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Herbals of Asia

Prevalent Diseases and Their Treatments

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Preface

Medicinal flora has and is playing an important role in the health care system globally. A large percentage of people around the world, especially the rural communities, depend on medicinal plants for their basic health care. The use of medicinal plants to relieve physical suffering as well as treatment of various ailments has started from the early history of mankind, and several plants have been utilized to sustain life together with coping with the health problems since the beginning of civilization. In the health care system of many countries, traditional medicine plays an important role in curing various diseases.

Conceptually medicines are derived from the music of the harmonious nature of plants. There was not enough evidence regarding the reasons for illnesses or knowledge about which plant and how it could be used for treatment as such everything was based on practice. Even though a significant number of medicinally proven drugs have been established by the pharmaceutical industry, native phototherapy is still in vogue in many countries, where treatments are passed down the progeny. The World Health Organization has highlighted the significance of the medicines obtained from the native medicinal plants because a greater part of the population in many countries are still using herbal medicines as the first defense in health care. Globally, people have shown an encouraging response towards the products obtained from medicinal plants and consider them to be natural. They accept that such products are safe to use and have no major harmful effects. Many people consider herbal drugs as a part of a healthy routine due to their low side effect and avoid the use of synthetically produced medicines.

Primary health care system is described as a set of universally approachable facilities evaluated to boost vigor, counteract diseases, and offer therapeutic, diagnostic, rehabilitative, soothing, and supportive benefits with an objective to authenticate complete health and social service system that accentuates disease control and health improvement. Traditionally, beliefs about health enhancement have been related to inputs and outputs of therapeutic services. Decades of development have given birth to the idea of primary health care and its basic needs. An evaluation has been put forward to associate improved health conditions not only in health services but also under the prevailing socio-economic conditions. Primary health care applies

the herbal treatment system to the primary health services, providing a comprehensive continuum of health and social welfare together with protection and avoidance of disease. Overall, many researchers and scientists have identified different plants used traditionally in different countries. However, there are still several obstacles faced even now in understanding the successful treatment of diseases with plant-based drugs as some of these have not been fully validated to render them safer in traditional therapies.

In Asia, we come across a well-developed traditional medicinal system based on the use of plants and other organisms. "Avicenna" says that there are people who have wit but no religion, and people who have religion but no wit. In ecological terminology anything we see has a cause, knowledge about anything is not complete unless you know its causes, and as such in the case of traditional herbal medicine we have to know the causes of sickness and health.

This book is unique, begins with a brief introduction on the medicinal plant life in Asia, and has attempted to bridge the gap between botany, treatment of diseases, pharmaceutical aspects, along with discussions on the recent studies, some side and toxicity effects. The book presents details on the taxonomy of plant taxa evaluated here on the basis of the most common diseases in Asia. We hope it will prove of great help to students and investigators involved in herbal drug research, in particular to students studying in the "Unani Medicine Field."

The book comprises different chapters, discussing the role of MAPs in health care, industry, and their pharmaceutical applications. We are hopeful that this book will furnish the need of budding researchers who are working or have interest in medicinal plants. Undoubtedly, this book will be helpful for general use of research students, teachers, and those who have interest in MAPs.

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Introduction

1.1 Medicinal Plants + Herbals

All through the history, people have used plants as an important source of pharmaceuticals. People have explored herbal drugs in nature to cure diseases (Jamshidi-Kia et al. 2018; Ozturk and Hakeem 2018, 2019a, b; Masoodi et al. 2020). The history of folk medicine in fact dates back to the beginning of human history which included the use of plants and plant extracts, including fungi, bee products, minerals, shells, and even certain animals (Butler 2004; Shinwari 2010). The earliest documented record dates from the Paleolithic age (50,000 B.C.). This record has been reported from the grave of a Neanderthal man in the southern part of Hakkari in southeast Turkey (Baytop 1999). A number of plant remedies are described on the clay tablets that have survived from the Mesopotamian civilizations from Turkey. In the written record, the study of herbs dates back over 5000 years to the Sumerians, who provided clay tablets with lists of hundreds of medicinal plants including myrrh and opium (Yeşilada 2005). In 1500 B.C., the Ancient Egyptians wrote the Ebers Papyrus, which contains information on over 850 plant medicines, including garlic, juniper, cannabis, castor bean, aloe, and mandrake (Lyoussi 2011). Out of approximately 300,000 plant taxa reported from the world, nearly 10% are used to cure ailing communities. The medicines of plant origin, medical herbalism, herbal medicine, herbology, or phytotherapy are defined as the use of plants to cure the diseases of living beings (Shinwari 2010; Ullah et al. 2013; Ozturk et al. 2014, 2017a, b, c, 2018a, b, c, d, e, f, 2021a, b; Altay et al. 2015a, b; Altay and Karahan 2017).

The Greek physicians of Anatolia, Hippocrates (460–377 B.C.) from the Island of Kos and Pedanius Dioscorides from Anarzabos, a small town near Tarsus today's southcentral Turkey, had also described several plant remedies. Most of the 600 plants documented in the book of Dioscorides, "Materia Medica", had originated from the Anatolian peninsula. Originally written in Greek, this herbal was later

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translated into Latin as "De Materia Medica" which remained an authoritative reference into the seventeenth century (Yeşilada 2005, 2011).

