VII. Study of Different Fruit Species

1. Citrus (Agrumes)

A. Definition of Citrus Fruits

Citrus fruits are a group of fruit-bearing trees that produce fruits known as “Agrumes.” The term “Agrume” comes from the Latin word *Acŭmĭna*, which means fruit with a sour taste.

Citrus fruits are considered very nutritious, rich in water, sugars, acids, minerals, fiber, and especially vitamin C. They are consumed fresh, as juice, or used in the food industry to make beverages, jams, pectins, and sweet products.

B. Components of the fruit

Citrus fruits include fruits with a thick peel, called the rind, which is composed of the outer flavedo and the inner albedo, and a pulpy center, the pulp. The flesh of a citrus fruit is divided into sections (segments), and these sections are filled with juice. The peel (rind) is rich in oils, which are the source of citrus aromas and extracts.

C. Types

There are more than 400 types of citrus fruits in the world! Here are the main types:

- Orange
- Blood orange
- Lemon (yellow)
- Lime
- Clementine
- Mandarin
- Grapefruit
- Pomelo
- Kumquat
- Bergamot
- Citron
- Finger lime
- Kaffir lime
- Calamondin
- Yuzu

- Bitter orange

Many of these fruits are hybrids, created to produce new varieties. For example, bergamot (from the bergamot tree) is a citrus fruit derived from bitter orange and lemon, primarily used for producing essential oil for the pharmaceutical, cosmetic, and food industries.

D. Culture

Citrus fruits are among the most important horticultural crops in the world and the most commercially traded. They are believed to have originated in Southeast Asia before spreading globally. Citrus is grown in both developed and developing countries and is an essential source of vitamin C. Brazil, Mediterranean countries, China, and the United States account for about two-thirds of global production. Over the past 30 years, per capita consumption of citrus has increased worldwide, with North America leading, followed by South America and Europe. The types of citrus vary by region, with oranges dominating global production, followed by mandarins, and about one-third of citrus produced is used for processing.

E. Conditions de culture

- Température : Le climat est essentiel pour le développement, la floraison et la qualité des fruits. Les agrumes ne tolèrent pas bien le froid (en dessous de −3 °C).
- Humidité : Une humidité modérée est importante pour une bonne nouaison des fruits.
- Sol : Ils s'adaptent à divers types de sols, mais préfèrent les sols profonds, légers et bien drainés, avec une bonne aération.
- pH optimal : Entre environ 5,5 et 6 pour une meilleure nutrition.

〉 Irrigation et nutrition

Les agrumes ont une forte évapotranspiration due à leur feuillage important, ce qui signifie qu'ils ont des besoins en eau réguliers selon le climat, le sol et la phase de production.

La prise de nutriments varie au cours de l'année, étant la plus élevée pendant la floraison et la nouaison.

F. Economic Uses of Citrus

Citrus fruits (Citrus) are not only consumed fresh but also have significant economic importance in both agriculture and industry. They are widely used in food, as fruits like oranges, lemons, mandarins, and grapefruits are an important source of vitamins, particularly vitamin C, making them a key component of daily nutrition. A large portion of the world's citrus

production is used for the manufacture of juices and beverages, which are major commercial products exported and traded internationally.

Citrus fruits are also processed into jams, syrups, pastries, and other prepared foods that take advantage of their distinctive flavor. In addition, the essential oils extracted from their peels are used in the perfume, food flavoring, and cosmetic industries. Finally, citrus fruits are among the most commercially important horticultural crops in the world, cultivated in many countries and exported to regions where they are not grown.

2. Olive Tree (Olivier)

A. Definition

The olive tree (Olea europaea L. subsp. europaea var. europaea) is a fruit tree that produces olives, a fruit consumed in various forms and from which one of the main edible oils, olive oil, is extracted. It is a cultivated variety that has been grown for several millennia, mainly in regions with a Mediterranean climate, and belongs to one of the subspecies of Olea europaea, a species of trees and shrubs in the Oleaceae family.

B. Description of the Olive Tree

Very decorative, the olive tree belongs to the Oleaceae family. Its growth is slow, but its longevity is exceptional, often earning it the nickname “immortal”!

- The leaves are evergreen, lance-shaped, and glossy gray-green.
- The white spring flowers are short-lived.
- Olives appear from the fifth year in autumn. They start green and turn black as temperatures drop.

Good to know: Spring frosts between 0 and -1°C combined with high humidity make olive flowering sterile. Therefore, it is impossible to produce olives north of the Loire.

C. Cultivated Species, Geographic Origin, and Distribution

Olives belong to the genus Olea L., which includes about 60 species of olives and related plants found in the Old World, such as Africa, Asia, and tropical and subtropical regions, but they do not occur naturally in the Americas. These species are typically evergreen trees or shrubs with dense, fine-grained wood. Among them, only one species, Olea europaea L., has been widely cultivated in the Mediterranean region since ancient times for the production of olive oil from its fruit. By the twentieth century (up to 1948), olive cultivation had also spread to the Americas,

South Africa, and Australia. The precise geographic origin of cultivated olives remains uncertain, though botanist Auguste de Candolle suggested that its homeland might be Palestine or further east in Asia. Olive cultivation has been recorded in the South Caucasus, Iran, Anatolia, Syria, Mesopotamia, the Arabian Peninsula, and the Punjab, with most ancient names for olives in Asia being of Semitic origin. In ancient times, olive cultivation was widespread in Greece during the era of Homer, then spread to Italy in the sixth century BCE before extending to North Africa, southern France, and the Iberian Peninsula. Today, thousands of cultivated olive varieties exist, differing by region; however, it remains unclear whether these varieties originated in specific regions and then spread, or if there were multiple independent centers of domestication.

D. Variety of *olea europaea*

The olive tree (Olea europaea) is an iconic tree of the Mediterranean, known for its delicious fruit and health benefits. With thousands of years of history behind it, the olive tree presents a diversity of varieties, making it an essential element of Mediterranean culture. Here, we explore the main olive varieties and their distinctive characteristics.

