PLANT IDENTIFICATION:

Construction and Use of Keys

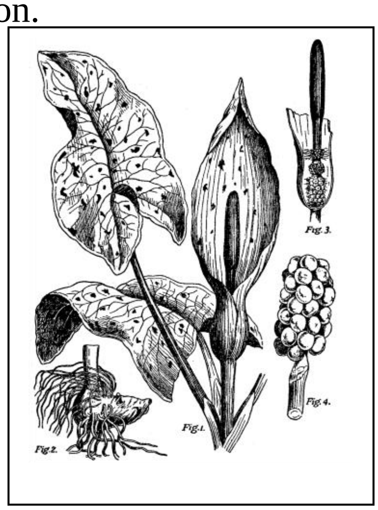
Identification of unknown plant is one of the basic components of plant taxonomy. A plant specimen can be identified with already known herbarium specimen utilizing the available literature and comparing the description of unknown plant with published description or taking the help of botanical gardens.

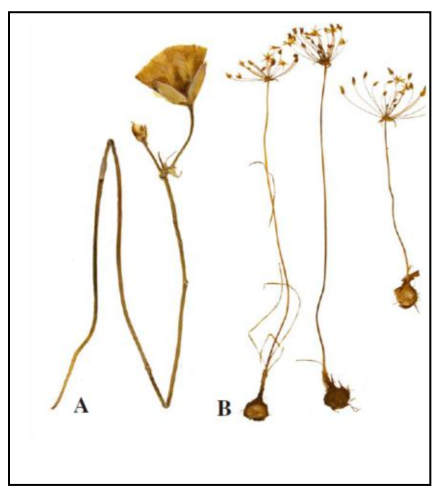
Taxonomic keys prove an ideal aid for rapid identification of unknown plants.

Construction and Use of Keys

First step for Identification of unknown plant is to determine whether the plant is a dicotyledon or monocotyledon. If a plant is woody or herbaceous, has taproot system, leaves with reticulate (netted) venation, floral parts in multiple of 5 whorls (or 4 or 2 whorls), it is assigned as a **dicotyledonous plant**. Of course, anatomical characters like vascular bundles arranged in a ring, secondary growth present and two cotyledons also provide supportive evidences. And if a plant herbaceous, has adventitious root system, leaves with parallel venation, floral parts in multiple of three whorls (rarely less or more), it is assigned as a **monocotyledonous plant**. Anatomical characters like scattered vascular bundles in the stem, absence of secondary growth, and cotyledon one, further support the assignment.

Then comes assignment of the plant to its specific category. Initial identification has to be at the **Family** level and subsequently up to **Genus, species, sub-species, variety, form** etc. Keys based on comparative characters, are quite helpful in plant identification.





Type of keys:

Based on the arrangement of characters and their utilization, keys are mainly of two types; **single-access (dichotomous, diagnostic** or **sequential)** keys or **multi-access (poly-claves)** keys.

Single-access (dichotomous, diagnostic or **sequential) keys**:

1) Indented or **Yoked keys;**

These are the most commonly used in floras and manuals, especially when they are of smaller size. In them, the statements (leads) and the taxa identified from them are arranged in usual groups or yokes. Additionally, the subordinate couplets are indented below the primary one at a fixed distance from the margin, the distance increasing with each subordinate couplet. An example of indented or yoked keys for taxa under consideration is given:

1. Fruit achene
    2. Calyx differentiated from corolla
        3. Petal with basal nectary . . . . 1. *Ranunculus*
        ′3. Petal without basal nectary . . . . 2. *Adonis*
    ′2. Calyx not differentiated from corolla
        4. Plants woody . . . . 4. *Clematis*
        ′4. Plants herbaceous . . . . 3. *Anemone*

′1. Fruit follicle
    5. Spur present
        6. Number of spur 1 . . . . 6. *Delphinium*
        ′6. Number of spur 5 . . . . 7. *Aquilegia*
    ′5. Spur absent . . . . 5. *Caltha*

2) **Bracketed** or **Parallel keys:**

These have been used in large floras (as in Flora of USSR, Plants of Central Asia and Flora of British Isles). In them, the two leads of a couplet are always together and the distance from the margin is always the same, thus saving the page space.

