



Vegetables from local markets in Myanmar



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The information on medicinal uses, effective compounds, and pharmacological properties and functions of different vegetables is taken from published literature and web resources. We have not validated this information, including the information on culinary use, which is based on interactions with communities in the vegetable markets. The information – including, but not limited to, text, graphics, images, and other material – contained in this book are for informational purposes only. No material in this publication is intended to be a substitute for professional medical or nutritional advice. We request readers to treat this as general information and not use these vegetables as medicine or to treat any ailments based on the information presented here. Readers are solely responsible for any potentially adverse reactions or allergies associated with the consumption of these vegetables.

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Vegetables from local markets in Myanmar

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About the book

This book presents the diversity of commonly used wild and cultivated vegetables in Myanmar and their nutritional and medicinal values. It draws on two field studies in Myanmar. The first study focused on selected local markets and community fairs in central Myanmar, and Kachin and Shan states, and detailed 87 species of typical vegetables, including parts used, their culinary use, cultural association, and their medicinal and nutritional values. The second is an ethnobotanical study conducted in nine villages around the Hponkanrazi Wildlife Sanctuary in Kachin State, which documented 103 wild and non-cultivated plant species used by local people as food, and for medicinal, cultural, and income-generating purposes. About 60 of these are a source of food, including several species used to make soups and other local dishes.

This book is a tribute to the rich knowledge of the indigenous peoples and local communities (IPLCs) who gather and sell vegetables in these markets. It outlines key research and policy implications and also, importantly, how institutions such as the Southeast Asian Biodiversity Research Institute and the Kunming Institute of Botany of the Chinese Academy of Sciences, the Forest Research Institute in Myanmar, and the International Centre for Integrated Mountain Development could collectively take the knowledge forward to support the objectives of the use of a wider food base from natural ecosystems, management of agrobiodiversity, and food and nutritional security, not only in Myanmar but across the Hindu Kush Himalaya.





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Introduction

Myanmar is a key site of conservation as it is a part of the Indo-Burma Biodiversity Hotspot (Myers et al. 2000). It is also a place of rich cultural diversity and agrobiodiversity. It has a large number of cereals, oilseeds, pulses, fruits, and vegetables, as well as plantation and industrial crops. Fruits and vegetables are important components of a healthy diet. This book enumerates the diversity in the prevalence and use of vegetables in parts of Myanmar. It draws on our field studies in Myanmar, where we encountered people consuming interesting plant species as vegetables. For example, we saw parts of the moorva dregea (*Wattakaka volubilis*), belonging to the family Apocyanaceae, and jengkol (*Archidendron pauciflorum*), belonging to the family Fabaceae, being consumed as vegetables. These plants are generally considered poisonous by scientists. Likewise, the roots of the winged bean (*Psophocarpus tetragonolobus*) and the seedlings of the wine palm (*Borassus flabellifer*), which have a pungent taste, are very popular vegetables in the dry season in Myanmar. Tea is a globally well-known and widely-consumed beverage. However, in Myanmar, Pu'er tea (*Camellia sinensis* var. *assamica*) is consumed as a beverage and a vegetable. The leaf that is consumed as a vegetable is fermented and preserved.

Traditional knowledge in Myanmar regarding the use of plant species still remains well preserved and has been sustained due to the weak influence of globalisation and modernisation there as compared to other developing countries. The country, therefore, remains a “mysterious treasure” for ethnobotanists who seek to understand the richness of its traditional knowledge. However, the flip side of the limited influence of globalisation and modernisation processes is that scientific knowledge about these vegetables is still very limited, and the level of adoption of new technologies towards the development, processing, and consumption of these vegetables

is low. Research on these interesting, unconventional vegetables is limited.

Myanmar also has a rich heritage of the use of traditional medicine (Codery 2021). The production of traditional medicines from plant extracts as an alternative to modern medicine is widely practised in Myanmar, particularly in rural areas (Aung et al. 2016). Public health in Myanmar is reliant on both modern and traditional medicine, and about 75 per cent of the country’s population still opts for traditional medicines to treat diseases (Awale et al. 2006; Peltzer et al. 2016).

Traditionally, they followed the Rasayana system of thought that advises people to use food to treat ailments. As the proverb in Myanmar goes, “Medicine is food, food is medicine”. There is a strong belief in Myanmar that food can serve as medicine and can treat many diseases and ailments.

Rasayana is one of the eight branches of Ayurvedic medicine (Balasubramani et al. 2011), which originated in ancient India and then was spread to Myanmar by Buddhist scholars. Sushruta, a master of Ayurveda, described Rasayana as a theory whose implementation would increase one’s lifespan, promote intelligence and memory, and increase immunity and resistance to disease (Puri 2002). In the word ‘Rasayana’, ‘Rasa’ means nutrition and ‘ayana’ refers to the body’s tissues. Following it has many health benefits, including keeping oneself in a good physical and psychological state.

The origins of disease in the body, according to Ayurveda, lie in metabolic imbalance in the body’s systems. ‘Tridosha’ and ‘Satrasa’ are key concepts of Rasayana. The former suggests the body consists of three forces – *vata* (air), *pitta* (bile), and *kapha* (phlegm). Satrasa refers to six *rasas* – sweet, acidic, salty, bitter, astringent, and pungent. If a particular rasa is deficient or in excess, the

equilibrium in one’s body is disturbed and various health challenges arise. The aim of Rasayana is to correct the system by balancing various rasas (Puri 2002). The six *rasas* are absorbed from different food items, hence food itself ought to be balanced to keep the *doshas* (ailments) in check. Vegetables, with their natural oxidative properties, have played a key role both as food and as medicines, enriching the Rasayana system.

1.1 Field sites and methodology

This book draws on two field surveys. In the first, in collaboration with the Myanmar Forest Research Institute (FRI), we documented vegetables prevalent in northern and central parts of Myanmar and also examined their phytochemical and pharmacological properties. We selected Zaycho Market in Mandalay, Sao San Tun Market in Taunggyi, and the five-day fairs of Inlay as the key study sites. Besides, some other small temporary fairs in Shan State and central Myanmar were also surveyed.

Zaycho market is one of Myanmar’s most important commercial complexes, located in Mandalay, central Myanmar. Zaycho market is the largest vegetable market in Mandalay and is catered to by all the major ethnic groups – Bamar, Shan, Pa’o, Palaung, and Lisu. The lifestyle of communities in central Myanmar is deeply influenced by Buddhist beliefs (Juliane 2011). The vegetation of this region is influenced by its hot semi-arid climate. Nourished by the Ayeyarwaddy River, central Myanmar is the most important agricultural region in the country (Aung et al. 2017).

Taunggyi city is the capital of Shan State, an important multi-ethnic state of Myanmar. Dozens of ethnic groups, including Shan, Pa’o, Kachin, Palaung, Danu, Lahu, Lisu, Padaung, and Kayin, live there. Inlay, located 10 kilometres (km) south of Taunggyi, is a bio-cultural hub, where the interesting culture of communities living

near Inlay Lake and its surrounding mountains at elevations of 880–1,700 metres above sea level (masl) has been well preserved. The Taunggyi district has many kinds of vegetation and varied ethnic communities have settled in different vegetation zones, rendering a diversity in traditional culture and livelihoods. Local livelihoods are based on paddy cultivation in small lowland basins and shifting cultivation of vegetables on the surrounding hillsides. These shifting cultivation practices are now giving way to the permanent cultivation of cash crops such as tea, oranges, and pears (Mon et al. 2020). Despite these changing practices, the harvesting of wild subsistence resources from forests is still common and plays an important role in the daily lives of local people. Related, local traditional knowledge about nature and plants is important to local people and has been passed down for many generations, largely as part of the local spiritual practices.

The famous, periodic ‘five-day fairs’ for the exchange of local goods are held in the Inlay region of Nyaungshwe township. These fairs are organised by the local communities in a few places around Inlay Lake – Nyaungshwe, Heho, Taunggyi, Minethauk, and Shwenyaung. Field studies in these selected markets were carried out during 2017–2019, in both the dry and monsoon seasons. We used direct observation to record and count the species of vegetables sold in these markets, and the frequency with which they appeared. We used the participant observation method and conducted semi-structured interviews with key informants (with their informed consent) to gather information about the health benefits of various vegetables. The method of preparation, their function, and amount of usage for were recorded for each species with health benefits. We also recorded the habitat and information about the source of each vegetable.

The interviews were conducted in Burmese and translated into English with the help of colleagues from the Foreset Research

Institute in Myanmar. The key informants were mainly vegetable sellers in the markets. The semi-structured interviews were carried out based on the following questions:

1. Would you introduce the vegetables you sold (or bought) to us?
2. Could you tell us where you are from and where you get the vegetables (for sellers)?
3. Would you tell us why you bought them and how to cook them (for customers)?
4. Would you mind leading us to the place you collected them?
5. Could you list the ailments you are skilled in treating with the vegetables?

Voucher specimens of most species were prepared and identified with the help of specialists from the Kunming Institute of Botany and the FRI. They were deposited at the herbarium of the Forest Research Institute and the herbarium of the Kunming Institute of Botany. The exceptions were common vegetables such as cabbage, tomato, and eggplant.

A second survey was carried out as part of The Landscape Initiative for Far Eastern Himalaya (HI-LIFE), ICIMOD in collaboration with the Forest Department, and the Wildlife Conservation Society (WCS). This ethnobotanical survey was carried out in nine villages – Wa San Dam, Namru Htu, Namro, Sawlawdi, Wang Hlaing Dam, Longna Dam, Awa Dam, Khalan, and Ziya Dam – located on the outskirts of Hponkanrazi Wildlife Sanctuary in Putao District, Kachin State. Quantitative and qualitative primary data was collected using a range of participatory tools (Aryal et al. 2018). This was followed by a household survey and assessment of plant diversity through the collection and display of plant species available in and around the study villages. Nine focus group

discussions – one in each village and with 7–11 participants in each – were organised. This survey documented a total of 103 wild and non-cultivated plant species, highly useful for the people as food, and for medicinal, cultural, and income-generating purposes.

A few words about the structure of the book. The concept and a general overview of the research on vegetables is presented in chapter 2. This includes their varied uses as food and medicine, history, and cultural relevance. We then present some research and policy implications of the study in chapter 3. Chapter 4 provides a detailed account of 87 species of vegetables in 25 market areas in central Myanmar, and Kachin and Shan states. Ethnobotanical findings from the survey of nine villages in Kachin are presented in chapter 5. Chapter 6 concludes with insights into how such knowledge on the biodiversity and food resources in Myanmar opens up avenues for collaboration for relevant institutions in the Hindu Kush Himalaya.

This book is the first of its kind, especially for Myanmar, and we hope that it will encourage more such documentation of the rich knowledge possessed by indigenous peoples and local communities (IPLCs) about the nutritional and medicinal value of plants, and eventually improve the conservation and sustainable utilisation of both cultivated and wild vegetables not just in Myanmar, but across all eight countries sharing the Hindu Kush Himalayan region.



CHAPTER 2

An overview

Food is essential to all life. Plants, as the primary producers in the ecological food chain, are the major source of food for all, even though not all plants are edible. About 300,000 species of plants have been recorded globally, of which about 30,000 are edible. Around 200 species of plants are commonly consumed worldwide. About 85–90 per cent of the total calories in daily diets are derived from merely 12 cultivated species (Ogoye-Ndegwa 2003). A majority of the remaining plant species are also considered either poisonous, having poor taste, or low in nutrition. Their qualities, especially their nutritional and health benefits, taste, and toxicity, remain ignored by science and hugely underexplored. Despite the fact that vegetables and fruits play an important role in providing food during famines or food-scare periods, due to the lack of knowledge about, and promotion of these species, hunger, malnutrition, and even starvation continue in some of the world's most rich biodiversity areas. That about 0.815 billion people remained undernourished globally between 2015 and 2016 partly reflects this (FAO 2017).

Information about most of the recorded 30,000 edible plant species comes from indigenous and local knowledge, the knowledge of IPLCs passed down from generation to generation. Compared to scientific knowledge, this knowledge remains fragmented and not systematically documented. Sadly, indigenous and local knowledge about the varied uses of plants is an invisible treasure that would gradually disappear with the rise of industrialisation, urbanisation, globalisation, and rapidly changing lifestyles and dietary cultures. People who were once knowledgeable about the use of wild and cultivated plants would lose that intricate connection with nature.

Global reports state that several health conditions and chronic illnesses are a result of unhealthy dietary habits and lifestyles. A greater number of people these days suffer from chronic ailments such as diabetes, cardiovascular diseases, cancer, and respiratory diseases. Chronic diseases impose a heavy economic burden on poor households in particular. According to the World Health Organization (WHO), about 38 million people died of chronic diseases worldwide in 2012, 52 per cent of the total number of deaths that year; that number is expected to rise to 52 million by 2030, three-quarters of them in low-income countries (WHO 2012).

The WHO recommends a balanced daily diet for effective public health management. A balanced diet is one that: (i) maintains the balance between calorie intake and consumption, which would ensure a healthy body weight; (ii) reduces the intake of fatty foods, especially trans-fats; (iii) limits the intake of simple sugars; (iv) limits the intake of salt; and importantly, (v) increases the intake of vegetables, fruits, beans, whole grains, and nuts. According to the WHO, about 14 per cent of the gastrointestinal cancers, 11 per cent of the ischaemic heart diseases, and 9 per cent of strokes worldwide are related to the lack, or insufficient intake of vegetables and fruits. The intake of over 400 grams of vegetables daily (excluding starchy tubers such as potato) could effectively reduce the incidence of heart disease, cancer, obesity, high blood pressure, and diabetes (WHO 2010). Vegetables also play an important role in preventing micronutrient deficiencies in developing countries.

2.1 Defining vegetables

The Food and Agricultural Organization of the United Nations (FAO) classifies vegetables as plants cultivated as field or garden crops in the open or under glasshouses and which are almost exclusively used as food (FAO 2015). In daily parlance, ‘vegetables’ refers to plants that could be eaten either raw or after they are cooked. Generally, the term comprises leafy plants such as cabbage, artichoke, asparagus, lettuce, and spinach; fruits or plants

such as pumpkin, peas, beans, squash, eggplant, chillies, and peppers; underground roots and tubers such as potato, radish, carrot, and turnip; and crops such as ginger, garlic, onion, and coriander. Vegetables that are fruits can be easily separated from ‘normal’ fruits going by how they are cooked. However, in some communities, conventional fruits are also used as vegetables; for example, mango and papaya are famous fruits but also consumed as vegetables in tropical areas, especially in salads. Jackfruit and pineapple are used as vegetables in Shan State, Myanmar. Some plants are used both as vegetables and grain. Typical examples are potato and corn.

Vegetables can also be classified as ‘cultivated’, ‘semi-cultivated’ or ‘semi-wild’, or ‘wild’, depending on whether or not people farm them. Semi-cultivated vegetables are those that grow naturally, but also occasionally planted by people in their farms and home gardens, such as genus *Amaranthus*, species of which are to be found growing wild or as weeds on arable land. Occasionally, seeds are gathered from the wild and broadcast in home gardens or backyard gardens.

2.2 A brief history of cultivation

After splitting from apes roughly 7 million years ago, our ancestors depended on fishing, hunting, and gathering practices, and mostly ate food raw. Hence, the digestive system of humans is evolutionarily able to consume food from multiple sources, especially natural foods from the wild. However, with the advent of fire, people began to cook. People then made utensils from stone, iron, or ceramics for cooking, and cooking became part of complex human behaviour, culture, and civilisation. About 11,000 years ago, people also started cultivating plants and began to breed animals (Diamond 2017).

The art of cultivation and livestock-rearing progressed over the centuries as more people adopted a sedentary lifestyle. Besides the cultivation of staple crops such as maize, rice, and wheat, people

gradually started domesticating vegetables gathered from the wild, improving their features over time. Today, about 56 million hectares (ha) of land are used worldwide for vegetable cultivation, with an annual global output of 1 billion tonnes. China, the world’s leading country in vegetable production, grows about half of this (FAO 2015). More than 60 types of vegetables are produced at a large scale in the world; these vegetables have production standards assigned by the International Organization for Standardisation, often referred as ISO-certified (ISO 1991).

2.3 Ethnobotanical studies

Vegetables have for long been the focus of the science of ethnobotany. Early ethnobotanical research focused on the cataloguing and documentation of vegetables used by local communities and in local markets. The research then advanced to understanding traditional or local knowledge, including regarding the gathering, preparation, and cooking of vegetables, and the spread of such knowledge. Gradually, comparative analyses of indigenous and local knowledge regarding vegetables among different communities became a research hotspot. More recently, research into nutrition, effective compounds, and the genetic diversity of vegetables have become popular.

Ethnobotanical studies have enumerated the enormous diversity of vegetables in different regions in the world. For example, a study recorded 22 species of vegetables in the area around the Republic of Dagestan in Russia (Kaliszewska and Kołodziejska-Degorska 2015). Thirty species of vegetables belonging to 23 genera were collected from different sites in Morocco (Powell et al. 2014). A study found that 68 species of vegetables are sold in 22 markets in Manipur, India (Konsam et al. 2016). Bvenura and Afolayan (2015) listed 103 species of vegetables belonging to 33 families in South Africa. Twenty-one cultivated and 241 wild species of vegetables were reported to be used by local communities in Zimbabwe (Abbasi et al. 2015). Biscotti and Pieroni (2015) reported 79 species of vegetables from South Italy, 10 of which were never reported

before. A study of the Kailash Sacred Landscape — a transboundary landscape shared by Nepal, India and China — reported 99 wild and non-cultivated edible plants belonging to 59 families which are mostly used for food, spices, medicine, rituals, and income generation. About 40 species are used as fruit and 31 as vegetables. The use value of *Dryopteris cochleata* was found to be the highest among frequently-used vegetable species (Aryal et al. 2018) Wujisguleng and Khasbagen (2010) catalogued 90 species of vegetables from the Inner Mongolia autonomous region of China.

There are about 1,800 kinds of vegetables consumed in China, approximately 12 per cent of them in Yunnan province in southwestern China, adjoining Myanmar (Xu and Liu 2002). A rich diversity of vegetables has been recorded in Yunnan. About 129 species of vegetables were found to be sold in local fairs of Jinping County, a multi-ethnic settlement in Southeast Yunnan (Huai et al. 2008). Wang and Long (1995) reported 86 species of vegetables used by the Jinuo community. Liu et al. (2012) recorded 69 species used by the Wa community in South Yunnan. In Northwest Yunnan, a study found that households from the Naxi Community collected 75 wild vegetable species (Geng et al. 2016). Xu and Liu (2002) reviewed studies of vegetables in Yunnan province, and documented 297 species. A recent study, Aryal et al. (2020), listed 31 species of vegetables that are frequently used by local communities in Putao, Myanmar (discussed in more detail below). Notwithstanding all the work that has been done, most of the knowledge regarding vegetables is limited to IPLCs, and systematic scientific documentation regarding their identification, phenolic compounds, health benefits, and food safety is still limited.

2.4 The varied uses of vegetables

Vegetables have played an important role in the diets of communities in rural areas. They have improved people’s food security and health, and led to the optimisation of land use. The seasonal collection and sale of vegetables has been one of the good ways that peri-urban communities augment their income.

Vegetables, being part of natural vegetation, contribute to ecological functions such as water and soil conservation (Konsam et al. 2016).

Vegetables are important for food diversity, and therefore essential for enhancing food security. On the one hand, they constitute a ‘natural storage of nutrition’ and help sustain people through a famine or food crisis. On the other hand, they are the repositories of locally adapted, disease- and pest-resistant genetic resources, and hence act as natural gene banks for cultivated crops and their genetic diversification (Bvenura and Afolayan 2015; Łuczaj 2010; Reyes-Garcia et al. 2015). They are ‘treasuries’ for the development of functional foods and medicines (Khan et al. 2016). Importantly, most vegetables have medicinal uses, as they have abundant vitamins, minerals, flavonoids, cellulose, and other important micronutrients (Kibar and Temel 2016; Łuczaj and Dolina 2015; Ogle et al. 2001) (discussed separately below). However, with the agricultural revolution, wild plants got significantly reduced in our diets and therefore also the proportions of dietary fibres and micronutrients, whereas the proportion of meats and carbohydrates increased.

Vegetables are an important source of food, especially during famines. In more normal times, vegetables serve as dietary supplements and novel foods (Łuczaj 2010; Ogle et al. 2001). Besides, they have other potential uses – for instance, the extracts of *Sanguisorba minor* and *Orobancha crenata* have been used as preservatives for their effective antimicrobial properties (Gatto et al. 2011). Vegetables also play an important role in sustaining local culture and traditions through their collection, purchase, sale, donation, and exchange (Kaliszewska and Kolodziejska-Degorska 2015).

To summarise, the utilisation and management of vegetables help improve human health and food security, optimise the use of land resources, provide environmental and economic benefits, and sustain communities’ cultural and traditional knowledge and practices.

2.5 Nutritional and health benefits of vegetables

Vegetables are regarded as health foods for they are rich in vitamins, minerals, flavones, saponins, and dietary fibres (Łuczaj and Dolina 2015). Some of them are the main source of vitamins and minerals for women in suburban areas of developing countries (Ogle et al. 2001). About 60 per cent of the populations of developing countries depend on wild plants for micronutrients and to treat different ailments (WHO 2010). Vegetables are said to be rich in folate, a naturally occurring source of vitamin B, and could reach up to 506 milligrams per gram in dry material (Morales et al. 2014). Generally, wild vegetables have more micronutrients than cultivated vegetables (Kibar and Temel 2016), and also contain more vitamins, proteins, and iron (Cao et al. 2015). Likewise, wild leek (*Allium ampeloprasum*) has more linoleic acid and polyunsaturated fatty acids, and higher dietary fibre and zinc than its cultivated species do (Garcia-Herrera et al. 2014). A study showed that the micro-minerals from vegetables are easier to absorb (Bae et al. 2014), and contain beneficial linoleic acids and vitamin E complex (Morales et al. 2014). Further, vegetables are important sources of energy and add to the diversity in human diets (Shin et al. 2018). They help improve dietary patterns of people in both rural and urban areas (Flyman and Afolayan 2006).