⇔ The Arbequina Variety

The Arbequina variety, originating from Catalonia in Spain, is distinguished by its compact size and small, high-oil-content olives. Arbequina trees are known for their adaptability to cooler climates but also thrive in warmer conditions. Cultivated worldwide, notably in California and Australia, this variety produces olive oil with a fruity taste, marked by hints of almond.

By choosing to grow an Arbequina olive tree in a pot, olive enthusiasts can enjoy the characteristic mildness of its oil while also decorating their space with an elegant tree, even in limited areas. The easier harvest of Arbequina olives in pots contributes to their growing popularity among urban gardeners and lovers of delicate flavors.

⇔ The Picual Variety

Originating from Andalusia, the Picual variety produces medium to large olives, yielding oil with a robust and balanced flavor. Recognized as one of the most widely grown olive varieties in the world, Picual trees thrive particularly in hot, dry regions. Picual olives have distinctive notes of fresh herbs and tomato, giving their oil a strong personality.

Often used in Mediterranean cuisine, Picual oil is valued for its taste and long shelf life. This versatile variety is also prized in the production of high-quality extra virgin olive oil. Whether for cooking or decoration, Picual olive trees add an authentic Mediterranean touch, highlighting their essential role in the culture and gastronomy of the region.

⇔ **The Kalamata Variety**

Famous in Greece, the Kalamata variety is known for its large, dark purple olives. These olives, often consumed traditionally, are prized for their meaty texture and rich flavor. Kalamata trees are specifically cultivated in the namesake region of southern Greece, where the Mediterranean climate promotes abundant flowering.

The oil extracted from these olives, although less abundant than that of other oil-focused varieties, is appreciated for its complex aromas and fruity taste. Besides oil production, Kalamata olives are commonly used in Greek salads, adding a distinctive flavor.

⇔ **The Picholine Variety**

Originating from southern France, Picholine is recognizable by its elongated green olives. These olives are often used in olive cocktails due to their distinctive flavor. Oil produced from Picholine has a fresh and slightly spicy taste, making it a popular choice among olive oil connoisseurs.

Picholine trees are known for their disease resistance and adaptability to various climates, making them prized both for olive oil production and for direct consumption as table olives. This variety is ideal for anyone looking to maintain a potted olive tree.

⇔ **The Frantoio Variety**

The Frantoio variety, originating from Italy and widely cultivated in Tuscany, is characterized by medium to small olives. Frantoio trees are valued for their adaptability to moderate climates and their ability to produce exceptionally high-quality olive oil. Frantoio oil is renowned for its complex flavor, combining notes of herbs, artichoke, and almond.

These characteristics make it a preferred choice among extra virgin olive oil enthusiasts. The attractive aesthetics of these olives and their contribution to the flavor palette make Frantoio a top choice both for cooking and for direct tasting.

E. Conditions de culture

Olive trees require a specific number of cold hours and long periods of heat to grow properly, with 3–4 months between budding and flowering, and 6–7 months between flowering and harvest. Dry winds and high temperatures during flowering can reduce production, while olive trees tolerate calcareous soils and show good salt tolerance. They also need plenty of sunlight, as insufficient light reduces flower formation. Regarding planting density, it was previously about 72 trees per hectare, but today it can reach 312 trees per hectare, and up to 400 trees per hectare in modern irrigated systems. Irrigation becomes necessary if annual rainfall is less than 800 mm, and drip irrigation is recommended at about 1800–1900 liters per tree per year, with approximate monthly distribution: 70 L/tree/day in April, 90 L/tree/day in May, 110 L/tree/day in June, 130 L/tree/day in July, 110 L/tree/day in August, and 90 L/tree/day in September. To optimize irrigation efficiency, AZUD recommends selecting distribution pipes that ensure even water distribution, proper soil saturation, and root development. Additionally, digital agriculture via the AZUD QGROW system allows precise management of water and nutrients using sensors for climate, soil, and plants, helping to avoid excessive moisture that can harm olive trees, while improving production quantity, yield, and oil quality.

F. Planting and Care of the Olive Tree

The olive tree prefers well-drained soils, even rocky ones, and thrives in dry, poor soil. It does not tolerate waterlogged soils, although it can withstand temperatures as low as -15°C. However, its flowering is sensitive to frost, so choose a sunny location. North of the Loire, it is best grown in a pot, where it adapts perfectly; use a mix of potting soil and garden soil in equal parts, and repot every three years. In spring, if planting in the ground, dig a hole four times larger than the root ball to allow the roots to spread easily into loosened soil. For watering, potted olive trees should not sit in stagnant water, and they should be watered only when the soil is dry. In the ground, drought will not prevent fruit production, but watering during hot periods can increase yield. Pruning is done from March to May to thin the canopy and encourage growth of last year’s wood, which will bear fruit, and it does not hinder fruit production; on the contrary, it prolongs the productive period. Olive trees prefer poor soil, but composted manure can be applied up to three times during winter and spring to enrich the soil. Olive trees are hardy and rustic, capable of surviving cold winters when properly cared for.

G. Economic Importance of Olive Oil:

Olive trees are economically important due to the production of olives, from which olive oil is extracted—a product increasingly valued in cooking. Olive oil is rich in monounsaturated oleic acid, which helps increase "good" cholesterol while reducing "bad" cholesterol. It also stimulates bile production and aids its elimination, and helps combat digestive disorders. To obtain the best quality, it is recommended to choose olive oil from the first cold pressing, preferably extra virgin, organic, and pure without any chemical additives.

⇔ **Health Benefits of Olive Leaves:** Olive leaves have long been used for their digestive and diuretic properties and to help manage high blood pressure, thereby supporting cardiovascular health. Additionally, olive leaves show beneficial effects in lowering blood sugar levels in people with diabetes.

3. Date Palm (Palmier dattier)

A. Definition of Palmier-dattier

Palmier-dattier refers to a type of date palm, scientifically named Phoenix dactylifera L., from the family Arecaceae. This plant is mainly cultivated for its famous fruit: dates. It is one of the essential crops in arid and hot regions, especially in North Africa and the Middle East.

