

PLANTS

HEALTH  VITALITY



Plants for Health and Vitality

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Lenka Závěská Drábková (ed.)

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Dear readers,

Welcome to a journey into the world of plants—the indispensable companions of our daily lives. We find them in our morning cup of tea, in fragrant spices, and in the foods that not only nourish us but also heal us. This book opens the door to a deeper understanding of their hidden powers.

Plants are the cornerstone of life on Earth. They inhabited our planet long before multicellular animals appeared, and through their oxygen production, they created the ozone layer that protects Earth from harmful UV radiation. They have colonized almost every ecosystem and can survive in extreme conditions where animals cannot thrive. They grow to staggering heights of over 360 feet (110 meters), like the Coast Redwood, and live for five millennia, like the Bristlecone Pine. Some even form clonal organisms, such as King's Lomatia (*Lomatia tasmanica*), whose age exceeds 43,000 years.

The significance of plants for animal life, including humans, is profound. They produce oxygen through photosynthesis, serve as a primary food source, and provide valuable substances used in medicine. A vast proportion of pharmaceuticals come directly from plants or are synthesized by modelling plant compounds. The pharmaceutical industry could not exist without plant raw materials and the inspiration they provide. Yet, the exploitation of our environment continues, and today, one in five plants on Earth is considered threatened with extinction.

Plants are also a rich source of bioactive substances—compounds that can positively influence human health. These include antioxidants, anti-inflammatory and antiviral agents, enzymes, alkaloids, and various other secondary metabolites. These substances help protect cells, strengthen or modulate the immune system, and act on various levels of human physiology. The range of their effects is surprisingly vast and can even aid in treating serious diseases of modern life.

Historically, plants were the foundation of traditional healing systems across continents—including Ayurveda in India, Traditional Chinese Medicine, and European folk medicine. Despite the rise of modern medicine, plant-based products retain a significant position and, in many cases, are being re-examined by scientific methods that confirm the effects known from traditional use.

While synthetic drugs often bring a rapid and targeted effect, plant substances can act more complexly and gently thanks to the synergistic action of tens to hundreds of compounds. Every plant is the result of millions of years of evolution; its chemical composition is not random but rather an adaptation to environmental conditions and often a defense against pathogens or pests. Humans can turn these protective substances to their own benefit.

This book, *The Healing Power of Plants: Plants for Health and Vitality*, presents selected species that are fascinating from health, nutritional, and cultural perspectives. Some are a common part of human life — such as the tea plant, coffee, or cacao. Others, like Hoodia or Kanna, are less known but no less intriguing. Many of these plants have been used for centuries in traditional healing systems. For example, Ashwagandha (*Withania somnifera*), Bacopa (*Bacopa monnieri*), Gotu Kola (*Centella asiatica*), Peonies, and Passionflowers have a long history of use in both Asia and Europe.

The plants presented here are valuable sources of vitamins, minerals, enzymes, and other bioactive substances that can support health and disease prevention. The goal of this publication is to provide an overview of their properties and uses, as well as potential interactions or side effects, with an emphasis on available scientific facts and traditional knowledge.

In today's world, where health is often taken for granted, it is important to remember that prevention begins with small decisions—what we eat, how we live, and what we pay attention to. Caring for the body and mind is not a luxury, but a necessity. This book is, therefore, also an invitation—an invitation to return to the natural world. To utilize the wisdom that surrounds us—in the scent of herbs, the colors of fruits, and the power of natural compounds. Each of us can take a step toward a healthier, more harmonious life.

We wish you an inspiring and enjoyable read.

Lenka Závěská Drábková

Founder & CEO Botanica Nova



Stimulating Plants

The Tea Plant

Along with coffee, the tea plant ranks among the most widely utilized beverage crops on the Earth. We have moved beyond the traditional nineteenth-century "five o'clock tea" or social collations; today, tea is enjoyed throughout the entire day, though it remains a morning staple. The variety available to us is vast, including black, green, and white teas, oolongs, pu-erhs, and many others. However, the foundation of them all is the leaf of the Chinese tea plant, or *Camellia sinensis*. This is one of the oldest cultivated plants in existence, having accompanied humanity since roughly 2,700 BCE. The earliest records from this era appear in the medical texts of the Chinese Emperor Shennong, where drinking tea is recommended for a wide range of ailments, from loss of appetite to tumors.

1/ The flowers of the Chinese tea plant are white, with over 200 golden stamens.

