of dry ginger was exported from West Indies to Spain” (Watt, 1872).

The most significant event in the history of the spices trade was the landing of Vasco da Gama on the west coast of India. Da Gama started from Lisbon in Portugal, arrived at Mozambique in March 1498, and from there he reached Mlinde by the end of April. The king of Mlinde advised da Gama to sail to Calicut and arranged an Arab pilot to help him. This Arab brought the Portuguese across the Arabian Sea in 20 days, and on May 17, 1498, da Gama anchored at Kappad, a hamlet near Calicut. Following this, a wave of expeditions arrived on the west coast of India (known at that time as the Malabar Coast), and the trade with Europe flourished. The arrival of the Portuguese also signaled the end of the Arab monopoly on the spices trade. Da Gama again came to India commanding an armada of 15 ships. By using all the techniques of intimidation, he entered into an alliance with the king of Cochin and secured all the rights of the spices trade from him. Subsequently in 1513 A.D., a treaty was signed with the king of Calicut (known as Zamorin), ending the decade-long fight between the two. By this treaty Portugal got the license to trade spices freely, although under the ineffectual supervision of the Zamorin government. However, there was no restriction in procuring ginger directly from the growers (Mahendru, 1982).

When the Portuguese started exporting spices directly to Europe, they forced the growers to cultivate almost every inch of land with pepper and ginger. This helped the growers in a way, as they were free from the bondage of a few big merchants. But the Portuguese could not continue alone for long. The Dutch arrived on the scene and they drove out the Portuguese practically from the entire west coast. The Dutch controlled the spices trade on the west coast of India only for a short while, as they concentrated more on East Indies. The powerful Travancore king defeated them. As time rolled on, the spices trade ultimately passed on to the British in the decades that followed.

When these developments were going on in the west coast, the north of India was under the rule of the Mogul emperor Akbar. Under the Mogul rule spices cultivation in the north and western India improved considerably. The spread of Mogul dishes also demanded a considerable quantity of various spices. Ginger was an important constituent of most of these dishes, both vegetarian and nonvegetarian. *Ain-i-Akbari*, written by Abdul-Fazl, Akbar’s prime minister, is a truthful account of the period, in which he presents the details of various dishes in vogue among the Moguls (*Ain* 24). In *Ain* 27(f) he records the market prices of spices. Ginger was comparatively cheaper than many other spices—dried ginger was four dinars per seer, and fresh ginger was 2.5 dinars. He mentioned that pickled green ginger was available at 2.5 dinars per seer. Ginger was thus a common man’s spice, unlike black pepper and saffron (Mahindru, 1982).

Ginger was being grown on the west coast (the present-day Kerala) of India from time immemorial, and later on its cultivation spread to various other parts, mainly to Bengal and northeastern India. Buchanan (1807), who journeyed through the heartlands of various kingdoms that existed in southern India, made many references on the cultivation of various spices, including ginger, on the Malabar Coast. Ridley (1912) gives a detailed description of agricultural practices prevalent in nineteenth-century India. About ginger and turmeric, he quoted from the work *A Hand Book of Agriculture* written by N. Mukherjee: "The planting of ginger and turmeric was preferred under the shade of orchard trees. . . . The output of ginger was 2500 pounds per acre. . . . Green ginger was sold at rupees four for 25 pounds. The cost of cultivation worked out to about rupees 250 per acre."

In other words, the farmer got Rs.166 per acre (66.4%) as profit from ginger. The quantity of rhizomes required for planting was estimated as 100 pounds per "bigga" (1600 sq. yards). Harvested ginger was processed before being sold in the market. Different methods were followed in the processing of ginger in different regions. In Maharashtra (Khandesh region), the processing was done as follows:

The rhizomes were dug up, cleaned of dirt and roots and boiled in a wide mouthed vessel, and then dried. After drying for a few days, the rhizomes were steeped in a diluted limewater, sun dried and again steeped in a stronger limewater and buried for fermentation. Later the rhizomes were dried and marketed. This product was known as "Sonth." (Watt, 1872)

The practice adopted in Bengal was: "Ginger was first brushed with a hand brush to remove dirt and steeped overnight in lime water; subsequently rinsed in clear water and dried slowly on a brick oven." The Bengal province in those days extended to the Himalayan hills, and ginger cultivation was prevalent in these areas. Campbell, who wrote the *Agricultural and Rural Economy of the Valley of Nepal*, states that ginger was carefully grown in Nepal and the produce "is reckoned by the people of the neighboring plains of Tirhoot and Sarun of very highest flavor and superior to the produce of their own country" (Watt, 1872). Watt also gives details of cultivation prevalent in these regions.

