

The **history of coffee** has been recorded as far back as the [ninth century](#).<sup>[1]</sup> At first, [coffee](#) remained largely confined to [Ethiopia](#), where its native beans were first cultivated by Ethiopian highlanders. However, the [Arab](#) world began expanding its trade horizons, and the beans moved into [Yemen](#), where until ca 1700 the major emporium was [Mocha](#), and thence to [North Africa](#) and were mass-cultivated. From there, the beans entered the [Indian](#) and [European](#) markets, and the popularity of the beverage spread.



☐  
Palestinian women grinding coffee the old fashioned way. 1905.

## Origins

### Etymology

The word "coffee" entered English in [1598](#) via Dutch *koffie*.<sup>[2]</sup> This word was created via [Turkish](#) *kahve*, the Turkish pronunciation [Arabic](#) *qahwa*, a truncation of *qahhwat al-bun* or *wine of the bean*. One possible origin of the name is the [Kingdom of Kaffa](#) in [Ethiopia](#), where the coffee plant originated; its name there is *bunn* or *bunna*.

### First uses

**Legendary accounts.** There are several legendary accounts of the origin of the drink itself. One account involves the Yemenite Sufi mystic Shaikh ash-Shadhili. When traveling in Ethiopia, the legend goes, he observed goats of unusual vitality, and, upon trying the berries that the goats had been eating, experienced the same vitality. A similar "[Legend of Dancing Goats](#)" attributes the discovery of coffee to an Ethiopian goatherder named [Kaldi](#). The story of Kaldi did not appear in writing until 1671, and these stories are considered to be apocryphal.<sup>[3]</sup>

It is supposed that the Ethiopians, the ancestors of today's [Oromo](#) tribe, were the first to have recognized the energizing effect of the native coffee plant.<sup>[3]</sup> Studies of [genetic diversity](#) have been performed on [Coffea arabica](#) varieties, found to be of low diversity but which retained some residual heterozygosity from ancestral materials, and closely-related diploid species [Coffea canephora](#) and [C. liberica](#).<sup>[4]</sup> However, no direct evidence has ever been found revealing exactly where in Africa coffee grew or who among the natives might have used it as a stimulant or even known about it there earlier than the seventeenth century.<sup>[3]</sup> The earliest credible evidence of either coffee drinking or knowledge of the coffee tree appears in the middle of the fifteenth century, in the Sufi monasteries of the Yemen in southern Arabia.<sup>[3]</sup> It was in Yemen that coffee

beans were first roasted and brewed as they are today. From Mocha, coffee spread to [Egypt](#) and North Africa,<sup>[5]</sup> and by the 15th century, it had reached the rest of the Middle East, [Persia](#) and [Turkey](#). From the [Muslim world](#), coffee drinking spread to [Italy](#), then to the rest of [Europe](#), and coffee plants were transported by the Dutch to the [East Indies](#) and to the Americas.<sup>[6]</sup>

## The Muslim world



[Syrian Bedouin](#) from a beehive village in [Aleppo](#), [Syria](#), sipping the traditional murra (bitter) coffee, [1930](#).

The earliest mention of coffee noted by the literary coffee merchant Philippe Sylvestre Dufour<sup>[7]</sup> is a reference to *bunchum* in the works of the 10th century CE [Persian](#) physician [Muhammad ibn Zakariya al-Razi, known as Rhazes](#) in the West,<sup>[8]</sup> but more definite information on the preparation of a beverage from the roasted coffee berries dates from several centuries later.

The most important of the early writers on coffee was [Abd al-Qadir al-Jaziri](#), who in 1587 compiled a work tracing the history and legal controversies of coffee entitled *Umdat al safwa fi hill al-qahwa*.<sup>[9]</sup> He reported that one [Sheikh](#), Jamal-al-Din al-Dhabhani, [mufti](#) of Aden, was the first to adopt the use of coffee (circa 1454). Coffee's usefulness in driving away sleep made it popular among Sufis. A translation<sup>[10]</sup> traces the spread of coffee from Arabia Felix (the present day Yemen) northward to [Mecca](#) and [Medina](#), and then to the larger cities of [Cairo](#), [Damascus](#), [Baghdad](#), and [Istanbul](#).

Coffee beans were first exported from Ethiopia to [Yemen](#). Yemeni traders brought coffee back to their homeland and began to cultivate the bean.<sup>[11]</sup> The first coffeehouse opened in Istanbul in 1554.<sup>[12]</sup> Coffee was at first not well received. In 1511, it was forbidden for its stimulating effect by conservative, orthodox imams at a theological court in [Mecca](#)<sup>[citation needed]</sup>. However, the popularity of the drink led these bans to be overturned in 1524 by an order of the [Ottoman Turkish Sultan Selim I](#), with [Grand Mufti Mehmet Ebussuud el-Imadi](#) issuing a celebrated *fatwa* allowing the consumption of coffee.<sup>[13]</sup> In [Cairo](#), Egypt, a similar ban was instituted in 1532, and the coffeehouses and warehouses containing coffee beans were sacked.<sup>[14]</sup>

Similarly, coffee was banned by the [Ethiopian Orthodox Church](#) some time before the 17th century.<sup>[15]</sup> However, in the second half of the 19th century, Ethiopian attitudes softened towards coffee drinking, and its consumption spread rapidly between 1880 and 1886; according to [Richard Pankhurst](#), "this was largely due to [Emperor] [Menilek](#), who himself drank it, and to [Abuna Matewos](#) who did much to dispel the belief of the clergy that it was a Muslim drink."<sup>[16]</sup>

## Europe



Dutch engraving of Mocha in 1692

Coffee was noted in Ottoman [Aleppo](#) by the German physician botanist [Leonhard Rauwolf](#), the first European to mention it, as *chaube*, in 1573; Rauwolf was closely followed by descriptions from other European travellers.<sup>[17]</sup> Coffee was first imported to Italy from the [Ottoman Empire](#). The vibrant trade between [Venice](#) and the Muslims in North Africa, Egypt, and the East brought a large variety of African goods, including coffee, to this leading European port. Venetian merchants introduced coffee-drinking to the wealthy in Venice, charging them heavily for the beverage. In this way, coffee was introduced to Europe. Coffee became more widely accepted after controversy over whether it was acceptable during [Lent](#) was settled in its favor by [Pope Clement VIII](#) in 1600, despite appeals to ban the drink. The first European [coffee house](#) (apart from those in the Ottoman Empire, mentioned above) was opened in Venice in 1645.<sup>[6]</sup>

## England

Largely through the efforts of the [British East India Company](#) and the [Dutch East India Company](#), coffee became available in England no later than the 16th century according to [Leonhard Rauwolf](#)'s 1583 account. The first [coffeehouse](#) in [England](#) was opened in St. Michael's Alley in [Cornhill](#). The proprietor was Pasqua Rosée, the servant of Daniel Edwards, a trader in Turkish goods. Edwards imported the coffee and assisted Rosée in setting up the establishment. Oxford's [Queen's Lane Coffee House](#), established in 1654, is still in existence today. By 1675, there were more than 3,000 coffeehouses throughout England.<sup>[18]</sup> Popularity of coffeehouses spread rapidly in Europe, and later, America.