2.6 Regional and cultural relevance

The selection and consumption of wild edible plants have strong regional and cultural features. The regional features are related to their geographical distribution. For example, local people in tropical areas consume flowers of *Musa* species and tender shoots of *Ficus* species, whereas Europeans usually prefer tubers such as beet (*Beta vulgaris*). It is not that people in the tropics do not like beet or that Europeans hate *Musa* and *Ficus*, but that *Musa* and *Ficus* species are abundant in tropical areas whereas beet grows well in the European temperate climate. In northern Thailand, according to the Cultural Food Significance Index (CFSI), twelve

vegetable species had high CFSI values among the indigenous and local communities in Karen and Lawa villages (Punchay et al. 2020). Even within the same geographical area, due to cultural influences, people from different communities choose to consume different plants or use the same plant in varied ways. For example, Eastern Himalaya is the epicentre of *Rhododendron* species, and the flowers of the *Rhododendron decorum* is a famous vegetable in Dali, a prefecture in Northwest Yunnan province, China. However, in adjoining Lijiang and Diqing prefectures, local people never eat these flowers as they consider it poisonous. *Rhododendron decorum* is indeed a poisonous plant (Shi et al. 2021), but the local people in Dali know how to extract its poison. Mushroom-eating culture is another example. Communities in the southern Himalaya rarely eat mushrooms as they are considered “filth” growing on rotten substrate. In contrast, mushrooms are considered a delicacy in Yunnan, and in many areas of the eastern Himalaya. Similarly, Matsutake mushrooms (*Tricholoma matsutake*) are considered as most nutritious and a delicacy in Japan, but in Yunnan province, China, locals do not like to eat it because of its perceived unpleasant smell. Matsutake mushrooms however began to be gathered and marketed internationally by locals after their commercial value was realised. Such regional, cultural features regarding the selection and consumption of wild edible plants may fade away with the rapid ingress of diverse, market-driven consumer goods from wider sources.

In Myanmar, food is often a medium through which many cultural groups portray their differences and maintain their cultural heritage. Ta-min, or rice, is a key component of Burmese culture that the word is even used in daily speech – such as “Nay kaung lar?” for ‘How are you?’ or literally, ‘Have you eaten rice?’ The consumption of a wide range of vegetables is common, as the majority of Myanmar’s population is Buddhist and some are vegetarian. Also, vegetables constitute the primary ingredient of a variety of salads or a-thoke that are often part of every meal, such as tea leaf salad made from fermented tea leaves mixed with peanuts, fried garlic, dried shrimp, and yellow split pea. It is a must

for any rituals and festivals. A-thoke are also specific to different ethnic communities and their geographical areas; for instance, Kayan Chin thi thoke uses green tomatoes and coriander, vegetables that are abundant in Chin and Kayan areas, indeed all around Myanmar.

2.7 Gathering, cooking, and consumption

The gathering and consumption of specific vegetables depends on the season, as they need to follow the plant’s natural phenological cycle. The edible parts of plants such as flowers and fruit are only available during certain seasons and months of the year.

These practices are also influenced by culture and religious beliefs that are aligned with different seasons. For example, the Mazeli (*Senna siamea*) is regarded as the *Tazaungmone* (November) tree in Burmese culture. Traditional belief is that all the spirits guarding medicinal plants come to pay their respect to the guardian spirit of the Mazeli tree at midnight during the full moon in November. Therefore, it is believed that eating Mazeli bud salad at that time would have a greater healing value. Locals believe that the flowers collected at that time also taste better.

Each vegetable has its own harvesting methods, including which parts are to be used. For vegetables, often only a part of the plant is used. Which parts are deemed edible depends on several factors – whether they are poisonous, tasty, or nutritious. Expectedly, different parts of vegetables are deemed edible. For example, the tender leaves and buds of the *Ficus* species are collected as vegetables, because they are delicious whereas mature branches are hard to swallow. When tender, the leaves and buds also contain more anti-oxidants and are hence more beneficial for health. Likewise, only the petals, or the coloured part of the flowers of the *Rhododendron decorum* are edible; the other parts of the flower are poisonous. Similarly, only the filaments of the flowers of the cotton tree (*Bombax ceiba*) are edible as vegetables. In the case of wild variants of cultivated edible plants, the parts that are used are

usually less visible and delicious than those in cultivated plants, as the latter represent ‘new species’ created via multiple genetic selection. A typical example is corn (*Zea mays*). The cultivated corn has a starchy and fleshy cob, whereas the corn’s wild relative *Zea mays* subsp. *parviglumis* has small and unsavoury fruits (Vigouroux et al. 2003).

The culinary preparation of vegetables involves processing and cooking skills. The first step is the selection of the edible parts. The second step is to remove poisons and toxins, or bad taste, if any. The common methods of doing this include blanching in boiled water, boiling for a long time, and deep frying. Some vegetables need to be put in brine to release their poisonous chemicals. The final step is cooking to prepare dishes. Processing and cooking techniques and methods vary between places and communities. Since some people are sensitive to many kinds of food and have food allergies, the gathering and consumption of vegetables requires attention and awareness regarding the type of vegetables.

Methods of cooking have also diversified over the years, and include making salads, pickling, steaming, boiling, pan-frying, deep frying, roasting, fermenting, and so on. The role of each ingredient varies with the dish being prepared – in some cases, the vegetable is the main ingredient; at other times they serve as the auxiliary ingredient, as spices and food colouring. The main ingredient is meant to provide calories and nutrients including carbohydrates, protein, fat, dietary fibre, vitamins, and minerals, whereas auxiliary ingredients are meant to make the food more delicious. Spices and food colouring provide special flavour to dishes. Besides, some vegetables contain effective compounds that could be used to treat ailments and boost one’s health.

2.8 Market potential of vegetables

Vegetables are sold in several local and regional markets to those seeking organic and natural food products. It is not easy to obtain basic information on the quantities of vegetables harvested,

processed, or traded, and when they are used primarily for subsistence, it may be difficult to estimate their value. Having said that, there have been a number of studies on the sale of vegetables in local and regional markets (Li et al. 2007; Xu et al., 2004. For instance, a study of such markets in southwestern China identified 248 species of vegetables sold by minority ethnic groups in the local markets of Xishuangbanna (Sipsongpanna) prefecture. It found that vegetables accounted for 20.6 per cent of the volume of vegetables sold (Xu et al. 2004). Aryal et al. (2020) documented a number of local farmers in Putao, Myanmar selling 40 species of vegetables in the morning market as a source of income (discussed below). Selling vegetables has become more common in recent times but it tends to be seasonal and area-specific. For instance, vegetables such as *Dryopteris cochleata* and the common nettle (*Urtica dioica*) are already popular in a number of local and regional markets in Nepal due to their nice taste and freshness. Similarly, value addition may be possible if the vegetables are processed into edible foods prior to sale, for example, *Urtica dioica* leaf powder available in supermarkets in Kathmandu (Aryal et al. 2018). However, the contribution of vegetables to individual incomes varies widely between regions and ethnic groups.

2.9 Medicinal value of vegetables

Varied research shows that vegetables have essential chemical compounds with health benefits. A study of 56 vegetables consumed in Korea showed they have anticarcinogenic (especially for breast and stomach cancers), antioxidant, anti-inflammatory, and antidiabetic properties (Ju et al. 2016). Several edible flowers, popular in Chinese vegetable markets, have been shown to have beneficial antioxidant properties. A study from Pakistan of 39 vegetables showed that species such as *Ficus palmate*, *Ficus carica* and *Solanum nigrum* have the potential to treat a large number of ailments as they are rich in flavone, an effective antioxidant (Abbasi et al. 2015). Flavones with antioxidant properties are major effective compounds in vegetables (Chen et al. 2015; He et al. 2015; Xiong et al. 2014).



Research and policy implications

This preliminary market-based study points to the importance of recognising the knowledge that indigenous people and local communities possess pertaining to the use of both wild edible plants and cultivated vegetables, knowledge that encompasses their collection, preparation, cooking, and medicinal uses. However, their knowledge is not considered ‘scientific’ as they lack proper documentation, identification, and scientific explanation.

The medicinal and health properties of many wild edible plants have not been scientifically studied and documented. Having such information could help their use and marketing for better income generation. It can also help to protect local people’s right and access to, and benefit-sharing from these plants. Likewise, the economic valuation of wild edible plant resources could incentivise local communities to manage them more sustainably. It is therefore important that such knowledge, including the phytochemical and pharmacological properties of both wild edible plants and cultivated vegetables, be properly documented.

Currently, most studies focus on the active compounds, nutrients, and toxicity of vegetables. The methods of preparing vegetables and the bio-availability of micronutrients in the human body could be essential topics for future research into vegetables. It is equally important to study the nutritional status of vegetables so they can be promoted as the next-generation organic food crops rich in nutrition.

With the ongoing rapid urbanisation, there is a growing demand for organic foods and traditional medicines. This pressure to sell vegetables in particular to meet this demand contains the risk of

overexploitation and depletion of such resources. Studies about market demand, supply capacities, value chains, value additions, benefit-sharing, sustainable harvesting, and governance mechanisms and practices are urgently needed to provide evidence-based guidance to policy making and the sustainable management of resources.

The use of wild edible plants and the related indigenous knowledge systems and institutions reflect important aspects of the interactions between human beings and nature and their cultural adaptation to their environment. Such knowledge systems and institutions are important assets for global sustainability. It is therefore important to understand how social and ecological subsystems interact with each other and impact the social–ecological resilience of the mountains.

3.1 Policy implications

Wild edible plants and the indigenous knowledge, culture, and practices related to their use and management have an important role to play in achieving global goals towards sustainable development enshrined in the SDGs, such as ending poverty (Goal 1), living healthy lives, ensuring food and nutritional security (Goal 2), ensuring good health and human well-being (Goal 3), building resilient communities (Goal 9), and halting biodiversity loss and enhancing services from ecosystems (Goal 15). They also further the three objectives of the Convention on Biological Diversity – biodiversity conservation, sustainable use, and equitable benefit-sharing – and the goals of climate change mitigation and adaptation covered by the UNFCCC’s Paris Agreement. As wild edible plants are usually produced naturally and consumed locally, they represent a low-carbon emissions way of life and method of food production needed for global safety and sustainability. It is important that national policies fully recognise the importance of wild edible plant species, traditional knowledge and management systems, the rights of local communities to the use of such resources, and the need for their sustainable management.

Considering the rapid changes in food sources and the deterioration in dietary habits, and their negative impact on human health and well-being, it is important that necessary policies are created to encourage the use of wild edible plant species as one of the strategies to address food and nutritional challenges. Policy makers at the local level need to promote healthy and nutrition-rich diets among local communities by facilitating the use and exchange of both cultivated and wild edible plant species as health food, particularly in women and children. There ought to be adequate policies and programmes to promote wild edible plant species and traditional diets to address undernutrition and micronutrient deficiencies in urban populations.

Relevant government institutions need to create an enabling environment for scientists and the local communities to disseminate their knowledge as inputs into policy making. This will not only systematise indigenous and local knowledge regarding the use of wild foods and widen the food base, but also open up avenues for the development of future food crops and thereby acknowledge the contributions of IPLCs, including local farmers, to the science of gastronomy and the development of food systems.

With rapid urbanisation, increasing commercialisation, globalisation of markets, and the growing demand for natural and organic food, governments at different levels should take precautionary measures to prevent the overexploitation of resources and loss of biodiversity. They also ought to guarantee access to wild produce, and the benefit-sharing rights of local communities, ensure equitable and transparent value chains, and support the development of value-added products through certification and branding. This can be done by involving business and market actors, the local tourism industry, the farming community, and organisations in health care and education.

Local markets and fairs are important sites of exchange of indigenous and local knowledge that can help raise awareness about local foods, diets, and nutrition and also support the local economy. Governments at the local and other levels ought to

support such fairs to build awareness, promote knowledge-sharing, and enable the exchange of experiences that would enable the sustainable management of wild edible plant species.

Wild edible plant species, as well as other non-timber forest products, are important sources of food, medicine, nutrition, and income for local communities, and are part of the linkages between communities and their natural environment. They are a most important incentive for local people to care for and use ‘nature’ sustainably. It should be supported by clear policies and laws that would encourage community participation in biodiversity conservation and promote community-initiated conservation initiatives.



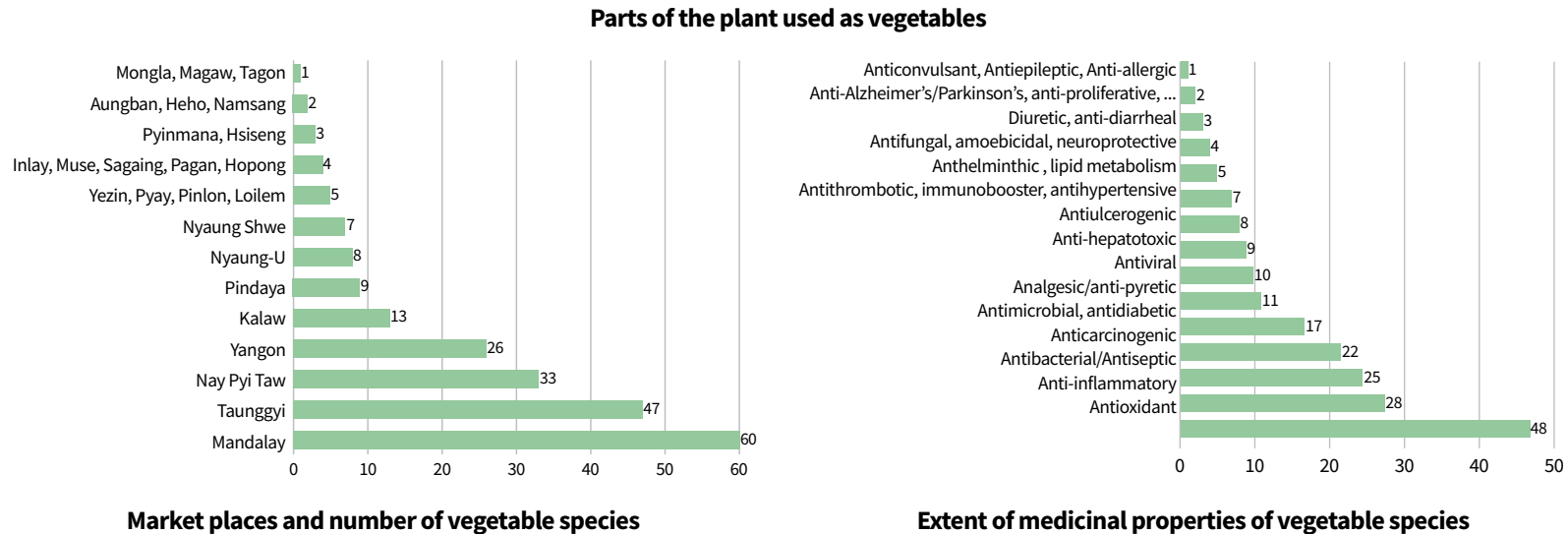
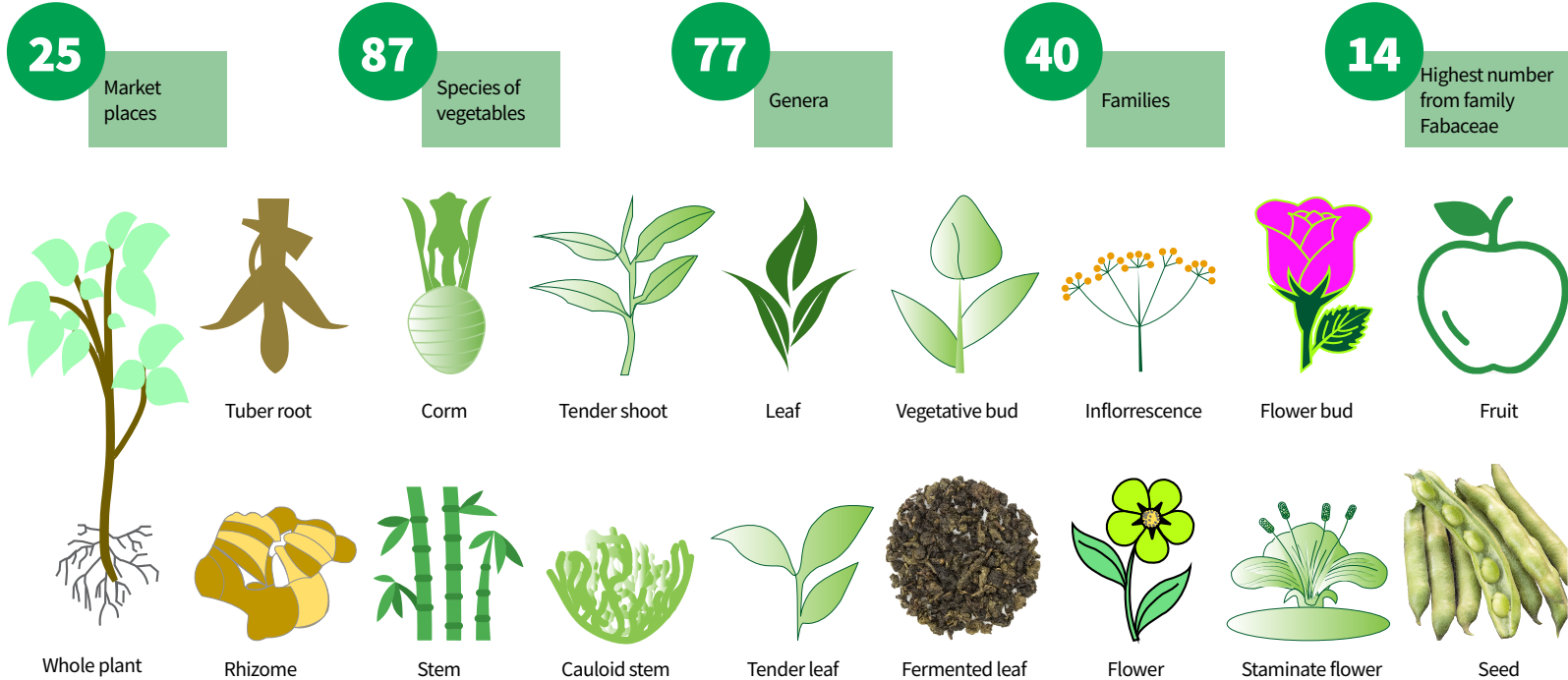
CHAPTER 4

Detailed accounts of vegetables in select markets of central Myanmar, and Kachin and Shan States

A total of 87 species of vegetables belonging to 40 families and 77 genera was documented from 25 market sites in central Myanmar, and Kachin and Shan states (see infograph 1). Among these sites, Mandalay recorded the highest number of species (60), followed by Taunggyi (47). Among the families, Fabaceae recorded the highest number of species (14). Herbs and trees were the most common life forms. The most commonly used parts were leaves, fruits, tender shoots, the stem, tuber roots, rhizomes, flowers, vegetable buds, flower buds, and seeds. In some cases, people use the whole plant for varied purposes.

Our study revealed that vegetables used here contain a large number of medicinal properties. We recorded 48 species with antioxidant properties, and 28 species with anti-inflammatory properties. A number of plant species are used to treat various ailments such as stomach disorders, colds and coughs, wounds and cuts, skin diseases, fever/headache, nausea and vomiting, among others. The following infograph outlines the key findings:

We now provide details of the 87 vegetable species. Each has a picture and some taxonomic, geographic, and phytochemical details. These include its family name, common name, its name in Burmese, distributional location, the markets where they are sold, which parts are used, its life form, how it is prepared, medicinal uses, effective compounds, its pharmacological properties, and morphological characteristics.





Piper nigrum L.

Family: Piperaceae (APG IV 11)

Common name: Black pepper

Burmese name: Nga-yok-kaung

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay

Parts used: Fruit

Life form: Climber

Culinary use: The fruits are used as spicy flavouring in salads and soups

Medicinal uses: Used as a digestive. The seeds (peppercorns) are used to stimulate the taste buds, whet one's appetite, support liver function and circulation, and reduce phlegm and gas.

Effective compounds: Its main compounds include sesquiterpene hydrocarbons and alkamides such as piperine and piperettine.

Pharmacological properties and functions: Pepper and piperine have a diverse array of pharmacological benefits such as antioxidant, anticancer, hepatoprotective, anti-inflammatory, antidepressant, anti-atherogenic, antihypertensive, and drug potentiating (Lim 2012).

Morphological characteristics: Climbers, woody. Nodes clearly enlarged and rooting, glabrous. Its leaf blades are ovate to ovate-oblong, rarely suborbicular, glabrous, their base rounded, apex acute, and reticulate veins prominent. Flowers are polygamous, usually monoecious. Spikes leaf-opposed and as long as the leaves. The drupe is red when ripe, drying black when unripe, globose, and sessile. Flowers during June–October.



Colocasia esculenta (L.) Schott

Family: Araceae (APG IV 28)

Common name: Taro

Burmese name: Pein-u

Distribution: Bago Region, Kachin State, Sagaing Region, Shan State, Tanintharyi Region, Yangon Region

Markets: Nay Pyi Taw, Yezin, Tagon, Taunggyi, Hopong

Parts used: Corm

Life form: Herb

Culinary use: The corms are boiled or steamed until they become soft and waxy.

Medicinal use: Treating snake bite

Effective compounds: Contains starch and potassium, calcium, magnesium, phosphorus, and other minerals

Pharmacological properties and functions: The starch is easily digestible, and since the grains are fine and small, taro is often used for baby food. The plant is toxic due to the presence of calcium oxalate, and the presence of needle-shaped raphides in the plant cells. However, the toxin can be minimised and the corm rendered palatable by cooking, or by steeping it in cold water overnight.

Morphological characteristics: Perennial herbs. Rhizome vertical to horizontal, and tuberous. Stolons long or absent. Has 2–3 leaves, or more, 25–80 centimetres (cm) long; its leaf blade adaxially matte, waxy-glaucous and water-shedding (water sometimes forming ‘mercury droplets’), and oblong–ovate to suborbicular. Peduncle usually solitary. The spathe is tube green, limb open proximally, cream-coloured to golden yellow, lanceolate or elliptic, the apex acuminate. Spadix. There are few seeds. Flowers during February–April, or August–September.



Ottelia cordata (Wall.) Dandy

Family: Hydrocharitaceae (APG IV 32)

Common name: Ottelia

Burmese name: Hin-nyant (Lal-taw-sar)

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Taunggyi, Nyaung Shwe, Kalaw

Parts used: Flowers

Life form: Herb

Culinary use: Used for making salads and soups

Medicinal use: Treating fungal foot infections (tinea pedis)

Morphological characteristics: Herbs, freshwater. Stems are cormlike. Its leaves are dimorphic; submerged leaves narrowly elliptic to ligulate; floating leaves broadly lanceolate or oblong-ovate, the base cordate, the apex acute to acuminate. Its flowers are unisexual. The spathe is oblong-ovate. Sepals yellowish; petals are white, and obovate. Its fruit is oblong. Seeds fusiform, and smooth. Flowering occurs in May.