B. Description – Dates

The date palm is a large tree, reaching 15 to 30 meters in height, with a cylindrical trunk called the stipe, topped by a crown of leaves, or fronds. Its leaves are pinnate, finely divided, and measure 4 to 7 meters in length. The species is dioecious, producing either male or female inflorescences known as spadices, which are enclosed in a large membranous bract called the spathe. Female flowers have three independent carpels, but only one develops to form the fruit. The fruits, dates, grow in clusters and are berries with sweet flesh surrounding a hard "stone," which is actually the seed.

C. Natural and Historical Distribution

The date palm is believed to have originated in Western India or the Persian Gulf, spreading in ancient times. It is widely found across the Middle East and North Africa, including countries such as Iraq, Saudi Arabia, Egypt, Tunisia, Algeria, Morocco, Libya, the UAE, and Yemen. Beyond these regions, the date palm has been introduced to parts of the Americas, including California, Arizona, Mexico, and other areas of the USA, as well as parts of Australia and

Europe, such as the Canary Islands and Spain. Optimal growth occurs between 15° and 30° north latitude, where hot and dry climates favor the production of high-quality dates.

D. Cultivation

Pollination occurs naturally by wind (anemophily). However, in cultivation, the reduced number of male palms—especially in Algerian or Tunisian oases, where they are called *dhokkars* and often represent only one male for every 100 female trees—makes artificial pollination necessary.

Date palms are propagated either by cloning or by removing offshoots in order to preserve selected cultivars. Indeed, simply sowing a seed would not guarantee the same fruit quality as the original plant, nor would it ensure the sex of the palm (only female trees are valuable because they produce fruit). That said, growing from seed is very easy and may, in rare cases, result in an interesting new cultivar.

In regions where temperatures never fall below –10 °C, the seed can be planted directly outdoors after being germinated in a glass of water. A female plant will take about 10 years to produce fruit if it grows near a male plant and benefits from suitable climatic conditions.

E. The economic importance of the date palm

The economic importance of the date palm sector (filière phoenicicole) is considerable in oasis and arid regions. It represents a key pillar of agricultural income, contributing between 20% and 60% of total agricultural revenue for farming households in producing countries such as Morocco, Algeria, and Tunisia. The sector supports the livelihoods of hundreds of thousands to millions of people who depend directly or indirectly on date production, processing, and marketing activities.

In Morocco, date palms cover more than 60,000 hectares with millions of trees, and the sector plays a major socio-economic role in the main oasis regions. Date production significantly boosts employment by generating millions of workdays each year in activities such as planting, pollination, harvesting, packaging, and commercialization, particularly in rural and under-resourced areas.

Over recent decades, large-scale programs aimed at planting millions of new trees and modernizing cultivation techniques have more than doubled the sector’s value added. Improvements in productivity and quality have led to substantial increases in farmers’ incomes, in some cases raising them by about one-third on average.

4. Fig Tree (Figuier)

A. definition of the fig tree

Ficus carica L., commonly known as the fig tree, edible fig, or common fig, is a fruit tree belonging to the Moraceae family that produces edible fruits called figs. The edible fig is one of the important plants of the Mediterranean basin, where it has been cultivated for millennia. It is the only European representative of the genus Ficus, which includes nearly six hundred species, most of them tropical.

The fig tree can live up to 300 years and reaches full production around the age of seven. The male fig tree, sometimes called the wild fig, does not produce edible fruits and is also known as the caprifig.

A. Distribution

More than the olive tree, the fig tree is the tree par excellence, closely associated with rural life among the Amazigh (Berbers). It is found throughout the Maghreb from west to east, from Souss and the land of the Chleuh to the outskirts of Tripoli. In terms of latitude, the fig tree grows along the Mediterranean coast and extends as far as the oases of the central Sahara. In terms of altitude, it reaches 1,200 meters in Kabylia and the Ouarsenis Mountains. It is therefore a widespread tree; however, its cultivation is not carried out with the same care everywhere, and its production is subject to considerable variation. The main production regions are Greater and Lesser Kabylia, the northeastern Tunisian Tell, western Rif, and the valleys of the Aurès. In the ksour of the Saharan Atlas, the fig tree is cultivated in gardens where it competes with the apricot tree, and in the Tunisian High Steppe, this tree was the only resource that enabled the eight villages clinging to the mountains of the Dorsale to resist “Bedouinization.” Further south, among the Jebalia of the Dahar and the Demer, the movements of these semi-nomads are closely linked to the harvest seasons of the three nourishing trees: the fig, the olive, and the date palm.

The fig tree is undemanding; it grows in rock crevices as well as in fertile soil. However, the abundance of its production depends on the care given to its cultivation and maintenance.

B. Reproduction and Cultivation of the Fig Tree

The fig tree reproduces very easily. In Kabylia, four main methods of propagation are used:

〉 **Direct cuttings:** Branches are broken off and left for a few days in moist soil, then planted. However, trees grown in this way have the disadvantage of bearing fruit only after several years.

〉 **Cuttings raised in nurseries:** These nurseries are established in irrigable land. At the end of the second or third year, the young plants are uprooted and transplanted. Those that remain three years in the nursery begin to produce fruit in the second year after transplantation.

〉 **Layering :** When planting a fig tree, a trench is always dug rather than a round or square hole as for other trees. The young plant is laid horizontally in the trench, and several incisions are made in the bark of the buried portion in order—according to local belief—to encourage root development. Planting takes place from late October to early March. Fig trees propagated by these methods produce the same fruit as the parent tree, making grafting unnecessary.

〉 **Grafting** is used only to change the variety or to rejuvenate an old trunk. The types of grafting practiced are those common throughout the Mediterranean world: cleft grafting on the stem or root (carried out in February–March) and shield budding (from April to August).

As winter approaches, women cover the buds and the tips of the branches to protect them from frost. From the first days of January, work begins in the fig orchards and continues almost uninterrupted until harvest time. The first task consists of clearing the soil around the base of the tree and forming a basin to retain rainwater. If manure is available, it is placed in this basin. A first plowing is then carried out, followed by three others at intervals of about one month. The periods considered most favorable for plowing are: January 10–23, February 13–19, March 10–22, April 10–20, and May 1–21. Owners who do not have draft oxen and cannot afford to rent them simply hoe the ground around the trees two or three times. Pruning is done in winter, with the period from February 25 to March 4 regarded as particularly auspicious.

