Morphology of the banana plant

Drawing of a banana mat showing the 'true' stem (shown in blue) inside the pseudostem. The clump formed by the fruit-bearing parent plant, its suckers and the rhizome is called a mat.

The banana plant is a tree-like perennial herb. It is an herb because it does not have woody tissues and the aerial parts of the parent plant die down to the ground after the growing season. It is a perennial because one of the offshoots growing at the base of the plant, the sucker, then takes over. The parent plant and its suckers form what is commonly called a mat, or stool. The botanical term is *genet*.

What looks like a trunk is not a woody stem but a pseudostem, a compact masse of overlapping and spirally arranged leaf sheaths. Most of the 'true' stem is inside the pseudostem. In a fruiting plant, it starts on the rhizome and ends with the meristem in the male bud (if present).

The variability observed in morphological traits is used to characterize banana plants. Wild species of bananas share the same body plant as cultivated bananas, except that they reproduce through both seeds and suckers.

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Root system

The root system is the means by which the plant takes up water and nutrients from the soil.

The roots are produced by the underground structure called a rhizome. The primary roots originate from the surface of the central cylinder (see below), whereas secondary and tertiary roots originate from the primary roots.

Rhizome

The rhizome is commonly referred to as a corm, and occasionally as a bulb, but the botanically correct term is rhizome. Rhizomes are characterized by horizontal underground growth; production of roots from multiple nodes; and production of clonal plants. Corms, on the other hand, are vertical enlarged compact stems with a tunic of thin leaves and roots arising from a single node; features that do not describe well the banana plant's underground structure.

In the vegetative phase, the terminal growing point of the rhizome, the apical meristem, has the form of a flattened dome. At the transition from the vegetative to the floral stage, the meristem area becomes convex and rises above the surrounding leaf bases. Flower bracts appear in place of leaves. Following the formation of the flower, the aerial stem begins to develop and carries the flower and leaf upwards, eventually emerging at the top of the pseudostem.

Pseudostem

Main page on the banana pseudostem

The pseudostem is the part of the plant that looks like a trunk. This ‘false stem' is formed by the tightly packed overlapping leaf sheaths. The pseudostem continues to grow in height as the leaves emerge one after the other and reaches its maximum height when the stem, which has been developing inside the pseudostem, emerges at the top of the plant.

Even though the pseudostem is very fleshy and consists mostly of water, it is quite sturdy and can support a bunch that weighs 50 kg or more.
Stem

Banana plants stripped of their leaves to reveal the stem.

The stem provides support to the leaves, and flowers and fruits. The leaves or flowers are attached to a node, and the sections between nodes are internodes. The stem develops from the apical meristem on the rhizome and grows inside the pseudostem until it emerges at the top of the plant. The part inside the pseudostem is called the aerial stem. When it emerges at the top of the plant, it becomes the peduncle.

The leaves are attached to the aerial stem (erroneously called floral stem), whereas the flowers and fruits are attached to the peduncle.

Leaf

Main page on the banana leaf

The leaf is the plant's main photosynthetic organ. Each leaf emerges from the center of the pseudostem as a rolled cylinder (see cigar leaf below). The distal end of the elongating leaf sheath contracts into a petiole, that is more or less open depending on the cultivar. The petiole becomes the midrib, which divides the blade into two lamina halves. The upper surface of the leaf is called adaxial while the lower one is called abaxial.

The first rudimentary leaves produced by a growing sucker are called scale leaves. Mature leaves that consist of sheath, petiole, midrib and blade are called foliage leaves.

Lamina veins run parallel to each other in a long S shape from midrib to margin. Veins do not branch, which results in leaves tearing easily.

Cigar leaf

The cigar leaf is a recently emerged leaf still rolled as a cylinder.

The lapse of time in which a leaf unfolds varies. Under favourable climatic conditions, it takes about seven days, but it can take up to 15 to 20 days under poor conditions.

The new leaf is tightly coiled, whitish, and particularly fragile.

The extension at the tip of the leaf is called the precursory appendage. After emergence, it withers and falls off.

Sucker

Main page on the banana sucker
A **sucker** is a lateral shoot that develops from the rhizome and usually emerges close to the parent plant. Other names for sucker are *keiki* (in Hawaii) and *pup*. A sucker that has just emerged through the soil surface is called a **peeper**. A full grown sucker bearing foliage leaves is called a **maiden** sucker.

Morphologically, there are two types of sucker: **sword** suckers (right on the photo), characterized by narrow leaves and a large rhizome, and **water** suckers (left on the photo), which have broad leaves and a small rhizome. Water suckers have a weak connection to the parent plant and as such will not develop into a strong plant.

The number of suckers produced varies with the type of cultivar. The sucker selected to replace the parent plant after fruiting is called the **follower** or **ratoon**.

**Inflorescence**

The **inflorescence** is a complex structure that includes the flowers that will develop into fruits. The botanical term for the banana inflorescence is a **thyrse** (an inflorescence in which the main axis continues to grow and the lateral branches have determinate growth). The main types of flowers are the female flowers, which develop into fruits, and the male flowers.

The **female (pistillate) flowers** appear first. In cultivated bananas, the ovary develops into a seedless fruit by parthenocarpy (without being pollinated). As it lifts, the **bract** (a modified leaf associated with a reproductive structure) exposes a cluster of female flowers that are normally arranged in two rows. These flowers will develop into a **hand** of fruit. The number of hands in the **bunch** depends on the number of female clusters in the inflorescence, and varies depending on the genotype and environmental conditions.

As the female flowers develop into fruit, the distal portion of the inflorescence elongates and produces clusters of **male (staminate) flowers** that produce pollen. In cultivated bananas, the amount of pollen is reduced or may be absent.

**Peduncle**
In botany, the **peduncle** is the stalk that supports the inflorescence. Yet, in the Descriptors for bananas, the peduncle refers only to the stalk between the leaf crown and the first hand of fruit, whereas the stalk that actually supports the female and male flowers is called **rachis**\(^1\). Jeff Daniells and David Turner have argued that in keeping with the botanical definition of the term, the peduncle extends to the meristem in the **male bud** and is composed of three sections: the transitional, female and male peduncles\(^12\).

**Transitional peduncle**

The **transitional peduncle** supports organs that are in transition from leaves to **bracts**: sterile nodes with a bract that abscises at bunch emergence. It corresponds that what is traditionally called the the peduncle.

**Female peduncle**

The **female peduncle** supports the female flowers that develop into fruits.

**Bunch**

The **bunch** is the descriptive term that includes all the fruits. The fruits are arranged into **hands**, the former clusters of flowers that were each subtended by a **bract**. By analogy, the fruits in a hand are often called **fingers**.

**Male peduncle**

The **male peduncle** supports the male flowers in the **male bud**. It corresponds that what is traditionally called the **rachis**, an ambiguous term that in botany has been used in relation to both vegetative and reproductive parts, whereas the term peduncle is only used for stems that support flowers\(^13\).

The part above the male bud can be bare or covered with persistent **bracts**. The scars (**nodes**) indicate where the bracts were attached. The male peduncle continues to grow as the fruits are maturing.

**Male bud**

The **male bud** contains clusters of **male flowers**. Each cluster is subtended by a **bract**. The male bud is sometimes called the **bell**. In some cultivars, it ceases to grow after the fruits have set and can be more or less exhausted by the time the bunch reaches maturity. The presence or absence of the male bud is one of the traits used to distinguish cultivars.

**References**

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