The banning of women from coffeehouses was not universal, but does appear to have been common in Europe. In Germany women frequented them, but in England they were banned<sup>[19]</sup>. Many believed coffee to have several medicinal properties in this period. For example, a [1661 tract](#) entitled "A character of coffee and coffee-houses", written by one "M.P.", lists some of these perceived virtues:

“ 'Tis extolled for drying up the Crudities of the Stomack, and for expelling Fumes out of the Head. Excellent Berry! which can cleanse the English-man's Stomak of Flegm, and expel Giddinesse out of his Head. ”

Not everyone was in favour of this new commodity, however. For example, the anonymous [1674](#) "Women's Petition Against Coffee" declared:

“ ...the Excessive Use of that Newfangled, Abominable, Heathenish Liquor called *COFFEE* [...] has [...] *Eunucht* our Husbands, and Crippled our more kind *Gallants*, that they are become as *Impotent*, as Age.[\[2\]](#) ”

## France

[Antoine Galland](#) (1646-1715) in his aforementioned translation described the Muslim association with coffee, tea and chocolate: "We are indebted to these great [Arab] physicians for introducing coffee to the modern world through their writings, as well as sugar, tea, and chocolate." Galland reported that he was informed by Mr. de la Croix, the interpreter of [King Louis XIV](#) of France, that coffee was brought to Paris by a certain [Mr. Thevenot](#), who had travelled through the East. On his return to that city in 1657, Thevenot gave some of the beans to his friends, one of whom was de la Croix. However, the major spread of the popularity of this beverage in Paris was soon to come. In 1669, [Soleiman Agha](#), Ambassador from Sultan [Mehmed IV](#), arrived in Paris with his entourage bringing with him a large quantity of coffee beans. Not only did they provide their French and European guests with coffee to drink, but they also donated some beans to the royal court. Between July 1669 and May 1670, the Ambassador managed to firmly establish the custom of drinking coffee among Parisians.



[Melange](#) in Vienna

## Austria

The first coffeehouse in [Austria](#) opened in [Vienna](#) in 1683 after the [Battle of Vienna](#), by using supplies from the spoils obtained after defeating the [Turks](#). The officer who received the coffee beans, Polish military officer of Ukrainian origin [Jerzy Franciszek Kulczycki](#), opened the coffee house and helped popularize the custom of adding sugar and milk to the coffee. Until recently, this was celebrated in Viennese coffeehouses by hanging a picture of Kulczycki in the window. *Melange* is the typical Viennese coffee, which comes mixed with hot foamed milk and a glass of water.

## Netherlands

The race among Europeans to make off with some live coffee trees or beans was eventually won by the [Dutch](#) in the late 17th century, when they allied with the natives of [Kerala](#) against the

[Portuguese](#) and brought some live plants back from [Malabar](#) to [Holland](#), where they were grown in greenhouses. The Dutch began growing coffee at their [forts](#) in Malabar, India, and in 1699 took some to [Batavia](#) in [Java](#), in what is now [Indonesia](#).

Within a few years the Dutch colonies (Java in Asia, [Surinam](#) in Americas) had become the main suppliers of coffee to Europe

## Americas



 Jean-Jacques Dessalines Empereur d'Haiti

[Gabriel de Clieu](#) brought coffee seedlings to [Martinique](#) in the Caribbean circa [1720](#).<sup>[20]</sup> Those sprouts flourished and 50 years later there were 18,680 coffee trees in Martinique enabling the spread of coffee cultivation to [Haiti](#), [Mexico](#) and other islands of the [Caribbean](#).

Coffee also found its way to the island of [Réunion](#) in the [Indian Ocean](#) known as the [Isle of Bourbon](#). The plant produced smaller beans and was deemed a different variety of Arabica known as *var. Bourbon*. The Santos coffee of [Brazil](#) and the [Oaxaca](#) coffee of Mexico are the progeny of that Bourbon tree. Circa 1727, the [Emperor of Brazil](#) sent [Francisco de Mello Palheta](#) to [French Guinea](#) to obtain coffee seeds to become a part of the coffee market. Francisco initially had difficulty obtaining these seeds yet he captivated the French Governor's wife and she in turn, sent him enough seeds and shoots which would commence the coffee industry of Brazil. In 1893, the coffee from Brazil was introduced into [Kenya](#) and [Tanzania](#) (Tanganyika), not far from its place of origin in Ethiopia, 600 years prior, ending its transcontinental journey.<sup>[21]</sup>

The French colonial plantations relied heavily on African slave laborers.

## Production

The first step in Europeans' wresting the means of production was effected by [Nicolaes Witsen](#), the enterprising burgomaster of Amsterdam and member of the governing board of the [Dutch East India Company](#) who urged [Joan van Hoorn](#), the Dutch governor at [Batavia](#) that some coffee

plants be obtained at the export port of [Mocha](#) in [Yemen](#), the source of Europe's supply, and established in the Dutch East Indies;<sup>[22]</sup> the project of raising many plants from the seeds of the first shipment met with such success that the Dutch East India Company was able to supply Europe's demand with "Java coffee" by 1719.<sup>[23]</sup> Encouraged by their success, they soon had coffee plantations in [Ceylon](#) [Sumatra](#) and other Sunda islands.<sup>[24]</sup> Coffee trees were soon grown under glass at the [Hortus Botanicus of Leiden](#), whence slips were generously extended to other botanical gardens. Dutch representatives at the negotiations that led to the [Treaty of Utrecht](#) presented their French counterparts with a coffee plant, which was grown on at the *Jardin du Roi*, predecessor of the [Jardin des Plantes](#), in Paris.

The introduction of coffee to the Americas was effected by [Captain Gabriel des Clieux](#), who obtained cuttings from the reluctant botanist [Antoine de Jussieu](#), who was loath to disfigure the king's coffee tree.<sup>[25]</sup> Clieux, when water rations dwindled during a difficult voyage, shared his portion with his precious plants and protected them from a Dutchman, perhaps an agent of the Provinces jealous of the Batavian trade.<sup>[26]</sup> Clieux nurtured the plants on his arrival in the West Indies, and established them in [Guadeloupe](#) and [Saint-Domingue](#) in addition to [Martinique](#), where a blight had struck the cacao plantations, which were replaced by coffee plantations in a space of three years. is attributed to France through its colonization of many parts of the continent starting with the Martinique and the colonies of the West Indies where the first French coffee plantations were founded.