1. Fruit achene 2

′1. Fruit follicle 5

2. Calyx differentiated from corolla 3
′2. Calyx not differentiated from corolla 4
3. Petal with basal nectary . . . . 1. *Ranunculus*
′3. Petal without basal nectary . . . . 2. *Adonis*
4. Plants woody . . . . 4. *Clematis*
′4. Plants herbaceous . . . . 3. *Anemone*
5. Spur present 6
′5. Spur absent . . . . 5. *Caltha*
6. Number of spur 1 . . . . 6. *Delphinium*
′6. Number of spur 5 . . . . 7. *Aquilegia*

SOME IMPORTANT (ANGIOSPERMS) FAMILIES
(1) DICOTYLEDONS

The traditionally defined group Dicotyledons, the Dicotyledonae or Dicots, have been defined in the past by their possession of embryos with two cotyledons, two cotyledons is an ancestral feature for the taxa of the flowering plants. Thus, dicots as traditionally delimited (all angiosperms other than monocots), and must be abandoned as a formal taxonomic unit.

The choice of these exemplars is very limited in the context of the huge diversity of the angiosperms. Only major, general features of these examples of families are intended as an introduction to some of the common or important groups for the beginning student. Finally, the family descriptions end with a floral formula.

The **Floral formulas** are used to summarize the number and fusion of floral parts. In these formulas, **P** refers to perianth parts and is used where the perianth is undifferentiated into a typical outer calyx and inner corolla. If the perianth is differentiated into a distinct calyx and corolla, **K** represents the number of sepals or calyx lobes and **C** the number of petals or corolla lobes. The androecium is denoted by **A** and represents the number of stamens, and $\frown$ (the stamens are fused with).

The gynoecium is denoted by **G**, showing the number of carpels in the gynoecium, followed by superior or inferior to denote ovary position. Connation, the fusion of similar parts, is illustrated with parentheses ( ) that enclose the number. Numbers that are enclosed by brackets [ ] represent a less common or rare condition.

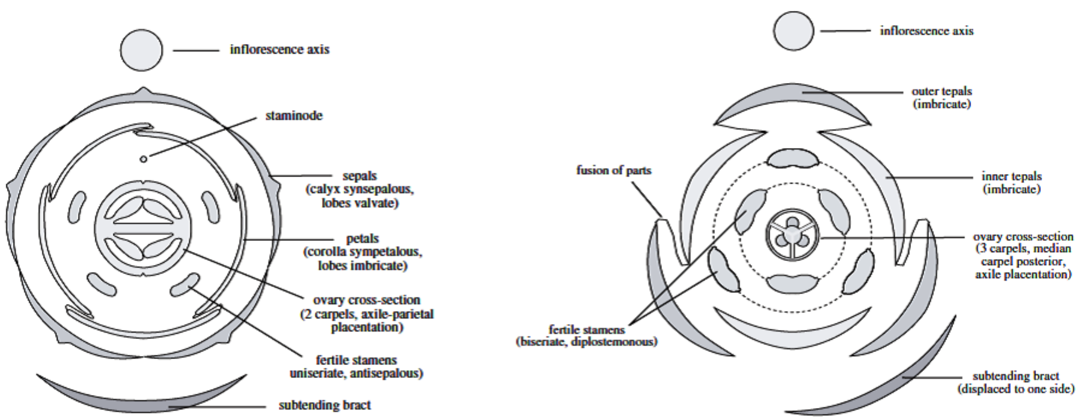
If there are more than about 10-12 parts, the ∞ sign is used for numerous, examples of floral formulas are:

K (5) [(4)] **C** 5 [4] **A** 5+5 [4+4] $\underline{\mathbf{G}}$ 5 [4]

P (3+3) **A** 3+3 $\bar{\mathbf{G}}$ (3) (often for Monocots)

K (5) **C** 5 **A** 5+5 $\underline{\mathbf{G}}$ 5 [4]

Floral diagram: These represent a diagrammatic cross-sectional view of a flower bud, showing the relative relationship of perianth, androecial, and gynoecial components. Floral diagrams may show fusion of floral parts as well as things such as stamen position, placentation, and perianth, calyx, or corolla aestivation.



Floral diagrams, illustrating relative relationships among the components of the perianth, androecium, and gynoecium.