C. Some Fig Varieties

❖ **Single-Crop (Uniferous) Varieties**

⇔ **'Blanche marseillaise'** (syn. 'Marseillaise', 'Blanquette', 'Petite Grise', 'Couille du pape', 'Athens'): This self-fertile fig tree is very productive with small to medium growth, initially upright but spreading with age. Its small fruits are very sweet and flavorful, with pink, sweet, and aromatic flesh that is both firm and tender. The skin is yellow-green, turning yellow when ripe, with a short thick stem; it splits easily in humid conditions. Figs are picked around mid-August and can be eaten fresh, dried (this is the variety used for the

famous 13 Christmas desserts), or made into jam. Cold tolerance: -12°C. Best grown in Mediterranean or Atlantic climates

⇔ '**Violette de Solliès'** (syn. 'Bourjassotte noire', 'Solliès', 'Parisienne', 'Barnisotte'): This variety produces very late, from mid-August to the end of October, making it better suited for southern regions. The fruits are large, flattened, blue-black, with a short stem. They have red, sweet, and aromatic flesh with good shelf life, best consumed fresh. The tree is self-fertile, has significant growth, and a strong, extensive root system. This variety is highly prized and even has a Protected Designation of Origin (PDO).

⇔ **'Sucre vert' (syn. 'Figue Reine', 'Mussega', 'Cougourdane', 'Higo Blanco'):** Fruits arrive late, from September to November. They are of good size, with green skin that turns brown-spotted when fully ripe. The pale green flesh is high quality, honeyed, and very sweet. It can be eaten fresh, dried, or made into jam. The tree grows to about 3.5 m with a compact shape and very dense foliage. Best cultivated in southern France or along the Atlantic coast.

❖ **Double-Crop (Biferous) Varieties**

⇔ '**Sultane' (syn. 'Noire de Bellone'):** This very early fig tree is particularly productive. It is hardy but best grown in mild climates where it can reach a height of 7 m. Self-fertile, it does not require another fig tree nearby to fruit. Its pear-shaped, violet figs are medium-sized, with early figs being plumper but less abundant than the autumn crop. The red, fragrant, and sweet flesh can be eaten fresh or dried.

⇔ **'Longue d'août' (syn. 'Figue banane', 'Figue poire', 'Jérusalem'):** Produces large, elongated figs in early and late summer that turn yellow-brown when ripe. The early figs are quite large, slightly bumpy, with a long stem and pink to pale green flesh. The autumn figs are smaller with pronounced ridges. Can be eaten fresh, made into jam, and dried if grown in well-drained soil. This self-fertile biferous fig tree is very frost-resistant, and its fruits withstand humidity well. It has medium growth and a spreading habit.

⇔ **'Grise de Tarascon' (syn. 'Dauphine', 'Rouge d'Argenteuil', 'Grosse de Juillet', 'Boule d'or'):** A vigorous, self-fertile fig tree producing very large, round early figs with gray-violet skin. In temperate regions, the early crop in July is abundant. The second harvest occurs in September–October. The pink flesh is juicy, meaty, sweet, and low in seeds; it can be eaten fresh or made into jam. The hardy tree has a beautiful drooping form and tends to produce suckers.

❖ **Ancient Varieties**

⇔ **'Goutte d'or' (syn. 'Dorée', 'Figue d'or', 'Goutte d'or de Carpentras'):** This is an old, self-fertile fig tree with small growth (ideal for small gardens or container cultivation) and a spreading habit. It is biferous, producing a few small early figs in July, followed by large autumn figs (mid-August) with thin skin prone to splitting. The flesh is pink, sweet, juicy, and the skin is yellow-violet. These figs can be eaten very ripe fresh or made into jam.

⇔ **'Madeleine des deux saisons' (syn. 'Angélique', 'Early lemon', 'Madeleine des 4 saisons'):** This self-fertile, biferous variety produces early figs of about 100 g in June–July and smaller, slightly flattened autumn figs from mid-August to September. The fruit is yellow-brown with pink, juicy flesh and a nearly absent stem. It can be eaten fresh or made into jam. The moderately vigorous tree has a fairly upright habit, reaching 2.5–4 m. Cold-hardy, it tolerates temperatures down to -15°C, but is sensitive to fruit flies and carpophilus beetles.

⇔ **'Ronde de Bordeaux':** A self-fertile, single-crop, early fig tree with strong growth. Very productive, its autumn figs ripen as early as late July. The small fruits have black skin, are sweet, and can be enjoyed fresh, dried, or in jams. They also hold up well in cooking. The tree is vigorous and very hardy.

❖ **White Varieties**

⇔ **'Blanche de Versailles'** (syn. 'Blanche d'Argenteuil'): Can be planted in very cold regions, tolerating down to -25°C. Biferous, this variety produces very sweet fruits with thin green skin and dense, amber-white flesh of excellent flavor.

⇔ '**Bourjassotte blanche'**: Single-crop fig tree with vigorous growth. Produces medium-sized figs in September with thick yellow-green skin. The red flesh is very sweet.

⇔ **'Dottato':** This Italian-origin fig tree is suited for hot, dry regions. Autumn figs ripen to yellow skin and are of very high quality with excellent shelf life. The amber flesh is perfect for drying, nearly seedless, honeyed, and sweet. Highly valued, it has PDO recognition in Italy. The tree has medium vigor and is very hardy.

❖ Varieties for Container Cultivation

⇔ **'Rouge de Bordeaux'** (syn. 'Pastilière', 'Hirta du Japon', 'Pastelière'): Self-fertile, single-crop fig of Japanese origin, small to medium size (~3 m) with a very compact habit. Ideal for pots or small gardens. Early figs fall easily, but it produces a good early summer crop (early August) of medium-sized, black-violet figs. The pink-golden flesh has few seeds and a sweet flavor. Hardy but moderately disease-prone, and fruits can split easily.

⇔ **'Précoce de Dalmatie'** (syn. 'Dalmatie', 'San Pietro'): Self-fertile, biferous, small-growing fig tree. Sparse foliage and few branches. Early figs ripen in July, and autumn figs from late August to October. Exceptionally large, with yellow-green skin and very sweet, fleshy flesh. Very cold-hardy (-15°C), with fruits resistant to rain.