The majority of the people in the Asian continent rely on medicinal plants to find treatment for their minor as well as major diseases. Several well-known drugs, such as aspirin, morphine, reserpine, tubocurarine, and others, owe their discovery to the traditional knowledge (Shinwari 2010). China and India are the two highly populated countries in the world. Ayurveda medicine has originated from India; it includes details on the use of herbs such as turmeric possibly as early as 1900 B.C. Sanskrit writings from around 1500 B.C., such as the Rig Veda, are some of the earliest available documents detailing the medicinal knowledge that formed the basis of the Ayurveda system. Many other herbs and minerals used in Ayurveda were later described by ancient Indian herbalists such as Charaka and Sushruta during the first millennium B.C. The Sushruta Samhita attributed to Sushruts in the sixth century B.C. describes 700 medicinal plants, 64 preparations from mineral sources, and 57 preparations based on animal sources (Ozturk and Hakeem 2018, 2019a, b). The ancient Chinese, Indians, Egyptians, Babylonians, and Native Americans were all herbalists. The Chinese emperor Shen N Ung (from Han Dynasty) is said to have written the first Chinese herbal, the Pen Tsao or Shennong Ben Cao Jing (c. 3000 B.C) which lists 365 medicinal plants and their uses, including *Ephedra*, the shrub which introduced Ephedrine to modern medicine. This Chinese herbal book is probably a compilation of older oral traditions (Ozturk and Hakeem 2019a, b).

Over thousands of years, Australian Indigenous communities have used plants for food and herbal treatments. They have gained comprehensive knowledge of Australia's plant diversity (Pearn 2005). Nonetheless, this conventional information is still partly known and is at risk of extinction. The history of ethnopharmacology in North America too has started from seventeenth century, but the use of herbal drugs in the continent is said to be more than 5000 years old. A remarkable pharmacological discovery in the history of America has been quinine (Moerman 1979).

In medical treatment, herbs have three basic functions: to detoxify the body and eliminate waste, to regenerate the organs, and enable the body to heal itself. Herbs can be taken in many ways: teas, tinctures, ointments, in capsules or tablet form, as inhalation, or as a herbal bath, to name just a few. The use of herbs to treat disease has been almost universal among nonindustrialized societies; even today, the World Health Organization (WHO) estimates that 80% of the world's population presently uses herbal medicine for some aspect of primary health care (WHO 2003).

Plant-based phytochemicals are known to have hepatoprotective, anticarcinogenic, antiallergic, antiinflammatory, antimicrobial, and antioxidant applications. Herbal preparations are the natural substances restoring harmony in humans (Zhang et al. 2005; Ozturk and Hakeem 2018, 2019a, b). Medicinal plants and their ingredients generally show activities that are beneficial for human health and are therefore used effectively to deal with illnesses (Eissa et al. 2014). The reasons regarding the use of specific medicinal plants for curing certain diseases have been enlightened to some extent (Souza et al. 2014). The significance of the medicines obtained from the native medicinal plants has been well highlighted by the World Health

Organization (WHO) (Goleniowski et al. 2006; Pleskanovskaya et al. 2019; Younessi-Hamzekhanlu et al. 2020). Nearly 85% of the remedies are developed from plants for primary health care today particularly in the economically backward areas (Amorozo 2002; Ozturk et al. 2020, 2021a, b).

Primary health care (PHC) is a set of universally approachable facilities. One of these is the medicinal herb cure which is as ancient as human history. The people have used numerous natural resources to treat their illnesses and enhance their health. These drugs have many fruitful effects on human health and play a key role in combating diseases. Under the title of "Ethnopharmacology", the studies undertaken are very important in determining the exact proportion and composition of active ingredients. PHC applies this system to the primary health services and thereby provides a comprehensive continuum of health and social welfare promoting health protection and avoidance of disease (Luqman et al. 2014; Bibi et al. 2014). The people in "Europe" have a long history of using traditional medicine as a primary health care tool, where they have made use of different herbs (Bibi et al. 2014). From early Greeks and Romans followed by Arabs of Andalusia, Europeans have been working on the medicinal properties of plants and have been using these in PHC. Overall, many researchers and scientists have identified different plants used traditionally in different countries and tribes of Europe.

The medicinal plants have played an essential role in the health care services of African countries as well (Lulekal et al. 2008). This has led to the curiosity in African plant-based pharmaceutical products used to treat different diseases. However, there are still several obstacles faced even now in understanding the successful treatment of diseases with plant-based drugs as some of these have not been fully validated to render them safer in traditional therapies.

In Asia, there is a well-developed traditional medicinal system based on the use of plants and other organisms. Unani and Ayurveda originating from Greeks and India are the most used medicinal system throughout the world (Ozturk et al. 2021b). The Chinese Medicine System too is ranked among the world's oldest health care systems (4000 years old). Various ideas of treatment have been developed over the years from medicinal products derived from plants, animals, and minerals (Lulekal et al. 2008). The key aim has been to increase the potency and/or decrease the toxicity.

Following the Islamic conquest of North Africa in the seventh and eighth centuries, Arabic scholars acquired many Greek and Roman medical texts. Unani medicine or Islamic medicine was set up by the Islamic physicians in the Middle East about a 1000 years ago based on the teachings of Hippocrates and Galen. This traditional medicine has always been practiced in the Middle East communities, the Islamic medicinal system has developed with time, and in Arabian countries, hakims have used plant medicines on the basis of their religious beliefs. Due to cultural beliefs and practices, people in these countries possess a rich tradition in the evaluation of herbal remedies. Traditional practitioners have used herbal remedies mainly based on Unani medicine. The famous Muslim scholar Ibn Sina (Avicenna, 980–1037 A.D.) combined the herbal traditions of Dioscorides and Galen with the ancient practices of his own people in "*The Canon of Medicine* (al-Qanun fi

at-Tibb)", one of the most influential medical texts ever written. This book spread through Europe during the eleventh and twelfth centuries (Yeşilada 2011). Plant-based products are widely used in almost all Muslim countries, because these are cheaper than allopathic medicines.