The first coffee plantation in [Brazil](#) occurred in 1727 when Lt. Col. Francisco de Melo Palheta smuggled seeds, still essentially from the germ plasm originally taken from Yemen to Batavia,<sup>[27]</sup> from [French Guiana](#). By the 1800s, Brazil's harvests would turn coffee from an elite indulgence to a drink for the masses. Brazil, which like most other countries cultivates coffee as a commercial commodity, relied heavily on slave labor from [Africa](#) for the viability of the plantations until the [abolition](#) of slavery in 1888. The success of coffee in 17th-century Europe was paralleled with the spread of the habit of [tobacco smoking](#) all over the continent during the course of the [Thirty Years' War](#) (1618–48).

For many decades in the 19th and early 20th centuries, Brazil was the biggest producer of coffee and a virtual monopolist in the trade. However, a policy of maintaining high prices soon opened opportunities to other nations, such as [Colombia](#),<sup>[28]</sup> [Guatemala](#), [Nicaragua](#), [Indonesia](#) and [Vietnam](#), now second only to Brazil as the major coffee producer in the world. Large-scale production in Vietnam began following normalization of trade relations with the US in 1995.<sup>[29]</sup> Nearly all of the coffee grown there is Robusta.<sup>[30]</sup>

Despite the origins of coffee cultivation in Ethiopia, that country produced only a small amount for export until the Twentieth Century, and much of that not from the south of the country but from the environs of [Harar](#) in the northeast. The [Kingdom of Kaffa](#), home of the plant, was estimated to produce between 50,000 and 60,000 kilograms of coffee beans in the 1880s. Commercial production effectively began in 1907 with the founding of the inland port of [Gambela](#), and greatly increased afterwards: 100,000 kilograms of coffee was exported from Gambela in 1908, while in 1927-8 over 4 million kilograms passed through that port.<sup>[31]</sup> Coffee plantations were also developed in [Arsi Province](#) at the same time, and were eventually exported by means of the [Addis Ababa - Djibouti Railway](#). While only 245,000 kilograms were freighted

by the Railway, this amount jumped to 2,240,000 kilograms by 1922, surpassed exports of "Harari" coffee by 1925, and reached 9,260,000 kilograms in 1936.<sup>[32]</sup>

Australia is a minor coffee producer, with little product for export, but its coffee history goes back to 1880 when the first of 500 acres (2.0 km<sup>2</sup>) began to be developed in an area between northern New South Wales and Cooktown. Today there are several producers of Arabica coffee in Australia that use a mechanical harvesting system invented in 1981.

## The Story Of Coffee

The story of how coffee growing and drinking spread around the world is one of the greatest and most romantic in history. It starts in the Horn of Africa, in Ethiopia, where the coffee tree probably originated in the province of Kaffa. There are various fanciful but unlikely stories surrounding the discovery of the properties of roasted coffee beans. One story has it that an Ethiopian goatherd was amazed at the lively behaviour of his goats after chewing red coffee berries. What we know with more certainty is that the succulent outer cherry flesh was eaten by slaves taken from present day Sudan into Yemen and Arabia, through the great port of its day, Mocha, now synonymous with coffee. Coffee was certainly being cultivated in Yemen by the 15th century and probably much earlier than that.

Mocha was also the main port for the one sea route to Mecca, and was the busiest place in the world at the time. But the Arabs had a strict policy not to export any fertile beans, so that coffee could not be cultivated anywhere else. The coffee bean is the seed of the coffee tree, but when stripped of its outer layers it becomes infertile. The race to make off with some live coffee trees or beans was eventually won by the Dutch in 1616, who brought some back to Holland where they were grown in greenhouses.

Initially, the authorities in Yemen actively encouraged coffee drinking as it was considered preferable to the extreme side effects of *Kat*, a shrub whose buds and leaves were chewed as a stimulant. The first coffeehouses were opened in Mecca and were called 'kaveh kanes'. They quickly spread throughout the Arab world and became successful places where chess was played, gossip was exchanged, and singing, dancing and music were enjoyed. They were luxuriously decorated and each had an individual character. Nothing quite like the coffeehouse had existed before: a place where society and business could be conducted in comfortable surroundings and where anyone could go, for the price of coffee.

The Arabian coffeehouses soon became centres of political activity and were suppressed. Coffee and coffeehouses were subsequently banned several times over the next few decades, but they kept reappearing. Eventually a solution was found when coffeehouses and coffee were taxed.

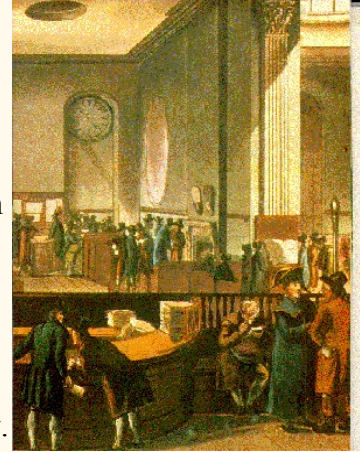
## COFFEE COMES TO ASIA

The Dutch were also growing coffee at Malabar in India, and in 1699 took some to Batavia in Java, in what is now Indonesia. Within a few years the Dutch colonies had become the main suppliers of coffee to Europe. Today Indonesia is the fourth largest exporter of coffee in the world.

## COFFEE COMES TO EUROPE

Venetian traders first brought coffee to Europe in 1615. This was a period when the two other great hot beverages also appeared in Europe. Hot chocolate was the first, brought by the Spanish from the Americas to Spain in 1528; and tea, which was first sold in Europe in 1610.

At first coffee was mainly sold by lemonade vendors and was believed to have medicinal qualities. The first European coffeehouse opened in Venice in 1683, with the most famous, Caffe Florian in Piazza San Marco, opening in 1720. It is still open for business today.



The largest insurance market in the world, Lloyd's of London, began life as a coffeehouse. It was started in 1688 by Edward Lloyd, who prepared lists of the ships that his customers had insured.

## COFFEE COMES TO THE AMERICAS

The first reference to coffee being drunk in North America is from 1668 and, soon after, coffee houses were established in New York, Philadelphia, Boston and other towns. The Boston Tea Party Of 1773 was planned in a coffee house, the Green Dragon. Both the New York Stock Exchange and the Bank of New York started in coffeehouses, in what is today the financial district known as Wall Street.

It was in the 1720s that coffee first came to be cultivated in the Americas, through what is perhaps the most fascinating and romantic story in the history of coffee.