⇔ **'Black Jack':** Single-crop, productive, small-growing fig tree producing large black figs with light red-orange flesh. Resistant to humidity, ripening can extend until the first frosts. Suitable for drying.

❖ **Cold-Hardy Varieties**

⇔ **'Brown Turkey'** (syn. Negro Largo, Common Blue, Brown Naples, Aubique Noire, English Brown Turkey): Biferous and self-fertile, withstands frost down to -30°C, widely grown in the northeastern regions. Summer figs are medium-sized, autumn figs smaller. Skin is reddish-brown, with tasty flesh suitable for cooking, jam, or fresh consumption. Medium-sized tree with a compact, bushy habit, suitable for container growth.

⇔ **'Brunswick'** (syn. Magnolia, Castle Kennedy, Madonna): Self-fertile, biferous, small-growing fig tree producing large early figs in July and smaller ones in September–October with abundant harvests. Skin turns light reddish-brown at maturity. Very hardy and drought-resistant.

⇔ **'Hardy Chicago':** Biferous variety, extremely cold-hardy, discovered relatively recently (1980s) in Chicago. Produces small purple figs on long, strong stems, with strawberry-colored flesh that is sweet and honeyed.

D. Economic and Health Importance of Fig (Ficus carica)

Fig (Ficus carica) is an economically valuable crop due to its attractive appearance, distinctive flavor, and high nutritional content. The fruits can be consumed fresh, dried, or candied, but because fresh figs are easily damaged during transport, dried figs are the most common product.

Fig fruits are also used in the production of beverages, sweeteners, food additives, and animal feed.

In addition to its economic value, F. carica has been used in traditional medicine to treat skin problems, inflammation, and gastrointestinal disorders. Modern research has also highlighted additional health benefits:

- A study by Mert et al. (2024) showed that fig seed oil reduces blood glucose levels in diabetic patients and supports pancreatic health.
- A study by Khaliq et al. (2024) suggested that fig leaf extracts may reduce depression-like symptoms and serve as a safe treatment for physiological and psychological stress.
- A study by Cakir et al. (2023) found that fig latex contains anti-cancer compounds and may help in treating HPV-related cervical cancer.

Overall, fig (Ficus carica) is a unique crop that combines high economic value with diverse health benefits, making it highly valuable for agriculture, the food industry, and both traditional and modern medicine.

5. Pome Rosaceae (Les rosacées à pépins)

A. Definition

Pome Rosaceae are fruit trees that belong to the Rosaceae family. Their fruits, such as apples, pears, and quinces, contain several seeds inside the core. These trees are cultivated for their fruits, which can be consumed fresh or processed

B. Apple trees

⇔ **Definition**: Apple trees (Pommiers) are a plant genus belonging to the Rosaceae family and originate from Asia. This genus includes about forty species of trees or shrubs, the most economically important being the common apple (Malus pumila). Today, more than 20,000 cultivars are known, including subspecies and selected varieties. Species of the genus Malus are small trees or shrubs with alternate, stemmed leaves, and sometimes spiny. The flowers are white, sometimes red, grouped in small clusters, and are often decorative.

⇔ **Uses:** Some apple tree species are cultivated either for their fruits (apples) or as ornamental trees, known as flowering apple trees.

⇔ **Distribution:** Global apple production is concentrated in China, the United States, France, Italy, and Turkey.

⇔ **Cultivation:** Apples can adapt to a wide variety of climates, with the best conditions being warm days, cool nights, and high sunlight exposure. About 1,000 chill units and roughly 150 frost-free days are required. Lack of cold is the limiting factor for apple cultivation in southern regions. The apple tree is frost-resistant, but fruit can be damaged when temperatures drop below -3 ºC. Because apple trees flower later than other deciduous crops, the risk of frost damage is lower. The apple tree is less demanding than the pear tree because it adapts to a wide range of soils. Ideal conditions are medium, well-drained soils with a pH of around 6. It is relatively tolerant of calcareous soils, and the wide range of rootstocks allows it to be planted in many soil types.

❖ Apple varieties

Apple varieties can be classified into **three ripening groups**:

⇔ **Early apples**, which are harvested as early as **August** and are meant to be consumed within days or weeks after harvest (see: *When to pick apples?*).

〉 **Gala** – A classic favorite for apple lovers! A small red apple with **fruity, sweet, aromatic, juicy, firm, and crunchy flesh**, the 'Gala' variety is great for eating fresh and for cooking, such as in pies or baked dishes (less commonly used for applesauce). This apple tree **produces quickly, abundantly, and consistently**. Of **medium vigor**, it is, however, **susceptible to apple scab**.**Mid-season apples**, which are harvested from **mid-September** and should be consumed within **two months** after harvest.

〉 **Initial** – A medium (or even large) apple with **yellow-orange skin tinged with red**, and **crunchy, juicy, aromatic, and slightly tangy flesh**. The 'Initial' variety is highly appreciated **fresh, for snacking, or in salads**. The apple tree produces quickly. Of medium vigor, it is resistant to apple scab. It is a recommended fruit tree for cool regions.

〉 **Transparente de Croncels** – An old apple variety of medium to large size, pale yellow with a pink blush in the sun, with fine (hence the name “transparente”) and juicy flesh, offering a perfect balance of sweetness and slight acidity. It has a distinct aroma, making it very pleasant to eat fresh, but also excellent for cooking and perfect for applesauce.

〉 **Elstar** – This apple is sometimes classified as an **early variety** and sometimes as a **mid-season variety**. When harvested **early** (before the second half of September), Elstar can be stored **until the end of the year**. If harvested later, it should be **consumed quickly**. Its **yellow and red skin** hides **aromatic, crunchy, and juicy flesh** that is both **slightly tart**

and sweet (the sweetness develops more with later harvest). It is enjoyable to eat fresh, but it is **even better for applesauce**. The apple tree is **vigorous and early-bearing**, but it can sometimes show **biennial bearing**. It is **susceptible to powdery mildew**, though **rarely affected by apple scab**. It has **good resistance to cool temperatures**.

⇔ **Mid-season apples**, which are harvested from mid-September and should be consumed within two months after harvest.