Sir Baden Powell, the legendary founder of the Boy Scout movement, reported the following practice:

The rhizomes were dried up by placing them in a basket suspended by a rope and shaking for two hours everyday for three days. Later on these were sun dried for eight days and again shaken in the basket and re-dried for 48 hours in the basket itself. This removed the scales and skins, making the produce suitable for marketing (Watt, 1882).

In the nineteenth century in Bombay province, ginger was processed by peeling the rhizome with a piece of metal or tile and later drying it in the sun.

The Cochin ginger (ginger that came from the Cochin principality and exported from Cochin) was processed similarly to the Bombay ginger. Harvested rhizomes were heaped for a few days and then washed thoroughly to remove dust and soil. The outer skin was peeled off using a bamboo splinter, washed again, and dried in the sun. Sometimes the

dried ginger was heaped in limewater for a few hours and redried to improve the appearance.

A *bigga* of ginger crop yielded 10 mounds fit for sale at the rate of Rs. 6 per mound. The prevailing rate for ginger during the end of the nineteenth century was: Bengal Rs. 10.6 per cwt; Bombay Rs. 9.9 per cwt; Sind Rs. 11.6 per cwt. In Madras Province (including the Cochin region) ginger was available at 20 paise per kilogram (Mukherjee, quoted by Ridley, 1912).

It is also of historical importance to record the first detailed chemical studies on ginger by J.O. Thresh (Year Book of Pharmacy, 1879, 1881, and 1882). He analyzed a sample of Cochin ginger that was found to contain (in percent): volatile oil—1.350, fat (wax) resin—1.205; neutral resin—0.950; α and β resins—0.865; gingerol—0.6; substance precipitated by acids—5.35; mucilage—1.45; indifferent substance precipitated by tannins—6.8; extraction soluble in spirits of wine, not in ether or water—0.28; alkaloid—trace; metarabin—8.12; starch—15.79; pararabin—14.4; oxalic acid—0.427; cellulose—3.75; albuminoides—5.57; vasculose etc.—14.4630; moisture—13.53; and ash—4.8.

Centers of Cultivation

Ginger is not known to occur in the truly wild state. It is believed to have originated in Southeast Asia, but was under cultivation from ancient times in India as well as in China. There is no definite information on the primary center of domestication. Because of the easiness with which ginger rhizomes can be transported long distances, it has spread throughout the tropical and subtropical regions in both hemispheres. Ginger is indeed the most widely cultivated spice (Lawrence, 1984).

The main ginger growing countries are: India, China, Jamaica, Taiwan, Sierra Leone, Nigeria, Fiji, Mauritius, Indonesia, Brazil, Costa Rica, Ghana, Japan, Malaysia, Bangladesh, Philippines, Sri Lanka, Solomon Islands, Thailand, Trinidad and Tobago, Uganda, Hawaii, Guatemala, and many Pacific Ocean islands.

India and Other South Asian Countries

India is the largest producer of ginger; the annual production is about 263,170 tons from an area of about 77,610 hectares, contributing approximately 30 to 40% of the world production. The productivity is low, at about 3,428 kg/ha. Out of the total production, 10 to 15% is exported to about 50 countries around the world. The crop occupies the largest area in the state of Kerala (19%), followed by Orissa (17%) Meghalaya (12%), West Bengal (12%), and Arunachal Pradesh (6%). Kerala and Meghalaya together account for nearly 40% of the country's production (Table 1.3). In terms of productivity, Arunachal Pradesh stands first with 7,164 kg/ha, followed by Meghalaya (5,139 kg/ha), Mizoram (5,000 kg/ha), and Kerala (3,428 kg/ha). During 1999–2000 India exported 8,773 tons of ginger valued at Rs. 306 million, out of which dry ginger contributed Rs. 199.2 million.

Nigeria

In Nigeria large-scale cultivation of ginger began in 1927 in southern Zaria, especially within Jemma's federated districts as well as in the adjoining parts of the plateau. Nigeria has tried to widen the genetic base of the crop through introduction of ginger cultivars,