Fabaceae

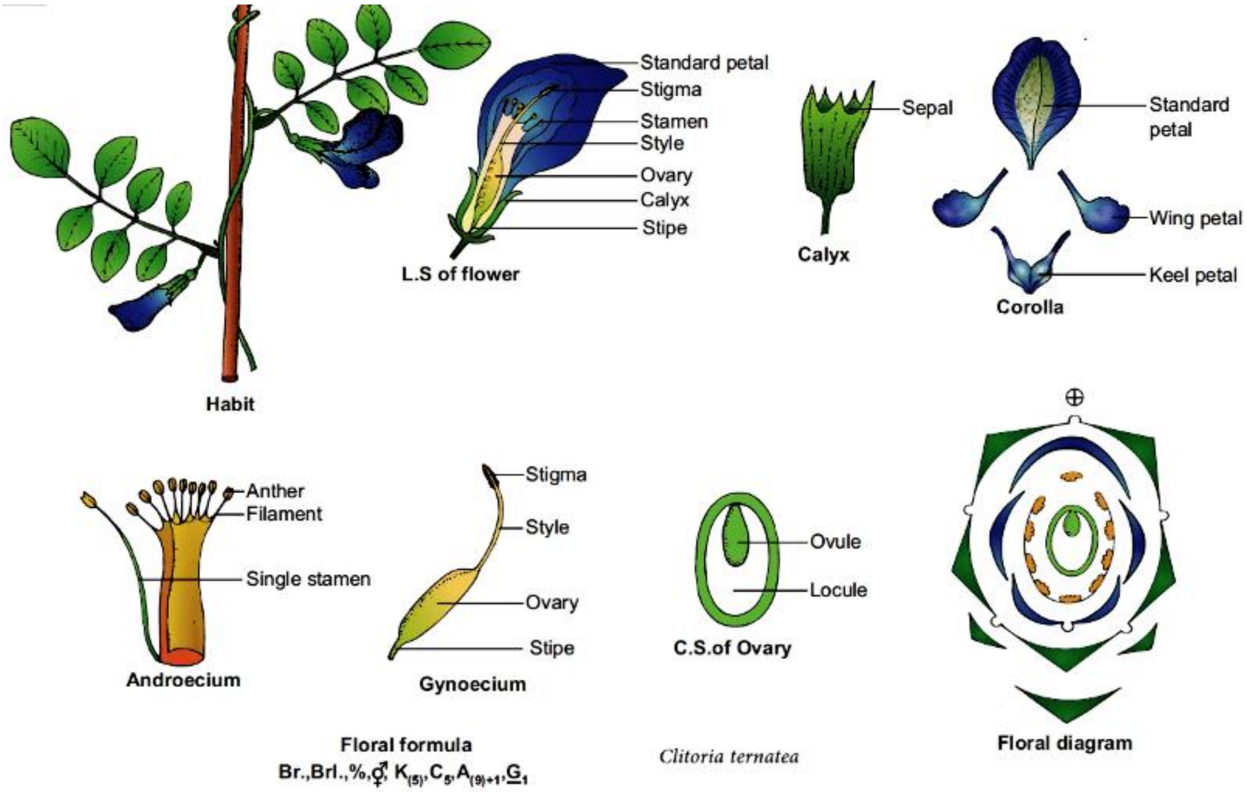
Fabaceae Lindley ***Bean or Pea family*** (=**Leguminosae** A. L. de Jussieu) 630 genera, 18,000 species (Third largest family after Asteraceae and Orchidaceae) Cosmopolitan in distribution, primarily in warm temperate regions. This large family has traditionally been divided into three subfamilies Papilionoideae (Faboideae), Caesalpinioideae and Mimosoideae. These have been recognized as independent families Fabaceae (Papilionaceae), Caesalpiniaceae and Mimosaceae in several recent systems of classification, a trend that tends to be reversing in last decade or so. Leguminosae is the alternate name only for former whereas Papilionaceae is the alternate name for latter. Common features of the family include leaves usually compound with pulvinate base, odd sepal anterior, flowers perigynous, carpel 1 with marginal placentation and fruit commonly a pod or lomentum.

Description:

Trees (*Dalbergia*, *Erythrina*), shrubs (*Tephrosia*, *Alhagi*, *Indigofera*) or herbs (*Medicago*, *Melilotus*), sometimes woody climbers (*Wisteria*), commonly with root nodules. **Leaves** alternate, pinnately (*Pisum*, *Vicia*) or palmately compound (*Trifolium*), sometimes simple (*Alysicarpus*, *Alhagi*), whole leaf (*Lathyrus aphaca*) or upper leaflets (*Vicia*, *Pisum*) sometimes modified into tendrils, leaf base (sometimes also the base of leaflets) pulvinate, stipules present. **Inflorescence** racemose, in racemes, heads (*Trifolium*) or spikes (*Ononis*), sometimes in clusters (*Lotus*, *Caragana*). **Flowers** bracteate (bracts often caducous), bisexual, zygomorphic, perigynous. **Calyx** with 5 sepals, more or less united, usually campanulate, odd sepal anterior. **Corolla** with 5 petals, free, papilionaceous consisting of a posterior standard or vexillum, two lateral wings or alae and two anterior petals fused along margin to form keel or carina which encloses stamens and pistil, posterior petal outermost. **Androecium** with 10 stamens, diadelphous (1 posterior free and filaments of nine fused into a tube which is open posteriorly), sometimes 5+5 as in *Smithia*, rarely monadelphous (*Ononis*), or free (*Sophora*, *Thermopsis*) anthers bithecous, dehiscence longitudinal. **Gynoecium** with a single carpel, unilocular with many ovules, placentation marginal, ovary superior, style single, curved. **Fruit** a legume or pod, rarely a lomentum (*Desmodium*), sometimes indehiscent (*Melilotus*), rarely spirally coiled (*Medicago*); seeds 1-many, seed coat hard, endosperm minute or absent, food reserves in cotyledons. Pollination primarily by insects, mostly bees. Dispersal is commonly by wind, but often exozoochorus (*Medicago*), or by mammals (*Tamarindus*).

Economic importance:

The subfamily is of major economic importance, ranking second to Poaceae. It is the source of several pulse crops such as kidney bean (*Phaseolus vulgaris*), green gram (*P. aureus*), black gram (*P. mungo*), lentil (*Lens esculenta*), chick pea (*Cicer arietinum*), pea (*Pisum sativum*) and pigeon pea (*Cajanus cajan*). Soybean (*Glycine max*) and peanut (*Arachis hypogaea*) yield oil and high-protein food. Indigo dye is obtained from *Indigofera tinctoria*. The seeds of *Abrus precatorius* are used in necklaces and rosaries, but are extremely poisonous and can be fatal if ingested. The important fodder plants include alfalfa (*Medicago sativa*) and clover (*Trifolium*). Common ornamentals include lupin (*Lupinus*), sweet pea (*Lathyrus odoratus*), Wisteria (*Wisteria*), *Laburnum*, coral tree (*Erythrina*), false acacia (*Robinia*) and broom (*Cytisus*).



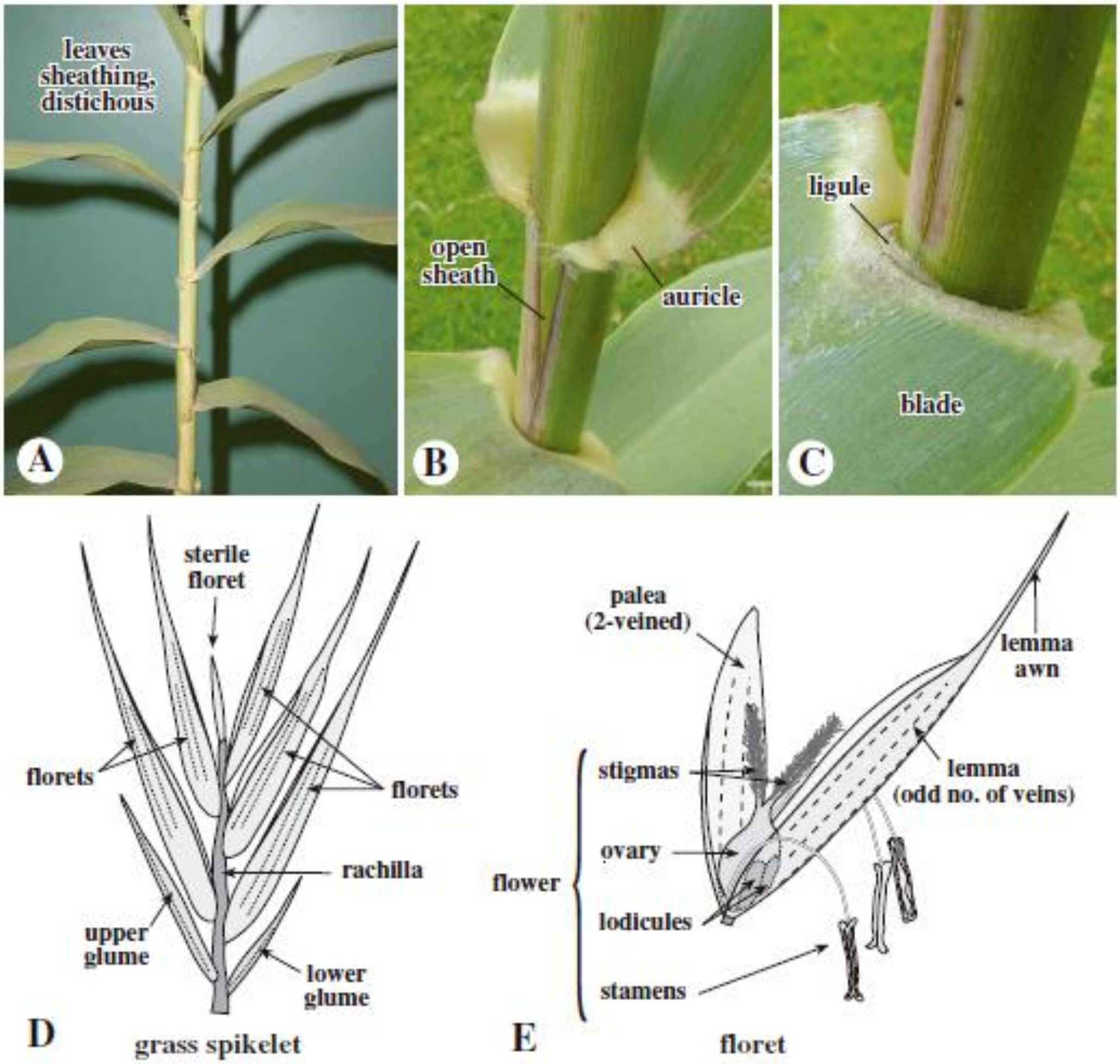
Grass family (Poaceae - - - - Gramineae)