The genus *Camellia*, which includes the tea plant, comprises in addition to *Camellia sinensis* about 230 species of evergreen subtropical trees and shrubs whose evolutionary relationships are currently being studied intensively. Most species in the wild reach heights of 2 to 15 meters (though in cultivation they are usually maintained around 1.2 meters). **The oldest plants reach an age of 80 years or more.** Large white flowers appear in the leaf axils, usually in groups of two to three. The plants reproduce by shiny brown seeds enclosed in three-chambered capsules. Tea plants have alternate, dark green leaves with serrated margins and a lower side covered with fine white hairs, which give young leaves a silvery appearance. It is precisely these leaves that represent the main product, making the tea plant a crop of major economic importance.

We distinguish four varieties of the Chinese tea plant, which correspond to the regions in which they occur: *Camellia sinensis* var. *assamica* is found in Assam, China, Laos, Myanmar, Thailand, and Vietnam. *C. sinensis* var. *dehungensis* grows in southern and central China, while *C. sinensis* var. *pubilimba* and *C. sinensis* var. *sinensis* are typical of broader regions of China.

The probable homeland of the tea plant is Assam in northeastern India (*C. sinensis* var. *assamica*) and southern and central China (*C. sinensis* var. *sinensis*). However, the common ancestor of these two varieties remains unknown, and genomic studies of the tea plant are still ongoing, so future research may refine our understanding. China guarded the secrets of tea cultivation for centuries, but by the 9th century the plant had gradually spread to neighboring regions—Vietnam, Laos, Burma, and Japan. The rest

of the world did not encounter the tea plant until the 19th century.

The Medicinal Properties of the Tea Plant

The tea plant contains polyphenolic compounds such as **catechins and epicatechins**, as well as **theaflavins, flavonol glycosides, L-theanine, the alkaloids caffeine, theobromine, and theophylline, and a range of volatile organic substances**. It is important to note that the previously used term **theine** refers to a substance that is chemically identical to caffeine, which is responsible for the stimulating effect. In tea, however, it occurs in a bound form, which is why the effects of coffee and tea differ. The caffeine in tea acts more slowly, but its effect lasts longer.

Did you know that the genus *Camellia* was named by Carl Linnaeus after J. J. Kamel, a native of Brno, the Czech Republic, who worked in the Philippines and described the flora of the largest Philippine island, Luzon? It should be noted that he had nothing to do with the tea plant.

1) Stimulating Plants

The bioactive compounds (described in more detail in the sidebar) found in the tea plant contribute not only to the taste and aroma of tea, but also to a wide range of therapeutic effects for the prevention and treatment of cardiovascular diseases, cancer, digestive disorders, and metabolic dysfunctions such as obesity and diabetes.

The flavonoids contained in tea are also powerful antioxidants. Caffeine and polyphenols exert neuroprotective effects in Alzheimer's and Parkinson's disease (acting on GABAergic, dopaminergic, and glutamatergic receptors). Their influence on the nervous system and their potential use in treating neurological and psychiatric disorders are currently the subject of extensive research. **Catechins demonstrate anti-inflammatory activity.** **Theophylline** has a bronchodilatory effect and is used in the treatment of **asthma** and **chronic obstructive pulmonary disease**.

From Tea Plant to Tea

For the highest-quality teas, only the terminal shoot is har-



2/ The Chinese Tea Plant Shrub

3/ Dried Tea Leaves

Groups of Tea Plants

Tea growers divide the Chinese tea plant into **three main groups**, known as jats: **Chinese, Assam, and Indo-Chinese**. Tea plants of different jats differ both morphologically and physiologically—for example, in frost resistance—as well as in their chemical composition.