1.2 Topography and Geography

The Asian continent is the largest in the world, covering approximately 40% of Earth's land area. It is at the same time world's most populated continent, hosting roughly 60% of the global population (over 4.5 billion inhabitants) (Nimitphong and Holick 2013), surrounded by a series of mountain ranges notable among these being the Himalayas, the Karakoram Ranges, Pamirs, Tian Shan, and Altay Mountains. The great Asian continent is divided into five geographical subregions, such as Central Asia, East Asia, South Asia, Southeast Asia, and Western Asia. South Asia, in particular, is the most densely populated area in the world (Gao et al. 2006; Ozturk et al. 2021a, b). It is the largest and most populous continent of the World, located in between the Eastern and Northern Hemisphere, sharing the borders of Eurasia with Europe and Afro-Eurasia, touched both by Africa and Europe. The continent itself includes 20% of the total land surface of the earth, being home to the largest population of humans (Wheeler and White 2000). Although there is no full consensus on the divisions of this continent, generally geographers divide it as follows:

The Asian regions include Fig. 1.1:

East Asia China, Japan, Mongolia, North Korea, South Korea, and Taiwan.

South Asia Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. A rough synonym of South Asia is the Indian subcontinent and Afghanistan.

Central Asia Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

Southeast Asia Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, and Vietnam.

North Asia East Russia.

West Asia (Mid East—Southwestern Asia)
Turkey, Azerbaijan, Georgia, Armenia, Iran, Iraq, Palestine, Cyprus, Syria, Lebanon, Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Yemen, and Bahrain.

Northeast Asia includes the Russian Far East, Northeast China, the northern Korean Peninsula, and the island of Hokkaido (Japan). This area encompasses about

Fig. 1.1 A general map of the Asian continent (modified from www.wpmap.org)

4,554,000 km^2, from 73° to nearly 37°N latitude and from 115°E to 169°W longitude.

The partition between Africa and Asia is the Isthmus of Suez and the Red Sea. Its border with Europe starts from the coast of the East Mediterranean, and Turkey in the Near East extends somewhat into Aegean island and includes Istanbul on the European side of Bosporus. The north boundary between the continent of Asia and Europe normally runs by the Marmara Sea, Dardanelle, Bosphorus, Caspian Sea, Black Sea, Caucasus Mountains, with Ural Rivers as its source, and the long border mostly follow the east side of the Ural Mountains to Kara Seas, Russia (Mattern 2002; Akhani 2007). The Arctic Ocean forms the north border. The Bering Straits divides Asia from North America (Mattern 2002).

On the southeast side of Asia lie Malaya and Indonesia Peninsulas, widespread nations among thousands of islands on the Sunda Shelf. Australia is situated nearby. The Pacific islands on the northeast sides of Australia are more isolated, cut from Japan and Korea. On the Indonesian side, the borders run beside the Red Sea to the Indian Ocean. Most islands in the Indian Ocean are on the Asian continent.

There are five main physical regions in the continent of Asia: mountains system; plateau; plain, steppe, and desert; freshwater and saltwater environs.

1.2.1 Mountain Systems

The Himalayan mountains extend up to 2600 km, separating the Indian subcontinent from the rest of Asia. The subcontinent has been in connection with Africa, but 50–55 million years ago, it collided with the Eurasian continent forming the Himalayas (Rasul 2010). It is still crashing into the northern sides of Asia, and the Himalayan range is said to grow about 5 cm every year. It covers more than 612,002 km^2, passing along the north states of India, and makes up most of the terra of Nepal, and Bhutan. These mountains are composed of three diverged belts. The northern one is called greater Himalayas, with a high averages elevation of up to 6097 m. The belt includes eight of the largest peaks of the world, which reach 7926 m (Agakhanjanz and Breckle 1995), together with the highest mountain peak of the world—the Mount Everest—8852 m.

Tien Shan mountain system includes Victory Peaks covered with glaciers. The name of the highest glacier is Engil'chek Glacier, nearly 60 km long.

The Ural Mountains are almost 2501 km long lying in the north-south direction from Kazakhstan to Russia. These are cited among the few of the world's old mountain ranges (Ananicheva et al. 2010). The highest peak in the area is Mount Narodnayas, 1897 m.

1.2.2 Plateaus

The Asian continent is home to a large number of plateaus, sites of comparatively higher level grounds. Iranian plateau covers about 3.8 million km^2, spread over most of Afghanistan, Iran, and Pakistan. The plateau is not consistently flat but comprises few higher mountains and low river basins (Sha et al. 2015). The large mountain peaks are Damavand, 5611 m high. The plateau has two large deserts, Dasht-e Lut and Dasht-e Kavir.

The Deccan Plateau makes up most of the south parts of India. The dominating height is about 700 m. It is bordered by three mountains ranges: the Satpuras in the north and Eastern and Western Ghat on other sides. The plateau and the main waterway—the Krishna and Godavari rivers—follow a gentle slope toward the East Ghat and Bengal Bay (www.nationalgeographic.org).