Gabriel Mathieu de Clieu was a French naval officer serving in Martinique who in 1720, went to Paris on leave. With assistance and no little personal charm he acquired a coffee tree which he took with him on the ship back. The plant was kept in a glass case on deck to keep it warm and prevent damage from salt water. The journey was eventful, or at least Mr. Mathieu de Clieu's journal of the voyage was. Pirates from Tunis threatened the ship, there was a violent storm and the plant had to be tied down. Our hero faced an enemy on board who was jealous and tried to sabotage the plant. There was a violent struggle in which a branch was torn off, but the plant survived this horror.

Then the ship was becalmed and drinking water was rationed. De Clieu had his priorities right and gave most of his allowance of precious water to the coffee plant. It survived, as did he.

Finally, the ship arrived in Martinique and the coffee tree was re-planted at Preebear, where it was surrounded by a thorn hedge and watched over by slaves. It grew, and multiplied, and by 1726 the first harvest was ready. It is recorded that by 1777, there were between 18 and 19 million coffee trees on Martinique, and the model for a new cash crop that could be grown in the New World was in place.

But it was the Dutch who first started the spread of the coffee plant in Central and South America, where today it reigns supreme as the main continental cash crop. Coffee first arrived in

the Dutch colony of Surinam in 1718, to be followed by plantations in French Guyana and the first of many in Brazil at Para. In 1730 the British introduced coffee to Jamaica, where today the most famous and expensive coffee in the world is grown in the Blue Mountains. By 1825, South and Central America were on track towards their coffee destiny. That date is also important as it was when coffee was first planted in Hawaii which produces the only US coffee, and one of the finest.

## **COFFEE TODAY**

For North Americans, the world's largest consumers, Seattle is the new spiritual home of coffee. The wettest major city in the USA gave birth in the 1970s to a café or 'Latte' culture which swept the USA and has dramatically improved the general quality of the coffee Americans drink. Today, any public place in the USA will have one or more coffee carts, serving a variety of coffees, drinks and snacks.

This new found 'coffee culture' has started to spread to the rest of the world. To those countries with great coffee traditions of their own, such as Italy, Germany, and Scandinavia, added new converts to the pleasures of good coffee. Today it is possible to find good coffee in every major city of the world, from London to Sydney to Tokyo; tomorrow the world will drink more and more importantly, better coffee.

## **COFFEE IS A GLOBAL COMMODITY**

The importance of coffee in the world economy cannot be overstated. It is one of the most valuable primary products in world trade, in many years second in value only to oil as a source of foreign exchange to developing countries. Its cultivation, processing, trading, transportation and marketing provide employment for millions of people worldwide. Coffee is crucial to the economies and politics of many developing countries; for many of the world's Least Developed Countries, exports of coffee account for a substantial part of their foreign exchange earnings in some cases over 80%. Coffee is a traded commodity on major futures and commodity exchanges, most importantly in London and New York.

### **What is decaffeinated coffee?**

According to legislation within the EU markets decaffeinated coffee is a coffee with a caffeine content reduced to 0.1% or less in roasted coffee beans, and to 0.3% or less in soluble/instant coffee.

Decaffeinated coffee is available as a choice for those consumers who wish to enjoy the taste and aroma of coffee without experiencing the mild stimulant effects provided by the caffeine.

### **Cup Quality of Decaffeinated Coffee**

The cup quality of decaffeinated coffee is fully in line with that of regular coffee. Indeed, all the many different coffee varieties and origins retain their specific flavour properties.

### **The Decaffeination Processes**

The decaffeination processes are performed on green coffee beans in industrial plants.

There are four methods of decaffeination, according to which substance is used to extract the caffeine; Water – Ethyl Acetate – Supercritical or Liquid CO<sub>2</sub> – Methylene Chloride.

These four processing methods all share the basic stages of;

- Swelling the green coffee beans with water or steam in order to make the caffeine available for extraction
- Extracting the caffeine from the beans
- Steam stripping to remove all solvent residues from the beans (when applied) / regenerating adsorbents (when applied)
- Drying the decaffeinated coffee beans back to their normal moisture content
- Under carefully controlled process conditions, such as temperature, pressure and time, the caffeine extraction step is based on physical phase transport mechanisms. Due to the difference in concentration, the caffeine is diffused out of the cell structure into solvent surrounding the bean until the concentration of caffeine is the same inside and outside the beans.

### The Decaffeination Methods

What really distinguishes the four methods is the choice of substance used for extraction;

- **Water method;** When green coffee is immersed in water the caffeine content is dissolved and removed, but along with this much of the coffee's aromatic character can be lost. To overcome this drawback, the liquid is saturated with the water-soluble components of the coffee. The caffeine is subsequently removed from the solution using activated carbon or other adsorbents, which retain the caffeine, and the extract deprived of the caffeine can then be recycled.
- **Ethyl - Acetate method:** Ethyl - Acetate (EA) occurs in several natural products and contributes to the characteristic aroma of many fruit. EA is also found in varying concentrations in foodstuffs including green and roasted coffee. In the decaffeination process the combination of water and ethyl-acetate is used. In the extracting vessel the EA is circulated around the water soaked beans for extracting the caffeine. Then the mixture of water, ethyl-acetate and caffeine is drained from the extracting vessel. The extraction step is repeated several times, until the residual caffeine content is at or below the legal maximum level of 0,1%.
- **Supercritical Carbon Dioxide and Liquid Carbon Dioxide method:** CO<sub>2</sub> is a readily available substance of great purity, naturally available in the air we breath and in the sparkling water we drink. Under certain conditions it allows for a selective caffeine extraction and leaves most of the other coffee bean constituents unaltered.  
The use of carbon dioxide in its supercritical state (between its liquid and gaseous state) needs very high pressure – up to 250 atmospheres. This method requires large-scale production in order to be economically viable.  
Also, liquid CO<sub>2</sub> can be used for caffeine extraction with lower pressure and lower temperatures, wherefore a longer time is necessary to achieve the extraction.
- **Methylene Chloride (i.e. Dichloromethane-DCM) method:** DCM extracts the caffeine selectively and has a low boiling point. In the extracting vessel dichloromethane is circulated around the water soaked beans for extracting the caffeine. Then the mixture of DCM and caffeine is drained from the extracting vessel. The extraction step is repeated several times, until the residual caffeine content is at or below the legal maximum level of 0,1%. The process followed guarantees that possible solvent residues remain below the limits fixed by the European legislation.

### ROASTING

The green coffee beans have no flavour or aroma and are just a pale green shadow of their future dark brown selves. All of the flavour and aroma that we enjoy in coffee is created by roasting



the beans.