- 〉 **Reine des Reinettes –** A medium-sized apple, red-orange in color on a yellow background. Its fine, pleasantly aromatic flesh is sweet and soft, but it can become mealy over time. It is an excellent apple for cooking, especially baked dishes. The apple tree is vigorous but prone to biennial bearing. It is slightly sensitive to apple scab and powdery mildew, and it tends to drop apples once they reach maturity.
- 〉 **Cox's Orange –** An English classic, this beautiful apple has yellow skin streaked with red and is slightly flattened. Its flesh is fine and tender, half-crisp and half-soft, juicy, aromatic, and sweet, though it also becomes mealy over time. Still, it is one of the best apples to eat fresh… without moderation! The apple tree has medium vigor and may show biennial bearing. The high quality of its apples compensates for its susceptibility to apple scab and powdery mildew.
- 〉 **Belle de Boskoop –** Traditional in northern France (and Belgium), Belle de Boskoop is a large apple, red on a green background. Its tangy, aromatic, and firm flesh is perfect for eating fresh in early October, and it is also an excellent apple for cooking. This rustic apple tree is very vigorous and disease-resistant, but it is prone to biennial bearing and sensitive to late frosts.

⇔ **Late apples (storage apples)**, which are harvested in **October** and can be stored under proper conditions **throughout the winter**.

- 〉 **Ariane** – A recent apple variety of **medium size**, with **beautiful pink-red skin on a yellow-green background**, and **particularly crisp, fine, and juicy flesh** with a good **balance of sweetness and acidity**. It adapts perfectly to all kinds of culinary uses!
- 〉 **Jonagold –** A large red-orange apple on a yellow-green background, with firm, crisp, juicy, fruity, and sweet flesh. Good to eat fresh right after harvest, it is also

excellent for pies. The apple tree is vigorous and bears fruit quickly and consistently. It is slightly susceptible to apple scab, but it does not tolerate heat well.

C. pears

Pear (genus Pyrus) belongs to the Rosaceae family and includes about 20 to 45 species of trees and shrubs, such as the common pear (Pyrus communis). It is one of the most important fruit trees in the world, cultivated in temperate regions across both hemispheres. Pear trees produce white or pink flowers with five petals, and their fruits are generally sweeter and softer than apples, with hard cells (stone cells) in the flesh. They are usually propagated by budding or grafting onto rootstocks. Like other members of the Rosaceae family, pear species are susceptible to diseases such as fire blight, anthracnose, canker, and powdery mildew.

⇔ **Cultivation**

Pear trees prefer a cool temperate climate, with most traditional varieties requiring adequate winter chilling for proper flowering and fruit production. The ideal temperature range for growth is between 10°C and 25°C, with some varieties needing 800–1200 hours below 7°C, while low-chill varieties require only 300–400 hours. Frost during flowering should be avoided, as it can reduce yield. Pear trees grow best in deep, fertile, well-drained soils, ranging from sandy loam to clay loam, with a soil pH between 6.0 and 7.5. Good drainage is essential to prevent root diseases, and waterlogged or highly alkaline soils should be avoided. Regions with mild summers and cold winters are best suited for pear cultivation.

⇔ **popular pear varieties**

- **Comtesse de Paris** – Comtesse de Paris
- **Conférence** – Conference
- **Précoce de Trévoux** – Précoce de Trévoux (early pear from Trévoux)
- **Williams** – Williams
- **Bartlett (Williams)**: Juicy and sweet, excellent for eating fresh or canning.
- **Anjou:** Comes in red or green, versatile for cooking and eating fresh.
- **Bosc:** Long-necked with brown skin, sweet flavor, holds up well in cooking.
- **Forelle:** Small in size with distinctive red speckles, sweet and tasty for eating fresh.
- **Concorde:** Long and smooth fruit, combines the characteristics of two different types.

- **Comice:** Large, very soft and sugary, ideal for eating fresh.

D. quinces

Quince (Cydonia oblonga) is a small tree or shrub belonging to the rose family (Rosaceae) and is cultivated for its edible fruit. It is the only species in the genus Cydonia and is native to regions such as Iran, Turkey, and possibly Greece and the Crimean Peninsula. The fruit has a strong, pleasant aroma but is quite astringent when eaten raw. However, when cooked, it becomes tender and flavorful, making it ideal for preserves, jellies, and conserves. It is also commonly used to add flavor and sharpness to stewed or baked apples. During cooking, the flesh turns a beautiful pink color, which gives an attractive appearance to jams and other preparations.

A. Cultivation

Quince is a hardy and drought-tolerant plant that can adapt to various soil types with low to medium acidity. It tolerates both shade and full sun; however, adequate sunlight is necessary to produce larger flowers and ensure proper fruit ripening. It is considered a low-maintenance plant, as it can go for years without pruning and without major problems from pests or diseases.

Quince is grown on all continents in warm-temperate and temperate climates. It requires a period of winter chilling, with temperatures dropping below 7°C, to ensure proper flowering. It is commonly propagated by cuttings or layering; cuttings generally produce better-quality plants, although they take longer to reach maturity than those produced by layering. Named cultivars are usually propagated by grafting onto quince rootstock. Seed propagation is not used commercially.

Quince naturally grows as a dense shrub, so it must be pruned and trained to a single trunk in order to develop into a fruit-bearing tree suitable for commercial production. Although the tree is self-pollinating, it produces higher yields when cross-pollinated.

The fruits are usually left on the tree until fully ripe. In warmer climates, they may soften enough to become edible, while in cooler climates additional ripening after harvest may be necessary. Harvesting takes place in late autumn before the first frosts. Quince is also used as a rootstock for certain pear cultivars. In Europe, it is grown in small quantities, often with one or two quince trees planted in mixed orchards alongside apple and other fruit trees.