Tibetan Plateau is usually high and large, considered as the "Rooftops of the World". The plateaus are in general more than 5010 m above sea level. These are most vital to the world water cycles because of their larger number of glaciers, with maximum volumes of ice exteriors of the poles (Grassini et al. 2013). The ice and

snow from these glaciers feed the big rivers in Asia. Around two billion individuals depend on these rivers, fed by plateaus glaciers.

1.2.3 Plains, Steppes, and Desert

Western Siberia's Plain is located in the center of Russia, known as the world's large area of constant flatland, extending from north to south for about 2400 km and from the west to east about 1900 km. More than 50% of the area is less than 100 m asl. The plain comprises some of the world's major flood and swamp plains (www.nationalgeographic.org).

Central Asian landscape is full of steppes, with more flat areas, with forests and grasslands (Mallon and Jiang 2009; Egamberdieva and Ozturk 2018; Imanberdieva et al. 2018a, b). Mongolia has numerous steppe zones, the mountain forest steppe, arid steppe, and desert steppe. These zones change over the Mountainous regions in the North to the Gobi Desert in the south in China (www.nationalgeographic.org).

Rub'al Khalis desert, noted as the world's large sand sea, covers an area longer than France including Saudi Arabia, United Arab Emirates, Oman, and Yemen (www.nationalgeographic.org). It holds roughly half of the sandy habitats as compared to the deserts in the Africa Sahara, but this is 16 times smaller in size. These deserts are known as Empty Quarter.

1.2.4 Rivers, and Fresh and Saline Water Systems

Dozens of essential rivers rise in Asia, and the most significant ones are Yellow River, Ganges, Lena, Mekong, Ob, Indus, and Yangtze (Table 1.1) (Feng and He 2006).

Lake Baikal tops the list, situated in the south of Russia, being the deepest lake in the world, up to 1622 m (Feng and He 2006). It has 22% of the world's unfrozen freshwater, which makes it a big water reservoir on Earth. It is known as the world's old lake, going back to 26 million years in history.

The Yangtze is the largest river in Asia and the third longest in the world, being 6303 km long. It moves eastward from the glaciers of the Tibetean Plateau up to the river mouth in the Sea of East China. This river is recorded as the lifeblood of China, draining one-sixth of the country's land area, being home to half of its population, and contributing greatly to China's economy (Kundzewicz et al. 2009). There are other rivers like Ganges and Jehlum lying in the subcontinent.

Euphrates and Tigris Rivers begin in the highlands of eastern Turkey and flow toward Syria and Iraq, where they join in the city of Qurna, Iraq before flowing toward the Persian Gulf. The land between these two rivers is named Mesopotamia, known in the world as the center of early civilizations, like Sumer and Akkadians.

Table 1.1 Important rivers in Asia

River name	Length (in km)
Yangtzes River	6310
Yellows River	5475
Mekongs Rivers	4910
Lenas River	4412
Euphrates	3000
Siri Darya	2865
Ganges River	2525
Tigris	1750
Kızılırmak	1355
Jhelum River	725
Yeşilırmak	519

The Persian Gulf is spread over an area of 234,002 km^2. It borders United Arab Emirates, Iran, Saudi Arabia, Qatar, Bahrain, Iraq, Kuwait, and Oman. This Gulf faces high evaporation rates, making it salty and shallower. The Persian Gulf has low seabed and is estimated to have 52% of the world's oil reserves (Rebentrost et al. 2008).

Okhotsk Sea covers an area of 1.5 million km^2, located between the Kamchatka Peninsula and the Russian mainland. It is mostly freezing between March and October; large ice blocks in winter make navigation almost impossible.

The Bay of Bengal is one of the biggest bays in the world, covering about 2.2 million km^2, and borders Burma, Bangladesh, and India. The large rivers include the Ganges and Brahmaputra, which end up in this bay. The wetlands formed by the Ganges on the Bay of Bengal are included among the biggest deltas of the world.

1.3 Socioeconomic Conditions

Currently, the continent ranks number one as per the population, among other regions of the world. The population density has been given as 153 persons/m^2 and the overall land area is 44,580,000 km^2 (Gumma et al. 2020). The urban population is around 50.8%, with 2361 billion individuals in 2019. The average age is 32 years. The big cities in East Asia are Shanghai, Seoul, and Tokyo. These cities are all situated on the coast and the area abounds in impressive mountains, including Mount Fuji and Mount Everest.

The major economic activities of Asia are agriculture, animal husbandry, fisheries, mining of minerals, exhuming, and few others. The continent includes 49 different countries. In terms of economy, it is a fast-growing continent, with larger economies based both on GDP and PPP. At the same time, it is the place of the world's largest economic boom. Starting from 1978 to 2013, China has come up fast

followed by India from 1991 onward. Other giants in the economy of the continent include Japan and South Korea (Chen et al. 2015; Abraham 2018).

The wealth of Asia varies broadly, due to the environment, government system, vast area, cultural divergence, and history. The biggest economies in terms of GDP are China, Japan, India, Turkey, South Korea, Saudi Arabia, Qatar, Iran, Malaysia, Indonesia, Thailand, and Taiwan (Sato and Natsuki 2017; Ivanov and Isayev 2019). There are several rich and impressive states, such as South Korea, Taiwan, Macau-China, Brunei, Japan, Hong Kong-China, and Singapore. Other oil-rich countries include Oman, Bahrain, Kuwait, and United Arab Emirates. Turkey and Israel are also major economically growing countries in West Asia (Kawai et al. 2015). The continent as a whole has nearly US$ 8.6 trillion of reserves—more than half of the world's total.