Aloe vera (L.) Burm. f.

Family: Asphodelaceae (APG IV 72)

Common name: Aloe vera

Burmese name: Sharr-saung-let-pet

Distribution: Cultivated in tropical regions of central Myanmar

Markets: Yangon, Mandalay

Parts used: Leaf

Life form: Herb

Culinary use: The leaves are peeled and the gel then collected is used in making salads

Medicinal uses: Used to treat menstrual disorders. Used against boils, oedema, liver diseases, skin diseases, fevers, asthma, leprosy, jaundice, and bladder stones. Also powerful and effective as an ointment.

Effective compounds: Contains anthraquinones, including aloin, barbaloin, isobarbaloin, anttiranol, aloetic acid, anthracene, among others. Has vitamins, including B complex and C. Contains essential amino acids and non-essential amino acids (Shelton 2010).

Pharmacological properties and functions: It has a regulating effect on the immune system and anti-tumour activity. Crystallisation from juice can significantly reduce the increase of alanine aminotransferase caused by carbon tetrachloride or thioacetamide.

Morphological characteristics: Herbs, succulent. Its stems are short, suckering freely to form dense clumps. Its leaves are sub-basal, slightly distichous in seedlings and new shoots, erect, pale green, sometimes with pale spots in very young plants, linear-lanceolate, the margins sparsely spiny-dentate. Its inflorescence is erect, with numerous flowers. The flowers are reflexed, perianth pale yellow, mottled with red, slightly ventricose. Fruit a loculicidal capsule. The seeds tend to be three-angled, and winged. Its flowering period is indefinite.



Allium hookeri Thwaites

Family: Amaryllidaceae (APG IV 73)

Common name: Hooker chives

Myanmar name: Jue-myt

Distribution: Cultivated in Shan State.

Markets: Taunggyi, Inlay, Kalaw, Pindaya

Parts used: Whole plant, scape, flower, flower bud

Life form: Herb

Culinary use: Making salads and soups or the side dish of Shan noodles

Medicinal uses: Treating indigestion and diarrhoea.

Effective compounds: Rich in vitamin C, vitamin B1, vitamin B2, niacin, carotene, multiple minerals, and dietary fibre

Pharmacological properties and functions: Antimicrobial (Kima et al. 2015) and antioxidant properties (Jun et al. 2015). Its seeds have the function of improving sexual function, enhancing immunity, resisting high and low body temperature, resisting oxidative senescence, mutagenesis, and other benefits.

Morphological characteristics: Perennial herbs. Its roots are elongate, thick, and fleshy. Its bulbs are clustered, and cylindric. Tunic membranous, entire. The leaves tend to be linear to broadly so, shorter than to subequalling scape, with their mid-vein distinct. Scape lateral, usually arising from the base of the bulb, usually without leaf sheaths, and usually deciduous. Its umbel is hemispheric to globose, with many flowers. Its perianth is white or greenish-yellow to yellow. Its ovary is obovoid, smooth, with the base constricted into a short stipe. Capsule loculicidal. Its seeds tend to be black, and rhomboidal. Flowering and fruiting occurs during July–October.



Borassus flabellifer L.

Family: Arecaceae (APG IV 76)

Common name: Wine palm

Burmese name: Htan-pin

Distribution: Bago Region, Sagaing Region, Mandalay Region, and Tanintharyi Region

Markets: Mandalay, Yangon

Parts used: Buds, tender shoot, fresh endosperm, juice

Life form: Tree

Culinary use: It is steamed, and the shells then removed to eat the fleshy embryonal axis as a snack. Fresh endosperm is used to make desserts. The juice is famous soft drink and the fermented juice is local alcoholic beverage. Palm sugar is used as flavor in cooking.

Medicinal uses: Used in treating scabies, asthma, and haemoptysis

Effective compounds: The main ingredient of palm sugar is fructose

Pharmacological properties and functions: Antidiabetic

Morphological characteristics: Robust tree, 30 metres (m) tall. Its trunk is grey, robust, and ringed with leaf scars. Old leaves remain attached to the trunk for several years before falling cleanly. The wine palm is dioecious, with male and female flowers on separate plants. Its fruits are black to brown, with a sweet, fibrous pulp. Each seed is enclosed within a woody endocarp. Its flowering period is indefinite.



Lasia spinosa (L.) Thwaites

Family: Araceae (APG IV 28)

Common name: Lasia

Burmese name: Za-yit-pin (Za-yit-yoe)

Distribution: Mandalay Region, Yangon Region

Markets: Yangon, Mandalay, Nyaung-U, New Pagan

Parts used: Tender leaves

Life form: Herb

Culinary use: Directly used in making salads and soups

Medicinal uses: Used to relieve constipation

Effective compounds: Research into this is limited

Pharmacological properties and functions: *Lasia spinosa* stem extracts (hydroalcoholic extract) in different doses (200 and 400 mg/kg body weight) show potent antidiabetic activity against the standard in dexamethasone-induced diabetic albino rats (Das et al. 2014).

Morphological characteristics: Herbs 1–2 m tall. Its stem is long, creeping, and stoloniferous, erect or ascending. Its leaf blade is variable, and sagittate–hastate. Its spathe is dull orange to black–red outside, dull yellow or, rarely, dull crimson inside. Its fruit is obpyramidal in shape. Its seed is ovoid–cordate. Flowering occurs during July–September.



Musa species

Family: Musaceae (APG IV 85)

Common name: Banana

Burmese name: Ngat-pyaw

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay

Parts used: Flowers, cauloid (stem)

Life form: Herb

Culinary use: Makes curries and soups

Medicinal uses: Treating constipation

Effective compounds: Gallic acid; caffeic acid methyl ester; guaiacylglycerol; 3-(3, 4-dihydroxyphenyl)-acrylic acid; 1-(3, 4-dihydroxyphenyl)-2-methoxy carbonyl ethyl ester; thero-guaiacylglycerol 8-O-beta-d-glycopyranoside; quercitrin; buein; (2R, 3S)-5,7,3',4',5'-pentahydroxyflavanonol; isoquercitrin, and 1, 7-bis(3, 4-dihydroxyphenyl)-hepta-4E, 6E-dien-3-one (Tai et al. 2014).

Pharmacological properties and functions: The ethyl acetate soluble fraction of *Musa basjoo* flowers is a rich source of antioxidant (Tai et al. 2014).

Morphological characteristics: Perennial herbs, tufted, rhizomatous, and stoloniferous. Its leaves are large, spirally arranged, their petioles long, and the leaf blade oblong. Its inflorescence is terminal, erect, or drooping, with a cluster of flowers beneath the bracts. Its flowers are deciduous, becoming unisexual by abortion, the distal functioning as the male, the proximal as the female. Flowering occurs during December–January.



Maranta arundinacea L.

Family: Marantaceae (APG IV 87)

Common Name: Arrowroot

Burmese name: Ar-tar-lut

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Yangon

Parts used: Rhizome

Life form: Herb

Culinary use: The rhizomes are boiled or steamed as taros

Medicinal uses: The rhizome is used as a rubefacient

Effective compounds: The roots are rich in starch

Pharmacological properties and functions: Methanolic extract of arrowroot leaves significantly helps with diarrhoea (Rahman et al. 2015).

Morphological characteristics: Herbs. Its rhizomes are sympodial, cylindric, fleshy, and starchy. Its stems are erect, often apically branched, and slender. It has 4–8 basal leaves, 1–8 cauline leaves; the leaf blade is ovate–oblong, adaxially sparsely pilose, abaxially glabrous or sparsely pilose, base rounded to truncate, the apex acuminate. It has several inflorescences per leafy shoot. Has one or two (or three) bracts, each subtending 2–3 pairs of flowers that are distichous and green. Its flowers are mostly self-pollinating; common pedicel 2.3–5.5 centimetres (cm) long. Its sepals are green, and narrowly ovate. Has a white corolla. Its staminodes are white; outer staminodes, two, obovate. The capsule tends to be green or tinged reddish brown, ellipsoid, and dehiscent. Its seeds are brown, and rugose; aril basal, white, two-lobed. Flowering occurs during June–August.



Boesenbergia rotunda (L.) Mansf.

Family: Zingiberaceae (APG IV 89)

Common name: Finger root

Burmese name: Sate-phoo

Distribution: Bago Region, Sagaing Region, Mandalay Region, Nay Pyi Taw Union Territory, Tanintaryi Region, Ayeyarwaddy Region

Markets: Nay Pyi Taw

Parts used: Rhizome

Life form: Herb

Culinary use: Used as spicy flavouring in Shan- or Thai-style hot-sour soups.

Medicinal uses: Treating dyspepsia and oral ulcers.

Effective compounds: Protein, fats, carbohydrates, calcium, phosphorus, iron, β -carotene, thiamine, and riboflavin. Pinostrobin and alpinetin are isolated from the rhizome of *B. pandurata* (Lim 2016).

Pharmacological properties and functions: Antioxidant, anti-microbial, and antiviral (Lim 2016).

Morphological characteristics: Herbs, up to 50 cm in height. Its rhizomes are bright yellow, ovoid-globose, and strongly aromatic; its roots are robust. Leaves, three or four; its leaf sheath is red; ligule 2-cleft, channelled. Its leaf blade is green on both surfaces, ovate-oblong or elliptic-lanceolate, glabrous except for sparsely hairy mid-vein abaxially, its base is rounded to cuneate, the apex apiculate. Its inflorescences are terminal on pseudostems, appearing from within apical leaf sheaths, and subsessile; bracts lanceolate. Its flowers are aromatic. Calyx apex 2-cleft. Its corolla is pink, and the corolla tube lobes oblong. The lateral staminodes are light pink, and obovate. Its labellum is white or pink with purple stripes, fiddle-shaped, concave, with its margins slightly crisped, apex entire. Its filament is short; connective appendage reflexed, 2-cleft. Flowering occurs during July–August.



Hellenia speciosa (J. Koenig) S. R. Dutta

Family: Zingiberaceae (APG IV 89)

Common name: Crêpe ginger

Burmese name: Pha-lan-taung-hmwe

Distribution: Grows in the wild in central Myanmar

Markets: Mandalay, Taunggyi

Parts used: Fleshy rhizomes

Life form: Herb

Culinary use: The fleshy rhizomes are blanched in boiling water, and used in making salads.

Medicinal uses: Used as a laxative

Effective compounds: Protein, iron, vitamin C81, beta carotene, and alpha-tocopherol

Pharmacological properties and functions: Anti-inflammatory, antioxidant, analgesic, and antipyretic functions (Eliza et al. 2010; Srivastava et al. 2013).

Morphological characteristics: Perennial herbs. The rhizome is massive, and recumbent. The stem's base is slightly woody, the leaf blades oblong or lanceolate. Its inflorescences are terminal, the bracts bright red, ovate, leathery, pubescent, the apex sharply pointed; the bracteoles are pale red. The calyx is red, with the lobes reddish-black, rigid, and densely sericeous at the apex. The corolla tube apex is white or red. Labellum white, trumpet-shaped, apex toothed and crisped, with their edges overlapping. Its stamen is white with a orange–yellow base, urceolate, and pubescent. The capsule is red, globose, and slightly woody. Its seeds are black, and glossy. Flowering occurs during July–September, and fruiting during September–November.



Curcuma aromatica Salisb.

Family: Zingiberaceae (APG IV 89)

Common name: Wild turmeric

Burmese name: Taw-na-nwin (Na-nwin-kyar)

Distribution: Ayeyarwaddy Region, Yangon Region, Chin State, Mandalay Region, Shan State

Markets: Taunggyi, Kalaw, Nyaung Shwe

Parts used: Rhizome, flower

Life form: Herb

Culinary use: The rhizomes are used as spices. The flowers are used to make salads.

Medicinal uses: Treating digestive problems

Effective compounds: Root tubers and rhizomes include turmeric pigment and its essential oil mainly contains curdione.

Pharmacological properties and functions: Anti-inflammatory (Sudharshan et al. 2015), antibacterial (Revathi and Malathy 2013).

Morphological characteristics: Perennial herbs. The rhizomes are yellow inside, elliptic or narrowly so, fleshy, and aromatic. Its petiole equals the leaf blade in length; the leaf blade is oblong. Its inflorescences are on separate shoots arising from rhizomes, usually appearing before leaves. Its fertile bracts are pale green, coma bracts are white, tinged with red, narrowly oblong, pubescent, with the apex mucronate. The calyx is sparsely hairy. The corolla tube is funnel-like in shape, and villous at the throat; the lobes are pinkish-white, and oblong. The lateral staminodes are yellowish, and obovate-oblong. The labellum is yellow, obovate, and the apex emarginate. Its ovary is villous. Flowering occurs during April–June.



Curcuma glauca (Wall.) J. Škorničková

Family: Zingiberaceae (APG IV 89)

Common name: Grey-green leaf turmeric

Burmese name: Mar-lar-phoo

Distribution: Bago Region, Magway Region, Mandalay Region

Markets: Nay Pyi Taw

Parts used: Flower

Life form: Herb

Culinary use: Flowers are used to make salads

Medicinal uses: Treating digestion problems

Morphological characteristics: An evergreen herb, up to 125 cm in height; its rhizome is fibrous, aromatic, inner colour is white; has tubers. Has 10–20 leafy shoots per plant, erect and densely clumped. It has 4–5 leaves per shoot; its basal leaf sheaths are reddish and glabrous. Has a green and clasping stem, margin slightly revolute; its ligule is small, papery, and ephemeral, disappearing in mature leaves. Inflorescence basal on leafless shoot, glabrous, with green sheaths; has about 40 bracts per inflorescence. Its flowers are conspicuous, 3–4 per bract; its calyx is tubular, and white; its floral tube is white, externally glabrous with scattered unicellular papillate hairs inside. The lateral staminodes are cup-shaped, and glabrous. Its labellum is linear to spatulate, not lobed, and is white, and glabrous. Fruits and seeds unknown.



Curcuma longa L.

Family: Zingiberaceae (APG IV 89)

Common Name: Turmeric

Burmese Name: Na-nwin

Distribution: Cultivated widely in Myanmar

Markets: Nay Pyi Taw, Mandalay

Parts used: Rhizome, flower

Life form: Herb

Culinary use: Its rhizomes are used as a spice. Its flowers are used to make salads.

Medicinal uses: Use of the rhizome, via oral or topical administration, is known for reversing many ailments, such as digestive problems, inflammation, and cardiovascular diseases, and for increasing overall longevity. Has anticancer properties.

Effective compounds: Curcumin is a polyphenol derived from turmeric.

Pharmacological properties and functions: Anti-inflammatory, antioxidant, anti-protozoal, and antibacterial activity (Araújo et al. 2001).

Morphological characteristics: Perennial herbs, and roughly 1 m tall. Its rhizomes are many-branched, orange or bright yellow, cylindrical, and aromatic. Its roots are tuberous at the tip. The leaf blade is green, oblong or elliptical in shape, glabrous, the base attenuate, the apex shortly acuminate. Its inflorescences terminal on pseudostems; its fertile bracts are pale green, and ovate or oblong; the coma bracts spreading, white and green, sometimes tinged a reddish purple, with the apex acute. The calyx is white, puberulent, its apex unequally 3-toothed. The corolla is pale yellow, lobes deltoid, the central one is larger, and the apex mucronate. The lateral staminodes are shorter than the labellum. Its labellum tends to be yellowish with a central, yellow band, and obovate. The ovary is sparsely hairy. Flowering occurs in August.



Curcuma candida (Wall.) Techapr. & Škorničk.

Family: Zingiberaceae (APG IV 89)

Burmese Name: Pa-dat-sar

Distribution: Ayeyarwaddy Region, Mandalay Region, Magway Region

Markets: Nay Pyi Taw

Parts used: Flower

Life form: Herb

Culinary use: Used for making salads

Medicinal uses: Treating traumatic haemorrhage and indigestion

Pharmacological properties and functions: Antimicrobial and antioxidant qualities (Mekseepralard et al. 2010).

Morphological characteristics: Herbs, perennial. The rhizomes and roots are tuberous. Leaves are not seen. Its inflorescences are on separate shoots arising from rhizomes, appearing before the pseudostems, and have 6–8 flowers. The bracts are white, elliptic in shape, with the apex tinged with red. The calyx's apex is 3-toothed. The corolla tube is roughly twice as long as the calyx; the lobes are lanceolate, the central one cucullate, the apex apiculate. The lateral staminodes are erect, white, yellow at the base, and obovate. The labellum is reflexed, white, with two yellow lines in the centre, orbicular–cuneate, apically two-lobed for roughly one-third its length. Anther has connective appendage 2-cleft. Flowering occurs in May.



Kaempferia elegans (Wall.) Baker

Family: Zingiberaceae (APG IV 89)

Common name: Silver spot

Burmese name: A-yeik-ma-htut

Distribution: Bago Region, Yangon Region, Tanintharyi Region, Mon State

Markets: Nay Pyi Taw

Parts used: Leaf

Life form: Herb

Culinary use: Used in making salads

Medicinal uses: Used to treat dysentery

Pharmacological properties and functions: Antioxidant

Morphological characteristics: Perennial herbs. Rhizomes with fibrous roots bearing globose tubers. Has 2–4 leaves; the petiole extends to 10 cm; the leaf blade is adaxially green, abaxially pale green, oblong or elliptic, with the base rounded, and the apex acute. Inflorescences terminal on pseudostems, with many flowers. The peduncle is short, bracts green, and oblong–lanceolate. Flowers are pale purple. The calyx is roughly 2.5 cm. The corolla tube is slender, and lobes lanceolate. The lateral staminodes are obovate–cuneate. Labellum apically 2-cleft to base; lobes obovate. Its filament is very short. The fruits and seeds are subglobose, aril small lacerated. Flowers occurs during May.



Typha latifolia L.

Family: Typhaceae (APG IV 90)

Common name: Broadleaf cattail

Burmese name: Peik-swal (Shin-mwe-lun, Semi-daing)

Distribution: Cultivated widely in Myanmar

Markets: Mandalay, Taunggyi, Yangon, Nay Pyi Taw, Pagan, Pyay

Parts used: Tender shoot

Life form: Herb

Culinary use: Makes salads and soups

Medicinal uses: Treating diarrhoea

Effective compounds: Its roots have high levels of polysaccharides, proteins, and amino acids. Xyloglucan oligosaccharides is a kind of probiotic.

Pharmacological properties and functions: The ethanol extract of pollen grains of Typha species (*T. latifolia*, *T. angustifolia*, *T. orientalis*), consisting of a mixture of flavonoids, steroids, and volatile oils exhibited immuno-suppressive activity in mice (Lim 2014).

Morphological characteristics: Perennial emergent water herb. Its stems are 1–2.5 m tall, and stout. The leaves are abaxially convex, the transverse section semilunate. The male part of the spikes with 1–3 deciduous bracts are at the base or occasionally in the middle portion; the female part of the spikes is not separated from the male part. Male flowers: usually two stamens; the anthers are roughly 3 millimetres (mm) long. The female flowers are without bracteoles; the ovary lanceolate; its stalk is roughly 4 mm in length, and slender, the styles are 2.5–3 mm; the stigmas are lanceolate in shape; the hairs on the stalk are shorter than the style. The fruit is also lanceolate. Flowering and fruiting occurs during May–August.



Cymbopogon citratus (DC.) Stapf

Family: Poaceae (APG IV 103)

Common name: Lemon grass

Burmese name: Sa-ba-lin

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Yangon, Taunggyi, Nay Pyi Taw

Parts used: Leaf

Life form: Herb

Culinary use: Leaves are used as flavouring in cooking.

Medicinal uses: Used for heart and throat problems, conditions of flatulence and phlegm, sicknesses that cause blood in vomit, cholera, coughs, and fevers with chest congestion.

Effective compounds: The leaves contain a large amount of essential oil, including functional components such as citronella alcohol.

Pharmacological properties and functions: Citronella oil has a broad spectrum of antibacterial and antioxidant activities.

Morphological characteristics: Perennial herbs, shortly rhizomatous. The culms are tufted, robust, up to 2 m tall, roughly 4 mm in diameter and farinaceous below the nodes. The leaf sheaths are glabrous, and greenish inside. The leaf blades are glaucous, with both surfaces scabrous, base gradually narrowed, and the apex long acuminate. Spathed compound panicle is large, lax, up to 50 cm long, and drooping, branches slender. The spatheoles are reddish or yellowish brown; racemes 1.5–2 cm in length. The rachis internodes and pedicels are 2.5–4 mm, loosely villous at the margins; the pedicel of a homogamous pair is not swollen. The spikelet is sessile and linear-lanceolate; the lower glume is flat or slightly concave toward the base, is sharply two-keeled, the keels are wingless, scabrous, veinless between the keels. The upper lemma is narrow, entire, and awnless, or slightly two-lobed with a mucro of roughly 0.2 mm. It has a pedicelled spikelet of 4–5 mm. Flowering and fruiting occurs in summer.



Senegalia pennata (L.) Maslin

Family: Fabaceae (APG IV 140)

Common name: Climbing wattle

Burmese name: Sue-poke-gyi

Distribution: Tropical and subtropical regions of Myanmar

Markets: Mandalay, Taunggyi, Inlay, Pindaya, Hopong, Aungban, Kalaw, Heho, Pinlon, Loilem, Namsang, Hsiseng, Muse, Mongla

Part used: Tender shoot

Life forms: Shrub

Culinary use: The tender shoots are blanched in boiling water, then made into salads or eaten directly with Burmese-style dipping sauces, or made into soups and fried dishes

Medicinal uses: Treating traumatic infections and abscesses

Effective compounds: Contains phenols and flavonoids (Kim et al 2015).

Pharmacological properties and functions: Stomachic, styptic, antiseptic (Khare 2007), analgesic, and anti-inflammatory activities (Dongmo et al. 2005).

Morphological characteristics: Climbers, with copious, scattered prickles. The branchlets and leaf rachis are ferruginous and pubescent. The stipules are (ovate-) lanceolate, and cuspidate. The flowers are pedicellate or subsessile. The calyx is subcampanulate in shape. The ovary is puberulent, and has stipes. The legume is strap-shaped, glabrous or finely puberulent when young, the sutures are slightly sinuate. Its seeds are black and flat. Flowering occurs during March–October, fruiting during July–April the following year.