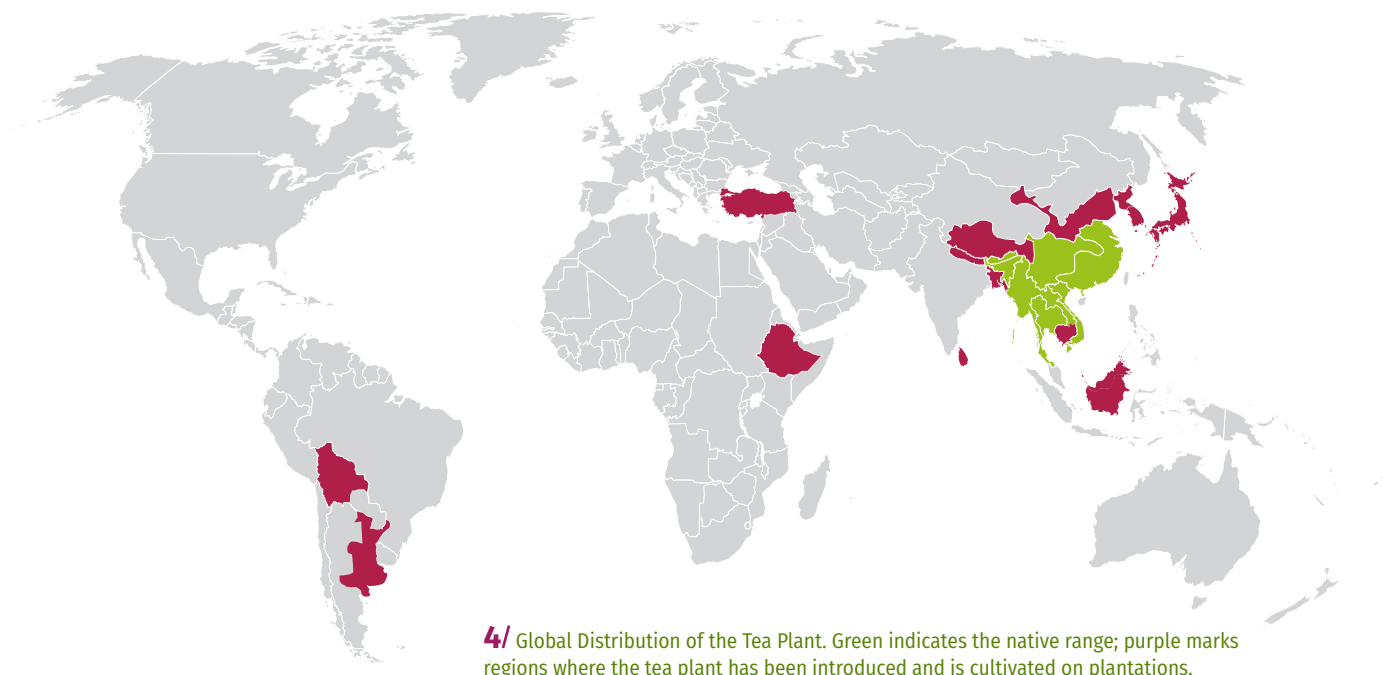
The Chinese jat includes tea plants of subtropical climates, which are frost-resistant. They can tolerate frost down to -10 °C (under snow, they can withstand up to -24 °C). The flowers of these tea plants are self-pollinating. The leaves are smaller, 4-7 cm long, and the tea produced from them is of very high quality, with the first harvest being the finest.

The Assam jat consists of tropical tea plants that require high temperatures. Damage occurs already at -4 °C. Their flowers are cross-pollinated. The leaves are 15-20 cm long, and the tea quality is lower than that of the Chinese jat.

The Indo-Chinese jat forms a small group of smaller tea plants, reaching up to 5 meters in height, with leaves around 15 cm long that turn red in autumn. The tea is also of good quality.

Hybrids of all three jats are also cultivated; they provide higher yields but do not reach the same quality as teas from the original groups.

In Europe, tea plants are cultivated on the Azores. Specifically, on the island of São Miguel Island, tea has been grown since the 18th century, though larger-scale production began only in the 19th century, when tea plantations replaced **orange orchards**. **Locals take pride in fully organic tea cultivation, as pesticides and other chemicals are unnecessary due to the island ecosystem, which lacks tea pests.** To this day, tea is grown at Chá Gorreana and Chá Porto Formoso.



4/ Global Distribution of the Tea Plant. Green indicates the native range; purple marks regions where the tea plant has been introduced and is cultivated on plantations.

vested—that is, the unopened bud and the next two young leaves, including the stem. On tea packaging, these teas are often labeled “**Fine**.” Another well-known designation is “**Imperial**,” which includes **only the downy terminal buds from the youngest shoots**. To enhance quality, these buds are sometimes added to black tea as “**Golden Tips**” or to green tea as “**Silver Tips**.” Leaves harvested without the terminal bud are considered lower-grade and are referred to as “sleeping” leaves. Older leaves reduce the overall quality of the resulting tea.

According to the processing method used on the tea leaves, tea is classified as either black or green. **Black tea is produced through a series of steps: withering, rolling, fermentation, drying, and grading.** First, the withered leaves are rolled, which breaks the cell walls and initiates oxidation. During fermentation, endogenous plant enzymes act on the leaves, leading to the breakdown of chlorophyll, proteins, and tannins, and to the release of caffeine. It is this carefully temperature- and humidity-controlled fermentation process that gives the leaves their characteristic color, shifting from green to a honey-red hue. Drying then transforms the leaves to the familiar reddish-brown to black shade. The final step is grading: pieces that fall through the sieves form broken tea, while intact leaves remain on the screens and are cut into uniform sizes. Various quality grades exist, based on the proportion of terminal leaves and buds, the precision of the rolling, and the extent of fermentation.