1.4 Ethnicity and Culture

The culture in Asia is highly diverse with varying customs and traditions, practiced and maintained by different ethnic groups since the ages (Abraham 2018). Identification of a specific culture in the continent as a whole or universal element among the colossal diversity that has emanated from multiple spheres together with the three of the four ancient river valley civilizations is quite complicated. The six geographical subregions in Asia are characterized by well-developed commonalities, such as; religion, language, and relative ethnic homogeneity (Saxer 2017). The ancestral population in today's Asia has its origin in two primary prehistorical settlements—Southwest Asia and the area from Mongolian plateau toward the North China (Abraham 2018).

Migration of different ethnolinguistic groups has probably taken place as early as 10,001 years ago. Though about 2001 BCE early Iranians and Indo-Aryans have arrived in northern India and Iran. Following the Mongolian incursions, Turkish ethnic groups have migrated to the west and northern regions of Central Asian plains (Chen et al. 2015). Prehistoric migrations from South China and Southeast Asia seem to have populated East Asian areas, in particular, Japan and Korea, where they slowly replaced the natives, like Ainu, who are of uncertain origin. Austroasiatic and Austronesian people got established in Southeast Asia between 5001 and 2001 BCE, partially integrated with, but eventually displaced by the native Austral-Melanesians. Among the Asian populations, there is a wealth of ethnic groups. Each group has got adapted to varying climatic zones, and these include subarctic, arctic, temperate, tropical, and subtropical as well as extensive deserts in the West and Central Asia (Jeong and Ho 2005). The ethnic groups have tried to live in the mountains, deserts, forests, and grasslands; whereas, in the coastal areas, varying ethnic groups have followed several ways of harvesting foodstuffs and transportation.

1.4.1 Ethnological Features of the Pamirs

Among the communities living in this area, some groups are primary hunter-gatherers, others have been practicing agriculture for ages, some have lately developed into industrial societies and have developed urban lifestyles, and some have got completely urbanized, e.g., Singapore. On the basis of the population, the largest countries in the continent are China, India, Indonesia, Pakistan, Bangladesh, Philippines, Japan, Vietnam, Iran, Burma, South Korea, and Thailand. Colonization of Asian ethnic groups and states by the Europeans began in the sixteenth century and reached its peak in the early twentieth century (Kreutzmann and Watanabe 2016a). The continent in fact is home to most of the worlds-old civilizations, with varying religious systems (Kreutzmann and Watanabe 2016b). Inter-regional trade was the cohesive force, through which the cultural ideas and elements spread to several subregions via the land and sea routes (www.en.wikipedia.org).

1.4.2 Multiple Culture Centers

Various cultural spheres and different religions have got connected through varying centers of civilizations. West Asia has cultural roots in the famous civilizations of Fertile Crescents, i.e., Mesopotamia, which spawns over different empires with differing religions (Alegria et al. 2004). Some historians mention that the new civilizations of Hilly Flanks are so far the most ancient, being the birthplace of western cultures. South Asia has its origin in Indus Valley Civilization and the East Asian cultural sphere has evolved from the Yellow River civilization (Furihata 2008). Southeast Asia migration waves have led to larger divergences of ethnic groups which are comparatively recent ones.

Commercial interactions with South Asia have resulted in the spread of culture and religion from India and China which included Buddhism, Taoism, Confucianism, and Hinduism. These regions later were influenced by Islam as well. The area inhabited by the Malays has led to greater populations of Muslims. In North Asia, severe climatic features have hindered the permanent development of large urban settlements, and only pastoral and nomadic population has spread over this large area (Pirbhai 2004). The religion and spiritual tradition has finally diffused here into Tibetan Buddhism following its own distinctive characters. However, it is nonconvenient to separate it from the rest of Eastern Asian cultures. Central Asia countries have been influenced by both East as well as West Asian (includes Persia and Mongolia) cultures, making it a melting pot of cultures (Hunter 2005). The culture spheres are not equally disconnected and even overlap, representing the innate syncretisms and diversities of historical influences and human cultures (Preyer and Krause 2017).

1.5 Climate and Biodiversity

In South Asia, there are three types of climate: tropical, dry, and temperate; northeast being tropical to subtropical (temperate); the moisture and elevation change while going to the west, resulting in steppe and a desert climate like the Middle East. The major climate types in this region are Alpine/Mountain, Subtropical, Tropical, Desert, and Savanna.

The continental climate is associated with large landmasses and prevails over a large part of Asia. Southeast Asia faces high environmental stress resulting from global warming, urbanization, deforestation, water scarcity, overfishing, and pollution (Lippert et al. 2014). The weather in the continent is dry throughout the southeastern states and drier in most of the interior areas. Some of the large daily temperature ranges on Earth occur in western sections of Asia. In the east and south, the monsoons dominate. The Southwest area of the continent experiences little relief as a result of the high-pressure belts in the subtropicals; in summer, they are warm, cold to hot in winter, and may have snowfalls at high altitudes. In the north, Siberia is the coolest region. In the south of Japan and the North East side of the Philippines, the maximum active places on the Earth face tropical cyclones. Southeast Asia is warm to hot, and higher temperature in Asia has been recorded as 56 °C. West Central Asian region has limited diurnal temperature ranges on Earth (Bush 2004). The low temperature recorded is −68.9 °C at Verkhoyansk and Oymyakon at the Sakhas Republic of Russia.