Archidendron pauciflorum (Benth.) I. C. Nielsen

Family: Fabaceae (APG IV 140)

Common name: Djenkol

Burmese name: Da-nyin

Distribution: Cultivated in tropical regions of central and southern Myanmar

Markets: Mandalay, Nay Pyi Taw, Yezin, Taunggyi, Muse

Parts used: Seeds

Life form: Tree

Culinary use: The seeds are boiled until they become soft and waxy, and used in making curries

Medicinal uses: Treating dysentery

Effective compounds: The seed protein contains sulphur amino acids, the acetone extract is rich in polyphenols (Panpipat et al. 2010).

Pharmacological properties and functions: Polyphenols have an antioxidant function

Morphological characteristics: Trees, 18–25 m tall, with a spreading crown, bipinnate leaves, and a greyish, smooth bark. The young leaves have a wine-red colour. Its white, calyx cup-shaped flowers are bisexual and have several yellowish-white stamens. The fruit is a woody, glabrous, and deep purple pod. The pods are falcate in shape or twisted in a wide spiral. Flowering occurs during September–January.



Bauhinia acuminata L.

Family: Fabaceae (APG IV 140)

Common name: Snowy orchid-tree

Burmese name: Chin-byit (Ma-har-hlay-gar-phyu)

Distribution: Cultivated or grows wild in the tropical and subtropical regions of Myanmar

Markets: Taunggyi

Parts used: Tender leaf

Life form: Shrub

Culinary use: Making salads

Medicinal uses: Used as a laxative

Effective compounds: Polyphenols are found in the leaves of the genus Bauhinia

Pharmacological properties and functions: Has antioxidant properties (Thuppia et al. 2017).

Morphological characteristics: Shrubs or small trees. Young branches zigzag, and are glabrous. Petiole pubescent, the leaf blade ovate–cordate to cordate, subleathery, abaxially greyish pubescent, adaxially glabrous, with 9–11 primary veins, the secondary and higher-order veins protrude, base cordate, its apex bifid to 1/3–2/5, the lobes are acuminate or slightly acute at the apex and rarely rounded. The inflorescence is a raceme, with a few flowers, typically 3–15, axillary, with the flower buds acutely tapering. The hypanthium is tubular. Calyx spathes are open on one side, shortly 5-toothed. The petals are white, obovate–elliptic, and sessile. There are 10 fertile stamens, in 2 whorls, subequal, and pubescent on the lower one-third. The legume is straight or slightly curved, linear–oblanceolate, compressed, with a stalk, the apex acuminate, and beaked. The valves are leathery, glabrous, and sharply ridged near the suture. It has 5–12 seeds, compressed. Flowering occurs April–June, fruiting during June–August.



Bauhinia variegata var. *candida* Voigt

Family: Fabaceae (APG IV 140)

Common name: Orchid tree

Burmese name: Swal-taw

Distribution: Cultivated or grows wild in tropical and subtropical regions of Myanmar

Markets: Mongla, Taunggyi

Parts used: Flowers

Life form: Tree

Culinary use: The flowers are boiled, and made into salads or soups

Medicinal uses: As a laxative

Effective compounds: The flavonoids kaempferol, kaempferol-3-galactoside and kaempferol-3-rhamnoside were isolated from the ethanol extract of white flowers (Lim 2014)

Pharmacological properties and functions: *B. variegata* possesses chemopreventive, anti-tumour, cytotoxic, hepatoprotective, antibacterial, and anti-inflammatory qualities.

Morphological characteristics: Deciduous trees, up to 15 m in height. Its bark is dark brown, and nearly smooth. The branches are grey and puberulent when young, and glabrous when older. The leaf blade is suborbicular or broadly ovate, subleathery, abaxially almost glabrous, adaxially glabrous, the base is shallowly to deeply cordate, apex bifid to one-third, the lobes rounded at the apex. The inflorescence is a raceme, has a few flowers, sometimes corymblike, axillary, or terminal. The flower buds fusiform, smooth, and subsessile. The calyx opens as a spathe into two lobes. The petals are white, obovate or oblanceolate, and clawed. The legume is linear and flat, the valves woody. It has 10–15 seeds, which are compressed and suborbicular. Flowering occurs during February–May, fruiting during March–July.



Cajanus cajan (L.) Huth

Family: Fabaceae (APG IV 140)

Common name: Pigeon pea

Burmese name: Pae-sin-ngon

Distribution: Cultivated in tropical and subtropical areas of central and southern Myanmar

Markets: Mandalay, Taunggyi, Sagaing, Nyaungshwe

Parts used: Fresh seeds

Life form: Shrub

Culinary use: The seeds are boiled until they become soft and waxy

Medicinal use: A traditional tonic to cure colic and constipation

Effective compounds: Pigeon pea contains high levels of protein and the important amino acids methionine, lysine, and tryptophan.

Morphological characteristics: Shrubs, erect, and 1–3 m tall. The branchlets are grey and pubescent. The leaves are pinnately 3-foliolate; the stipules small, and ovate-lanceolate. The leaflets are lanceolate to elliptic, and papery. The raceme is 3–7 cm long, and the peduncle 2–4 cm; there are few flowers, terminal or almost terminal; the bracts are ovate-elliptic. The calyx is campanulate, the lobes are triangular or lanceolate, and pubescent. The corolla is yellow; standard suborbicular, with the auricle inflexed. The wings are slightly obovate, with a short auricle; keel apex obtuse, slightly inflexed. The legume is linear-oblong, the dun pubescent, the apex beaked, acuminate, long mucronate. There are 3–6 seeds, which are grey, sometimes with brown spots, subspherical in shape, and slightly compressed; strophioles are absent. Flowering and fruiting both occur during November–January.



Cicer arietinum L.

Family: Fabaceae (APG IV 140)

Common name: Chickpea

Burmese name: Ka-lar-pae

Distribution: Kachin State, Mon State, Tanintharyi Region

Markets: Yangon, Mandalay

Parts used: Seeds tender shoots

Life form: Herb

Culinary use: The fresh seeds and tender shoots are used to make soups and salads. The dry seeds are used like soybean.

Medicinal uses: The seeds are a traditional tonic

Effective compounds: Chickpeas are a nutrient-dense food, providing rich content (20 per cent or higher of the daily value) of protein, dietary fibre, folate, and certain dietary minerals such as iron and phosphorus. Chickpea leaves have a significantly higher mineral content than either cabbage leaves or spinach leaves.

Pharmacological properties and functions: Chickpea consumption may lower blood cholesterol (Ibrikci et al. 2003).

Morphological characteristics: Herbs, annual. Its stem has many branches, is erect, glandular, and hairy. The leaves are imparipinnate, with a terminal leaflet; the stipules are leaflike, unequal, margin toothed; the leaflets are in pairs of 3–8, elliptic in shape, with their margins dentate, at least in their distal half. The raceme has one or two flowers. The corolla tends to be white, light blue, or purplish-red. The legume is pendulous, inflated, ovate in outline, has 1–4 seeds, pubescent, and glandular hairy. Flowering occurs during June–July, fruiting during August–September.



Lablab purpureus (L.) Sweet

Family: Fabaceae (APG IV 140)

Common name: Lablab bean

Burmese name: Pae-pa-zun-thee (Nway-pa-thee)

Distribution: Cultivated widely in Myanmar

Markets: Mandalay, Taunggyi

Parts used: Seeds

Life form: Climbing herb

Culinary use: To make curries and soups

Medicinal uses: To reduce fevers, help digestion, and as an antispasmodic

Effective compounds: Includes protein, fat, calcium, magnesium, iron, zinc, and other nutrients. It also contains trypsin inhibitor, amylase inhibitor, amino acid, alkaloid, vitamins and hemagglutinin.

Pharmacological properties and functions: It has the function of regulating immunity, and is antibacterial and antiviral. The tender pods and fresh beans include hydrocyanic acid and anti-nutritional factors so it should be fully cooked before eating.

Morphological characteristics: Herbs, twining. The stems extend to 6 m in length, and are usually purplish. The stipules are lanceolate; the leaflets are deltoid-ovate, the lateral ones oblique, the base subtruncate, and the apex acute or acuminate. The racemes are axillary, and erect. There are 2–5 flowers clustered at each node. The calyx's upper two teeth are wholly connate, the lower three are subequal. The corolla is white or purple; standard orbicular in shape; wings with blade; the keel's base is attenuate. The legumes are oblong-falcate, compressed, straight or slightly curved, and beaked. There are 3–5 seeds, which are white, purple, or purplish-black, and oblong. The hilum is linear. Flowering occurs during April–December.



Neptunia plena (L.) Benth.

Family: Fabaceae (APG IV 140)

Common name: Water mimosa

Burmese name: Yay-hti-ka-yone

Distribution: Chin State, Shan State, Kachin State, Mandalay Region

Markets: Mandalay, Nay Pyi Taw

Parts used: The whole plant

Life form: Herb

Culinary use: Used in making salads and soups directly

Medicinal uses: Helps clear the intestines and in treating diarrhoea

Morphological characteristics: Herbs, perennial, terrestrial, or subaquatic. The stems are erect or ascending, and branched. The stipules are persistent, lanceolate, with the base obliquely cordate. There are 4–10 pairs of pinnae, with a suppressed gland between or just below the lowest pair of pinnae; there are 9–40 pairs of leaflets per pinna, linear-oblong in shape, with the base rounded, and the apex obtuse, acute, or mucronate. The heads are ovoid. The calyx is campanulate in shape, and 5-dentate. The petals are lanceolate in shape, and fused at the base. The legumes are oblong. There are 5–20 seeds. Flowering occurs during August–October, fruiting during October–November.



Pachyrrhizus erosus (L.) Urb.

Family: Fabaceae (APG IV 140)

Common name: Yam bean

Burmese name: Pae-sein-sar-u (Sein-sar-u, Pae-u)

Distribution: Sagaing Region, Mandalay Region

Markets: Mandalay

Parts used: Tuber root

Life form: Herb

Culinary use: The raw tuber roots can be eaten directly after removing the peel and used to make soups

Medicinal uses: As treatment for alcoholism

Effective compounds: Rich in carbohydrates and vitamin C.

Pharmacological properties and functions: The oligofructoseinulin in the tuber is a prebiotic (Hughes et al. 2017).

Morphological characteristics: Vines, robust, and twining. The root tubers are 10–20 cm in diameter. The leaflets tend to be rhombic or ovate in shape, the upper margins often somewhat dentate or lobed, the lateral ones very oblique, and sparsely pubescent abaxially. The racemes are axillary; 3–5 flowers at thickened nodes. The calyx is campanulate in shape, adpressed, and pilose. The corolla is purplish or pink; standard suborbicular, with yellow-green spots and two thickenings near the base; the wings are falcate, and auriculate; the keel is subfalcate in shape. The legumes are compressed and hirsute. There are 8–10 subsquare seeds. Flowering occurs in August, fruiting in November.



Psophocarpus tetragonolobus (L.) DC.

Family: Fabaceae (APG IV 140)

Common Name: Winged bean

Burmese name: Pae-zaung-hlyar

Distribution: Kachin State, Mandalay Region, Yangon Region

Markets: Mandalay, Nay Pyi Taw, Taunggyi, Muse

Parts used: Tender shoot, tender fruit, tuber root

Life form: Climber

Culinary use: The tender shoots and fruits are used to making curries and soups. The tuber is boiled and eaten directly

Medicinal use: The tender fruits are used to treat diabetes, the leaves are used to treat eye diseases and toothache

Effective compounds: Its pods are rich in protein, calcium, iron, and vitamins A and E. The leaves too are rich in protein and vitamins A and C. Oleic and linoleic acids were found to be the main unsaturated fatty acids in winged bean seed oil (Lim 2012).

Pharmacological properties and functions: Antioxidant and antibacterial activities

Morphological characteristics: Herbs, annual or perennial, climbing, with tubers. The stems are glabrous. The stipules are dorsifixed, and ovate to lanceolate in shape. The petiole is sulcate; the leaflets are ovate–deltoid, the base is truncated or rounded, the apex acute or acuminate. The racemes axillary, with 2–12 flowers; the bracteoles are suborbicular. The calyx is campanulate. Standard green outside, pale blue inside, with the base appendaged; the apex is emarginate. The wings are pale blue, with a T-shaped auricle at the middle of the claw; the keel is white, tinged with pale blue, and slightly incurved with a rounded auricle at the base. The legumes are yellowish-green or green, sometimes have red spots, and are tetragonal. Their wings are 0.3–1 cm wide and with serrated margins. It has 8–17 seeds, which are white, yellow, brown, black, or variegated. They are subglobose, shiny, and with arillate margins. Fruiting occurs during October–November.



Senna siamea (Lam.) H. S. Irwin & Barneby

Family: Fabaceae (APG IV 140)

Common name: Cassod tree

Burmese name: Mel-za-li

Distribution: Cultivated in Shan State

Markets: Taunggyi

Parts used: Flower bud

Life form: Tree

Culinary use: The flesh buds are blanched in boiling water, and then used to make salads

Medicinal uses: Made into a soup which is drunk as a tonic and to relieve stomach pain

Effective compounds: The flowers include phenolics such as gallic acid, protocatechuic acid, p-hydroxy benzoic acid, vanillic acid, chlorogenic acid, caffeic acid, syringic acid, p-coumaric acid, ferulic acid, sinapic acid, rutin, myricetin, quercetin, and kaempferol (Lim 2014).

Pharmacological properties and functions: Antimicrobial and antioxidant activities (Nanasombat and Teckchuen 2009)

Morphological characteristics: Trees, 10–15 m tall. Their bark is grey, and subsmooth. Its young branches tend to be ribbed, and sparsely puberulent. The leaves stipules are caducous, linear, and tiny. The rachis and petiole are without glands, and puberulent. The leaflets tend to be in 6–15 pairs, are oblong or ovate-oblong, leathery, abaxially finely pubescent, with the base rounded, apex obtusely rounded, often emarginate, and mucronate. The racemes are in the axils of apical leaves, often several forming a large terminal panicle on a robust peduncle; the bracts are linear. The sepals are suborbicular, unequal in size, the outer ones smaller, inner ones larger, and hairy outside. The petals are yellow, broadly obovate, shortly clawed. There are 10 stamens, seven of them fertile. The legume is flattened, its suture thick, rib-like, pubescent, and purplish brown when mature. There are 10–30 seeds, light brown, and ovoid. Flowering occurs during March–November.



Senna spectabilis (Candolle) H. S. Irwin & Barneby

Family: Fabaceae (APG IV 140)

Common name: Golden shower tree

Burmese name: Ngu-pan

Distribution: Cultivated in Shan State

Markets: Taunggyi

Parts used: Flower, bud

Life form: Tree

Culinary use: The fleshy buds are blanched in boiling water, then made into salads

Medicinal uses: As a laxative

Effective compounds: The leaves include 3(R)-benzoyloxy-2(R)-methyl-6(R)- (11'-oxododecyl)-piperidine, 5-hydroxy-2-methyl-6-(11'-oxododecyl)-pyridine, 5-hydroxy-2-methyl-6-(11'-oxododecyl)-pyridine N-oxide, (-)-cassine, N,O-diacetylcassine, etc. (Sriphong et al. 2003).

Pharmacological properties and functions: Has anticancer properties (Sriphong et al. 2003).

Morphological characteristics: Evergreen trees. Leaves rachis and petiole without glands; There are 8–15(–19) pairs of leaflets, that are elliptical or oblong–lanceolate. The flowers are in terminal panicles or axillary racemes. It has five sepals, which are orangish-yellow. The petals are yellow, dark brownish-yellow veined, unequal in size, broadly to narrowly obovate, and shortly clawed. The legume is pendulous, black, narrowly cylindric, slightly compressed, slightly contracted between seeds, annulate, septate, and glabrous. There are 50–70 seeds, which are suborbicular. Flowering occurs in October.



Sesbania grandiflora (L.) Poir.

Family: Fabaceae (APG IV 140)

Common name: Hummingbird tree

Burmese name: Pauk-pan-ni/Pauk-pan-phyu

Distribution: Cultivated widely in Myanmar

Markets: Mandalay, Taunggyi, Nay Pyi Taw, Yangon, Kalaw

Parts used: Flower, tender leaf

Life form: Tree

Culinary use: Used in making salads and soups. The tender leaves are blanched in boiling water and eaten with Burmese dipping sauces.

Medicinal use: Used to treat stomach bloating, tumours, fevers, sores, diabetes, skin irregularities caused by blood problems, and throat ailments, and to protect against colds, leprosy, inflammation of the spleen, and germs

Effective compounds: Isoflavanoids such as isovestitol, medicarpin, sativan, and betulinic acid are regarded as the functional compounds for treating tuberculosis (Hasan et al. 2012)

Pharmacological properties and functions: Antibacterial (Anantaworasakul et al. 2011), cardioprotective (Ramesh et al. 2008), anti-tuberculosis (Hasan et al. 2012), and anticancer (Roy et al. 2013).

Morphological characteristics: Trees, 4–10 m tall. Branches terete, leaf scars and stipule scars conspicuous. Leaves with 20–60 foliolate; rachis terete, densely appressed and pubescent when young, glabrescent. The leaflet blades are oblong, smaller at both ends of the rachis than in the middle. The racemes are pendulous, with 2–4 flowers. The bract and bracteoles are ovate to ovate–lanceolate, caducous, with both surfaces appressed, pubescent. The flowers are 7–10 cm long, conspicuously falcately curved while in bud. The corolla is white, pink, or rosy; standard oblong–obovate to broadly ovate, reflexed at anthesis, callus absent, claw base subcordate, the apex retuse; wings falcately long ovate, asymmetric, and the apex obtuse. The keel is curved, limbs with basal abaxial edges connate, apical 1/4–1/3 free, apex obtuse. The legume is linear, slightly curved, nodding, dehiscent, carpopodium, suture is angulated at maturity, the apex tapers into a 3–4 cm beak. The seeds are reddish-brown, ellipsoid to subreniform, slightly compressed, turgid, and slightly glossy; the hilum is rounded, and retuse. Flowering and fruiting takes place during September–April.



Tamarindus indica L.

Family: Fabaceae (APG IV 140)

Common name: Tamarind

Burmese name: Magyi

Distribution: Cultivated or grows wild in tropical and subtropical regions of Myanmar

Markets: Mandalay, Taunggyi

Parts used: Fruit tender leaf

Life form: Tree

Culinary use: The fruits are used as sour flavouring in salads and soups, and the tender leaves are used to make soups

Medicinal uses: In making laxatives and tonics

Effective compounds: 2-phenylacetaldehyde, 2-furfural, and hexadecanoic acid (palmitic acid) are regarded as the main functional compounds. Tamarind fruit pulp contained tartaric acid, reducing sugars, pectin, and proteins, besides fibre and cellulosic material (Lim 2012).

Pharmacological properties and functions: Antimicrobial, antioxidant, anti-inflammatory, hypoglycaemic, antihypercholesterolemic, antidiabetogenic, antivenom, anti-emetic, analgesic, immunomodulatory, retards fluorosis, antiplatelet, provides UVB protection and corneal healing (Lim 2012).

Morphological characteristics: Trees, 10–15(–25) m tall. Its bark is dark ashy, irregularly split longitudinally. The leaflets are oblong, small, glabrous, their base obliquely rounded, the apex rounded or emarginate. It has few flowers, yellowish and tinged with purplish-red stripes. The peduncles and pedicels are yellowish-green and puberulent. There are two bracteoles, enclosing the flower bud before anthesis. The calyx lobes are lanceolate and oblong, and reflexed after anthesis. The petals are obovate, subequal to the calyx lobes, the margins repand, and curled. The legume is brownish, straight or bow-shaped, terete-oblong, and turgid, 5–14 cm in length, and often irregularly constricted. It has 3–14 seeds that are brownish and shiny. Flowering occurs during May–August, fruiting during December–May.



Docynia indica (Colebr. ex Wall.) Decne.

Family: Rosaceae (APG IV 143)

Common name: Docynia

Burmese name: Pin-sein (Pin-sein-thee-pin)

Distribution: Kachin State, Sagaing Region, Shan State, Chin State

Market: Pindaya

Parts used: Fruit

Life form: Tree

Culinary use: The fruits are used as sour flavouring in salads and soups

Medicinal uses: The fruit is rich in vitamin C and has antioxidant properties

Effective compounds: The elements of raw proteins, calcium, phosphorus, potassium, proline, and aspartate higher than other

common fruits (Mei et al. 2002).

Pharmacological properties and functions: Antioxidant and antibacterial activities.

Morphological characteristics: Trees, semi-evergreen or deciduous, up to 2–3 m tall. The branchlets are purplish brown or blackish-brown when old, and terete, stout, initially densely pubescent, but glabrous when old. The leaf blade is elliptic or oblong–lanceolate, firmly papery, the base broadly cuneate or subrounded, the margin shallowly crenate, rarely serrated or entire only at apex; the apex is acute or acuminate. The pedicel is short or nearly absent, and pubescent. The flowers are 3–5-fascicled, the bracts lanceolate. The hypanthium is campanulate, abaxially densely pubescent. The sepals are lanceolate or triangular–lanceolate. The petals are white, oblong, or oblong–obovate. The pome is yellow, subglobose or ellipsoid, 2–3 cm in diameter, and slightly pubescent when young. The sepals are persistent, and erect. Flowering occurs during March–April, fruiting during August–September.



Elaeagnus conferta Roxb.

Family: Elaeagnaceae (APG IV 146)

Common name: Silverberry

Burmese name: Hman-ku (Hman-ku-thee-pin)

Distribution: Grows wild in wetlands

Markets: Inlay

Parts used: Fruit

Life form: Shrub

Culinary use: The fruits are used as sour flavouring in salads and soups

Medicinal uses: In treating diarrhoea, dysentery, cough, and wheezing

Effective compounds: The main components of its seed's oil include oleic acid, linoleic acid, palmitic acid, and stearic acid. Its mineral contents include potassium, iron, zinc, and sodium. (Liu et al. 2007).

Morphological characteristics: Shrubs, straggling. The axillary branches are sometimes spine-tipped. The leaf blade is elliptic to elliptic-oblong, abaxially with scales dense, silvery and/or scattered, brownish, adaxially glabrescent, with the base rounded or cuneate, the margin obscurely undulate, the apex shortly acuminate or subacute. The inflorescence has up to eight flowers. The flowers are silvery brown, and scaly. The calyx is tubular, and four-angled. The immature drupe is ellipsoid. The mature drupe is more or less ellipsoid, with dimensions of $1.3\text{--}1.8 \times 0.7\text{--}1$ cm. Flowering occurs during October–November, fruiting during February–March.