Poaceae; from *poa*, Greek name for a grass, 668 genera / 9500 species. The Poaceae consist of perennial or annual, hermaphroditic, monoecious, or dioecious herbs or (in the bamboos) trees. The **roots** are adventitious. The underground **stems** of perennials are rhizomes or stolons, the erect stems (termed culms) are hollow (solid at the nodes). The **leaves** are simple, basal or cauline, distichous, rarely spiral, with a usually open, basal sheath; the leaf blade is parallel-veined, often auriculate at base, and typically ligulate, with a ligule at junction of sheath and blade (resembling a sheath-like structure or tuft of trichomes). The **inflorescence** consists of terminal or axillary spikelets (more properly termed grass spikelets), these aggregated in secondary inflorescences of spikes, racemes, panicles, or glomerules; the spikelets are sessile or stalked (the spikelet stalk termed a pedicel); the grass spikelet itself consists of an axis (termed the rachilla) bearing distichous parts: two basal bracts (termed glumes, the lower one called the first glume, the upper the second glume, sometimes modified or absent) and one or more florets ; each floret consists of a minute lateral axis with two additional bracts (termed the lemma and palea) and a flower; the lemma is the lower and larger bract; the palea is the upper, smaller bract, is partially enveloped or enclosed by the lemma. A bristle-like **awn** may be present at the apex of glumes or lemmas. The **flowers** are bisexual or unisexual, sessile, and hypogynous. The **perianth** is absent or modified into 2 or 3 **lodicules** (located on the lower side, toward the lemma), which upon swelling function to open the floret by separating the lemma from palea. The **stamens** are 2 or 3. **Anthers** are basifixed-versatile, usually sagittate at the base, generally pendulous on elongate filaments, dithecal, and longitudinal in dehiscence. The **pollen** is monoporate. The **gynoecium** is syncarpous, with a superior ovary, 2-3 carpels, and 1 locule. The **stigmas** are 2 or 3, usually plumose. **Placentation** is basal; **ovules** are usually bitegmic, 1 per ovary. **Nectaries** are absent. The **fruit** is a caryopsis (grain). The **seeds** are endospermous. Plants are wind pollinated.

Economic importance:

The Poaceae are worldwide in distribution. The grasses are perhaps the most economically important group of plants, containing the agricultural grains, including barley (*Hordeum*), corn (*Zea*), oats (*Avena*), rice (*Oryza*), rye (*Secale*), wheat (*Triticum*), and others, as well as important forage and grazing plants. Members of the family are also important components of many ecosystems, such as grasslands and savannahs.

P 2-3 [-6+] lodicules **A** 2-3 [1] **G** (2-3), superior.


leaves sheathing, distichous
A
open sheath
auricle
B
ligule
blade
C
sterile floret
florets
florets
rachilla
upper glume
lower glume
D
grass spikelet
palea (2-veined)
lemma awn
stigmas
lemma (odd no. of veins)
ovary
flower
lodicules
stamens
E
floret