The continent as a whole has various combinations of biomes with differing biodiversity. The northernmost regions are covered by tundra vegetation because of the subpolar climate in these areas. Near Arctic coasts, tundra has given rise to taigas; these biomes are characterized by conifers like pine, spruce, and larch. In the South, taiga mixes with broader leafy trees and needle-leaved trees. Northern central Asia is full of forests mixed with huge grasslands. Southwestern Asia experiences dry weather and semiarid vegetation. These desert areas have usually a vegetation cover that needs low precipitations for growth.

The eastern parts of South Asia are covered by semiarid tropical vegetation. The tropical rain forests predominate alongside the south coastal strips of Sri Lanka. The Deccan Plateau mostly experiences drier tropical forest vegetation (Shuyu and Zhe 2004). Some of the Islands of Southeast Asia are full of tropical rain forests which face rigorous illegal as well as legal harvesting restricting enough regrowth. Tropical forests predominate in the coastal strip of the mainland of Southeastern Asia and stretch up to south China. The temperate forests are spread on the north side. Chaparral vegetation is present in Bo Hai Gulfs. It consists of woody shrubs growing up to 5 m tall.

The continent on the whole has a drier climate in the southeastern section which continues toward the interior regions. West part of Asia witnesses large daily temperature changes. In the south and east, the presence of Himalaya results in the formation of thermal flows resulting in Monsoon circulations in the area (Lu and

Guo 2014). Because of subtropical high pressure, the southwest area of the continent experiences fewer reliefs; as a result, this area is warmer to cooler in winters, hotter in summers, and experiences snow at high altitudes. The Siberian region is responsible for the most sources of arctic air masses. The northeastern side of the Philippines and south of Japan includes the most active places on Earth for tropical cyclonic activities and phases of Nino-South Oscillations modulate in Asia.

The continent is included in the eastern part of the Palearctic Ecozone (Rajpar and Zakaria 2014). It has diverse ecosystems, habitats, differing altitudes, topographies, and overall climate. All these have an impact on its biodiversity (Mattern 2002; Morse 2016; Ozturk et al. 2021a, b). As per the recent reports of the World Wildlife Fund, 368 new plants have been recorded from Southeast Asia. In the Greater Mekong region alone, the numbers of new species reported are 291 plants, 27 reptiles, 2 fishes, 22 amphibians, three mammals, and one bird species during 2014. Panda, Snow Leopard, Leopard, Bengal Tiger, and Asian Elephant are native but at the same time endangered animals. We find Red Head Vultures and Chinese Pangolins in Sumatra, Indonesia, Laos, Myanmar, Thailand, and Peninsular Malaysia (De Silva et al. 2007). Asia is blended with elements from the ancient supercontinent of Gondwana and Laurasia. The Gondwanian elements have been retained in Africa and India, which got detached from Gondwana about 92 MYA. Glaciations together with human migrations have also affected the biodiversity of the continent to a large extent (Vojnits 1981).

We come across numerous biomes in the continent as a whole, as it is a landscape with similar combinations of climate, vegetation, and animal life (Egamberdieva and Ozturk 2018; Ozturk et al. 2021a, b). The north of Asia experiences a subpolar climate, studded with tundra vegetation including mosses, grasses, and other small plants (Park and Sohn 2010). Further inland from the Arctic coast, the tundra gives way to the taiga, followed by the regions of vast forests of coniferous trees such as spruce, larch, and fir. In the south, the taiga merges with the forest of broadleaved trees or a mixed forest of broadleaved as well as needle-leaved trees. In the northern areas toward the interior parts, the forests merge with vast grasslands, mainly including short, steppe grasses. A larger area of southwest Asia and interior parts of the continent are covered by semiarid or desert vegetation. Small grasses and other vegetation require minimum precipitation and are surrounded by many but mostly barren deserts (Harrison et al. 2001).

Though tropical rain forests predominate along the south coastal strip but on the islands of Sri Lanka, the eastern side of South Asia, we see characteristic semiarid tropical vegetation. The Deccan Plateau is covered by tropical dry forest vegetation mostly. The mainland and islands of Southeastern Asia extensively support tropical rain forests, which thrive under warmer, moist climates (Boles et al. 2004). A significant part of these forests is found in most of the countries, but illegal and legal harvesting is rapidly destroying these, affecting their sustainable regrowth.

Inland from the coastal strip of the mainland in south China, tropical forests predominate. They merge into temperate forests farther north. Around Bo Hai gulfs, vegetation is chaparrals', woody shrubs that grow up to 5 m tall, and on the western sides, we come across maquis and phrygana. On the west Asian side, Palestine,

Israel, Jordan, Lebanon, and Turkey abound in maquis and phrygana resembling chaparrals.

1.5.1 Terrestrial Flora and Fauna

China is called the "Mother of Gardens" by botanists. There are more plant species as compared to South and North America. The reason is diverse landscapes in China such as the arid Gobi Desert to the tropical rain forest of Yunnan Province. Many plants adapt here to the climate (Hoffmann et al. 2019). China is also regarded as a possible place of origin of peaches. It is home to dawn redwoods; the only redwood trees present outside the North American region. In the Himalayas, the community uses yak to carry the burden. These large animals have thicker skin, wool, and survive better in oxygen-poor high altitudes (Anderson and Anderson 1993). In addition to their use for transportation and plowing fields, their fur is the source of warm, fiber and milk is used for producing cheese and butter. In the Mongolian steppes, the two-hump camel Bactrian is used to carry the load. Bactrian is a critically endangered animal species (Couvreur et al. 2020). These camels were traditional animals used in the caravan on the Silk Road trade route.