Table 1.3 Area under ginger cultivation in the world

Ginger area harvested (ha)	Year		
	1999	2000	2001
Bangladesh	6,879	6,879	7,290
Bhutan	350	350	350
Cameroon	1,370	1,370	1,370
China	17,750	19,170	20,700
Costa Rica	110	361	361
Dominica	45	45	45
Dominican Republic	400	400	400
Ethiopia	150	150	150
Fiji	65	65	65
Fiji Islands			80,000
India	80,000	80,000	80,000
Indonesia	10,200	10,600	10,600
Indonesia	180	180	180
Jamaica	180	55	55
Kenya	65	55	55
Kenya	4,255	4,255	4,255
Korea, Republic of	8	8	8
Madagascar	8	8	8
Madagascar	1,000	1,000	1,000
Malaysia	1,000	1,000	1,000
Mauritius	50	170	170
Mauritius	1,400	1,400	1,400
Nepal	1,400	1,400	1,400
Nepal	166,800	174,000	174,000
Nigeria	78	78	78
Nigeria	78	78	78
Pakistan	4,700	5,000	5,000
Philippines	4,700	5,000	5,000
Philippines	30	30	30
Reunion	30	30	30
Reunion	25	25	25
Saint Lucia	25	25	25
Saint Lucia	2,000	2,000	2,000
Sri Lanka	2,000	2,000	2,000
Sri Lanka	12,000	12,000	12,000
Thailand	12,000	12,000	12,000
Thailand	50	50	50
Uganda	50	50	50
Uganda	140	110	110
United States of America	140	110	110
World	310,100	319,751	321,732

Source: FAOSTAT Database

mainly from India. Currently, Nigeria is one of the largest producers and exporters of split-dried ginger. The annual production is around 90,000 metric tons from an area of 17,400 ha.

Jamaica

In Jamaica, ginger is grown in the hills of the South Central Parish of Manchester and in the Christiana Area Land Authority. There is also some production in the border parishes of Clarendon, Trelawny, and St. Elizabeth as well as in the hills of St. James, Hanover, and Westmoreland in the northwest. The area under ginger was about 65,000 to 70,000 acres in the past (Prentice, 1959), but now the area has dwindled considerably and the current production is below 1,000 tons.

Fiji

In Fiji, the early European settlements introduced ginger as an export crop in 1890. The Indian migrants started large-scale cultivation later. The major production areas are Suva peninsula, especially in Tamarua, Colo-Suva, and Tacinua districts. Ginger has also spread to Sawani, Waibu Nabukaluka, and Viria districts. The area under cultivation is around 1,000 hectares.

Ghana

In Ghana the early attempts at growing ginger were not successful, but with the launching of the Economic Recovery Programme in 1983, ginger cultivation was promoted by the government. Large-scale production was taken up in the Kadzebi district. The production touched 80,000 tons in 1990. However, production declined in subsequent years. The current production is very meager—below 1,000 tons.

Australia

Ginger became a commercial crop in Queensland (Australia) during the Second World War. In 1920 a farmer introduced ginger to Buderim, a small town north of Brisbane in Queensland, which has been the center of ginger production ever since. The growers are concentrated in Buderim, Nambour, North Arm, and Eumundi. The production was over 6,200 tons in 1974. The production figure has increased since, and the entire production is processed into preserved ginger and other ginger products. However, ginger production declined later, and currently ginger occupies very little area, and the production is processed mainly by the famous Buderim Ginger Co. into more than 100 products.

Sierra Leone

Sierra Leone remained a ginger producer for over 100 years. Ginger is grown along the railway lines around Freetown, Bola, Kennama, Pendemba, and Njala, as well as in the Mayamba district and parts of East Kano. Sierra Leone ginger was traditionally known as African ginger. It is less aromatic but is more pungent than other commercial gingers (Lawrence, 1984).

Mauritius, Trinidad, and Tobago

In Mauritius ginger is grown in all districts on the island, although most of the production comes from Pamplemousses and Flacqdisbiets. Guajana has a small-scale ginger production in the northern-western region. The current production is around 500 metric tons in Mauritius.

In Trinidad and Tobago ginger is a traditional spice that is grown mixed with other crops.

Southeast Asia

Southeast Asia is a major ginger production region. Ginger production in this region comes mainly from China, Thailand, Taiwan, Korea and Vietnam. China is the largest producer, followed by Thailand, Korea, and Vietnam. China cultivates ginger in an area ranging from 50,000 to 80,000 hectares. Ginger is cultivated in the provinces of Shandong, Guangdong, Zhejiang, Anhui, Jiagxi, and Hubai. The largest variability in

ginger is seen in China, where many distinctly different morphotypes have been identified. Available figures indicate a production of 2,40,000 tons. China consumes internally the major share of ginger produced, with many ginger products being available in the markets.

Taiwan has only 3,000 to 4,000 hectares under ginger, and the produce is marketed mainly as vegetable ginger. It is grown as an intercrop with tea or as a pure crop on hill slopes.

Thailand and Korea also produce ginger for internal consumption. Thailand produces about 30,000 tons of ginger from a 12,000-hectare area. The Republic of Korea has a ginger area of around 4,200 hectares and produces about 8,000 metric tons of ginger.