Green tea, by contrast, does not undergo withering or fermentation. The enzymes naturally present in the tea leaves are inactivated by steam, **preventing significant changes in chlorophyll or tannins**. The subsequent drying, rolling, and grading steps are similar to those used in black tea production. Other types of tea include, in addition to black and green tea, **white tea**, which is only **lightly fermented**, and **yellow tea**, which undergoes **an additional fermentation stage**. There is also **oolong**, a **partially fermented tea**, and **pu-erh (red tea)**, which is **fermented twice**. During one of the fermentation stages, microorganisms—typically fungi of the genera *Aspergillus*, *Rhizopus*, *Penicillium*, and others—are introduced into the process. The specific microbial mix influences both fermentation and the final chemical composition of the tea. 🍵

ACTIVE CONSTITUENTS

The tea plant contains a wide range of bioactive compounds. Identified constituents include **polyphenols** (catechin, epicatechin, epigallocatechin, epicatechin gallate, epigallocatechin gallate), **phenolic acids** (gallic, chlorogenic, caffeic, and ellagic acids), **flavonoids** (theaflavins and glycosides of quercetin, myricetin, and kaempferol), **alkaloids** (caffeine, theophylline, theobromine), both proteinogenic and non-proteinogenic amino acids (L-theanine, γ-aminobutyric acid, arginine, serine, glutamic acid), carbohydrates, organic acids, enzymes, aromatic compounds (linalool, geraniol, phenylacetaldehyde, nerolidol, benzaldehyde, and many others), as well as vitamins and minerals.



5/ Tea Plantation in Malaysia



6/ Tea Plantation on the Azorean Island of São Miguel Island , Chã Gorreana



7/ The Second-Largest Tea Plantation on the Azorean Island of São Miguel Island, Chã Porto Formoso



1/ The fruits of the cacao tree (*Theobroma cacao*) can weigh around 700 g.

THE CACAO TREE, COCOA, AND CHOCOLATE

If we wish to trace the origins of chocolate, which has become an inseparable part of our diet, we must—at least in theory—travel to the tropical regions of Central and South America. This is the place of origin of the tree bearing the Latin name *Theobroma cacao* (the cacao tree), a name bestowed by Carl Linnaeus, the founder of binomial nomenclature, and one that translates quite literally as “food of the gods.” The cacao tree was well known to and highly valued by the ancient Olmecs, Maya, and Aztecs. Today, however, cacao is no longer the exclusive privilege of rulers of long-fallen empires: large-scale cultivation of cacao trees has spread throughout the tropics worldwide, and cacao can now be found in an immense variety of foods. What earned the cacao tree such an exalted status in ancient times—and what do the latest scientific studies have to say about it today?



2/ The flower of the cacao tree is bisexual, with a pink calyx and a whitish corolla.



3/ The flowers of the cacao tree grow directly on the branches or trunk of the tree; they are cauliflorous.

A Brief History and the Discovery of Cacao by Europeans

The history of knowledge about the cacao tree is quite complex, full of mysteries and speculation. **Traces of theobromine have been found on Olmec vessels dating back to around 1,500 BCE.** It is believed that the Olmecs of southern Mexico were likely the first to discover it. The Maya acquired knowledge of cacao from the Olmecs, not only consuming it regularly—often mixed with chili peppers and honey—but also venerating it. For the Aztecs, who received cacao beans as tribute from surrounding rulers and later conquered territories where the native population already knew the cacao tree, the beans were more valuable than gold and were used as currency. The most famous cacao lover among them was their last ruler, Montezuma II.

The first European to encounter cacao was probably Christopher Columbus, who observed indigenous people with a canoe full of cacao beans and realized that they were used as currency. His young son wondered why the natives guarded such a thing as if it were the apple of their eye. One theory claims that Columbus brought cacao beans to Europe as early as 1502. However, after the conquest of the Aztec Empire in 1521, it was more likely the Spanish conqueror Hernán Cortés who, in 1528, presented cacao to the Spanish king. From that time onward,

cacao gradually began to conquer the world. From cacao, it was only a short step to chocolate as we know it today.

Origin and Varieties of the Cacao Tree

The precise origin of the cacao tree (*Theobroma cacao*) is not known. Four regions have traditionally been suggested: the upper Amazon, the upper Orinoco basin (northeastern Colombia, northwestern Venezuela), the foothills of the Andes (northwestern Colombia), and Central America (between southern Mexico and Guatemala).