B. Common Quince Varieties

These are among the most cultivated and well-known quince cultivars in the world:

- Missouri Mammoth – Large, round fruit; one of the early varieties.
- Portugal (Lusitanica) – Medium, pear-shaped; widely grown and often used for cooking.
- Powell's Prize – Small, pear-shaped fruit with good quality.
- De Vranja – Large, long pear-shaped fruit with good eating quality.
- Champion – Medium, pear-shaped with good quality.
- Smyrna – Large, long pear-shaped fruit with good quality.
- Mummery's Seedling – Large, pear-shaped and good quality.
- Fuller's – Medium-large, pear-shaped fruit.
- Pineapple – Medium, pear-shaped with good quality; a traditional popular variety.
- Master's Early – Medium-large, pear-shaped fruit.
- De Bourgeaut – Medium-large, pear-shaped with deep pink colour when cooked.
- Van Deman – Medium, pear-shaped that matures very late.

6. Stone Rosaceae (Les rosacées à noyau)

A. Definition

Stone Rosaceae are fruit trees that also belong to the Rosaceae family, such as plums, peaches, cherries, apricots, and almonds. Their fruits have a single stone (pit) inside, and in some cases, the seed is edible. These trees are grown for their fruits or seeds

B. Peach (Prunus persica)

Peach is a low spreading freely branching Chinese tree (Prunus persica) of the rose family that has lanceolate leaves and sessile usually pink flowers and is widely cultivated in temperate areas for its edible fruit which is a single-seeded drupe with a hard central stone, a pulpy white or yellow flesh, and a thin fuzzy skin

⇔ Cultivation

Peaches are easiest to grow in dry, continental, or temperate climates, while high humidity increases the risk of diseases and pests in tropical and subtropical regions. Peach trees require a chilling period of usually 600 to 1,000 hours at temperatures between 4 and 10 °C (39–50 °F); outside these conditions, the chilling requirement can only be met in high-altitude areas using low-chill cultivars. The trees can tolerate temperatures as low as −26 °C (−15 °F), but flower buds may die at this cold, and spring frost is a threat if temperatures drop below −1 °C (30 °F).

Summer heat is essential for fruit ripening, with the average temperature of the hottest month between 20 and 30 °C (68–86 °F), while heavy winter rains below 16 °C (61 °F) promote peach leaf curl disease.

Peaches prefer well-draining soils with a depth of 45–60 cm (18–24 in) and high fertility. They need regular watering, especially before harvest, and nitrogen-rich fertilizers such as blood meal or bone meal. Flowers and fruits are thinned to ensure good size and flavor, and trees are usually grafted onto suitable rootstocks to improve hardiness and fruit quality. Most peach trees begin producing fruit in their third year and have a lifespan of 7 to 15 years depending on the region. They can also be trained in an espalier shape along walls to increase warmth and improve production in colder areas.

Peaches are highly perishable and are best eaten or canned within two weeks of harvest, with optimal nutritional quality, especially vitamin C, when fully ripened on the tree. Peaches are climacteric fruits, meaning they continue to ripen after picking. Ethylene and auxin hormones regulate the ripening process, and ethylene inhibitors can be used to delay ripening, although they negatively affect the fruit's aroma.

⇔ **Peaches classified**

There are hundreds of peach and nectarine cultivars, primarily classified as freestone or clingstone. Freestone peaches have flesh that easily separates from the pit and are preferred for fresh eating, while clingstone peaches have flesh that clings to the pit and are often used for canning. Some cultivars are intermediate, called semifree. Peach flesh ranges in color from creamy white to deep yellow or dark red depending on the cultivar, and China has the greatest genetic diversity, with 495 recognized cultivars. Breeding has focused on producing peaches with firmer flesh, more red coloration, and shorter fuzz to improve appearance for shipping and retail, although this has not necessarily enhanced flavor. Commercial growers typically plant a mix of cultivars to ensure fruit availability throughout the season.

Nectarines are smooth-skinned peaches, sometimes called "fuzzless peaches" or "shaved peaches," and they belong to the same species as peaches. The smooth skin is due to a recessive allele, while fuzz on peaches is dominant. Like peaches, nectarines can be white or yellow, freestone or clingstone, and tend to be slightly smaller and sweeter than peaches. Their smooth skin can sometimes appear more reddish, giving them a plum-like appearance. The history of nectarines is somewhat unclear: they were first mentioned in English in 1611 but were likely cultivated earlier in central and eastern Asia. In the United States, nectarines were grown before

the Revolutionary War, with records from 1768 in Long Island, New York. Later, higher-quality cultivars with improved shipping traits were introduced to the U.S. by David Fairchild in 1906.

⇔ **Peach Varieties Mentioned**

- Peach / Common Peach – the general name for the species.
- White Peach – peach with white flesh.
- Donut / Flat Peach – flat-shaped or "donut" peach.
- Saturn Peach – a type of flat peach.
- Clingstone Peach – peach whose flesh clings to the pit.
- Freestone Peach – peach whose flesh separates easily from the pit.

C. Apricot (Prunus armeniaca)

Prunus armeniaca, the most commonly cultivated apricot species, has a somewhat uncertain native range due to its extensive prehistoric cultivation. Genetic studies indicate that Central Asia is the species' center of origin. Today, it is widely cultivated in many countries and has escaped into the wild in numerous regions. The species name *armeniaca* refers to the country of Armenia in Western Asia.

⇔ **Cultivation**

Apricot trees (Prunus armeniaca) thrive in full sun, requiring at least 6–8 hours of sunlight daily, and they grow best in sites with good air drainage to protect early blossoms from frost. They prefer fertile, well-drained loam or sandy loam soils with a pH of 6.0–7.5, and they do not tolerate waterlogged or heavy clay soils; raised beds or slight mounds can help in poorly draining areas. Bare-root trees should be planted in late winter to early spring while dormant, and container-grown trees can be planted from spring through early fall if the soil is not frozen or too hot. Trees should be set so the root crown is at or slightly above soil level, with mulch applied around the drip line but kept away from the trunk. Depending on the variety, apricots require about 300–900 hours of chilling below 7 °C (45 °F) to break dormancy properly, and they grow best in USDA hardiness zones 5–8, though low-chill cultivars are suitable for milder climates. Deep, infrequent watering is recommended, keeping soil evenly moist from bloom through harvest to reduce fruit cracking, and then reducing water after harvest to allow wood to harden for winter. Apricots are moderate feeders and usually require annual compost or a light balanced fertilizer in spring; excessive nitrogen encourages too much leafy growth. Trees

are best trained to an open-center (vase) shape with 3–4 main scaffold branches to allow sunlight and airflow, and annual pruning helps control vigor, renew fruiting wood, and remove dead or crossing branches. Fruit thinning is important after natural drop, leaving one fruit every 10–15 cm to increase size, sweetness, and reduce limb breakage. Early blossoms are frost-sensitive, so frost cloths or avoiding frost pockets may be needed. Common pests and diseases include brown rot, shot hole disease, aphids, and peach twig borers, but good pruning, airflow, and keeping canopies dry help reduce problems. Apricots are harvested when fully colored and fragrant, and they taste best when allowed to ripen on the tree, handling carefully to avoid bruising.