Ziziphus jujuba Mill.

Family: Rhamnaceae (APG IV 147)

Common name: Chinese jujube

Burmese name: Zee-chin

Distribution: Dry, hot areas of central Myanmar

Markets: Mandalay, Taunggyi, Yangon, Nay Pyi Taw, Magaw, Sagaing

Parts used: Fruit

Life form: Shrub

Culinary use: In making salads and soups

Medicinal uses: As a laxative and blood purifier

Effective compounds: Jujube fruit are a good source of phenolics (especially flavonoids), comparable to prunes (Lim 2013).

Pharmacological properties and functions: Antioxidant, anticancer, anti-angiogenic, anti-inflammatory, anti-ulcerogenic, anti-obesity, and antihypercholesterolemic activities (Lim 2013).

Morphological characteristics: Small trees, sometimes shrubs, deciduous, spinose or unarmed. New branches tend to be purplish-red or greyish-brown, flexuose, smooth, with two stipular spines or not. The leaf blade abaxially is pale green, and adaxially dark green. It is ovate, ovate-elliptic, or elliptic-oblong. The flowers are yellowish-green. The drupe is red at maturity, turning reddish-purple, is oblong or narrowly ovoid. The mesocarp is fleshy, thick, and sweet- or sour-tasting. The stone is acute or obtuse at both ends, with two locules, with one or two seeds. Flowering occurs during May–July, fruiting during August–October.



Artocarpus heterophyllus Lam.

Family: Moraceae (APG IV 150)

Common name: Jackfruit

Burmese name: Pein-ne

Distribution: Cultivated widely in Myanmar

Markets: Mandalay, Taunggyi

Parts used: Tender fruit

Life form: Tree

Culinary use: Stewed with meat or fried

Medicinal uses: Used to treat indigestion

Effective compounds: The flesh of the jackfruit is starchy and a source of dietary fibre. The pulp is composed of water, carbohydrates, protein, and fat. In a 100-gram portion, raw jackfruit provides 400 kilojoules (kJ) (95 kilocalories [kcal]) and is a rich source of vitamin B6). It contains moderate levels of vitamin C and potassium, with no other nutrients in significant content (USDA 2008).

Pharmacological properties and functions: Antibacterial, antitubercular, antiviral, antifungal, antiplatelet, antiarthritic, tyrosinase inhibitor, and inhibits cytotoxicity (Haleel et al. 2018).

Morphological characteristics: Evergreen trees. Mature trees have tubular roots. The leaves are spirally arranged, lobed on new growth of young trees, leathery, are pale green abaxially and with scattered globose to ellipsoid resin cells, dark green adaxially, glabrous, and shiny. The base is cuneate, the margin of mature leaves entire, the apex is blunt to acuminate; the leaves on mature trees entire. There are inflorescences on old stems or brachyblasts. The male inflorescences are axillary on an apical branchlet, sometimes axillary on axillary brachyblasts. The female inflorescences have a globose and fleshy rachis. The fruiting syncarp is pale yellow when young, yellowish-brown when mature; it is ellipsoid, globose, or irregularly shaped, with stiff hexagonal tubercles and thick hairs. The drupes are narrowly elliptic. Flowering occurs during February–March.



Ficus virens Aiton

Family: Moraceae (APG IV 150)

Common name: Sour fig tree

Burmese name: Nyaung-chin

Distribution: Chin State, Shan State, Kachin State, Mandalay Region

Markets: Mandalay, Pyinmana, Yezin, Taunggyi, Kalaw

Parts used: Tender leaf

Life form: Tree

Culinary use: Used directly in soups or blanched in boiling water, then used to make salad

Medicinal uses: In treating ostealgia

Effective compounds: Rich in vitamin C, and a variety of mineral elements. Also rich in polyphenols and flavonoids.

Pharmacological properties and functions: Antioxidant, HMG-CoA reductase inhibitory, and hypolipidemic activity (Iqbal et al. 2015).

Morphological characteristics: Trees, epiphytic when young, with buttress or prop roots, and deciduous or semideciduous. Their leaf blade is obovate, narrowly lanceolate, ovate-lanceolate, or elliptic-ovate. They are thinly leathery to thickly papery, not shiny when dry, their base bluntly rounded, cuneate, or cordate, their margins entire, the apex acuminate to shortly acuminate. The figs are axillary on leafy branchlets, paired, solitary, or in clusters on leafless older branchlets. They are purplish-red when mature, globose, 7–12 mm in diameter, with conspicuous interfloral bristles, sessile or pedunculate; the involucral bracts are small. There are male, gall, and female flowers within the same fig. Male flowers are few, near the apical pore, and sessile. There are 4–5 calyx lobes, which are lanceolate. There is one stamen, with a short filament; the anther is broadly ovoid. The gall flowers are pedicellate. There are 3–4 calyx lobes; style lateral, shorter than the ovary. The female flowers are similar to the gall flowers; style longer than the ovary. The achenes are wrinkled on the surface. Flowering occurs during April–August.



Coccinia grandis (L.) Voigt

Family: Cucurbitaceae (APG IV 163)

Common name: Ivy gourd

Burmese name: Kin-pon-thee

Distribution: Cultivated widely in Myanmar

Markets: Taunggyi, Pindaya, Hopong, Pinlon, Loilem

Parts used: Fruit tender leaf/shoot

Life form: Climber

Culinary use: Used in making salads and soups directly

Medicinal uses: Cooling and laxative properties, and is considered good for phlegm and bile. The green leaves are stir-fried and eaten by diabetics.

Effective compounds: Antioxidant, antihypoglycemic agent, immune system modulator. The fruit includes glucose-6-phosphatase, a key liver enzyme involved in regulating sugar metabolism (Shibib et al. 1993).

Pharmacological properties and functions: The fruit possesses mast cell-stabilising, anti-anaphylactic, and antihistaminic potential (Taur and Patil 2011).

Morphological characteristics: Climber herbs. Its roots are robust. The stem is slender, slightly woody, many-branched, angular, and glabrous. The tendrils are filiform, glabrous, and simple. The leaf blade is broadly cordate, usually with five angles or lobes, the base has several glands, and the apex is obtuse. The plants are dioecious, the flowers solitary. The male pedicel is slender, and glabrous; the calyx tube is broadly campanulate, segments linear-lanceolate. The corolla is white or slightly yellow, the segments ovate, glabrous outside, and pubescent inside. The filaments and anthers are connate; the anthers are subglobose. The female pedicel is slender; there are three staminodes, 1–3 mm in length, nearly subulate, and villous at the base. The ovary is fusiform; style 6–7 mm; three stigmas, 5–6 mm. The fruit is red when mature, and fusiform, with dimensions about 5 × 2.5 cm. The seeds are yellow, oblong, with dimensions 6–7 × 2.5–4 mm, about 1.5 mm thick, both its surfaces densely punctate, and apex rounded. Flowering and fruiting happen in summer.



Lagenaria siceraria (Molina) Standl.

Family: Cucurbitaceae (APG IV 163)

Common name: Calabash

Burmese name: Bu (Bu-thee-pin)

Distribution: Cultivated widely in Myanmar

Markets: Mandalay, Nay Pyi Taw, Pyinmana, Yezin, Nyaung-U, Pyay, Yangon, Taunggyi, Kalaw

Part used: Tender fruit/tender shoot

Life form: Climber

Culinary use: Used in making salads and soups directly, or blanched in boiling water and eaten with Burmese dipping sauces

Medicinal uses: Used for heat-clearing

Effective compounds: It includes Vitamin C, B Complex, multiple minerals and functional compounds such as isoquercitrin, kaempferol, and cucurbitacin (Lim 2012).

Pharmacological properties and functions: Antioxidant, anticancer, antihyperlipidemic, hepatoprotective, anti-inflammatory, and diuretic activities.

Morphological characteristics: Climber herbs, annual. The stem and branches are sulcate-angular, and pubescent. The tendrils are filiform, and puberulent. The leaf blade is ovate-cordate or reniform-ovate, undivided or 3–5-lobed. Both surfaces are puberulent, palmately 5–7-veined, the base cordate, the margin irregularly dentate. The plants are monoecious, the flowers solitary. Male flowers: Pedicels are slender; the calyx tube funnelform; segments are lanceolate; the corolla is yellow; segments 3–4 × 2–3 cm; the filaments are 3–4 mm; the anthers are oblong, 8–10 mm. Female flowers: The calyx segments and corolla as in male flowers. The ovary is densely pubescent; stigma is enlarged, and two-lobed. The fruit varies in size and shape, and is woody when mature. Its seeds are white, obovate or triangular in shape, roughly 20 mm, the apex is truncate. Flowering occurs in summer, fruiting during the autumn.



Momordica charantia L.

Family: Cucurbitaceae (APG IV 163).

Common name: Bitter melon

Burmese name: Kyat-hin-hkar

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Yangon, Taunggyi

Parts used: Tender fruit, tender shoot

Life form: Climber

Culinary use: The fresh fruits and tender shoots are blanched in boiling water, then used in salads with Myanmar chilli sauce, or in making curries.

Medicinal uses: Both the fruit and the whole plant are used in the treatment of diabetes

Effective compounds: The fruit is a rich source of minerals such as calcium, potassium, magnesium, phosphorus and iron, vitamin C, vitamin B, folate, vitamin A, and also has α - and β -carotene. The tender leafy tips are also very nutritious and are an excellent source of minerals, vitamin C, vitamin B, folate, and vitamin A. Momordicinins and momordicosides are regarded as the functional compounds (Lim 2012).

Pharmacological properties and functions: Has antidiabetic properties and is used in treating type 2 diabetes (Farhan et al. 2018)

Morphological characteristics: Climber herbs, annual, scandent, many-branched; the stem and branches are pubescent. The tendrils extend to 20 cm, and are puberulent, and simple. The leaf blade is ovate–reniform or suborbicular, membranous, the veins palmate, the margin crenate or irregularly lobed, the apex obtuse or acute; the sinus is semicircular. The plants are monoecious. The male flowers are solitary in the axils of leaves; the pedicel is slender, puberulent, and with a median bract; the bract is reniform or orbicular, entire, with both surfaces puberulent. The calyx segments are ovate–lanceolate, white pubescent, the apex acute. The corolla is yellow; the segments are obovate, pubescent, and obtuse or retuse. There are three stamens, free; the anther cells conduplicate. The female flowers are solitary; the pedicel has a bract at the base; the ovary is fusiform, and densely verrucose; the stigmas are expanded, and two-lobed. The fruit is orange in colour when mature, fusiform or cylindric in shape, verrucose, and three-valved from the apex. The seeds are numerous, and oblong. Flowering and fruiting both occur during May–October.



Trichosanthes cucumerina L.

Family: Cucurbitaceae (APG IV 163)

Common name: Snake gourd

Burmese name: Pae-lin-mway (Pae-lin-mway-thee-pin)

Distribution: Cultivated widely in Myanmar

Markets: Mandalay, Taunggyi, Yangon, Nay Pyi Taw

Parts used: Fruit

Life form: Climber

Culinary use: In making salads, curries, and soups

Medicinal uses: In treating diseases of the urinary system

Effective compounds: A good source of vitamins C and A. Triterpenes are regarded as the functional compounds for treating diabetics (Lim 2012).

Pharmacological properties and functions: Antioxidant, antidiabetic, hepatoprotective, anti-inflammatory, anticancer, gastroprotective, larvicidal, antimicrobial, and nematocidal properties (Lim 2012).

Morphological characteristics: Climber herbs, annual. Its stems are slender, profusely branched, and more or less pubescent. The leaf blade is reniform or broadly ovate, membranous, more or less deeply 5–7-lobed; the lobes are triangular or rhombic. The plants are monoecious. The male peduncles are in pairs, with a single flower early on, later bearing a raceme; the raceme has a few flowers. Its peduncle is slender, and puberulent; the pedicel is erect, and also puberulent. Bracts are either absent or very small; the calyx tube is somewhat dilated at the apex. Female flowers are solitary or sometimes replace the earlier male flower; the ovary is oblong. The fruit is ovoid-oblong, its dimensions 5–7 × 2.5–3.5 cm, with 7–10 seeds. The seeds are ovate-oblong, their dimensions 9–12 × 5–6 mm, compressed, and rugulose, the margins thick with toothed projections from both surfaces. Flowering and fruiting both occur in autumn.



Manihot esculenta Crantz

Family: Euphorbiaceae (APG IV 207)

Common name: Cassava

Burmese name: Pilaw-pinan

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Nyaung-U, Pagan, Taunggyi, Pyay, Yangon

Parts used: Tuber root

Life form: Shrub

Culinary use: The roots are peeled, sliced, soaked, rinsed, and exposed to the sun to get rid of the toxins, and then cooked

Medicinal uses: Treating traumatic injuries

Effective compounds: Cassava tuber contains starch, ethanol-soluble sugars uronic acid, lignin, ash, and other cell wall material. All cassava tissue, with the exception of seeds, contain the toxic cyanogenic glycosides linamarin and lotaustralin (Yi et al. 2011).

Pharmacological properties and functions: Antioxidant, anticancer, antidiabetic, antimicrobial, analgesic, anti-inflammatory, antipyretic, prebiotic, and amoebicidal activities (Lim 2016).

Morphological characteristics: Erect shrubs, 1.5–5 m tall; the root tubers are terete. Leaf alternate, blade palmately 3–9-lobed, lobes oblanceolate to narrowly elliptic, apex acuminate, entire. The racemes terminal or axillary; the bracts are oblong–lanceolate. Male flowers: the calyx is purplish-red, divided to or over middle, lobes long ovate, hairy inside; the stamens are 6–7 mm; the anthers are white and pubescent at the apex. Female flowers: the calyx lobes are oblong–lanceolate; the ovary is ovoid, longitudinally six-angled; the stigmas recurved, and plaited. The capsule is ellipsoidal, longitudinally six-winged, and scabrous. The seeds are slightly triangular; the testa is crustaceous, smooth, and with spot–stripes. Flowering occurs during September–November.



Phyllanthus acidus (L.) Skeels

Family: Phyllanthaceae (APG IV 211)

Common name: West Indian gooseberry

Burmese name: Thin-baw-zee-phyu

Distribution: Shan State

Markets: Taunggyi, Hsiseng

Parts used: Fruit

Life form: Tree

Culinary use: The fruits are used as sour flavouring in salads and soups

Medicinal uses: As an aperient (its vitamin C content approaches in quantity the amount in lemon and grapefruit)

Effective compounds: It contains 4-hydroxybenzoic acid, caffeic acid, adenosine, kaempferol, and hypogallic acid (Leeya et al. 2010; Sousa et al. 2006).

Pharmacological properties and functions: Anticancer, Anticystic fibrosis, hypotensive, antimicrobial, hepatoprotective, and antioxidant activities (Lim 2012).

Morphological characteristics: Evergreen shrubs or small trees, 2–5 m tall. Leaves entire, alternate, the apex is acute, ovate, or elliptic. Axillary inflorescence, spike. There are usually four sepals and disc-glands in both sexes, four stamens, free, staminodes are usually present in the female flowers. The ovary is 3–4-celled, only one or two of which usually develop into fruit. The fruit is 1–1.5 x 1.5–2 cm, and is greenish-yellow to whitish. Flowering and fruiting occur during April –May and August –September.



Phyllanthus emblica L.

Family: Phyllanthaceae (APG IV 211)

Common name: Indian gooseberry

Burmese name: Zee-phyu

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Taunggyi

Parts used: Fruit

Life form: Shrub

Culinary use: The fruits are used as sour flavouring in salads and soups

Medicinal uses: Used to promote longevity, and alleviate coughs, asthma, and bronchitis. Also used as an anti-scorbutic, diuretic, and laxative.

Effective compounds: It includes high amounts of vitamin C, up to 610 mg per 100 g. It also contains punicafolin and phyllanemblinin A, phyllanemblin, other polyphenols such as flavonoids, kaempferol, ellagic acid, and gallic acid (Rehman et al. 2007).

Pharmacological properties and functions: Antioxidant properties

Morphological characteristics: Trees, 3–8(–23) m tall, monoecious, and deciduous. Its bark is brownish; the main stems are terete, sparsely lenticellate, with very reduced, short shoots producing groups of leafy shoots; the leafy shoots are angular, tawny, and pubescent, often with poorly developed leaves and densely flowered at start of growing season, but later has fewer flowers and better-developed leaves. The leaves are distichous; the stipules are triangularovate, brown, the margins entire or denticulate, and ciliate. The leaf blade is oblong or linear–oblong, the base shallowly cordate and slightly oblique, the margin narrowly revolute, the apex truncate, rounded, or obtuse, mucronate or retuse at the tip. There are fascicles with many male flowers and sometimes 1–2 larger female flowers. Male flowers: there are six sepals, which are membranous, yellow, obovate or spatulate, subequal, the apex obtuse or rounded, the margin entire or shallowly denticulate; there are six disk glands, subtriangular; there are three stamens; filaments coherent into column; the anthers are erect, oblong, longitudinally dehiscent, the apex mucronate. Female flowers: there are six sepals, oblong or spatulate, the apex obtuse or rounded, thicker than in the female flower, the margin membranous, more or less lobate; the ovary is ovoid, and three-celled; there are three styles, connate at the base, deeply bifid, the lobes divided at the tip. The fruit is a drupe, globose, 1–1.3 cm in diameter, the exocarp is fleshy, pale green or yellowish-white, the endocarp crustaceous; the seeds are reddish. Flowering occurs in April–June, fruiting in July–September.



Breynia androgyna (L.) Chakrab. & N. P. Balakr.

Family: Phyllanthaceae (APG IV 211)

Common name: Sweet leaf

Burmese name: Kyat-tha-hin

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Market: Taunggyi

Parts used: Tender shoot

Life form: Shrub

Culinary use: In making soups

Medicinal uses: In treating dysentery, hematochezia, abdominal pain, and lymphadenitis

Effective compounds: A good source of α - and β -carotenes, and vitamins A and K. It is also rich in Vitamin C (about 239 mg/100 g of fresh leaves)

Pharmacological properties and functions: Antifungal (Chan et al. 2018)

Morphological characteristics: Shrubs, 1–3 m tall, erect, monoecious, and glabrous throughout. The branchlets are angular when young, become terete with age, are slender and green. The leaf blade is ovate–lanceolate, oblong–lanceolate, the base is cuneate, rounded, or truncate, the apex acuminate. Inflorescence axillary, with one or two flowers, or with several male and female flowers per cluster. Male flowers: pedicels slender; calyx shallowly disk-shaped, shallowly 6-fid; the sepals are obovate; there are six disk segments, opposite the sepals, distally incurved, covering anthers; there are three stamens; the filaments are connate; the anthers are extrorse. The female flowers are usually solitary, and axillary; the pedicel is 6–8 mm; the calyx is red, and six-lobed; the sepals are obovate or obovate–triangular, their dimensions 5–6 \times 3–5.5 mm, the base attenuate into a short claw; disk absent; the ovary is depressed globose, with three locules; styles, three; bifid. The fruiting pedicel is 0.5–1 cm; the persistent calyx is red; the capsule is white, depressed globose or globose in shape, roughly 1.2 \times 1.7 cm, and thinly crustaceous. The seeds are black, and triquetrous. Flowering occurs during April–July, fruiting occurs during July–December.



Trapa natans L.

Family: Lythraceae (APG IV 215)

Common name: Water caltrop

Burmese name: Kywe-gaung-thee-pin

Distribution: Found in lakes and rivers in Myanmar

Markets: Mandalay, Taunggyi, Yangon, Nay Pyi Taw, Taunggyi

Parts used: Fruit

Life form: Herb

Culinary use: The fruits are boiled and eaten directly

Medicinal uses: As a traditional tonic

Effective compounds: The fruit is rich in starch and manganese. It contains more calcium, iron, and phosphorous than rice (Lim 2012).

Pharmacological properties and functions: Antioxidant, antimicrobial, analgesic, anti-inflammatory and antiviral activities (Lim 2012).

Morphological characteristics: Annual floating aquatic herb. Its stem is weak, and branched. The petiole is stout, more or less swollen distally, and pubescent. The leaf blade is glossy and dark green adaxially, greenish-purple abaxially, often with coloured spots between veins, deltoid-rhombic to oblate-rhombic in shape, abaxially pubescent, adaxially glabrous, the base broadly cuneate, and the margin irregularly dentate distally. Its petals are white. The fruit is turbinate to shortly rhombic, (0-)2-4-horned, the crest a prominent bulge to a thin rib, crown tetragonal to rounded, or dome-shaped, rarely crownless, beak conic or a tuft of hairs; the horns are horizontal, ascending, or recurved, flat-triangular or broadly conic, 2-3.5 cm; the apex is barbellate or cultivated without barbs. Flowering occurs during May-October, fruiting during July-November.



Ludwigia adscendens (L.) H. Hara

Family: Onagraceae (APG IV 216)

Common name: Water primrose

Burmese name: Yay-ka-nyut

Distribution: Wetlands of Kachin State, Sagaing Region, Shan State, Chin State

Markets: Nyaung Shwe

Parts used: Tender shoot

Life form: Herb

Culinary use: The tender shoots are blanched in boiling water, and then made into salads

Medicinal uses: Treating diarrhoea

Pharmacological properties and functions: Antibacterial activity (Ahmed et al. 2005)

Morphological characteristics: Perennial herbs, with creeping or floating stems, rooting at the nodes, with white, erect, short, spindle-shaped pneumatophores in clusters at the nodes of floating stems. Floating stems to 400 cm in length, terrestrial stems 20–60 cm, with many branches, tips ascending, glabrous or densely villous. The leaf blade is oblong to spatulate-oblong, glabrous, the base narrowly cuneate or attenuate, the margin entire, the apex obtuse to subacute. It has five sepals, that are deltoid-acuminate, and glabrous or villous. The petals are creamy-white with a yellow base, and obovate. The capsule is light brown with dark brown ribs, cylindric, terete, glabrous or villous, thickly walled, and tardily and irregularly dehiscent. The seeds are in one row per locule, firmly embedded in coherent cubes of woody endocarp fused to the capsule wall, pale brown, oblong or elliptic, the raphe inconspicuous. Flowering occurs during April–November, fruiting during May–November.



Mangifera indica L.