Green coffee beans are heated to between 180°C and 240°C for 8 to 15 minutes, depending on the degree of roast required. The longer the coffee is roasted the darker it becomes. During the roasting process moisture is lost and the bean "pops" audibly rather like popcorn. A chemical reaction takes place: starches are converted into sugar, proteins are broken down and the whole cellular structure of the bean is altered. The heating process precipitates the release of coffee oil, or what is called "cafeol", which is the essence of coffee.



This essence of coffee is what we enjoy in the cup. It is also volatile and water soluble, so once the coffee beans have been roasted until dark, the flavour can be damaged by moisture, light and especially by oxygen.

Roasting is one part art, one part science, and several parts judgment. It is a skill. Too much heat and the beans are roasted too dark and too much cafeol is burnt; not enough and the cafeol is not precipitated. In industrial quantities, the process is carefully controlled, but in smaller quantities, judgement is all. The higher the roast, the more uniform the resulting flavour.



The different kinds of roast include light or low, medium and dark or high, while various other terms, such as European, are used in the USA. Some beans are more appropriate for certain roasts. A light Ethiopian bean would lose its character if it was high roasted, while some Mexican beans can benefit from a high roast.

## MAKING COFFEE



There is no single best way to make coffee; each of us prefers one method to the rest. Coffee is an everyday part of our lives and it must above all fit our lifestyles and our pockets. Making coffee is both a ritual and a practical part of life. Unlike tea or cocoa, coffee lends itself readily to many different ways of making the infusion. All these methods share the basic principle which is to use hot water, to extract from the ground beans the natural essential oils, the cafeol, that give coffee its wonderful aroma and flavour. The resulting brew, or liquor, is a coffee infusion.

## ARAB OR TURKISH COFFEE

Although the coffee bean spread from Arabia to the rest of the world, the Arab method of making coffee did not. There is a fundamental difference between the Arab and other methods: the Arabs boil their coffee, traditionally, three times. Boiling coffee boils away the most delicate flavours, but it is a romantic way to make strong-tasting coffee. Arab coffee is made in an ibriq, a small copper pot with a long handle. Two teaspoons of finely-ground coffee plus one of sugar are added to a cup of water and the mixture is brought to the boil. The ibriq is taken off the heat as it comes to the boil, usually three times, and then it is poured out and drunk. A cardamom seed can also be added for flavour.

## **THE FILTER METHOD**

The drip or filter method is possibly the most widely used method today. Finely-ground coffee is placed in a paper or reusable cone-shaped unit and nearly boiling water poured on top. For best results, a small quantity of water should be poured on first to wet the grounds and speed up the release of caffeine. The resulting brew filters through the unit into a pot or mug and is ready to drink. The coffee grounds remain in the cone. There are electric versions which automate this process, including heating the water, and in general make a better or more consistent cup of coffee than the manual version. The filter method is used especially in Germany and the USA.

## **THE PLUNGER/CAFETIERE**

The plunger method, said to have been invented in 1933, extracts the most flavour from the ground beans. The pot is warmed, coarsely ground coffee is placed in the bottom, hot water is added to the grounds and stirred, then it is allowed to steep for three to five minutes, before the plunger is pushed down to separate the coffee grounds from the coffee infusion. This method is only slightly less convenient than the filter method and is today one of the two fastest growing ways to make fresh ground coffee. Cheaper pot models have nylon rather than stainless steel mesh to separate the grounds from the infusion, but they do not last as long.

## **THE JUG**

The jug method of making coffee is the simplest of all. The coffee should be quite coarsely ground and then the hot water added. It is somewhat like the cafetiere method, but without the convenience of the cafetiere's plunger to separate the coffee grounds from the infusion. The jug is not now widely used, although it is always a serviceable stop-gap method.

## **ESPRESSO AND CAPPUCCINO**

Today, espresso and cappuccino, which were invented in Italy, are the fastest growing methods of making coffee. All the other methods involve a 'natural' form of infusion, and for a small cost you can have a system that will make acceptable coffee. But not with espresso. Espresso machines force the hot water through very finely and compacted coffee and then into the cups below. Good espresso is expensive to make because in order to extract the greatest amount of flavour from the coffee, a high level of pressure is required and thus a high specification machine. Yet when making espresso, it is important not to over-extract the coffee, which means the machine should be switched off sooner, rather than later. While the coffee is still coming out as a golden brown liquid, it is perfect. This liquid is the 'crema', which lies on top of the black coffee underneath. The crema will dissipate a few minutes after the coffee is made, but in those few minutes it will tell you everything about the quality of the espresso. Too light, or too thick or too thin: all mean that the espresso is sub standard. Espresso can become like a religion to some people. And there certainly is a big difference between a really good espresso and a not so good one. How much we spend in terms of money or energy in seeking out the best is one of those lifestyle choices we all make for ourselves.

Espresso is the foundation of cappuccino; it is the coffee upon which a luxuriant structure of frothed and foamed milk is ladled and poured. A good espresso is less obvious under its head of frothed milk, but the quality of the coffee underneath is still an important factor. The milk, ideally semi-skimmed, is poured into a jug, into which a steam spout is placed. The steam control should not be turned on until the nozzle of the steam spout is under the surface of the milk. Once the steam is gurgling and bubbling under the milk, the jug should be moved around, or the milk will spoil. The aim is to aerate the milk and give it the consistency of whipped cream without burning it. It is essential that the cups are warm when the milk is poured in or the froth will deflate. They are normally stored upside down on top of the espresso machine. The combination of frothed and steamed milk is then poured and ladled onto the coffee in the cup, gently as though folding it in. The small amount of remaining milk is poured in also. And there we have the perfect cappuccino.

## **THE MOKA-NAPOLETANA**

No Italian home is without one or more mocha jugs of varying sizes, and no matter what you think of the coffee, their visual appeal is undeniable. Wonderfully designed double beaded stove-top pots, they combine the characteristics of espresso and percolator coffee. They force the water, which has come to the boil in the lower chamber, up through a tube and then down through the finely-ground coffee. Handled expertly they can satisfy coffee cravings and produce an adequate 'espresso type' coffee in under a minute.

## **THE PERCOLATOR**

The coffee percolator was a civilising influence in the American wild west; it was certainly widely used throughout the USA, where, until the recent coffee 'revolution', it was a standard piece of equipment in most homes. The percolator heats the coarsely ground coffee and cold water so that it boils and bubbles up into the top of the unit. It is an excellent way to have the relaxing sound of the coffee liquid burbling and gurgling, and to waft the aroma of coffee through the home, as all the volatile wonderful flavours go out of the percolator and into the air! There is possibly no worse way to make fresh coffee than this.