Various “varieties” of cacao have existed for a long time, later distinguished by morphological and flavor differences. **Traditionally, two main varietal groups are recognized, which later gave rise to a third, hybrid group.** The so-called **Criollo** likely originated in the northern regions of South America and spread to Central America, where it was first encountered by the Spanish. **It is characterized by fruits with thin shells (pericarps) and beans that are lighter in color and have a milder flavor; it is considered the highest-quality cacao,** though it produces lower yields and is less resistant.

The second group, **Forastero**, comes from the Amazon basin and bears fruits with harder pericarps and dark purple, more bitter beans. The third group, **Trinitario**, emerged in the 18th century on the island of Trinidad (near Venezuela) as a hybrid between **Criollo** and **Forastero**. Modern genetic studies, however, have revealed that **there are many more genetically distinct groups of cacao**, such as Marañón, Curaray, Iquitos, Nanay, Contamana, Amelonado, Purús, Nacional, and Guiana, as well as newly disco-



4/ Yellow cacao pods with a white inner pericarp and five separate compartments containing seeds (so-called cacao beans) surrounded by a whitish pulp.

1) Stimulating Plants



5/ A split cacao pod reveals its contents: cacao beans surrounded by pulp, which can also be eaten as a refreshing fruit.

vered varieties in Bolivia, Peru, and Colombia. The current genetic structure of cultivated cacao trees is, however, undoubtedly far more complex, as countless historical crossbreeding events have occurred among these groups during their spread to different growing regions.

Traditional Uses of the Cacao Tree and Its Cultivation Today

It was likely not only the intriguing flavor but also the nutritional properties and beneficial effects that led indigenous peoples to pay such close attention to cacao beans. While in the northern regions of its range the indigenous peoples further processed the beans into foods and beverages, in the lower Amazon they primarily used the cacao tree in its fresh form, as a fruit. Due to the cacao tree's requirements for high temperatures (optimal range: maximum annual average temperature 30–32 °C, minimum annual average temperature 18–21 °C) and high humidity (air humidity during the day up to 100%, at night 70–80%), **its cultivation is limited to tropical regions**. Similar to many other crops, cacao is now predominantly grown far from its original homeland; today, **most of the world's production comes from Africa, for example, the Ivory Coast**. If you want to see a cacao tree locally, the option is to visit a botanical garden that cultivates it.

Active Compounds in Cacao Beans

Raw cacao beans are composed primarily of fat, which can make up **40–50% of their weight** in the form of cocoa butter, consisting mainly of oleic, palmitic, and stearic acids, with smaller amounts of linoleic acid. Another important component is **polyphenols, which can constitute up to 10% of the dry weight and include catechins (37%), anthocyanins (4%), and proanthocyanidins (58%)**. These polyphenols are responsible for the initial bitterness of cacao, which is significantly reduced (up to tenfold) during processing, but it is precisely these phenolic antioxidants—abundant in cacao compared to other foods—that provide health benefits. The nitrogenous compounds in cacao include proteins and methylxanthine alkaloids such as **theobromine and caffeine**. Among the minerals, cacao is rich in **potassium, phosphorus, copper, iron, zinc, and magnesium**.

Potential Health Effects of Consuming Cacao

Is chocolate healthy or not? This is a frequently discussed topic in the media, but the answer is, of course, somewhat more nuanced than a simple yes or no.

Assessing the health effects of any food is methodologically complex.

Chocolate with a high cocoa content contains numerous valuable compounds that can exert certain beneficial biological effects in the body. In contrast, sweet chocolates with low cocoa content and a higher proportion of other ingredients, including sugar, are considered less healthy and less suitable for regular consumption, even though they are undoubtedly more appealing to most of us.

High-cocoa-content chocolates (containing cocoa solids and cocoa butter) are less common in markets; their drawbacks are bitterness and relatively high price. However, their popularity is growing worldwide. Encouragingly, small “bean-to-bar” chocolatiers are emerging locally, aiming to produce the highest-quality chocolate possible.

So, what do research studies say about consuming cocoa-based products?

Potential Cardiovascular Effects of Cacao

Consumption of foods rich in cacao compounds may **positively influence blood pressure, insulin resistance, and vascular function**. The polyphenolic components of cacao activate NO synthase, an enzyme in the vascular endothelium that produces nitric oxide (NO), resulting in **vasodilation and a reduction in blood pressure**. Clinical studies suggest that moderate chocolate consumption may

offer a protective effect against the risk of myocardial infarction and stroke. However, excessive consumption—often associated with higher sugar intake—can negate these beneficial effects.