Family: Anacardiaceae (APG IV 239)

Common name: Mango

Burmese name: Tha-yat

Distribution: Cultivated widely in Myanmar

Markets: Mandalay, Taunggyi, Yangon, Nay Pyi Taw

Parts used: Fruit

Life form: Tree

Culinary use: In making salads, and pickles

Medicinal uses: Used as an astringent, laxative, and tonic

Effective compounds: Functional phenolic compounds include gallic acid, 3,4-dihydroxy benzoic acid, gallic acid methyl ester, gallic acid propyl ester, mangiferin, (+)-catechin, (-)-epicatechin, benzoic acid, and benzoic acid propyl ester (Lim 2012).

Pharmacological properties and functions: Antioxidant, antiviral, antimicrobial, antidiarrhoeal, anti-inflammatory, and antinociceptive activities (Lim 2012).

Morphological characteristics: Trees, 10–20 m tall. Its branchlets are brown and glabrous. The leaf blade is oblong to oblong-lanceolate, leathery, deep green adaxially, light green abaxially, the base cuneate to obtuse, the margin entire, undulate, the apex acute to long acuminate. The inflorescence is panicle, terminal, glabrous to tomentose-pilose; lanceolate, pubescent. The sepals are ovate-lanceolate, glabrous to pubescent, and acuminate. The petals are light yellow with a prominent red, tree-shaped pattern adaxially, oblong or oblong-lanceolate, glabrous, and recurved during the anthesis. The drupe is oblong to subreniform, greenish-yellow to red, with dimensions of 5–10 × 3–4.5 cm; the fleshy mesocarp is bright yellow; the endocarp more or less compressed. Flowering occurs during March–April, fruiting during May–July.



Spondias pinnata (L. f.) Kurz

Family: Anacardiaceae (APG IV 239)

Common name: Forest mango

Burmese name: Gway-thee

Distribution: Tropical and subtropical areas of Myanmar

Markets: Nyaung Shwe

Parts used: Fruit

Life form: Tree

Culinary use: The fruits are used as sour flavouring in salads and soups

Medicinal Use: As an anti-scorbutic; considered a remedy for dyspepsia

Effective compounds: They contain amino acids, carbohydrates, terpenoids, flavonoids, polysaccharides, and steroids (Hu et al. 2014).

Pharmacological properties and functions: Hypoglycaemic, anticancer, ulcer-protective, antidiarrhoeal, antimicrobial, hepatoprotective, thrombolytic, anti-inflammatory, antiarthritic, analgesic, antipyretic, antihypertensive, anthelmintic, diuretic and laxative, anti-tuberculosis, cytotoxic, antioxidant, and anti-hyperlipidemic (Mondal et al., 2021)

Morphological characteristics: Deciduous trees, 10–15 m tall. The branchlets are yellowish-brown, and glabrous. The leaf blade imparipinnately compound with 5–11 opposite leaflets; the leaflet blade is ovate–oblong to elliptic–oblong, the base cuneate to rounded, often oblique, the margin serrate or entire, the apex acuminate. The inflorescence is panicle, terminal, and glabrous. Its flower is sessile or subsessile, white, and glabrous. The calyx lobes are triangular. The petals are ovate–oblong, and apically acute. The drupe is ellipsoid to elliptic–ovoid, yellowish orange at maturity, the inner part of the endocarp woody and grooved, its outer part fibrous; the mature fruit usually has two or three seeds. Flowering occurs during April–June, fruiting during August–September.



Searsia paniculata (Wall. ex G.Don) Moffett

Family: Anacardiaceae (APG IV 239)

Common name: Three leaf rhus fruit

Burmese name: Gaung-pin

Distribution: Chin State, Shan State, Kachin State, Mandalay Region

Markets: Sagaing

Parts used: Fruit

Life form: Shrub

Culinary use: The fruits are used as sour flavouring in salads and soups

Medicinal uses: In treating dysentery and gout

Effective compounds: Terminpanigenia A, terminpanigenia E, and terminpanigenia G

Pharmacological properties and functions: Terminpanigenia A, terminpanigenia E, and terminpanigenia G exhibited significant inhibitory effects on xanthine oxidase (XO) activity (Yang 2016).

Morphological characteristics: Shrubs or small trees, 2–6 m tall; its branchlets are glabrous, and lenticellate. The leaf blade is palmately 3-foliolate or, rarely, 5-foliolate. The leaflets are sessile; the leaflet blade is oblong or oblanceolate, the base broadly cuneate, entirely or shallowly undulate, the apex obtuse. The inflorescence is paniculate, terminal, or axillary, with many slender branches, yellow, and hirsute. The flowers are light yellow, 4- or 5-merous. The calyx is glabrous, the lobes obtuse, and ovate. The petals are elliptic with a featherlike venation pattern. The drupe is subglobose and slightly compressed; the exocarp is orangish-red at maturity, and finally separates; the mesocarp is glutinous. Flowering occurs during September–November, fruiting during November–May.



Citrus hystrix DC.

Family: Rutaceae (APG IV 241)

Common name: Kaffir lime

Burmese name: Shauk-nue-thee

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Nay Pyi Taw, Yangon, Taunggyi

Parts used: Fruit

Life form: Tree

Culinary use: Fruits are used as lemon flavouring in cooking

Medicinal uses: In treating dyspepsia

Effective compounds: The fruit is rich in calcium, vitamin C, and potassium. It also contains vitamins B1 and B2, and has high amounts of flavones, flavanones, and dihydrochalcone C- and/or O-glycosides (Lim 2012).

Pharmacological properties and functions: Antioxidant, antimicrobial, and anti-inflammatory properties (Abirami 2014; Lim 2012).

Morphological characteristics: Trees 3–6 m tall. Its branchlets have spines. The leaves are dark red when young; its petiole is winged, the apex rounded to truncate; the leaf blade is ovate, wider than the winged petiole, the margin, apically, conspicuously and sparsely crenate, the apex narrowly obtuse. The inflorescences have (one or) 3–5 flowers. The flower buds are globose. There are four or five calyx lobes, broadly triangular. The petals are white but pinkish-red on the outside. The fruit is lemon yellow, ellipsoid to subglobose, its dimensions 5–7 × 3–5 cm, slightly coarse or smooth, oil dots numerous and prominent, its apex rounded; its pericarp is thick; the sarcocarp is in 11–13 segments, very acidic and slightly bitter. There are numerous seeds, 1.5–1.8 × 1–1.2 cm, and ridged; the embryo is solitary; the cotyledons are milky white. Flowering occurs during March–May, fruiting during November–December.



Citrus medica L.

Family: Rutaceae (APG IV 241)

Common name: Citron

Burmese name: Shauk-cho-thee

Distribution: Ayeyarwaddy Region, Yangon Region, Kayin State, Mon State

Markets: Mandalay, Nay Pyi Taw

Parts used: Fruit, tender leaf

Life form: Tree

Culinary use: The tender leaves are used as lemon flavouring in cooking, and fruits are used to make salads

Medicinal uses: In treating dyspepsia

Effective compounds: The main component in both citron leaf and peel oils is limonene (Lim 2012)

Pharmacological properties and functions: Antioxidant and anti-inflammatory activities (Lim 2012).

Morphological characteristics: Shrubs or small trees. The branches, leaf buds, and flower buds are purplish when young. The branches have spines of roughly 4 cm. The leaves are simple or rarely 1-foliolate; the petiole is short, and not winged; the leaf blade is elliptic to ovate-elliptic, the margin serrate, the apex rounded, obtuse, or, rarely, mucronate. The inflorescences are axillary, roughly 12-flowered or sometimes with solitary flowers. The flowers are bisexual or sometimes male by more or less the complete abortion of the pistil. It has five petals. The fruit is pale yellow, elliptic to subglobose, can weight up to 2 kilogrammes (kg), its surface coarse; the pericarp is white to pale yellow and soft within, thicker than the sarcocarp, and removed with difficulty. The sarcocarp has 10–15 segments, colourless, nearly pellucid to pale milky yellow, acidic to slightly sweet, and fragrant. The seeds are small, the seed coat smooth, the embryo(s) solitary to several, and the cotyledons milky white. Flowering occurs during April–May, fruiting during October–November.



Limonia acidissima Groff

Family: Rutaceae (APG IV 241)

Common name: Wood apple

Burmese name: Thee-thee

Distribution: Magway Region, Mandalay Region

Markets: Mandalay

Parts used: Fruit

Life form: Tree

Culinary use: The fruits are used as sour flavouring in cooking. The ripe fruit is making salads with palm sugar.

Medicinal uses: Used in making medicines for neutralising poisons, strength-giving tonics, and for treating high fever

Effective compounds: The fruits include fruit acids, limonoids, vitamins, and minerals.

Pharmacological properties and functions: The extracts of the bark, leaf, and fruit have antioxidant properties, the leaf extract has anti-mosquito activity, and the fruit extract has anti-breast cancer activity (Banerjee et al. 2011; Pradhan et al. 2012; Wangthong et al. 2010).

Morphological characteristics: Trees, roughly 9 m tall. The spines are axillary, about 15 mm long. Leaflets 5–7, their dimensions 25–35 x 10–20 mm, obovate, subsessile, entire to obscurely crenulate, retuse, and glandular–punctate. The petiole and rachis are narrowly winged. The flowers are a dull red, and fragrant. The petals are elliptic, and spreading. The filaments are subulate, and hairy at the base. The berries are 5–9 cm in diameter. The seeds are brown, and woolly. Flowering occurs during March–May.



Murraya koenigii (L.) Spreng.

Family: Rutaceae (APG IV 241)

Common name: Curry leaf tree

Burmese name: Pyin-taw-thein

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Yangon

Parts used: Leaf

Life form: Tree

Culinary use: The leaves are used as flavouring in cooking

Medicinal uses: In treating parasitic diseases

Effective compounds: They include bioactive carbazole alkaloids containing mahanimbine, murrayanol, and mahanine (Ramsewak et al. 1999)

Pharmacological properties and functions: Carbazole alkaloids are mosquitocidal and antimicrobial and exhibited topoisomerase I and II inhibition activities (Ramsewark et al. 1999). The alcohol to water ratio (of 1:1) extract of curry leaves showed the highest antioxidant and free radical scavenging activity (Ningappa et al. 2008).

Morphological characteristics: Shrubs or trees, up to 4 m tall. The leaves 17-31-foliolate; the leaflet blades are ovate, the base obtuse to rounded and oblique, the margin entire or crenulate. The inflorescences are terminal, panicleate, and many-flowered. The flowers are 5-merous, ellipsoid in bud. The sepals are ovate, less than 1 mm. The petals are white, oblanceolate to oblong. Stamens, 10. Stigma capitate. The fruit is bluish-black, ovoid to oblong, and 1- or 2-seeded. The seed coat is membranous. Flowering occurs during March–April, and fruiting during July–August.



Citrus × aurantiifolia (Christm.) Swingle

Family: Rutaceae (APG IV 241)

Common name: Key lime

Burmese name: Than-pa-yar

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Yangon, Taunggyi, Nyaung-U, Nay Pyi Taw, Pyay

Parts used: Fruit, tender leaf

Life form: Tree

Culinary use: The tender leaves are used as lemon flavouring in cooking, and the fruits are used as sour flavouring

Medicinal uses: To stimulate the appetite and aid digestion, and to control vomiting, coughing, sore throat, asthma, and bloating

Effective compounds: Lime juice contains vitamin C, whose content at 35% of the daily value per 100 g serving is significant for nutrition (Penniston et al. 2008). The lime pulp and peel contain polyphenols and terpenes (Loizzo et al. 2012).

Pharmacological properties and functions: Has antioxidant properties.

Morphological characteristics: Small trees. It has branchlets with short, stout spines. The leaves are slightly stiff with a short, conspicuous petiole; the leaf blade is broadly ovate to elliptic, base rounded, the margin crenulate, the apex obtuse and sometimes mucronate. It has inflorescences with seven flowers or, rarely, flowers solitary. The calyx is cup-shaped, and white. The fruit is greenish-yellow, globose, ellipsoid, or obovoid. Flowering occurs during April–May, fruiting during September–December.



Azadirachta indica A. Juss

Family: Meliaceae (APG IV 243)

Common name: Neem

Burmese name: Ta-mar

Distribution: Cultivated or wild in dry, hot areas of central Myanmar

Markets: Mandalay, Yangon, Taunggyi, Nyaung-U, Nay Pyi Taw

Parts used: Tender leaf

Life form: Tree

Culinary use: The tender shoots and leaves are boiled with sour foods such as tamarind until the bitter taste reduces. It is then used in making salads and eaten with Myanmar style sauces.

Medicinal use: The crushed leaves are made into a poultice and applied as a remedy for scabies and boils. A decoction of the leaves is used as a wash to alleviate rashes, itching, and bumps on the skin.

Effective compounds: More than 150 compounds have been isolated from various parts of the neem tree since the isolation of nimbin and nimbinin (Lim 2014).

Pharmacological properties and functions: Immunomodulatory, anti-inflammatory, antihyperglycaemic, anti-ulcerogenic, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic, hepatoprotective, anticarcinogenic, antiparasitic, diuretic, antipyretic, neuroprotective, anxiolytic, analgesic, and cardiovascular, besides having insecticidal and pesticidal properties (Lim 2014).

Morphological characteristics: Trees. The branches are glabrous. The leaves are imparipinnate, with a pulvinus at the base; leaflets alternate to opposite, ovate, subsessile, and acuminate. The flowers are white, and sweet-scented. The sepals are obovate, puberulous, and imbricate. The petals are obovate to oblong, white, the margin ciliate. The drupe is oblong, greenish-yellow, and with one seed. Flowers during April–May.



Abelmoschus esculentus (L.) Moench

Family: Malvaceae (APG IV 247)

Common name: Okra

Burmese name: Yone-pa-de

Distribution: Cultivated in tropical and subtropical regions of Myanmar

Markets: Mandalay, Taunggyi, Inlay, Pindaya, Hopong, Aungban, Kalaw, Heho, Pinlon, Loilem, Namsang, Hsiseng, Muse

Parts used: Fruit, tender leaf

Life form: Herb

Culinary use: The fruits or tender leaves are blanched in boiling water, and then used in making salads or taken directly with Burmese dipping sauces.

Medicinal uses: As a traditional tonic

Effective compounds: Rich in functional polysaccharides.

Pharmacological properties and functions: Anti-fatigue (Li et al. 2016); antidiabetic, and antihyperlipidemic activities (Sabitha et al. 2011).

Morphological characteristics: Herbs, annual, 1–2 m tall, most parts with very sparse prickly hairs. The stem is often hollow. The leaf blade is palmate and 3–7-lobed. The lobes are broad to narrow, the margin sparsely dentate and emarginate. The flowers are solitary, axillary. The pedicel is sparsely strigose. The epicalyx's lobes are filiform, and sparsely hirsute. The calyx is campanulate, densely stellate, and puberulent. The corolla is yellow or white with a dark purple centre; the petals are obovate. The capsule is cylindric to tower-shaped, 10–25 × 1.5–2(–3) cm, long beaked, and sparsely strigose. The seeds are dark brown or grey, globose to reniform, 5–15 per locule, (3–)4–5(–6) mm, striated, and minutely warty. Flowering occurs during May–September.



Bombax ceiba L.

Family: Malvaceae (APG IV 247)

Common name: Cotton tree

Burmese name: Let-pan

Distribution: Grows wild in the tropical areas of Myanmar

Markets: Mandalay, Taunggyi

Parts used: Flower

Life form: Tree

Culinary use: The flowers are blanched in boiling water, then made into salads or eaten directly with Burmese dipping sauces. The flowers are also sun-dried for later use as highly valued dried vegetable.

Medicinal uses: In treating diabetes

Effective compounds: Apigenin, quercetin, cosmetin, taraxerol, hentriacontane, gallic acid, bombasin, bombasin 4-O-glucoside (9-norneolignans) and a novel d-gluconolactone derivative bombalin (Jain and Verma 2012).

Pharmacological properties and functions: Antioxidant effects (Tundis et al. 2014); antineoplastic, antispasmodic, antihypertensive, immunomodulatory, hypoglycaemic, anti-ulcer, anti-inflammatory, antibacterial, antiviral, positive ionotropic, and anti-HIV activities (Jain and Verma 2012).

Morphological characteristics: Trees, up to 25 m tall; the trunk is buttressed, usually very spiny on young trees; its bark is greyish-white, the branches spreading. Leaflets 5–7; the blades are oblong to oblong-lanceolate, glabrous, the base broad or tapering, and the apex acuminate. The flowers are solitary, and terminal. The calyx is cup-shaped, abaxially glabrous, adaxially densely yellowish, and sericeous. Calyx lobes 3–5, and semi-orbicular. The petals are usually red, sometimes orangish-red, obovate-oblong in shape, fleshy, with both surfaces stellate and puberulent, but sparser adaxially. The filament tube is short, the filaments thicker at the base than the apex, with the outer series in five fascicles, each with more than 10 stamens, the inner series bifid, the central filaments with 10 stamens, shorter, entire. The capsule is ellipsoid, densely greyish-white, villous and stellate puberulent. There are many seeds, which are obovate, and smooth. Flowering occurs during March–April, fruiting during summer.



Hibiscus cannabinus L.

Family: Malvaceae (APG IV 247)

Common name: Kenaf

Burmese name: Chin-paung-khar

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Yangon

Parts used: Tender shoot

Life form: Herb

Culinary use: The tender shoots are blanched in boiling water, and then used to make salads, or fried

Medicinal uses: As a laxative.

Morphological characteristics: Herbs, annual or perennial, erect, robust, up to 3 m tall, glabrous, sparsely but sharply spiny. The leaf blade is dimorphic; the blades on the proximal part of the stem are cordate, those on distal part of the stem are palmately 3–7-lobed; the lobes are lanceolate, and the apex acuminate. The flowers are solitary, axillary, and nearly sessile. Epicalyx lobes 7–10, not red, filiform, free, and sparsely spiny. The calyx is nearly campanulate, connate for roughly half its length, spiny, and with white tomentose, lobes 5, lanceolate, and a long caudate. The corolla is yellow and red at the centre; the petals are oblong–obovate. Staminal column, glabrous. Styles 5, glabrous. The capsule is globose, densely spiny, the apex shortly beaked. The seeds are reniform, and subglabrous. Flowering occurs during the autumn.



Hibiscus sabdariffa L.

Family: Malvaceae (APG IV 247)

Common name: Roselle

Burmese name: Chin-paung

Distribution: Cultivated in the dry hot areas of central Myanmar

Markets: Mandalay, Nay Pyi Taw

Parts used: Tender leaf, fruit

Life form: Herb

Culinary use: The fruits and leaves are used as sour flavouring in salads and soups. The tender leaves are also used to make fried dishes.

Medicinal uses: As an emollient

Effective compounds: Fresh calyx is rich in vitamins C and B, amino acids, organic acids, flavonoids, anthocyanins, and other components

Pharmacological properties and functions: In vitro and in vivo antioxidant activity (Ali et al. 2010)

Morphological characteristics: Herbs, annual, erect, up to 2 m tall. The stems are purplish, robust, and glabrous. The leaf blade is dimorphic; the blades on the proximal part of the stem ovate, those on distal part of the stem palmately three-lobed. The lobes are lanceolate, their base rounded or broadly cuneate, margin serrate, the apex obtuse or acuminate, glabrous. The flowers are solitary, axillary, and subsessile. The epicalyx lobes number 8–12, are red, lanceolate, connate at the base, sparsely long hirsute, with a spiny appendix near the apex. The calyx is purplish, cup-shaped, connate for roughly one-third its length, fleshy, sparsely spiny and coarsely hairy, lobes 5, triangular, and acuminate. The corolla is yellow with a dark red centre. The capsule is ovoid–globose, densely and coarsely hairy. The seeds are reniform, and glabrous. Flowering occurs during summer–autumn.



Moringa oleifera Lam.

Family: Moringaceae (APG IV 256)

Common name: Moringa

Burmese name: Dant-da-lun

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Nay Pyi Taw

Parts used: Tender fruit, leaf

Life form: Tree

Culinary use: Used in making curries and soups

Medicinal uses: It assists the treatment of hypertension, hyperlipidemia, hyperglycaemia, heart disease, and cancer

Effective compounds: The moringa plant provides a rich and rare combination of zeatin, quercetin, β -sitosterol, caffeoylquinic acid, and kaempferol

Pharmacological properties and functions: Has cardiac and circulatory stimulants, and possesses anti-tumour, antipyretic, antiepileptic, anti-inflammatory, anti-ulcer, antispasmodic, diuretic, antihypertensive, cholesterol lowering, antioxidant, antidiabetic, hepatoprotective, antibacterial, and antifungal activities (Anwar et al. 2010).

Morphological characteristics: Trees, up to 12 m tall; its bark is pale and smooth to rugose but not fissured. The leaves are petiolate, 3-pinnate, 25–60 cm, with stalked glands often exuding a clear or amber liquid at the base of the petiole and leaflets; leaflets in 4–6 pairs, ovate, elliptic, or oblong, base rounded to cuneate, apex rounded to emarginate; petiolules slender. The inflorescence a widely spreading panicle, bracteate, 10–30 cm; bracts linear. Flowers white to cream, fragrant, somewhat resembling an inverted Fabaceae flower with two dorsal sepals and one dorsal petal usually remaining unreflexed and forming a projecting ‘keel’ while the rest of the perianth reflexes down to form a ‘banner’ at right angles to the ‘keel’, each flower borne on a false pedicel. The sepals are lanceolate to linear–lanceolate, and usually puberulent. The petals are spatulate, glabrous or puberulent at the base. The capsule is three-valved, with dimensions of 20–50 cm \times 1–3 cm, and dehiscent. The seeds are subglobose, three -angled, 8–15 mm in diameter excluding the wings; the wings are 0.5–1 cm wide, and rarely absent. Flowering occurs the year round, fruiting during June–December.



Carica papaya L.

Family: Caricaceae (APG IV 257)

Common Name: Papaya

Burmese name: Thin-baw

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Taunggyi, Mandalay, Yangon, Nay Pyi Taw

Parts used: Unripe fruit, staminate inflorescence (flower)

Life Form: Herb

Culinary use: The unripe fruit is used to make salads. The staminate inflorescence is blanched in boiling water, and used to make salads and soups.

Medicinal uses: The sweet and easily digestible ripe fruit stimulates hunger, facilitates digestion, promotes healthy urinary function, decreases phlegm, benefits the heart, cleanses the blood, calms the bile, and protects against urinary diseases and gallstones.

