

PHYLLODE THEORY

Modification of petiole or any part of the rachis (axis of a compound leaf) into leaf-like flattened green structure is known as 'phyllode'. The phyllode is a characteristic of xerophytic plants, and its main function is to carry on photosynthesis.

Phyllodes are modified [petioles](#) or [leaf](#) stems, which are leaf-like in appearance and function.^[1] In some plants, these become flattened and widened, while the leaf itself becomes reduced or vanishes altogether. Thus the phyllode comes to serve the purpose of the leaf. Some important examples are [Euphorbia royleana](#) which are cylindrical and [Opuntia](#) which are flattened.

*They are common in the genus [Acacia](#), especially the Australian species, at one time put in *Acacia* subg. *Phyllodineae*. Sometimes, especially on younger plants, partially formed phyllodes bearing reduced leaves can be seen. The illustration (to the right) of [Acacia suaveolens](#) from [Novae Hollandiae plantarum specimen](#) shows the juvenile true leaves, together with the developing phyllodes, and the phyllodes of the mature plant.*

The genus, [Daviesia](#), in the family [Fabaceae](#), is characterised in part by the plants having phyllodes.

The leaves of many plants which have to perform specialized functions become modified or metamorphosed into distinct forms. The phyllodes are common in monocotyledons, but rare in dicotyledons.

The leaves of most monocotyledons are phyllodes instead of typical leaves in true morphological sense. The leaves of those plants lack the lamina or blade. They are so called apparent leaf blade and comprises actually expanded petiole or leaf base or both. This replacement of leaf lamina by phyllode is not only confined to monocotyledons but also occur rarely in dicotyledons, e.g., *Acacia*, *Eryngium*, *Oreomyrrhis*, etc. This view regarding the presence of phyllode in majority of the families of monocotyledons is supported by Arber (1920, 1925) and is known as **Phyllode theory**.

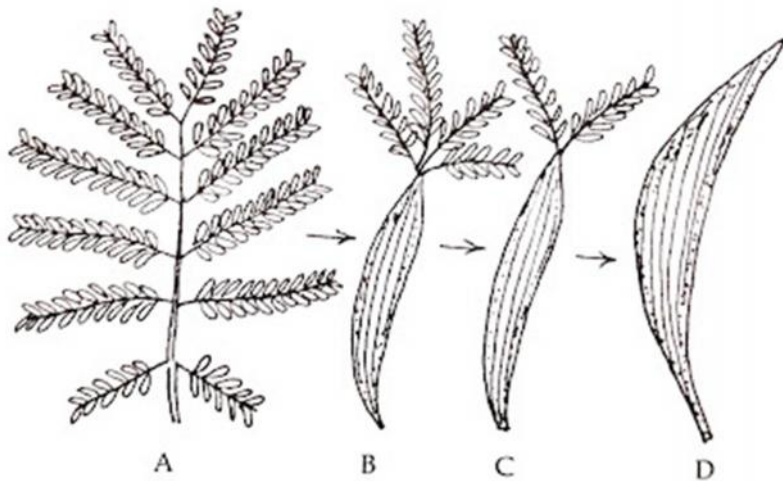


Fig: Development of phyllode on Australian *Acacia*.
 A. Pinnately compound leaf, B & C. Petiole developing into phyllode & D. Phyllode.

The peculiarity of possessing basal leaf sheath and a simple blade by numerous monocotyledonous families is a common feature. Phyllodes found in monocotyledons may be either petiolar or a leaf sheath in origin, the true lamina being absent or suppressed. So there are two types of phyllode – the *petiolar phyllode* and the *leaf sheath phyllode*.

1. **The petiolar phyllode:-** The cylindrical elongated leaf of *Allium sepa* and other species of *Allium* is a typical petiolar phyllode. In this case, the membranous sheath is very distinct and apparent which is prolonged upward into a green cylindrical petiole forming a lamina. In *Trigochin maritimum*, the same morphological structure is found. Here the leaf is actually composed of basal sheath and awl-like petiole. The petiole may be flattened or expanded in vertical as well as in horizontal plane.
2. **Leaf sheath phyllode:-** Leaf sheath and leaf base phyllodes also occur in many monocotyledons. In a leaf sheath phyllode the leaf is further reduced. In petiolar phyllode, the leaf represents two parts – the base and the petiole. The lamina is

suppressed whereas the leaf sheath phyllode consists of flattened base only. In several genera of Iridaceae and Liliaceae, the petiole is very small or reduced to minute apical portion, hence the leaf consists of flattened base only. The leaf sheath phyllode is found in monocotyledons like *Doryanthes*, *Distichia*, *Elegia*, etc.

In dicotyledons, the petiole metamorphosed into expanded blade-like structure. In Australian *Acacia*, the petiole or any part of the rachis become flattened or winged taking the shape of the leaf and turning green in colour. This flattened or winged petiole or rachis is known as **phyllode**. There are altogether 300 species of Australian *Acacia*, all showing phyllode. Examples are – *A. moniliformis*, *Acacia melanoxylon*, etc.

Significance of phyllode theory

1. Morphological support of this theory is given by close resemblance of the monocotyledon leaf to the sheathing bases of some dicotyledonous leaves.
2. The theory holds that the typical monocotyledon leaf arose by the self-adaptation of dicotyledon leaf.

AGNES ARBER

THERE is now a considerable balance of evidence in favour of the view that the Monocotyledons are descended from Dicotyledonous ancestors. If this theory be accepted, it should become possible to trace homologies between the various organs occurring at the present day in the two groups, since both these groups are thus regarded as the modern representatives of an original common stock. From this point of view, the only structure in the mature plant which presents any difficulty is the leaf. The typical Monocotyledonous leaf is of a simple, more or less linear, form, with a sheathing base and parallel veins: how is such a leaf to be compared with that of a Dicotyledon, consisting, in its fullest expression, of leaf-base and stipules, petiole and net-veined lamina? This question has naturally attracted the attention of morphologists, and an interpretation, which has become known as the 'phyllode theory', was put forward, with some reservations, by de Candolle 2 not much less than a century ago. According to this view, the typical Monocotyledonous leaf does not correspond to the complete Dicotyledonous leaf, with its leaf-base and stipules, petiole and lamina, but is merely the equivalent of a petiole with a sheathing base. On this interpretation, the Monocotyledonous leaf, in spite of the reduction which it has suffered, still includes within itself, in many cases, parts derived from each of the two developmental regions of the leaf—the 'Oberblatt', which normally produces the lamina and petiole, and the 'Blattgrund' or 'Unterblatt', which gives rise to the leaf-base and stipules.