Potential Antidiabetic and Anti-Obesity Effects of Cacao

Both type 1 and type 2 diabetes mellitus are serious conditions in which proper nutrition and adherence to dietary guidelines play a crucial role. Cacao and its **flavanols may help regulate glucose transport and reduce oxidative stress and inflammation in insulin-sensitive tissues** such as the liver, adipose tissue, and skeletal muscles. Clinical studies have indicated a **preventive effect of cacao on the development of type 2 diabetes, primarily linked to a higher intake of polyphenolic compounds**. However, these compounds are present in only small amounts in most common cacao products, including chocolate. Higher consumption of ordinary chocolate showed no preventive effect against type 2 diabetes and, in fact, had negative impacts on metabolic indicators. Therefore, only small amounts of high-quality, sugar-free chocolate can be recommended. Similar findings have been observed in studies related to obesity, including cases with excess body fat despite normal body weight. In these studies, consumption of dark chocolate with a high cocoa content was associated with reductions in total cholesterol and LDL cholesterol. Additionally, **dark chocolate consumption may have beneficial effects on gut microbiota**.

Cacao and Allergies

The effects of cacao on allergies are ambivalent. Its anti-inflammatory properties may help alleviate allergy symptoms in most people. On the other hand, cacao can be a food allergen for certain individuals.

THE CACAO TREE

Theobroma cacao from the Malvaceae family and the Byttnerioideae subfamily is a small evergreen tree reaching up to 8 meters in height, with a robust brownish or grayish trunk up to 30 cm in diameter and long, entire leaves that are red when young and later turn dark green. Its bisexual flowers grow directly on the trunk or thick branches, a phenomenon known as cauliflory. Wild plants are predominantly cross-pollinating, whereas cultivated varieties are self-pollinating. The fruit is a pod up to 30 cm long, yellow, brown, or reddish in color, with an outer pericarp. Inside, it is divided into five sections containing 4–14 seeds, approximately 2 cm long, known as cacao beans, surrounded by a whitish pulp.

In total, **22 botanical species of cacao are recognized, with several subspecies**. Notable examples include the Peruvian cacao tree (*Theobroma bicolor*), which grows from northern South America to southern Mexico. Its seeds contain more fat and less theobromine. The large-flowered cacao tree (*T. grandiflora*), which can produce fruits weighing up to 1 kg, grows mainly in Brazil, but its range extends into Colombia and Ecuador.



6/ Roasted Cacao Beans

Psychological Effects (Chocoholism) and the Sexual Aspects of Cacao Consumption

Humans are naturally prone to various indulgences, and chocolate addiction—sometimes called chocoholism—is recognized as a real phenomenon. Studies suggest that up to 40% of women and 15% of men in Western societies may be affected. Biologically, **this is linked to increased carbohydrate intake; elevated tryptophan transport leads to higher serotonin production in the brain, generating feelings of pleasure and well-being**. Cacao is also associated with aphrodisiac effects, attributed to a combination of compounds it contains. Three unsaturated N-acyl ethanolamines, which mimic endocannabinoids, can activate cannabinoid receptors or raise anandamide levels. Anandamide, together with caffeine and theobromine, contributes to a sense of bliss, with serotonin also playing a role in the overall effect.

Quo Vadis, Cacao?

It is undeniable that chocolate has conquered the world and gained countless fans. While consuming standard chocolate bars—low in cacao content but high in sugar, milk, and other ingredients—bears little resemblance to the sacred rituals of ancient indigenous peoples, many people cannot imagine life without it. Are these effects due to bioactive compounds beneficial to our body, or are they simply addictive substances? Scientific research on this topic is still limited and has often focused on pure cacao, rather than commercially sold chocolate. **Industrial production, chemical processing, and attempts to substitute cacao with cheaper ingredients result in lower polyphenol content, which reduces the health benefits**. Hopefully, the availability of high-quality chocolate will continue to expand. In the meantime, we can enjoy cacao in other forms—such as unsweetened cacao drinks, tasting raw cacao beans, roasting our own, or even attempting to make homemade chocolate. Perhaps this is the best way to appreciate cacao. Meanwhile, we can look forward to further studies on its health effects. 🌱



THE COFFEE PLANT

From Cofee to Evolution

1/ Coffee is one of the world's most popular stimulating beverages. It all begins with the harvest of coffee cherries and the roasting of their seeds. Pictured here is the most widely grown Arabica, cultivated in a range of locally specific cultivars.