## **SOLUBLE, OR INSTANT COFFEE**

The first soluble "instant" coffee was invented in 1901 by Japanese-American chemist Satori Kato of Chicago. It was not marketed commercially until the launch of Nescafe in 1938. The quality and diversity of instant coffee have grown dramatically over the years, and we can make a good cup of coffee from today's products. Instant coffee has a number of advantages over fresh brewed coffee, including ease and convenience. It stays fresher longer, it is hard to damage the flavour, however hard you try, and most of all it is fast, cheap and clean. Instant coffee is manufactured, just like any other coffee, from ground beans. The first stage involves the preparation of a coffee concentrate from which the water is removed, either by heat, known as spray dried, or by freezing, to produce a soluble powder or granules. During the process of dehydration, the coffee essences may be lost, but these are captured and returned to the processed coffee.

## **FLAVOURED COFFEES**

An interesting and fast growing area of the market is flavoured coffees. Today there are over 100 different flavoured varieties available. While coffee connoisseurs may turn up their noses at the idea of spoiling the flavour of their sacred brew, there are definitely moments when a chocolate or cinnamon flavoured coffee is just right. Coffee is a wonderful taste itself, but also acts very well as the platform for many other flavours. Flavouring coffee is actually an old trick. In the Middle East it is traditional to add cardamom to coffee, while the practice of adding cinnamon has been widespread in Mexico for many years. The growth in popularity of flavoured coffee is proof of coffee's versatility and strength. The flavours are added directly to the beans by roasting them, then spraying them with a carrier oil and then the particular flavouring. Another way to make a cup of flavoured coffee is to add a syrup to hot brewed coffee. This makes an ideal summer coffee drink, which can be served cold, as can iced coffee: pre-made coffee which has been chilled with either ice cubes or crushed ice added. By far the most important flavouring added to coffee over the world is milk. Although milk is not added to Arabian coffee, and coffee purists tend not to add milk, most people find coffee more palatable with its addition.

## **Field Processing**

Coffee beans are the seeds of fruits which resemble cherries, with a red skin (the exocarp) when ripe. Beneath the pulp (the mesocarp), each surrounded by a parchment-like covering (the endocarp), lie two beans, flat sides together. When the fruit is ripe a thin, slimy layer of mucilage surrounds the parchment. Underneath the parchment the beans are covered in another thinner membrane, the silver skin (the seed coat). Each cherry generally contains two coffee beans; if there is only one it assumes a rounder shape and is known as a peaberry. Coffee beans must be removed from the fruit and dried before they can be roasted; this can be done in two ways, known as the dry and the wet methods. When the process is complete the unroasted coffee beans are known as green coffee.

## **DRY METHOD**

The dry method (also called the natural method) is the oldest, simplest and requires little machinery.

The method involves drying the whole cherry. There are variations on how the process may be carried out, depending on the size of the plantation, the facilities available and the final quality desired. The three basic steps, cleaning, drying and hulling, are described below.

Firstly, the harvested cherries are usually sorted and cleaned, to separate the unripe, overripe and damaged cherries and to remove dirt, soil, twigs and leaves. This can be done by winnowing, which is commonly done by hand, using a large sieve. Any unwanted cherries or other material not winnowed away can be picked out from the top of the sieve. The ripe cherries can also be separated by flotation in washing channels close to the drying areas.

The coffee cherries are spread out in the sun, either on large concrete or brick patios or on matting raised to waist height on trestles. As the cherries dry, they are raked or turned by hand to ensure even drying. It may take up to 4 weeks before the cherries are dried to the 12.5% maximum moisture content, depending on the weather conditions. On larger plantations, machine-drying is sometimes used to speed up the process after the coffee has been pre-dried in the sun for a few days.

The drying operation is the most important stage of the process, since it affects the final quality of the green coffee. A coffee that has been overdried will become brittle and produce too many broken beans during hulling (broken beans are considered defective beans). Coffee that has not been dried sufficiently will be too moist and prone to rapid deterioration caused by the attack of fungi and bacteria.

The dried cherries are stored in bulk in special silos until they are sent to the mill where hulling, sorting, grading and bagging take place. All the outer layers of the dried cherry are removed in one step by the hulling machine.

The dry method is used for about 95% of the Arabica coffee produced in Brazil, most of the coffees produced in Ethiopia, Haiti and Paraguay, as well as for some Arabicas produced in India and Ecuador. Almost all Robustas are processed by this method. It is not practical in very rainy regions, where the humidity of the atmosphere is too high or where it rains frequently during harvesting.

## **WET METHOD**

The wet method requires the use of specific equipment and substantial quantities of water. When properly done, it ensures that the intrinsic qualities of the coffee beans are better preserved, producing a green coffee which is homogeneous and has few defective beans. Hence, the coffee produced by this method is usually regarded as being of better quality and commands higher prices.

Even after careful harvesting, a certain number of partially dried and unripe cherries, as well as some stones and dirt, will be present among the ripe cherries. As in the dry method, preliminary sorting and cleaning of the cherries is usually necessary and should be done as soon as possible after harvesting. This operation can be done by washing the cherries in tanks filled with flowing

water. Screens may also be used to improve the separation between the ripe and unripe, large and small, cherries.

After sorting and cleaning, the pulp is removed from the cherry. This operation is the key difference between the dry and the wet methods, since in the wet method the pulp of the fruit is separated from the beans before the drying stage. The pulping is done by a machine which squeezes the cherries between fixed and moving surfaces. The flesh and the skin of the fruit are left on one side and the beans, enclosed in their mucilaginous parchment covering, on the other. The clearance between the surfaces is adjusted to avoid damage to the beans. The pulping operation should also be done as soon as possible after harvesting to avoid any deterioration of the fruit which might affect the quality of the beans.

The pulped beans go on to vibrating screens which separate them from any unpulped or imperfectly pulped cherries, as well as from any large pieces of pulp that might have passed through with them. From the screens, the separated pulped beans then pass through water-washing channels where a further flotation separation takes place before they are sent to the next stage.

Because the pulping is done by mechanical means it normally leaves some residual flesh as well as the sticky mucilage adhering to the parchment surrounding the beans. This has to be completely removed to avoid contamination of the coffee beans by products resulting from the degradation of the mucilage. The newly pulped beans are placed in large fermentation tanks in which the mucilage is broken down by natural enzymes until it is dispersible, when it can be washed away. Unless the fermentation is carefully monitored, the coffee can acquire undesirable, sour flavours. For most coffees mucilage removal takes between 24 and 36 hours, depending on the temperature, thickness of the mucilage layer and concentration of the enzymes. The end of the fermentation is assessed by feel, as the parchment surrounding the beans loses its slimy texture and acquires a rougher "pebbly" feel.