Effective compounds: The fruit is a very rich source of vitamin A, β -carotene, β -cryptoxanthin, vitamin C, lutein, and zeaxanthin and is low in lipids, calories, and sodium (Lim 2012).

Pharmacological properties and functions: Antioxidant, anticancer, antiviral, anti-inflammation, antidiabetic, and antibacterial activities (Lim 2012).

Morphological characteristics: Trees or shrubs, 8–10 m tall. The stem is simple, with stipulate scars helically arranged. The petiole is hollow, 60–100 cm in length; the leaf blade is roughly 60 cm long, usually 5–9 palmatifid; lobes pinnatifid. The male inflorescence is pendulous, to 1 m. Male flowers: the pedicel is absent; corolla tube creamy yellow, lobes are lanceolate; there are five longer and five shorter stamens, the shorter ones almost without filaments; the filaments are white, white tomentose. Female flowers: usually solitary or aggregated in corymbose cymes; the pedicel is short or nearly absent; the corolla lobes are creamy yellow, oblong or lanceolate; the ovary is ovoid; the stigmas are partite, and nearly fimbriate. Bisexual flowers: corolla tube 1.9–2.5 cm, lobes oblong, stamens five or 10 in one or two whorls; ovary smaller than in female flowers. The fruit is orange–yellow or yellow at maturity, cylindric, ovoid–cylindric, or subglobose, 10–30 cm; the sarcocarp is soft and with a mild, pleasant flavour. Seeds are numerous, black at maturity, and ovoid.



Lepidium sativum L.

Family: Brassicaceae (APG IV 270)

Common name: Cress

Burmese name: Myet-mon-nyin

Distribution: Cultivated in Shan State

Market: Taunggyi

Parts used: The whole plant

Life form: Herb

Culinary use: Directly in making salads and soups

Medicinal uses: Treating parasitic diseases

Effective compounds: There are a number of essential oils and fatty oils in its seeds

Pharmacological properties and functions: Antidiarrhoeal and spasmolytic activities (Rehman et al. 2012)

Morphological characteristics: Herbs, annual. The stems are erect, simple or branched, sparsely crisped pilose above. The basal leaves are not rosulate, the blade variable in shape, 1- or 2-pinnatifid, or 1- or 2-pinnatisect; ultimate lobes are ovate or oblong, margin dentate, the apex acute. The cauline leaves are petiolate, their blade similar to basal ones but less divided, with 1–4 lateral lobes on each side of the mid-vein; the uppermost leaves are subsessile, linear, the margin entire. The fruiting pedicels are suberect, appressed to rachis, or ascending, straight, terete or slightly flattened, and glabrous. The sepals are oblong, glabrous or pubescent abaxially. The petals are white or lavender, spatulate or obovate, the base attenuate. The fruit is oblong–ovate or elliptic, the base rounded, margin and apex broadly winged, the apex emarginate, with wings at the apex. The seeds are reddish brown, oblong, and wingless; the cotyledons incumbent, and three-lobed. Flowering occurs during June–July, fruiting during August–September.



Nasturtium officinale R. Br.

Family: Brassicaceae (APG IV 270)

Common name: Watercress

Burmese name: Yay-mon-nyin

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Yangon, Taunggyi

Parts used: Whole plant

Life form: Herb

Culinary use: In making salads and soups directly

Effective compounds: Watercress is 95 per cent water and has a low content of carbohydrates, protein, fat, and dietary fibre. A 100-g serving of watercress provides 11 calories, is particularly rich in vitamin K, and contains significant amounts of vitamin A, vitamin C, riboflavin, vitamin B6, calcium, and manganese (USDA 2008).

Pharmacological properties and functions: Phenethyl isothiocyanate (PEITC) is a naturally occurring isothiocyanate whose precursor, gluconasturtiin, is found in some cruciferous vegetables, especially watercress. PEITC has been studied for its potential for chemoprevention of cancers, such as prostate cancer.

Morphological characteristics: Perennial herbs, rhizomatous, aquatic, glabrous throughout or sparsely pubescent, with simple trichomes. The stems are decumbent or prostrate, erect in emergent plants, branched above, and rooting at proximal nodes. The leaves are all cauline, pinnately compound; the petiole is auriculate at the base; the terminal leaflet is suborbicular or oblong, the base obtuse, cuneate, or subcordate, margin entire or repand, the apex obtuse; lateral leaflets are smaller, usually sessile. The fruiting pedicels are slender, divaricate or recurved. The sepals are oblong, the lateral pair slightly saccate. The petals are white or pink, spatulate or obovate, with the apex rounded. The fruit is cylindric; the valves have an obscure mid-vein. The seeds are biseriate, ovoid, reddish brown, coarsely reticulate, with 25–50(–60) areolae on each side. Flowering occurs during April–September, fruiting during May–September.



Chenopodium album L.

Family: Amaranthaceae (APG IV 297)

Common name: Goosefoot

Burmese name: Myu-pin (Myu-ywet)

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Taunggyi

Parts used: Tender leaf

Life form: Herb

Culinary use: In making salads and soups directly

Medicinal uses: Used in treating diarrhoea and constipation

Effective compounds: Contains potassium, calcium, sodium, phosphorus, magnesium, iron, copper, zinc and other mineral elements, vitamin C, and beta carotene. The secondary metabolites are mainly alkaloids, coumarins, and polyphenols (Yadav and Sehgal 1997).

Pharmacological properties and functions: Antioxidant (Jan et al. 2017) and antibacterial properties (Pandey and Gupta 2014)

Morphological characteristics: Herbs, annual. The stem is erect, with many branches, with green or purplish-red striations, stout, and ribbed; the branches are oblique or spreading. The leaf blade is rhombic-ovate to broadly lanceolate, abaxially more or less farinose, adaxially usually glabrous, or sometimes reddish purple vesicular hairy on young leaves, the base cuneate to broadly so, the margin irregularly serrate, the apex subobtuse or acute. The glomerules are arranged into large or small panicles or spikelike panicles on the upper part of branches. The flowers are bisexual. There are five perianth segments, broadly ovate to elliptic, abaxially longitudinally keeled, farinose, the margin membranous, the apex acute or slightly emarginate. There are five stamens; the anthers are exserted. Stigmas, two. The pericarp is adnate to the seed. The seed is horizontal, black, sublustrous, lenticular, lineate, and its rim margin obtuse. Flowering and fruiting occur during May–October.



Portulaca oleracea L.

Family: Portulacaceae (APG IV 315)

Common name: Purslane

Burmese name: Myay-pyit-pin

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay

Parts used: Whole plant

Life form: Herb

Culinary use: In making salads and soups

Medicinal uses: Used in the treatment of kidney disease, and as a laxative and digestive.

Effective compounds: Contains diverse compounds such as flavonoids, alkaloids, polysaccharides, fatty acids, terpenoids, sterols, proteins, vitamins, and minerals

Pharmacological properties and functions: Neuroprotective, antimicrobial, antidiabetic, antioxidant, anti-inflammatory, anti-ulcerogenic, and anticancer activities (Zhou et al. 2015).

Morphological characteristics: Herbs, annual. The stems are sometimes flushed red or purple, not articulated, prostrate or decumbent, less often more or less erect, diffuse, and with many branches. The leaf axils have a few inconspicuous and stiff bristles. The leaves are alternate or occasionally subopposite. The petiole is short, the leaf blade flat, and obovate. The base is cuneate, and the apex obtuse, rounded, truncate, or retuse. Flowers are in clusters of 3–5, 0.4–0.5 cm in diameter, surrounded by involucre of 2–6 bracts. The sepals are green, helmeted, the apex acute, and keeled. There are five petals, which are yellow, obovate, slightly connate at the base, the apex retuse. The capsule is ovoid. The seeds are glossy black when mature, never iridescent, obliquely globose–reniform; the testa cells are stellate, usually with a central peg-like tubercle, sometimes without, and the surface more or less granular. Flowering occurs during May–Aug, fruiting during June–September.



Camellia sinensis var. *assamica* (J. W. Mast.) Kitam.

Family: Theaceae (APG IV 336)

Common name: Tea

Burmese name: Lat-phet

Distribution: Cultivated in Shan State and Kachin State.

Markets: Mandalay, Taunggyi, Yangon, Nay Pyi Taw

Parts used: Fermented leaf

Life form: Shrub

Culinary use: The young fresh leaves are collected and fermented in bamboo tubes with salt, and used in making salad with fried nuts and vegetables

Medicinal uses: Leaf extract improves heart health by lowering blood pressure, cholesterol, triglycerides, and prevents plaque buildup in the blood vessel

Effective compounds: Tea contains vitamins and minerals, functional amino acids, and polyphenols.

Pharmacological properties and functions: Antioxidant, anti-inflammatory, and anti-tumour properties (Anna Gramza-Michałowska, 2016).

Morphological characteristics: Shrubs or trees, 1–5(–9) m tall. The young branches are greyish-yellow, and glabrous. The current year's branchlets are purplish-red and white pubescent; the terminal buds are silvery grey, and sericeous. The leaf blade is elliptic, oblong–elliptic, or oblong, leathery, abaxially pale green and glabrous or pubescent, adaxially dark green, shiny, and glabrous. The mid-vein is more or less, raised on both surfaces, the base cuneate to broadly cuneate, the margin serrate to serrulate, the apex bluntly acute to acuminate and with an obtuse tip. The flowers are axillary, solitary or up to three in a cluster. The pedicel is recurved, pubescent or glabrous, and thickened toward the apex. There are two bracteoles, that are caducous and ovate, of roughly 2 mm. There are five sepals, persistent, broadly ovate to suborbicular, glabrous or white pubescent outside, white sericeous inside, the margin ciliolate. There are 6–8 white petals; the outer 1–3 petals are sepaloid; the inner petals are obovate to broadly obovate, basally connate, the apex rounded. The stamens are numerous, and glabrous. The ovary is globose, densely white pubescent, tomentose, or subglabrous, and three-loculed; style apically three-lobed. The capsule is oblate, two-coccal, or rarely globose, one- or two-loculed with one seed per locule; the pericarp is roughly 1 mm thick. The seeds are brown and subglobose. Flowering occurs during October–Feb, fruiting during August–October.



Morinda citrifolia L.

Family: Rubiaceae (APG IV 352)

Common name: Noni

Burmese name: Ye-yo

Distribution: Cultivated widely in Myanmar.

Markets: Mandalay, Taunggyi, Nay Pyi Taw

Parts used: Leaf

Life form: Shrub

Culinary use: The fresh leaves are blanched, and then used as wrappers to make dumplings or in soups. The fruits and leaves are used to make fish curry.

Medicinal uses: To alleviate arthritis, as an emmenagogue, and to promote menstrual flow

Effective compounds: The fruit contains a number of phytochemicals, including lignans, oligo- and polysaccharides, flavonoids, iridoids, fatty acids, scopoletin, catechin, beta-sitosterol, damnacanthol, and alkaloids (Levand and Larson 2009).

Pharmacological properties and functions: Immunostimulatory, anti-tumour, antidiabetic, anti-obesity, antibacterial, antiseptic, antifungal, antiviral, leishmanicidal, anti-inflammatory, antinociceptive, acts as an analgesic, antioxidant, neuroprotective, heals wounds, anti-allergic, anti-angiogenic, anti-emetic and anti-nausea, anti-gastric ulcer and oesophagitis, anthelmintic, antimutagenic, antipsychotic, anxiolytic, photoprotective, anti-wrinkle and periodontal tissue regeneration activities (Torres et al. 2017).

Morphological characteristics: Evergreen shrubs or small trees, to 5 m tall, often fleshy; branches subquadrangular, and glabrous. Leaves opposite or solitary opposite an inflorescence, elliptic-oblong, elliptic, or ovate; glabrous and shiny on both surfaces, the base acute or acuminate, the apex acute to obtuse. Inflorescence solitary and leaf-opposed; the peduncle 1–1.5 cm long; one head, oblong to subglobose, and many-flowered; bracts are absent. Flowers with hypanthia partially fused, and distylous. The calyx is glabrous or puberulent; the limb subtruncate to truncate, sometimes in one to numerous flowers of a head with 1(–3) calycophylls, white, narrowly elliptic to oblanceolate, obtuse to acute. The corolla is white, funnelform, glabrous outside; densely villous in the throat; lobes, five, and ovate-lanceolate. The drupetum is white, irregularly ovoid to subglobose, its dimensions 2.5–5 cm. The drupes are not distinguishable individually. Flowering and fruiting occur all year around.



Caudanthera edulis (Edgew.) Meve & Liede

Family: Apocynaceae (APG IV 356)

Common name: Edible caralluma

Burmese name: Ta-zaung-chin

Distribution: Dry, hot areas of central Myanmar

Markets: Mandalay, Nyaung-U, Pagan

Parts used: Fleshy stem

Life form: Herb

Culinary use: The flesh stems are blanched in boiling water, and then used in making salads

Medicinal uses: Used for heat-clearing

Effective compounds: Caralluma contains progesterone glycoside, flavonoid glycoside, and other functional healthcare components.

Pharmacological properties and functions: Antidiabetic and antioxidant activities (Maheshu 2014).

Morphological characteristics: Erect, succulent herb. The branches are subterete, and four-grooved. The leaves are linear, and acute. Flowers in pairs in axils of scale-like bracts. The pedicels are glabrous, ovate, and acute. The corolla is campanulate, purple inside, the lobes ovate-lanceolate, acute; the outer corona is five-lobed, each lobe having two teeth. The lobes of the inner corona are roughly 1 mm long, and linear. Flowering occurs during September.



Wattakaka volubilis (L.f.) Stapf

Family: Apocynaceae (APG IV 356)

Common name: Dregea

Burmese name: Gwe-dauk

Distribution: Cultivated or grows wild in central Myanmar.

Markets: Nay Pyi Taw

Parts used: Flower, tender shoot, leaf

Life form: Climber

Culinary use: The fresh flowers, tender shoots, and leaves are blanched in boiling water, and made into salads

Medicinal uses: Used in preparations given to regulate the bowels, strengthen blood, promote virility, and stimulate one's appetite, as well as to alleviate sore throat, gonorrhoea, asthma, and conditions caused by the ingestion of rat poison

Effective compounds: They include dregeosides (Yoshimura et al. 1983), such as drevogenin A 3-O-3-O-methyl-6-deoxy- β -D-allopyranosyl-(1 \rightarrow 4)- β -D-oleandropyranosyl-(1 \rightarrow 4)- β -D-cymaropyranosyl-(1 \rightarrow 4)- β -D-cymaropyranoside.

Pharmacological properties and functions: Antibacterial, antioxidant, and antidiabetic activities (Das et al. 2017; Shankar et al. 2014).

Morphological characteristics: Lianas, up to 12 m. The branches are pale grey, lenticellate, the branchlets green and smooth. The leaf blade is broadly ovate or suborbicular, glabrous or soft pubescent, the base shallowly cordate, the apex acute or short acuminate. The inflorescences are pendent, and with many flowers; the peduncle is slender, and puberulent. The flowers are green or yellowish green, and fragrant. The sepals are ovate-oblong, pubescent, and ciliate. The corolla is glabrous; the lobes are broadly ovate, obtuse, and ciliate. The corona is yellowish green. The follicles are narrowly ovoid, longitudinally wrinkled-striate or irregularly ribbed. The seeds are ovate, flattened, and marginate; Flowering occurs during April–September, fruiting during July–December.



Plumeria rubra L.

Family: Apocynaceae (APG IV 356)

Common name: Temple tree

Burmese name: Ta-yoke-sagar

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay

Parts used: Flower

Life form: Tree

Culinary use: Used in making salads. Red flower cultivars are known to be toxic

Medicinal uses: Known to promote digestive, excretory, respiratory, and immune functioning, and useful against leprosy, infections, and stomach ailments

Effective compounds: *P. rubra* flowers contain tannins, flavonoids, terpenoids, reducing sugars, and alkaloids

Pharmacological properties and functions: The flowers, leaves, and bark of *Plumeria rubra* contain many bioactive compounds with anticancerous, anti-inflammatory, and antimicrobial properties (Lim 2014).

Morphological characteristics: Trees, up to 8 m in height. The bark is pale green, smooth, and thin. The petiole is up to 7 cm long; the leaf blade is elliptic to very narrowly so, glaucous adaxially, the apex acute or acuminate; there are 30–40 pairs of lateral veins, slightly elevated abaxially. The corolla is tinged with pink or purple, at least outside, and 4–6 cm in diameter; the lobes are pink, yellow, or white, with a yellow base, obliquely spreading. The follicles are oblong. Flowering occurs during March–September, fruiting during June–December.



Solanum betaceum Cav.

Family: Solanaceae (APG IV 360)

Common name: Tamarillo

Burmese name: Sin-kha-yan-chin

Distribution: Shan State, Kachin State, Chin State

Markets: Taunggyi

Parts used: Fruit

Life form: Tree

Culinary use: The fruits are used as sour flavouring in salads and soups

Medicinal uses: In treating insomnia and food poisoning

Effective compounds: Tamarillo is a good source of vitamins A and C, and multiple minerals

Pharmacological properties and functions: Has antidiabetic properties (Salazar-Lugo et al. 2016)

Morphological characteristics: Small trees or sometimes shrubs, up to 3 m; trunk single and upright with lateral branches. The leaves are ovate-cordate, the apex shortly acuminate or acute, and their base oblique. The leaves have a strong pungent smell. There are 2–3 branched scorpioid cymes, and the flowers and fruits hang from the lateral branches. The flowers are pinkish-white, are in clusters of 10–50 flowers, 1–6 fruits per cluster. The fruits are ovate, juicy, 5–7 cm long, smooth, and orange or reddish. The seeds are disk-shaped, roughly 4 mm in diameter, surrounded by narrow wings. Flowering and fruiting occurs all year around.



Solanum lycopersicum L.

Family: Solanaceae (APG IV 360)

Common name: Tomato

Burmese name: Kha-yan-chin

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Taunggyi, Yangon, Nay Pyi Taw, Kalaw, Pindaya, Loilem, Pinlon, Nyaung Shwe

Parts used: Fruit

Life form: Herb

Culinary use: In making salads and soups directly, or used as sour flavouring in cooking

Medicinal uses: As a traditional tonic

Effective compounds: Tomato is a vegetable rich in nutrients such as vitamins, minerals, and others

Pharmacological properties and functions: Antioxidant, anti-atherosclerotic, anticancer, and useful for Parkinson's disease (Lim 2013)

Morphological characteristics: Herbs, annual, sprawling, 0.6–2 m tall, viscid pubescent, and odorous. The leaf blade is mostly pinnately compound or divided, sometimes entire, its base oblique, cuneate, the apex obtuse; the leaflets are mostly 5–9 in number, sessile or petiolulate, unequal in length, ovate or oblong, entirely or irregularly dentate, and sparingly glandular pilose. The peduncle is a little or not branched at all, and often 3–7-flowered. The calyx is rotate–campanulate, the lobes lanceolate. The corolla lobes are narrowly oblong, and often reflexed. The berry is red or orangish-yellow, subglobose, fleshy, juicy, and shiny. The seeds are straw-coloured, 2–4 mm, and pilose. Flowering occurs during May–September, fruiting during September–November.



Solanum melongena L.

Family: Solanaceae (APG IV 360)

Common name: Eggplant

Burmese name: Kha-yan-thee

Distribution: Cultivated widely in Myanmar

Markets: Mandalay, Taunggyi, Yangon, Nay Pyi Taw, Kalaw, Pindaya, Loilem, Pinlon, Nyaung Shwe

Parts used: Fruit

Life form: Herb

Culinary use: In making salads, curries, and soups

Medicinal uses: In traditional tonics

Effective compounds: Eggplant is a vegetable rich in nutrients such as vitamins, minerals, and others. The purple eggplant is rich in anthocyanin.

Pharmacological properties and functions: Antioxidant activity (Sadilova et al. 2006).

Morphological characteristics: Herbs or subshrubs, up to 60 cm tall, sparingly armed, pubescent with stellate hairs. The stems and branches are minutely tomentose, sometimes with stout recurved prickles. The leaf blade is ovate to oblong-ovate, stellate, and tomentose, or sometimes with a few fine prickles on both surfaces, denser abaxially. Its base is oblique, the margin sinuate-lobed, and its apex obtuse. The inflorescences are mostly solitary flowers, and rarely reduced racemes; the peduncle is obsolete. The flowers are andromonoecious. The calyx is stellate and tomentose, often with prickles abaxially; the lobes are lanceolate. The corolla is purplish or violet in colour, rotate lobes deltate. The berry could be black, purple, pink, brown, or yellow, but is yellowish when completely mature, and varies greatly in form and size, mostly more than 6 cm in diameter, with a thick, spongy, whitish mesocarp and septal region. The seeds are lenticular, and yellowish. Flowering and fruiting occur all year around.



Solanum torvum Sw.

Family: Solanaceae (APG IV 360)

Common name: Wild eggplant

Burmese name: Kazaw-khar (Myoh-pyat-kha-yan)

Distribution: Cultivated or found in the wild widely in Myanmar

Markets: Nay Pyi Taw

Parts used: Fruit

Life form: Shrub

Culinary use: Used in making salads, soup and curries. The fruits are blanched in boiling water and eaten with Burmese dipping sauces.

Medicinal uses: In treating colds, coughs, and diseases of the urinary system

Effective compounds: The fruits include steroidal alkaloids solasonine, torvogenin, chlorogenin, chlorogenone, neochlorogenone, steroidal glycoside, β -glucosidase, torvosides, solasonine, and solamargine (Lim 2013).

Pharmacological properties and functions: Antioxidant, anticancer, antiviral, antimicrobial, anti-inflammatory, and analgesic activities (Lim 2013).

Morphological characteristics: Shrubs, 1–2(–3) m tall. They are sparingly armed, densely pubescent overall with many-rayed, greyish, stellate hairs. The stems are stout, and recurved. The leaves are solitary or paired; the leaf blade is ovate to elliptic, with yellow, many-branched stellate hairs, armed or unarmed, the base cordate or cuneate, the margin sinuate or usually 5–7-lobed, the apex acute. The inflorescences are extra-axillary, with many-flowered, racemose panicles; the peduncle is mostly 1- or 2-branched, stellate pubescent. The flowers are andromonoecious. The pedicel is dark, slender, and bearing simple glandular hairs and stalked stellate hairs. The calyx is cup-shaped, pubescence as on pedicel; the lobes are ovate–lanceolate. The corolla is white, rotate, and the lobes ovate–lanceolate, stellate pubescent abaxially. The fruiting pedicel is thickened upwards, with sparse, stellate and simple glandular hairs. The fruiting calyx is roughly 1.5 cm in length. The berry is yellow, smooth, glabrous, and 1–1.5 cm in diameter. The seeds are discoid. Flowering and fruiting occur throughout the year.