1.5.2 Aquatic Flora and Fauna

The fresh and marine water habitats of Asia show rich biodiversity. Isolations and Lake Baikal surroundings make it different sites of biology. Aquatic diversity has evolved millions of years ago, being relatively undisturbed, with richer diversity of flora and fauna. Lakes are known as "Russian Galápagos" because of their importance in the species evolutionary aspects (Alum-Udensi 2016). There are 1342 animal species and 572 plant species distributed here. Nearly 100 species in Lake Baikal are endemic. The seal of the Baikal Lake is one of the important freshwater seal species in the world. They are feeding primarily on Baikal and omul fish oils, and these together with the salmon provide fish catch for the communities living around the area (Thomas et al. 2014).

The Bay of Bengal in the Indian Ocean is one of the world's biggest marine tropical ecosystems, being home to numerous marine mammals; including the bottlenose dolphin, spinner dolphin, spot dolphin, and Bryde whale (Morse et al. 2007). The bay also abounds in healthy populations of tunas, jack, and marlines. Rich biodiversity is found in several bays with the most varied array of organisms living on wetland and in the coastal areas. Much of the wildlife reserves are found around the bays in order to protect the biological diversity of the continent. The wetland area of Sundarbans is located on the delta of the Ganges and Brahmaputra rivers. It is the biggest mangrove forest. The mangroves are strong trees able to withstand the tidal power as well as the salt tides in the Bay of Bengal together with freshwaters

flowing from Ganges and Brahmaputra. In addition to mangroves, the Sundarbans are forested by palm trees and swamp grasses (McConnell 2004; Hanum et al. 2013; Mitra et al. 2015).

The swamps jungle of the Sundarbans supports the richest animal communities, including nearly 100 species of fish, shrimp, crabs, and snails sharing the exposed root system of mangrove trees. There are more than 220 species of wade, aquatic birds, and smaller animals living as the parts of the food chain which includes wild boar, macaques monkeys, monitoring lizards, and a healthy population of Bengal tigers (Zhao et al. 2006; Mitra et al. 2015).

1.5.3 Floral Diversity: Herbaceous Cover

The plant diversity in Asia is reasonably high. There are records of thousands of taxa and exceptionally high proportion of endemics. Out of 34 international biodiversity hotspots, 10 are located in Asia (Myers et al. 2000; Jaramillo and Manos 2001). Vegetation types show a parallel variation with changes in precipitation and temperature. There is a full spectrum of vegetation from tundra to tropical rainforest, with a typical latitudinal distribution pattern (Majumder et al. 2013). Many crops, such as rice, beans, tea, citrus, litchi, lacquer, and tung oil trees, have their origin in East Asia; mango, banana, sugarcane, castor, and eggplant have originated from South Asia; onions, spinach, alfalfa, dates, carrots, and melon from West Asia; and apple, pea, and broad bean from Central Asia. It is a global plant diversity paradise, deserving a high priority in conservation practices (Yarcı and Altay 2016; Ozturk et al. 2018g, 2021a, b). There are nearly 40% of the plant species found here (Table 1.2). Nearly 42 plant families and 1500 genera are the endemics. The five major vegetation types are based on the richness and type of each regional flora. These include tropical rain forest in Southeastern Asia, temperate mixed forest in Eastern Asia, dry forests/tropical rain in Southern Asia, deserts and steppes in West and Central Asia, and tundra and taiga in Northern Asia (Raghunandan and Basavarajappa 2014). The flora generally consists of; trees, orchids, crop species, garden plants, carnivorous taxa, ferns, bryophytes, lichens, grasses, weeds, shrubs, native taxa, endemics, medicinal-flowering plants, and some endangered or extinct species.

1.6 Medicinal Plants

Phytogeographical medicinal flora of Asia can be evaluated under various divisions of the continent (Fig. 1.2 and Table 1.3).

Central Asia The geographical boundaries include Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. All these countries possess several spe-

Table 1.2 Total number of plant species by countries in the Asian continent (modified from Ozturk et al. 2019; Butler 2020; Li et al. 2020; Wang et al. 2020; Xu et al. 2020; Xue et al. 2020)

Region/country	Native vascular plants
East Asia	
China	31,362
Japan	5600
South Korea	4500
Taiwan	4442
North Korea	4426
Mongolia	2950
South Asia	
India	18,000
Nepal	6200
Pakistan	6000
Bangladesh	5700
Bhutan	5603
Afghanistan	5000
Sri Lanka	3210
Maldives	583
Central Asia	
Kazakhistan	6000
Tajikistan	4513
Uzbekistan	4344
Kyrgyzstan	3800
Turkmenistan	2900
Southeast Asia	
Indonesia	28,000
Borneo	20,000–25,300
Malaysia	19,000
Myanmar	16,000
Brunei	15,000
Thailand	15,000
Vietnam	11,373
Philippines	10,107
Cambodia	8260
Laos	6000
Singapore	4180
North Asia	
North Asia (Asian Russia)	6961
West Asia	
Turkey	11,000
Iran	8000
Azerbaijan	4557

(continued)

Table 1.2 (continued)

Region/country	Native vascular plants
Syria	4200
Georgia	4100
Lebanon	3600
Iraq	3300
Armenia	3260
Yemen	2838
Israel	2780
Jordan	2531
Saudia Arabia	2282
Palestine	2076
Cyprus	1900
Oman	1239
United Arab Emirates	650
Kuwait	407
Qatar	379
Bahrain	357

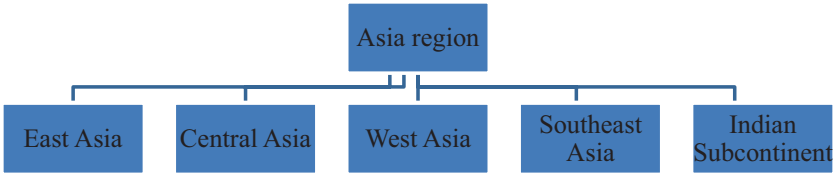

Fig. 1.2 Flowchart of geographical distribution of regions in the Asian continent

cies of medicinal species used in the traditional system as well as Ayurvedic applications (Khojimatov and Khassanov 2021).