When the fermentation is complete, the coffee is thoroughly washed with clean water in tanks or in special washing machines. The wet parchment coffee at this stage consists of approximately 57% moisture. To reduce the moisture to a maximum 12.5% the parchment coffee is dried either in the sun, in a mechanical dryer, or by a combination of the two. The sun-drying is done on extensive flat concrete or brick areas, known as patios, or on tables made of fine-mesh wire netting. The beans are laid out in a layer of 2 to 10 cm, and turned frequently to ensure even drying. Sun-drying should take from 8 to 10 days, depending upon ambient temperature and humidity. Coffee dries more quickly if raised on tables because of the upward draught of warm air. The use of hot-air drying machines becomes necessary to speed up the process in large plantations where, at the peak of the harvesting period, there might be much more coffee than can be effectively dried on the terraces. However, the process must be carefully controlled to achieve satisfactory and economical drying without any damage to quality.

After drying, the wet-processed coffee, or parchment coffee as it is commonly known, is stored and remains in this form until shortly before export.

The final stages of preparation of the coffee, known as 'curing', usually take place at a special plant just before the coffee is sold for export. The coffee is hulled, to remove the parchment, then passes through a number of cleaning, screening, sorting and grading operations which are common to both wet- and dry-processed coffee. Electronic sorting machines may be used to remove defective beans, including those known as 'stinkers', which cannot be distinguished by eye.

The wet method is generally used for all the Arabica coffees, with the exception of those produced in Brazil and the Arabica-producing countries mentioned above as users of the dry method. It is rarely used for Robustas.

The terminology used for dry and wet processed coffee in different languages is indicated below:

<b>Dry-processed coffee</b>		
	<b>Before hulling</b>	<b>Green coffee</b>
English	Dry cherry	Unwashed coffee Natural coffee Cherry coffee (India)
French	Café en coque	Café non lavé Café naturel
Portuguese	Café em coco	Café de terreiro
Spanish	Cereza seca	Café no-lavado Café natural
<b>Wet-processed coffee</b>		
	<b>After pulping</b>	<b>Green coffee</b>
English	Parchment coffee	Washed coffee Plantation coffee (India)
French	Café en parche	Café lavé
Portuguese	Café em pergaminho	Café despoldado
Spanish	Café en pergamino	Café lavado

## Botanical Aspects

- [Botany](#)
- [Plant breeding](#)

## BOTANY

Coffee belongs to the botanical family Rubiaceae, which has some 500 genera and over 6,000 species. Most are tropical trees and shrubs which grow in the lower storey of forests. Other members of the family include the gardenias and plants which yield quinine and other useful substances, but *Coffea* is by far the most important member of the family economically.



Family	Genus	Species (many including:)	Varieties (examples:)
Rubiaceae	Coffea	Arabica	Typica
		Canephora	Robusta
		Liberica	

Since *Coffea* was first correctly described, by Linnaeus in the mid 18th century, botanists have failed to agree on a precise classification system. There are probably at least 25 major species, all indigenous to tropical Africa and certain islands in the Indian Ocean, notably Madagascar. Difficulties in classification and even in designation of a plant as a true member of the *Coffea* genus arise because of the great variation in the plants and seeds. All species of *Coffea* are woody, but they range from small shrubs to large trees over 10 metres tall; the leaves can be yellowish, dark green, bronze or tinged with purple.

The two most important species of coffee economically are *Coffea arabica* (Arabica coffee) - which accounts for over 70% of world production - and *Coffea canephora* (Robusta coffee). Two other species which are grown on a much smaller scale are *Coffea liberica* (Liberica coffee) and *Coffea dewevrei* (Excelsa coffee).

Some differences between Arabica and Robusta coffee

	<u>Arabica</u>	<u>Robusta</u>
Date species described	1753	1895
Chromosomes (2n)	44	22

Time from flower to ripe cherry	9 months	10-11 months
Flowering	after rain	irregular
Ripe cherries	fall	stay
Yield (kg beans/ha)	1500-3000	2300-4000
Root system	deep	shallow
Optimum temperature (yearly average)	15-24° C	24-30° C
Optimal rainfall	1500-2000 mm	2000-3000 mm
Growth optimum	1000-2000 m	0-700 m
Hemileia vastatrix	susceptible	resistant
Koleroga	susceptible	tolerant
Nematodes	susceptible	resistant
Tracheomyces	resistant	susceptible
Coffee berry disease	susceptible	resistant
Caffeine content of beans	0.8-1.4%	1.7-4.0%
Shape of bean	flat	oval
Typical brew characteristics	acidity	bitterness, full
body	average 1.2%	average 2.0%

### **Coffea arabica - Arabica coffee**

Coffea arabica was first described by Linnaeus in 1753. The best known varieties are 'Typica' and 'Bourbon' but from these many different strains and cultivars have been developed, such as caturra (Brazil, Colombia), Mundo Novo (Brazil), Tico (Central America), the dwarf San Ramon and the Jamaican Blue Mountain. The average arabica plant is a large bush with dark-green oval leaves. It is genetically different from other coffee species, having four sets of chromosomes rather than two. The fruits are oval and mature in 7 to 9 months; they usually contain two flat seeds (the coffee beans) - when only one bean develops it is called a peaberry. Arabica coffee is often susceptible to attack by pests and diseases, therefore resistance is a major goal of plant breeding programmes. Arabica coffee is grown throughout Latin America, in Central and East Africa, in India and to some extent in Indonesia.

### **Coffea canephora - Robusta coffee**

The term 'robusta' is actually the name of a widely grown variety of this species. It is a robust shrub or small tree growing up to 10 metres in height, but with a shallow root system. The fruits are rounded and take up to 11 months to mature; the seeds are oval in shape and smaller than those of *C. arabica*. Robusta coffee is grown in West and Central Africa, throughout South-East Asia and to some extent in Brazil, where it is known as Conillon.

### **Coffea liberica - Liberica coffee**

Liberica coffee grows as a large strong tree, up to 18 metres in height, with large leathery leaves. The fruits and seeds (beans) are also large. Liberica coffee is grown in Malaysia and in West Africa, but only very small quantities are traded as demand for its flavour characteristics is low.

### **Standard references**

*Clifford M.N. and Willson K.C. (Editors) - Coffee; botany, biochemistry and production of beans and beverage. London, Croom Helm, 1985*

*Wrigley G. - Coffee. London, Longman, 1988*

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## **PLANT BREEDING**

### **Coffea arabica**



*C. arabica* is a tetraploid (44 chromosomes) and is self-pollinating. There are two distinct botanical varieties: *arabica* (*typica*) and *bourbon*. Historically, *typica* was cultivated in Latin America and Asia, whereas *bourbon* arrived in South America and, later, East Africa via the French colony of Bourbon (Reunion). Because *C. arabica* is self-pollinating, these varieties tended to remain genetically stable. However, spontaneous mutations showing desirable characteristics have been cultivated in their own right, as well as being exploited for cross-breeding purposes. Some of these mutants and cultivars are described below.