Indonesia

Indonesia is another important producer, having a ginger area of over 10,000 hectares and production around 77,000 metric tons. Ginger cultivation here is concentrated in the Java-Sumatra islands.

Sri Lanka

In Sri Lanka ginger is grown as a mixed crop with turmeric, cocoa, coffee, jack, arecanut, coconut, or green vegetables mostly in a haphazard way. It is cultivated mostly in the central eastern provinces in Yatinurwara, Harispatta, Siambolagoda and Girijama. Ginger production is mostly used up by local consumers, mainly for the manufacture of ginger beer and ginger ale.

Philippines

In the Philippines ginger is produced in Las Banos, Laguna, Tanavan, Bantagas, Silag, and Carite. The current area under cultivation is about 5,000 hectares and production is around 29,000 metric tons.

Many other countries, such as Nepal, Bangladesh, Bhutan, Cameroon, Costa Rica, Kenya, Reunion Islands, and the United States, produce small quantities of ginger for home consumption (Table 1.3 and Table 1.4).

According to the Food and Agriculture Organization, ginger production is looking bright because harvesting areas and production have increased, and are estimated to enlarge in the coming years (Anon, 2003).

Research and Development Efforts

Although a spice crop of global use, the research and development (R&D) efforts on ginger have not been commensurate with its importance. Research on ginger was initiated only in the second half of the last century, but only in a rudimentary manner. In India the first research project was started in 1953 at four centers: Kandaghat (in the former Punjab, now in Himachal Pradesh), Targaon (Maharashtra), Thodupuzha, and Ambalavayal (both in Kerala). However, these programs ended with the termination of the respective projects. Later, spice research was taken over by the Indian Council of Agricultural Research (ICAR) and ginger was brought under the purview of the All India Coordinated Spices and Cashew Improvement Project, which was started in 1971. However, the research programs were mainly adaptive trials. In 1975 ICAR set up the Regional Station of Central Plantation Crops Research Institute (CPCRI) at Calicut in

Table 1.4 World ginger production (Mt)

	Year		
	1999	2000	2001
China	201,128	228,056	240,000
Bangladesh	38,000	38,000	42,000
Bhutan	3,100	3,100	3,100
Cameroon	7,430	7,500	7,500
Costa Rica	1,225	4,375	4,400
Dominica	100	100	100
Dominican Republic	1,500	1,500	1,500
Ethiopia	450	400	400
Fiji Islands	2,500	2,500	2,500
Ghana	60	65	65
India	270,000	275,000	275,000
Indonesia	70,100	71,900	77,500
Jamaica	620	620	620
Kenya	200	150	150
Korea, Republic of	7,950	7,950	7,950
Madagascar	30	30	30
Malaysia	2,500	2,500	2,500
Mauritius	116	498	500
Nepal	4,200	4,200	4,200
Nigeria	90,000	90,000	90,000
Pakistan	28	28	28
Philippines	28,000	29,000	29,000
Reunion	900	500	500
Saint Lucia	60	60	60
Sri Lanka	8,000	8,000	8,000
Thailand	30,000	30,000	30,000
Uganda	120	120	120
United States of America	7,300	6,120	7,350
Zambia	100	100	100
World	775,717	812,372	835,173

Source: FAOSTAT Database

Kerala to do research on spices, and ginger became a major mandate crop in this center. The research programs were further strengthened with the setting up of an independent All India Coordinated Research Project on Spices with headquarters at Calicut in 1986. Under this project research on ginger was going on mainly at the Y.S. Parmar University of Horticulture and Forestry at Nauni, Solan (Himachal Pradesh) and at the High Altitude Research Station at Pottangi under the Orissa University of Agriculture and Technology. Some multilocational and adaptive trials were also going on in a few other centers. The upgrading of the regional station at Calicut to a National Research Centre for Spices in 1986 and later to The Indian Institute of Spices Research (IISR) in 1995 led to further strengthening of the R&D programs. At the IISR, research programs on

ginger are going on in areas such as: (1) genetic resources collection, conservation, characterization and documentation; (2) crop improvement; (3) disease and insect pest management; (4) agronomic management; (5) postharvest technology and quality evaluation; and (6) biotechnology. The research activities in India led to the development and release of seven high-yielding cultivars of ginger, establishment of a germplasm of about 650 accessions, development of management practices for diseases and insect pests, evolution of various agronomic and nutrient management schedules, evolution of post-harvest technology and storage aspects, development of biotechnological tools for improvement of ginger, and establishment of an in vitro gene bank. Apart from these applied aspects, basic studies on taxonomy, anatomy, cytology, and sterility, etc., have also been conducted.