West Asia This part includes Palestine, Jordan, Israel, Syria, Cyprus, Lebanon, Turkey, Iraq, Iran, United Arab Emirates, Bahrain, Kuwait, Qatar, Oman, Saudi Arabia, Yemen, Georgia, Armenia, Azerbaijan, and Afghanistan. Most of these are deserts or show dry, hot, and humid climates, encompassing 1/6 of earth's biomasses.

Southeast Asia The region's borderlines include Indonesia, Malaysia, Singapore, Thailand, Philippines, Vietnam, Myanmar, Cambodia, up to Brunei. The countries like Thailand, Brunei, and Malaysia have a great history of the use of medicinal plants which has offered a considerable number of pharmaceutical products. Lee and Houghton (2005) have noted that this region, due to its vast biodiversity, holds great promises for the discovery of novel biologically active compounds.

Indian Subcontinent Covers the countries like Pakistan, Bangladesh, India, Sri Lanka, Bhutan, Maldives, and Nepal. The people here use enormous therapeutic

Table 1.3 Some of the representative medicinal plants

	Species	Family	Country	Uses
Central Asia	*Achillea millefolium*	Asteraceae	Kyrgyzstan	Bloody gums, bleeding nose, abbrasions, small wounds
	Achillea filipendula	Asteraceae	Tajikistan, Uzbekistan	Strongly suppressed gene expressions associated with inflammations, antiinflammatory, treatment of inflammations, pains, gastrointestinal disorders
	Aconitum karakolicum	Ranunculaceae	Kyrgyzstan	Essential oils show antimicrobial effects for *Clostridium perfringen* and *Candida albinos* Sesquiterpenes isolated from the species exhibit antiinflammatory activities in croton oil ear tests
	Aconitum leucostomum	Ranunculaceae	Kyrgyzstan	Tinctures are used to treat radiculitis, neuralgia, rheumatisms, and also work as analgesics
	Aconitum soongaricum	Ranunculaceae	Uzbekistan	Antibacterials, antiarrhythmic
	Aconitum talassicum	Ranunculaceae	Kyrgyzstan	Treatment of radiculitis, neuritis, tuberculosis, headaches
	Anethum graveolens	Apiaceae	Tajikistan	Carminatives, stomach aches, and for diuretic purposes
	Cannabis sativa	Cannabaceae	Turkmenistan	Relaxants, stop nausea, and vomiting, used to increase appetite in AIDS patients
	Plantago lanceolata	Plantaginaceae	Kazakhstan	Diuretics and astringents, eye initiations, skin diseases, skin burns

(continued)

Table 1.3 (continued)

	Species	Family	Country	Uses
West Asia	*Aloe barbadensis*	Asphodelaceae	Cyprus	Skin infection, blood purification, wound healing, diabetes
	Artemisia absinthium	Asteraceae	Palestine	Cure stomach worms and smoking habit
	Coriandrum sativum	Apiaceae	Afghanistan	Antirheumatic, carminative, digestive, analgesic
	Ferula foetida	Apiaceae	Afghanistan	Cure bronchitis, whooping cough, asthma, hysteria
	Matricaria chamomilla	Asteraceae	Cyprus	Relaxants, treat insomnias, antidepressants
	Mentha longifolia	Lamiaceae	Turkey	Indigestion, stomach ache, bad breaths, vomiting, nausea
	Origanum syriacum	Lamiaceae	Lebanon	Gastrointestinal disorders, rheumatism, antihypertensive
	Satureja hortensis	Lamiaceae	Iran and Iraq	Coughs, sore throats, intestinal disorders
	Thymus capitatus	Lamiaceae	Lebanon	Antiseptics, antifungals, dry cough
Southeast Asia	*Abrus precatorius*	Fabaceae	Thailand	Abortions, labor pains, antiinflammatory
	Acanthus ebracteatus	Acanthaceae	Thailand	Coughs, antiasthmatics
	Acorus calamus	Acoraceae	Thailand	Antiasthmatics, antiinflammatory, inflammations of joints
	Albizia myriophylla	Fabaceae	Malaysia	Fevers, earache
	Alpinia galanga	Zingeberaceae	Malaysia	Infections, reduce inflammation, boost male fertility, treatment of five kinds of cancers
	Blumea balsamifera	Asteraceae	Philipines	Kidney stone, urinary tract infection
	Clinopodium douglasii	Lamiaceae	Philippines	Indigestion, colds, arthritic pains
	Dillenia suffruticosa	Dilleniaceae	Brunei	Inflammations, itching, stomachache
	Senna alata	Fabaceae	Philippines	Vermicide, astringent, purgative
	Vitex pinnata	Lamiaceae	Brunei	Stomach ache, fever, wound healings

(continued)