Asystasia gangetica (L.) T. Anders.

Family: Acanthaceae (APG IV 377)

Common name: Chinese violet

Burmese name: Kyauk-kwe

Distribution: Mandalay region

Markets: Mandalay

Parts used: Tender leaf

Life form: Herb

Culinary use: The tender leaves are blanched in boiling water, then made into salads

Medicinal uses: In treating traumatic injuries

Effective compounds: Rich in polyphenols and functional polysaccharides

Pharmacological properties and functions: Polyphenols have certain scavenging activities on DPPH free radicals, ABTS free radicals, and hydroxyl free radicals, as well as certain antioxidant activities (Li et al 2014).

Morphological characteristics: Suberect to climbing subshrubs, with four-angled, pilose to glabrescent twigs. The leaves have a petiole roughly up to 2 cm long; the lamina is elliptic-ovate to deltoid, grey-pubescent to glabrate, the base truncate to rounded, the margins crenulate to entire, and apically acute or shortly acuminate. The flowers are in terminal, one-sided, lax raceme. The bracts are lanceolate, and pilose. The calyx lobes are lanceolate and sparsely pubescent. The corolla is yellow to creamy-white with purple streaks on its throat, the tube up to 2.5 cm long, narrow below, roughly 1 cm wide at the throat, hairy outside, the lobes more or less orbicular, and up to 1.5 cm long. The anthers are oblong. The style is up to 2 cm long. The capsule is oblong, up to 2.8 cm long including the stipe, pubescent, and with four seeds. Flowering occurs during September–December, fruiting during December–March.



Dolichandrone serrulata (Wall. ex DC.) Seem.

Family: Bignoniaceae (APG IV 378)

Common name: Trumpet flower

Burmese name: Tha-kwuk

Distribution: Kachin State, Shan State

Markets: Mandalay

Parts used: Flower

Life form: Tree

Culinary use: The flowers are collected, and all the parts removed except the corollas, which are blanched in boiling water and used to make salads

Medicinal uses: For heat-clearing; lowers blood sugar

Effective compounds: Hallerone, protocatechuic acid, rengyolone, cleroidicin B, ixoside, and isomaltose (Phanthong et al. 2015).

Pharmacological properties and functions: Biological studies of the methanolic extract of these flowers have shown promising antioxidant activity.

Morphological characteristics: Trees. Leaves opposite, 1-pinnately compound. The inflorescences are terminal, flowers white. The calyx is closed in bud, laterally divided to the base, spathe-like during anthesis, floccose to lanate-woolly. Corolla lobes 5, subequal, rounded, tube short. Stamens 4, didynamous. Capsule dehiscing loculicidally, long, terete, compressed, yellowish-brown, and floccose to lanate-woolly; the septum is woody, compressed, with one concave midrib. The seeds are long and ellipsoid, with two rows in each locule, transparent and membranous winged at both ends. Flowering occurs during January–March, fruiting during May–August.



Oroxylum indicum (L.) Kurz

Family: Bignoniaceae (APG IV 378)

Common name: Indian trumpet flower

Burmese name: Kyaung-shar

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Taunggyi

Parts used: Tender fruit

Life form: Tree

Culinary use: The tender fruits are blanched in boiling water, and then used to make salads curries

Medicinal uses: Boiled or roasted, it is taken for the treatment of indigestion, goitre, flatulence, and haemorrhoids

Effective compounds: Prunetin, sitosterol, oroxindin, oroxylin-A, biochanin-A, ellagic acid, tetuin, anthraquinone, and emodin (Harminder et al. 2012)

Pharmacological properties and functions: Normalising intestinal motility (Joshi et al. 2012); anti-inflammatory, anti-ulcer, antimicrobial, and antioxidant activity (Harminder et al. 2012).

Morphological characteristics: Trees, 6–10 m tall. Its bark is greyish-brown. The leaves are 2(–4)-pinnately compound, borne nearly at the stem’s apex; the leaflets are triangular–ovateglabrous, become blue after drying, their base subrounded or cordate, and oblique, the margin entire, the apex short acuminate. The inflorescences are 40–150 cm long. The flowers usually open at night, but smell foul. The calyx is purple, campanulate, glabrous, membranous, becoming subwoody in fruit, and the apex truncate. The corolla is purplish-red; the tube is fleshy, the upper lip two-lobed, the lower lip three-lobed, and the lobes slightly reflexed. The capsule is woody, the valves have a midrib, and the margin is convex. The seeds are rounded, including papery wing. Flowering occurs during September–December.



Mentha spicata L.

Family: Lamiaceae (APG IV 383)

Common name: Wrinkled-leaf mint

Burmese name: Pu-si-nan

Distribution: Cultivated in tropical and subtropical areas of Myanmar

Markets: Mandalay, Yangon

Parts used: Whole plant

Life form: Herb

Culinary use: The fresh whole plants are used as flavouring in cooking

Medicinal uses: In treating colds, headache, and heat stroke

Effective compounds: Protocatechuic aldehyde; protocatechuic acid; chrysoeriol; 5, 6-dihydroxy-7, 8, 3', 4'-tetramethoxyflavone; nodifloretin (Chen et al. 2006). ursane I; 3-methoxy-4-methylbenzaldehyde; veratric acid; 5-hydroxy-3',4',6,7-tetramethoxyflavone; diosmetin; thymonin; daucosterol (Zheng et al. 2002).

Pharmacological properties and functions: Hypoglycaemic, hypocholesterolemic, and antioxidant properties (Bayani et al. 2017)

Morphological characteristics: Herbs, rhizomatous. The stems are erect, purplish, and glabrous. The leaves are sessile or subsessile, ovate to ovate-lanceolate, papery, the base rounded to shallow cordate, the margin serrate, and the apex acute. Verticillasters in terminal spikes, continuous or more or less interrupted at the base; the bracts are linear-lanceolate, slightly longer than the calyx. The calyx is campanulate, subglabrous, glandular, and obscurely five-veined; teeth triangular-lanceolate, and ciliate. The corolla is purplish, and glabrous; the lobes are subequal, the apex emarginate. The nutlets are brown, triquetrous, ovoid, and sparsely glandular. Flowering and fruiting occur during May–September



Ocimum basilicum L.

Family: Lamiaceae (APG IV 383)

Common name: Basil

Burmese name: Pin-sein

Distribution: Cultivated widely in Myanmar.

Markets: Kalaw

Parts used: Whole plant

Life form: Herb

Culinary use: The entire plant is used as flavouring in cooking

Medicinal uses: To control gas and phlegm, congestion, and indigestion. It can degrade bile, and is also used as a diuretic.

Effective compounds: The essential oil from European basil contains linalool and methyl chavicol (estragole) (Simon 1998); 1,8-cineole, eugenol, myrcene; 1,8-cineole, and methyl eugenol.

Pharmacological properties and functions: Antioxidant (Gülçin et al. 2010), antibacterial (Wannissorn et al. 2005), and antiviral (Chiang et al. 2010)

Morphological characteristics: Herbs, annual. Its stems are erect, 20–80 cm tall, the apex retrorse and puberulent, the base glabrous, tinged red, and much branched. Its leaf blade is ovate to oblong, subglabrous, abaxially glandular, the base attenuate, the margin irregularly dentate or subentire, its apex subobtuse to acute; the lateral veins are three- or four-paired. The thyrses are puberulent; the verticillasters are puberulent or densely pilose, approximate apically; the bracts are sessile, oblanceolate, their base attenuate, margin ciliate, apex acute, and coloured. The calyx is campanulate, pubescent outside, pilose at the throat inside; the middle tooth of the upper lip is widest, subcircular, and concave, the apex mucronate; the lateral teeth are broadly ovate, and the apex acute; the lower lip teeth are lanceolate, the apex spinescent, and ciliate; the fruiting calyx is persistent, and conspicuously veined. The corolla is purplish or with the upper lip white, the limb puberulent outside, and the lower lip purple. The nutlets are dark brown, ovoid, glandular foveolate. Flowering occurs during July–September, fruiting during September–December.



Stachys affinis Bunge

Family: Lamiaceae (APG IV 383)

Common name: Chinese artichoke

Burmese name: Pae-poe-ti

Distribution: Kachin State, Shan State

Markets: Pindaya

Parts used: Tuber root

Life form: Herb

Culinary use: Used in making soups. The fermented tuber shoots are eaten with Burmese dipping sauces

Medicinal uses: As a traditional tonic

Effective compounds: Tubers are rich in the oligosaccharide (tetrasaccharide) carbohydrate –which are regarded as prebiotics (Lim, 2016)

Pharmacological properties and functions: Antioxidant, antimicrobial, anti-anoxia, anti-tumour, and antinephritic activities (Lim 2016).

Morphological characteristics: Herbs, perennial. Its rhizomes are white. Its stems are erect or inclined. The leaf blade is ovate to elliptic–ovate, the base broadly cuneate to shallowly cordate, the margin crenate–serrate, the apex acute to acuminate. The spikes verticillasters are six-flowered, and widely spaced; the floral leaves are bractlike, reflexed (especially in the cultivated form), the adaxial ones sessile, lanceolate, the margin subentire, and shorter than the calyx; the bracteoles are linear. The calyx is narrowly campanulate, glandular pubescent; conspicuously ten-veined; the teeth are narrowly triangular, the apex spinescent, slightly reflexed. The corolla is red to purple, the lower lip spotted purple, somewhat saccate, and puberulent; the upper lip is oblong, and straight or slightly reflexed; the lower lip middle lobe is subcircular, the lateral lobes ovate. The nutlets are blackish-brown, ovoid, and tuberculate. Flowering occurs during July–August, fruiting during September.



Eclipta prostrata (L.) L.

Family: Asteraceae (APG IV 403)

Common name: False daisy

Burmese name: Kyeik-hman

Distribution: Cultivated or grows wild in central Myanmar

Markets: Mandalay, Nay Pyi Taw, Sagaing, Taunggyi

Parts used: Tender shoot

Life form: Herb

Culinary use: The tender shoots are blanched in boiling water, and then used to make salads

Medicinal uses: Promotes vitality, health, and circulation; stimulates strong hair growth; used for respiratory illnesses, as well as for inflammation of the eyes and other parts of the body.

Effective compounds: Limited related research available.

Pharmacological properties and functions: Antihyperlipidemic (Kumari et al. 2006), anti-venomous (Pithayanukul et al. 2004), antiproliferative (Lee et al. 2008), and anti-HIV activities (Tewtrakul et al. 2010).

Morphological characteristics: Herbs, annual. The stems are erect, ascending or prostrate to strigose–pilose, and branched at the base. The leaves are lanceolate, papery, densely strigose–pubescent on both surfaces, the base narrowed, sessile or shortly petiolate, the margin serrulate, the apex gradually acuminate. The capitulum peduncle is slender; the involucre is globose–campanulate, enlarging to 11 mm wide in fruit; there are 5–6 phyllaries, two-seriate, oblong, acute, with the outer longer. The ray florets are two-seriate, the lamina bifid or entire. Many disk florets, and the corolla is four-lobed. The achenes’ margin is ribbed. Flowering occurs during June–September.



Enydra fluctuans DC.

Family: Asteraceae (APG IV 403)

Common name: Enydra

Burmese name: Ka-na-phort

Distribution: Bago Region, Kachin State, Sagaing Region, Shan State, Tanintharyi Region, Yangon Region, Kayin State

Markets: Kalaw, Pindaya

Parts used: Tender shoot

Life form: Herb

Culinary use: The tender shoots are blanched in boiling water and then used to make salads

Medicinal uses: To treat oedema, smallpox, and liver diseases

Effective compounds: Limited related research available.

Pharmacological properties and functions: Anti-hepatotoxicity (Patil and Majumder 2008)

Morphological characteristics: Herbs. The stems are stout, cylindric, slightly fleshy, and prostrate in the lower part. The leaves are subsessile, oblong or linear-oblong, both surfaces glabrous, their base amplexicaul, the margin sparsely serrate, the apex obtuse or acute. The capitula's involucre has four phyllaries, dorsally glabrous, the outer pair larger, ovate-oblong, with the apex rounded; the receptacle's paleae is rigid, the apex toothed, and sparsely pubescent. Ray florets, lamina three- or four-lobed at the apex. The disk florets are five-lobed; there are five stamens, and in rare cases, six. The achenes are obovoid-cylindric. Flowering occurs during November–April.



Gynura procumbens (Lour.) Merr.

Family: Asteraceae (APG IV 403)

Common name: Longevity spinach

Burmese name: Pyar-hmyee-swal

Distribution: Cultivated in tropical and subtropical areas of Myanmar.

Markets: Mandalay, Nay Pyi Taw

Parts used: Tender shoot

Life form: Herb

Culinary use: Directly used in making salads and soups

Medicinal uses: In treating diabetes

Effective compounds: It includes functional polysaccharides, phytosterols, sterols, glycosides, adenosine, and kaempferol

Pharmacological properties and functions: Antioxidant (Rosidah et al. 2008), anti-inflammatory (Iskander et al. 2002), antihypertensive (Kim et al. 2016), anti-ulcer (Mahmood et al. 2010), and antibacterial (Hassan et al. 2010) activities.

Morphological characteristics: Herbs, scandent. The stems are procumbent, brownish or purple striate, glabrous or pubescent when young, and branched. The leaf blade is abaxially purplish, adaxially green, ovate, ovate-oblong, or elliptic in shape, both surfaces glabrous, in rare cases sparsely pubescent, the lateral veins 5–7-paired, curved, the veinlets inconspicuous, base rounded-obtuse or cuneately attenuate into the petiole, the margin entire or repand-dentate, the apex acute or acuminate. The upper stem leaves and leaves on the synflorescence branches reduced, lanceolate or linear-lanceolate, and sessile or subsessile. There are 3–5 capitula in each corymb, in terminal or axillary corymbs; the peduncles are long, slender, often with 1–3 linear bracts, sparsely shortly pubescent or glabrous. The involucre are campanulate or funnelform; there are five or six bracteoles at the base; are linear; phyllaries (9 or) 11–13, becoming purplish, oblong-lanceolate, glabrous, 1–3-veined, the margin narrowly scarious, and apically acuminate. There are 20–30 florets; the corolla is orange with a slender tube and dilated limb; the lobes are ovate-lanceolate, apically acute. The anthers are obtuse at the base, the appendages triangular. The style branch tips are conical, and papillose. The achenes are brown, cylindric, glabrous, and 10-ribbed. The pappus is white and silky. Flowering occurs during March–April.



***Hydrocotyle verticillata* Thunb.**

Family: Araliaceae (APG IV 414)

Common name: Whorled pennywort

Burmese name: Zawa-myin-kwar

Distribution: It is an alien invasive plant commonly found in the wetlands of Myanmar

Markets: Mandalay

Parts used: The whole plant

Life form: Herb

Culinary use: In making salads and soups directly

Medicinal uses: In treating acute hepatitis

Effective compounds: Limited related research available

Pharmacological properties and functions: Limited related research available

Morphological characteristics: Herbs, perennial. The stem is slender, creeping or decumbent, and rooting at the nodes. The leaves are green, and petiolate, the blade cordate. The inflorescence is a simple umbel. The petals are greenish. The fruit is globose. Flowering and fruiting occur during June–August.



Centella asiatica (L.) Urb.

Family: Apiaceae (APG IV 416)

Common name: Asiatic pennywort

Burmese name: Myin-kwar

Distribution: Found widely in the wetlands of Myanmar

Markets: Mandalay

Parts used: Whole plant

Life form: Herb

Culinary use: Directly used in making salads and soups

Medicinal uses: Used to treat diabetes, and as a laxative and diuretic

Effective compounds: Contains pentacyclic triterpenoids, including asiaticoside, brahmoside, asiatic acid, and brahmic acid (madecassic acid). Other constituents include centellose, centelloside, and madecassoside.

Pharmacological properties and functions: Anti-thrombotic (Satake et al. 2007), antioxidant (Gupta et al. 2010), anti-Alzheimer's disease (Dhanasekaran et al. 2008), and antiproliferative (Yoshida et al. 2005) activities.

Morphological characteristics: Herbs. The leaf blade is orbicular or reniform, there are 5–7 prominent palmate veins, both surfaces glabrous or abaxially sparsely pubescent on the veins, the base broadly cordate, and coarsely toothed. The umbels are 3–4-flowered, and capitate. The flowers are sessile or subsessile. The petals are white or rose-tinged. Flowering and fruiting occur during April–October.



Eryngium foetidum L.

Family: Apiaceae (APG IV 416)

Common name: Mexican coriander

Burmese name: Shan-nan-nan

Distribution: Grows in the wild and also cultivated widely in Myanmar

Markets: Mandalay

Parts used: Whole plant

Life form: Herb

Culinary use: The whole plants are used in salads and soups as coriander leaves

Medicinal uses: The whole plants are used as a diuretic to treat oedema

Effective compounds: The main constituent of the essential oil of the plant is eryngial (E-2-dodecenal)

Pharmacological properties and functions: Demonstrated anthelmintic, anti-inflammatory, analgesic, anticonvulsant, anticlastogenic, anticarcinogenic, antidiabetic, and antibacterial activity (Singh et al. 2014).

Morphological characteristics: Plants, 8–40 cm high from a basal rosette. The taproot is fusiform and with fibrous roots. The stem is green. There are numerous basal leaves; the petiole is short or obsolete; the blade is lanceolate or oblanceolate, entire, venation pinnately reticulate, the base cuneate to decurrent, the apex obtuse, callous-margined, crenate to finely spinulose-serrate. The upper leaves are sessile, opposite, deeply spinulose-serrate to parted. The inflorescence is divaricately trifurcate; the lateral branches often continue to form a monochasium, heads numerous, and short-pedunculate. The flower heads are cylindrical; there are 4–7 bracts, foliaceous, lanceolate, spreading to reflexed, the margin 1–3-spinulose-serrate; the bracteoles are lanceolate, and brightly scarious-margined. The calyx teeth are ovate-lanceolate, acute, equalling petals in length. The petals are white or pale yellow. The styles erect, exceeding calyx teeth. The fruit is ovoid-globose, and covered with tubercles. Flowering and fruiting occur during April–December.



CHAPTER 5

Use of wild, non-cultivated plants in Putao

This second survey was conducted in nine villages in the vicinity of Hponkanrazi Wildlife Sanctuary, Putao district, in Kachin State. These villages comprised 1,125 people in little over 200 households belonging to the Rawang and Lisu communities. Of these, a total of 95 households were surveyed. We recorded all the plant species used by them as part of their diet, as medicine, as crops that generate income, and as plants with special cultural and religious significance (Aryal et al. 2020).

Our survey recorded a total of 103 wild, non-cultivated species in the study villages. Nearly 60 of these are a source of food, and little over 30 of them are used medicinally. Just like in Chin and Shan states discussed above, local people in Kachin too collect various parts of the plants such as fruits, nuts, leaves, flowers, and roots, and also the whole plant when needed.

An overwhelming majority of the households surveyed (90 per cent) use wild, non-cultivated plants to meet their daily vegetable requirements. Clearly, these vegetables play a significant role at the household level in terms of food and nutritional security. None of the surveyed households needed to purchase any vegetables as their daily needs were met from either cultivated crops or vegetables throughout the year.

Indeed, these vegetables constitute an important part of the staple diet in all the surveyed households. Our study documented 31 species that are used as vegetables. Farmers here prioritise those species that provide them multiple benefits such as food and nutritional security, medical benefits, and cash income.

Soup is an integral item of the cuisine and as many as 16 species are used for making different soups alone. Interestingly, a similar number of vegetables are used to make curries mixed with fish. Ten species are used in making salads. The most frequently collected species from the wild include *Dryopteris cochleata*, *Dioscorea bulbifera*, *Celastrus paniculatus*, *Polygonum perfoliatum*, *Houttuynia cordata*, *Fagopyrum esculentum*, and *Urtica dioica*.

However, there is a growing pressure on such species. Locals said that there has been a decline in the availability of wild plants over the past two decades. A majority of the respondents said that this was due to their heavy dependence on these resources and the depletion of natural vegetation caused by overharvesting. This suggests that there is an urgent need for resource conservation and management. This requires robust and sustained research and sound policy advocacy, discussed earlier in chapter 3.



CHAPTER 6

Ways forward

This study on vegetables from selected local markets and mountain villages in Myanmar opens up avenues for future collaborative research in the Hindu Kush Himalaya (HKH) region. A complete account of the wild edibles and cultivated plants in the HKH could shed light on the diversity of diets and dietary habits of communities in the region, a very important aspect of how people interact with local biodiversity and ecosystems. It would raise the awareness and appreciation of the public about the diversity and value of the local food resource base, the vital contribution it makes to food and nutritional security of the people in the region, and the traditional knowledge and practices involved. Research on the ethnobotanical and pharmacological dimensions of these locally-used vegetables will help to further understand the nutritional and health benefits of these plants, add new value to them and provide evidence for their more sustainable use.

The production and consumption of locally available vegetables represent a low-carbon way of life that is critically important for global sustainability. In the mountains, local markets are the economic hubs that support the local economy. They are also places for cultural exchange, knowledge-sharing, and skill transfer. They are also the venues for cross-border food trade and the movement of food products, especially local and traditional food commodities.

With this publication, the International Centre for Integrated Mountain Development (ICIMOD), the Kunming Institute of Botany of the Chinese Academy of Sciences, and the South Asian Biodiversity Research Institute jointly call upon other institutions in Myanmar and other countries in the HKH region – Afghanistan, Bangladesh, Bhutan, China, India, Nepal, and Pakistan – to join hands to further the knowledge on local food resources and their sustainable management.

Let us take concerted actions to:

- Document and carry out ethnobotanical, phytochemical, and pharmaceutical studies on wild and cultivated edible plants used by local communities across the region;
- Increase the awareness and appreciation of the general public about the science, indigenous knowledge, and traditional culture underlying the use and management of the local vegetables and food crops;
- Promote the production, consumption, and sustainable use of locally grown vegetables, ingredients, and food resources;
- Bridge the knowledge and policy gaps and promote policies that encourage the conservation and development of locally available fruits and vegetables; and
- Revitalise the local markets and support the livelihoods of local communities.



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