⇔ **Apricot Varieties**

- **'Moorpark'** – Classic flavorful apricot, great for fresh eating and baking.
- **'Blenheim (Royal)'** – Aromatic, excellent for fresh, drying, and canning.
- **'Goldcot' –** Cold-hardy, firm fruit good for freezing, pies, and jam.
- **'Harcot' –** Canadian-bred, balanced sweet-tart flavor and crack-resistant.
- '**Tomcot'** – Large, early ripening and heavy producer; good fresh or dehydrated.
- **'Tilton' –** Classic canning apricot with tangy flavor.
- '**Katy' –** Low-chill, very early ripening; good for mild winter regions.
- '**Chinese (Mormon)**' – Tough, later-blooming cultivar often suited to colder gardens.
- '**Early Golden' –** Early, richly flavored, self-fruitful, and reliable in moderate winters.

D. Plum (Prunus domestica)

The plum tree, or cultivated plum (Prunus domestica L.), is a flowering plant species belonging to the genus Prunus, the Amygdalus-Prunus clade, section Prunus, in the family Rosaceae. It is a fruit tree grown for its fruit, plums, and is less commonly called the domestic plum.**Cherry (Prunus avium / Prunus cerasus)**

⇔ **cultivation**

Prunus domestica 'Victoria' is a popular European plum variety that grows best in full sun in well-drained, moderately moist soil with a sandy or loamy texture. This plum tree requires approximately 700 chill hours (temperatures below 7 °C / 45 °F) during winter for proper bud break in spring. It typically reaches a medium size of about 4–6 m (13–20 ft) in height and width, though dwarf forms are smaller. Young trees should be trained to an open-center shape to ensure light and airflow reach all branches, promoting better fruit production. Minimal pruning is done after flowering while the tree is still leafless, mainly

to allow light into the center and encourage moderate new growth for the following season; roughly 20 % of the annual new growth is removed to rejuvenate the tree and control its spread. Propagation is achieved through budding or grafting onto a suitable rootstock, which influences tree vigor. Common pests and diseases include plum aphids, caterpillars, red spider mites, brown scale, plum moth, silver leaf, bacterial canker, and brown rot, though this variety is generally hardy and rarely seriously affected by disease. Birds are also attracted to the fruit, so regular care is needed to optimize harvest.

⇔ **Varieties**

- Quetschier / Prunier de Damas – fruits violets à chair jaune d'or
- Mirabellier – petites prunes rondes, jaunes
- Prunier de Reine-claude – fruits jaune-verdâtre, goût fin
- Seugnette (prune lorraine)
- Murcadier / Prunier de Saint Léonard (variété limousine) – petites prunes à épiderme violet et chair verte

5. Almond (Prunus dulcis)

⇔ **Definition**

Prunus dulcis (the almond tree) is a deciduous fruit tree in the rose family (Rosaceae), grown for its valuable edible nuts and beautiful spring blossoms. It has a rounded canopy with long, serrated leaves and is appreciated both for its aesthetic appeal and its nutritious seeds.

The almond tree produces fragrant, pale pink or white flowers in early spring, often before the leaves emerge. Its fruit is a velvety, pale green drupe with a hard shell inside that contains the edible almond nut. The leaves are simple, alternate, lanceolate with serrated edges, creating a lush canopy during the growing season. Young trees have smooth gray bark that becomes darker and more fissured with age. Almond trees typically reach 10–15 ft (3–4.5 m) in height and width in suitable climates and are hardy in USDA zones 7–9, thriving in hot, dry summers and mild winters for optimal growth and nut production. The flowers attract bees and butterflies early in the season. Mature trees are moderately drought-tolerant but still require regular watering during nut development. There are two main types: sweet almonds (var. dulcis) for eating and commercial use, and bitter almonds (var. amara), which require processing to remove toxins. Sweet almonds are safe to eat, while bitter almonds contain amygdalin, which can convert to toxic cyanide if consumed raw in large amounts.

⇔ **cultivation**

Prunus dulcis (almond tree) thrives in Mediterranean-style climates with warm, dry summers and mild, wetter winters. It needs a sunny location that receives at least 6–8 hours of direct sunlight daily, and prefers deep, moderately fertile, well-drained soil; heavy, poorly draining soils should be improved with compost to enhance fertility and drainage. Almond trees require a period of cold weather (about 300–600 chill hours below 7 °C / 45 °F) to end dormancy and begin flowering, but are susceptible to severe cold below around −4 °C (25 °F), which can damage blossoms and developing nuts.

Plant bare-root almond trees in late winter or early spring while dormant, placing them in a hole twice as wide and deep as the root ball, then backfilling and watering thoroughly. Young trees should be watered regularly to establish deep roots; once established they are moderately drought-tolerant but still need consistent moisture during the growing and nut-development stages. Fertilize with a balanced fertilizer in early spring before new growth begins, and mature trees benefit from additional nitrogen to support nut production.

Annual pruning in winter during dormancy helps thin the canopy, remove dead or diseased wood, improve sunlight penetration and air circulation, and shape the tree. Apply a thick layer of mulch around the base to retain soil moisture and regulate temperature, and monitor regularly for pests and diseases. Most almond varieties benefit from cross-pollination, so planting at least two compatible varieties nearby improves nut production.

⇔ **Almond (Prunus dulcis)**

- Sweet almond — Prunus dulcis var. dulcis — the type commonly grown for edible almonds.
- Bitter almond — Prunus dulcis var. amara — a type traditionally used for almond oil and flavorings after processing to remove toxins.