In Nigeria ginger research is being carried out at the National Root Crops Research Institute, where the programs are mainly centered on developing agronomic and fertilizer schedules, storage of seed ginger, and management of diseases. A crop improvement program has not progressed much, probably due to the narrow genetic base.

In China ginger research programs are mainly concentrated in universities such as Shandong University, where basic physiological studies on ginger have been carried out. Many universities in southern China (where ginger cultivation is located) have research programs on ginger. However, the language barrier is affecting the spread of the research results to other parts of the world.

Earlier some research programs existed in Queensland, Australia, when ginger cultivation was prevalent in that area. However, with the decline of cultivation the research programs also came to an end. Both in China and Australia (and also in Thailand and Taiwan), a large number of ginger-based products are popular in the market. Many studies must have been done for the development of these products. Occasional research papers on ginger also appear from many other countries around the world.

Uses of Ginger

Ginger is a unique plant—a spice that is used universally. The ancient Indians considered ginger as the *mahaoushadha* (the great medicine), and it is the raw material for certain soft drinks and a variety of sweetmeats. The plant thus possesses a combination of many attributes and properties. Ginger contains volatile oil, fixed oil, pungent compounds, resins, starch, protein, and minerals. The characteristic organoleptic properties are contributed by the volatile oil and nonvolatile solvent-extractable pungent compounds. Among the many components, alpha Zingiberene is the predominating component of the oil. Gingerol and shogaol are the pungency-contributing components. The refreshing aroma and the pungent taste makes ginger an essential ingredient of most world cuisine and of the food processing industry. The solvent-extracted oleoresin is available in convenient consumer packs. Ginger powder is also an ingredient in many *masala* mixes. In Western countries ginger is used, for example, in gingerbread, biscuits, cakes, puddings, soups, and pickles. Ginger ale, ginger beer, and ginger wine are widely used soft drinks. Ginger is one of the most widely used medicinal plants in the traditional Indian, Chinese, and Japanese systems of medicine. According to the Indian system (Ayurveda), ginger is carminative and digestive. It is believed to be useful in anorexia, in dyspepsia, and for the suppression of inflammation. Dry ginger is useful in dropsy, otalgia, cephalgia, asthma, cough, colic, diarrhea, flatulence, nausea, and vomiting. Pharmacological

studies have indicated the usefulness of ginger in preventing nausea and vomiting associated with chemotherapy, pregnancy, travel, and seasickness. Ginger also has anti-platelet activity, hypolipidemic activity, and an anxiolytic effect. It is an ingredient in many Ayurvedic preparations and is a folk cure for indigestion, fever, colic, and any ailment associated with the digestive system.

Ginger is also an important drug in the Chinese and Japanese systems of medicines. In the Chinese *Materia Medica*, ginger is indicated, for example, for the treatment of vomiting, diarrhea, light-headedness, blurred vision, dyspepsia, tremors, decrease in body temperature, and high blood pressure. In the Chinese and Japanese systems of medicine the dry and fresh gingers constitute two different drugs that are used for different purposes (Benskey and Gamble, 1986).

Future Outlook

In spite of the research efforts, productivity of ginger remains low in countries like India and Nigeria. The gap existing between the national productivity level of, say India, and that of the productivity reported in China is vast—3.8 t/ha and 70 t/ha, respectively. Many constraints are limiting the production and productivity of ginger, chief among them being the diseases caused by fungi and bacteria and various insect pests. Many of the producing countries have no product development programs based on ginger. On the other hand, countries like Australia, Thailand, Japan, and China have a large number of ginger-based products. The Buderim Ginger Company in Queensland, Australia, produces more than 100 ginger products. A dynamic product development agenda is essential for any producing country to offset the frequent price fall of the raw and dried ginger. Moreover, a network of small-scale industries involved in the manufacture of ginger products will ensure a good farm price for the product and help in the growth of ginger production.

Ginger will continue to be used worldwide in a vast variety of dishes, and will remain as the only spice used widely for the preparation of an array of sweetmeats. Ginger is also the only spice widely used in the manufacture of soft drinks. No doubt the importance of ginger can hardly decline in the future. However, due to overproduction or underproduction, the market prices can fluctuate widely, with the consequent impact being felt in the production and earning figures of the producing countries.

It is also necessary that the producing and consuming countries join hands in alleviating the serious constraints facing ginger production. Such a global effort will have much beneficial fallout in many areas of ginger production and utilization, thereby helping eventually in the growth in production, productivity, and utilization and finally to a healthy, prosperous global ginger economy.

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