**Mutants:** Caturra - a compact form of *bourbon* Maragogipe - a mutant *typica* with large beans San Ramon - a dwarf *typica* Purpurascens - purple leaved forms

Cultivars have been developed to give the maximum economic return under specific regional conditions such as climate, soil, methods of cultivation and the prevalence of pests and diseases. Some of the better known cultivars are:

- Blue Mountain - grown in Jamaica and Kenya
- Mundo Novo - a cross between *typica* and *bourbon*, originally grown in Brazil
- Kent - originally developed in India, showing some disease resistance
- Catuai - developed as a hybrid of Mundo Novo and Caturra, characterized by either yellow or red cherries: Catuai-amarelo and Catuai-vermelho respectively.

### **Coffea canephora**

*C. canephora* is diploid and self-sterile, producing many different forms and varieties in the wild. The identification of cultivars is confused, but two main forms are recognised:

- 'Robusta' - upright forms
- 'Nganda' - spreading forms

### **Arabica / robusta hybrids**

Coffee has been selectively bred to improve characteristics of: growth and flowering, yield, bean size and shape, cup quality, caffeine content, disease resistance, drought resistance.

Crosses between arabica and robusta aim to improve arabica by conferring disease resistance and vigour or to improve on the cup quality of robusta.

Hibrido de Timor is a natural hybrid of arabica x robusta which resembles arabica coffee and has 44 chromosomes.

Catimor is a cross between Caturra and Hibrido de Timor and is resistant to coffee leaf rust (*Hemileia vastatrix*).

A new dwarf hybrid called Ruiru Eleven, developed at the Coffee Research Station at Ruiru in Kenya, was launched in 1985. Ruiru 11 is resistant to coffee berry disease and to coffee leaf rust. It is also high yielding and suitable for planting at twice the normal density.

Icatu hybrids are the result of repeated backcrossing of interspecific arabica x robusta hybrids to arabica cultivars Mundo Novo and Caturra.

Arabusta hybrids are fertile interspecific F1 hybrids from crosses between arabica and induced auto-tetraploid robusta coffee.

### **Techniques used in coffee breeding**

1. Controlled pollination and multiplication by seed

2. Vegetative (clonal) propagation

- Traditional methods: grafting, taking cuttings
- New methods (tissue culture): micropropagation, somatic embryogenesis

In recent years the potential of genetic manipulation of *Coffea* using recombinant DNA technology and tissue culture techniques has been investigated. By introducing new genes for characteristics such as resistance to pests or to herbicides, or genes coding for desirable cup quality attributes, it may be possible to produce plants with any combination of features required.

### **Caffeine**

- [Caffeine contents](#)
- [Physiological effects of caffeine](#)



## CAFFEINE CONTENTS

### COFFEE

The amount of caffeine in a cup of coffee can vary greatly, depending on its origin or the composition of the blend, the method of brewing and the strength of the brew. Instant, or soluble, coffee generally contains less caffeine than roast and ground coffee, but may be consumed in greater volume. Robusta coffees have about twice as much caffeine as arabicas. A 'cup' is usually understood to contain 150 ml (5 oz in the United States) but an espresso may be as small as 40 ml.

The U.S. Food and Drug Administration gives the following ranges for caffeine contents:

(mg per 5 oz cup)

	range	average
Roast and ground	60-180	115
-drip method	40-170	80
-percolator		
Instant coffee	30-120	65

### Consumer surveys

An interesting survey of caffeine contents in cups of coffee was conducted in Canada (Stavric et al, reference below). Whether the coffee was prepared by housewives at home, for sale in commercial outlets, or by individuals at work, the mean caffeine content was about 80 mg per cup (about 350 mcg per ml). The means for roast and ground coffee, both drip and percolator brewed, were below 85 mg; for instant coffee 71 mg. However, the range of measurements was so wide that, for most individuals, it would be inaccurate to use these figures as a basis for calculating the exact amount of caffeine consumed in a day. The size of the cup/serving varied from 25 ml (Greek coffee) to 330 ml at home and from 130 ml to 280 ml in the out-of-home situation.

### DECAFFEINATED COFFEE

Whatever method of decaffeination is used, the decaffeinated green coffee must contain less than 0.1 % caffeine (dry weight basis) to comply with EC regulations. This corresponds to about 3mg caffeine in a cup of decaffeinated coffee.

## OTHER BEVERAGES

**Tea** contains more caffeine than coffee weight for weight, but less weight is used, in general, to brew a cup of tea. In the Canadian study referred to above, both the type of tea used and the steeping time affected the caffeine concentration of samples prepared in the laboratory as follows:

(mean, mcg per ml)

	<b>2 minutes</b>	<b>5 minutes</b>
Tea-bag	238	402
Loose tea	189	295

The average caffeine concentration of samples of tea prepared at home was lower, at 159 mcg per ml, but with a wide variation.

The caffeine content of a cup of tea is usually less than 60 mg, but a strong cup of tea may contain more caffeine than a weak cup of regular coffee.

**Cocoa and chocolate drinks** contribute 4-5mg caffeine per cup to the diet, **dark chocolate and cooking chocolate** 20-26mg per ounce (0.7-0.9mg per gram). Many **soft drinks**, including colas and "peppers", contain caffeine, which as well as being present in cola nuts is often added as a flavour ingredient. A 12-ounce serving may contain 30-60mg caffeine. The major brands of cola on sale in the UK contain about 120mg caffeine per litre.

## DRUGS

Caffeine is present in many prescription and non-prescription (over-the-counter) drugs, including some taken for headache, pain relief, appetite control, staying awake, colds, asthma and fluid retention. The caffeine contents of drugs varies from 7mg to 200mg per tablet.

## LEVELS OF CAFFEINE CONSUMPTION

Caffeine is generally consumed in amounts less than 300mg per day, roughly equivalent to:

- 3-4 cups of roast and ground coffee
- 5 cups of instant coffee
- 5 cups of tea
- 6 servings of some colas or
- 10 tablets of some painkillers

It has been suggested that the British consume more caffeine on average than Americans, but there are no large scale studies to support the observation. The nine, normal subjects recruited by

Dr M.S. Bruce and his colleagues, as habitual caffeine users, for a study in London (reference below) were found to consume on average 428mg caffeine a day, with a range from 230mg to 670mg.

Customary caffeine consumption has been classified as follows:

Low caffeine users: less than 200mg per day

Moderate caffeine users: 200-400mg per day

High caffeine users: more than 400mg per day