What would the answer be to the question: without which plant or organism (excluding animals) can you not imagine your life? It would likely depend heavily on the person asked. Given humanity's affinity for vices—often, unfortunately, life-threatening ones—we might hear answers ranging from tobacco to marijuana. Alcohol lovers would likely swear by yeast, while the average thoughtful person might mention the tea plant or cacao tree, but most often, the coffee plant. Indeed, without the boost from a cup of coffee, many people simply cannot imagine their daily lives. But what do we actually know about this plant originating from Ethiopia, and what conclusions have the latest research studies reached? Is coffee consumption healthy?

Characteristics, Origin, and Evolution of the Arabica Coffee Plant

The coffee plant belongs to the madder family (Rubiaceae) and **originates from Ethiopia, where wild populations still thrive in the mountainous regions of the southwest**. It is a tree or shrub bearing strongly fragrant, white flowers that are bisexual and self-pollinating. **The fruit is a drupe** that turns red to purple when ripe and typically contains two seeds (one is sometimes stunted), covered by a hard seed coat. Roasting these seeds creates the foundation for preparing coffee. **Coffea arabica**, commonly known as **Arabica**, is the primary source of this valuable agricultural commodity, followed by **Coffea canephora** (syn. *C. robusta*), known as **Robusta**. It is cultivated in tropical and subtropical regions, with Brazil, Vietnam, and Colombia being the largest producers. While the majority of coffee beans are grown in the Southern Hemisphere, the most coffee is consumed in the Northern Hemisphere.

The genus *Coffea* encompasses 124 species. Native populations of *Coffea arabica* are threatened by climate change, pests and diseases, deforestation, and the introduction of non-native genes from cultivated varieties. It is estimated that more than half of wild species are threatened with extinction.

Coffea arabica is the only known allopolyploid species in this genus (Greek allos = other, polyploid = having multiplied sets of chromosomes). It is **tetraploid (possessing four sets of chromosomes instead of two)**, whereas other species are diploid. **Inter-specific hybridization, as a significant evolutionary force, played a crucial role in its formation.**

According to the latest molecular study, *Coffea arabica* originated from the hybridization of the aforementioned Robusta (*C. canephora*) and the species *C. eugenioides* sometime between 1.08 million and 543,000 years ago. **Besides *Coffea arabica*, the only other self-pollinating species are *C. heterocalyx* and *C. anthonyi*.**



2/ Coffee flowers emit a strong fragrance.



3/ The fruit of the coffee plant is a drupe, usually containing two seeds protected by a hard seed coat.

COFFEE IN THE LIGHT OF RECENT STUDIES

- Coffee with a higher Robusta (*Coffea canephora*) content—and therefore higher caffeine levels—appears to potentially increase total cholesterol.
- Coffee consumption may boost the production of SIRT1, a protein crucial for various cellular processes, such as DNA repair or the maintenance of telomere length.
- Green coffee bean extract designated as CGA-7, containing seven isomers of chlorogenic acid, was found to reduce body weight, BMI, and body fat.
- A simulation of coffee consumption using a colorectal cancer cell line demonstrated antioxidant and anti-inflammatory effects *in vitro*.
- Caffeic acid and 5-caffeoylquinic acid inhibited cell growth in a colorectal cancer cell line.
- Caffeine exhibited cytotoxic effects, reducing cell division and viability in breast cancer cell lines.
- Genetic predispositions can influence coffee metabolism and its role in disease development. For instance, in individuals with a high genetic risk for dementia, coffee increased the risk of developing Alzheimer's disease. High consumption of instant coffee was also associated with an increased risk of dementia and Alzheimer's disease.
- Green coffee bean extract showed a neuroprotective effect in rats in a simulation of Alzheimer's disease.

Bioactive Compounds and Effects

The coffee plant contains a range of fascinating bioactive substances found **in both its leaves and fruits**, with the alkaloid caffeine being the most famous. Other substances include **polyphenolic compounds, hormones, sesquiterpenoids, and amino acids**. Coffee also contains **nicotinic acid as well as the hormones melatonin and serotonin**. Melanoidin polymer compounds are formed from sugars and amino acids via the Maillard reaction during the roasting of coffee beans (this is the same reaction that causes pastries to brown during baking).

Coffee also contains **cinnamic acid** (incidentally, a substance of interest to the perfume industry, which uses it to produce esters for floral scents, though it can also be produced synthetically) and **cinnamaldehyde** (cinnamon aldehyde, which can be used as a flavoring agent or in perfumery, but also acts as an insecticide and fungicide). **Phenolic compounds** include, for example, quercetin, as well as vanillic, tannic, chlorogenic, caffeic, ferulic, and p-coumaric acids. The effects of these substances can be **anti-oxidant, anti-inflammatory, antidiabetic, cardioprotective, neuroprotective, or antimicrobial**. The bioactive properties of coffee are attributed primarily to **chlorogenic acid, the alkaloids caffeine and trigonelline, melanoidins, cafestol, and kahweol** (both diterpenoids are present mainly in unfiltered coffee, as paper filters reportedly trap them).

Coffee is, of course, known primarily for its **stimulating effects**. However, alongside positive effects, excessive intake of coffee (or caffeine) can cause anxiety, headaches, insomnia, migraines, tachycardia, and elevated blood pressure. Coffee can also irritate the stomach and digestive system; it is not suitable for children, pregnant women, or those with liver disorders. Regarding the positive effects of coffee, we must bear in mind that they can vary based on genetic predispositions, other lifestyle factors, and **the method of preparation, which influences the final composition**. However, according to current knowledge, moderate consumption should not be harmful to the average person.

Why Not Grow Your Own Coffee?

The coffee plant can be grown successfully indoors; it does not tolerate direct scorching sunlight or temperatures below 50°F (10°C). After a few years of growth, the small tree—which tolerates pruning quite well—will reward you with intoxicatingly fragrant flowers. After patiently waiting for the drupes to ripen, you can even prepare your own coffee. 🌿



Plants as Superfoods



PLANTS AS SUPERFOODS

Helpers on the Path to the Health

Superfoods. A buzzword we hear at every turn these days. But do you know what superfoods actually are? Is it merely a marketing gimmick, or does this label truly represent foods we should get to know and incorporate into our diet? We have prepared a new series for you that provides the key facts—the final decision is up to you.

Genetics, Epigenetics, and Our Health

Every person is a unique combination of genes. However, **genetic information (genotype) is influenced by a wide range of factors that can lead to different manifestations (phenotype).** The balance between the hereditary component and environmental influence varies for different diseases, as there are distinct types of inheritance, various regulatory factors, and epigenetic changes (such as DNA methylation or histone modifications) that influence gene expression.

1/ The most important bioactive compounds in green tea are polyphenolic substances known as catechins. The effects of green tea can include antibacterial, antidiabetic, neuroprotective, and anticancer properties. However, the use of pesticides on tea plantations remains an issue. The close-up shows flowering tea plants on the island of São Miguel Island in the Azores—one of only two tea plantations still operating in Europe, where pesticides are not required.

2) Plants as Superfoods



2/ Chia. The seeds of *Salvia hispanica* have recently become virtually a fashion trend in the realm of “health food.” Yet, as with any superfood, caution must be exercised regarding dosage.

Epigenetic changes act as a layer above the genetic information in the DNA itself and play a crucial role in embryonic and fetal development—meaning that how our bodies function in adulthood is determined as early as pregnancy. However, epigenetic factors also possess their own heritability, which is the subject of the latest research.

We are only at the beginning of understanding the extent of interactions between various environmental factors, the genome (the set of genes in DNA), gene expression regulators at various levels, and the epigenome (the set of changes to DNA and histones—nucleoproteins that form a complex with DNA called chromatin). **Nevertheless, it is clear that diet is one of the factors influencing the proper functioning of cells, tissues, and ultimately the entire organism.**

A Helper on the Path to Health

“Let food be the medicine and medicine be the food,” Hippocrates declared long ago, and it seems this ancient Greek “Father of Medicine” was not far from the truth. Of course, human health can also be influenced by other factors, such as stress, smoking, alcoholism, other drug dependencies, or a lack of physical activity. Another factor—a polluted environment—is often intrinsically linked to food intake; contaminated water (containing pesticides and residues of medications, including hormones, analgesics, and antibiotics) or chemical residues in the soil can easily become part of our daily diet. As if these substances were not enough on their own, the ingredients and additives used by the food industry to manufacture many of its products are certainly not guaranteed to be free of negative health effects.

A proper diet can profoundly impact our health; by eliminating the intake of harmful toxins and increasing our consumption of beneficial bioactive compounds, we can directly influence how our bodies function. The latest trend has ushered in the era of **so-called superfoods (also known as functional foods)**, which, according to some promoters and sellers, are supposed to act as an elixir of good health.

While there is not yet sufficient evidence to support



3/ Sea Buckthorn. A thorny path leads to the harvest of these “berries” (false drupe), and the result is decidedly tart. However, the overall impression is redeemed by the abundance of vitamins in this fruit and its other healing properties, such as those of sea buckthorn oil.

Vážení čtenáři, právě jste dočetli ukázkou z knihy ***Plants for health and Vitality***.
Pokud se Vám ukázka líbila, na našem webu si můžete zakoupit celou knihu.