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Compendium of Botany

Dr. Om Prakash Singh*

Assistant Professor, Department of Botany, R.K.S. College, Dalmianagar, Rohtas, V.K.S.U., Ara, Bihar

Abstract – The buds of many woody plants, especially in temperate or cold climates, are protected by a covering of modified leaves called scales which tightly enclose the more delicate parts of the bug. Many bud scales are covered by a gummy substance which serves as added protection. When the bud develops, the scales may enlarge somewhat but usually just drop off, leaving on the surface of the growing stem a series of horizontally-elongated scars.

By means of these scars one can determine the age of any young branch, since each year's growth ends in the formation of a bud, the formation of which produces an additional group of bud scale scars. Continued growth of the branch causes these scars to be obliterated after a few years so that the total age of older branches cannot be determined by this means.

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OVERVIEW

In many plants scales are not formed over the bud, which is then called a naked bud. The minute underdeveloped leaves in such buds are often excessively hairy. Naked buds are found in some shrubs, like some species of the Sumac and Viburnums (Viburnum alnifolium and V. lantana) and in herbaceous plants. In many of the latter, buds are even more reduced, often consisting of undifferentiated masses of cells in the axils of leaves. A termina bud occurs on the end of a stem and lateral buds are found on the side. A head of cabbage is an exceptionally large terminal bud, while Brussels sprouts are large buds.

Figure: On the left is an opening influorescence bud, that will develop like the one to the right.

Since buds are formed in the axils of leaves, their distribution on the stem is the same as that of leaves. There are alternate, opposite, and whorled buds, as well as the terminal bud at the tip of the stem. In many plants buds appear in unexpected places: these are known as adventitious buds. Often it is possible to find a bud in a remarkable series of gradations of bud scales. In the buckeye, for example, one may see a complete gradation from the small brown outer scale through larger scales which on unfolding become somewhat green to the inner scales through larger scales which on unfolding become somewhat green to the inner scales of the bud, which are remarkably leaf-like. Such a series suggests that the scales of the bud are in truth leaves, modified to protect the more delicate parts of the plant during unfavourable periods.

BUD

In botany, a bud is an undeveloped or embryonic shoot and normally occurs in the axil of a leaf or at the tip of the stem. Once formed, a bud may remain for some time in a dormant condition, or it may form a shoot immediately. Buds may be specialized to develop flowers or short shoots, or may have the potential for general shoot development. The term bud is also used in zoology, where it refers to an outgrowth from the body which can develop into a new individual.

Figure: Flower buds have not yet bloomed into a full-size flower

TYPES OF BUDS

Buds are often useful in the identification of plants, especially for woody plants in winter when leaves have fallen. Buds may be classified and described according to different criteria: location, status, morphology, and function.

Botanists commonly use the following terms:

- for location:

o terminal, when located at the tip of a stem (apical is equivalent but rather reserved for the one at the top of the plant);

o axillary, when located in the axil of a leaf (lateral is the equivalent but some adventitious buds may be lateral too);

o adventitious, when occurring elsewhere, for example on trunk or on roots (some adventitious buds may be former axillary ones reduced and hidden under the bark, other adventitious buds are completely new formed ones).

- for status:

o accessory, for secondary buds formed besides a principal bud (axillary or terminal);

o resting, for buds that form at the end of a growth season, which will lie dormant until onset of the next growth season:

o dormant or latent, for buds whose growth has been delayed for a rather long time. The term is usable as a synonym of resting, but is rather employed for buds waiting

undeveloped for years, for example epicormic buds;

o pseudoterminal, for an axillary bud taking over the function of a terminal bud (characteristic of species whose growth is sympodial: terminal bud dies and is replaced by the closer axillary bud, for examples beech, persimmon, Plantanus have sympodial growth).

- for morphology:

o naked, when not covered by scales;

o scaly or covered, when scales (which are in fact transformed and reduced leaves) cover and protect the embryonic parts:

o hairy, when also protected by hairs (it may apply either to scaly or to naked buds).

- for function:

o vegetative, if only containing pieces: embryonic shoot with leaves (a leaf bud is the same);

o reproductive, if containing embryonic flowers(s) (a flower bud is the same);

o mixed, if containing both embryonic leaves and flowers.

WITHIN ZOOLOGY

The term bud (as in budding) is used by analogy within zoology as well, where it refers to an outgrowth from the body which develops into a new individual. It is a form of asexual reproduction limited to animals or plants of relatively simple structure. In this process a portion of the wall of the parent cell softens and pushes out. The protuberance thus formed enlarges rapidly while at this time the nucleus of the parent cell divides. One of the resulting nuclei passes into the bud, and then the bud is cut off from its parent cell and the process is repeated. Often the daughter cell will begin to bud before it becomes separated from the parent, so that whole colonies of adhering cells may be formed. Eventually cross walls cut the bud from the original cell.

CHLOROPHYLL

Chlorophyll (also chlorophyll) is a green pigment found in almost all plants, algae, and cyanobacteria. Chlorophyll is an extremely important biomolecule, critical in photosynthesis, which allows plants to absorb energy from light. Chlorophyll absorbs light most strongly in the blue portion of the electromagnetic spectrum, followed by the red potion. However, it is a poor absorber of green and near-green portion of the spectrum, hence the green colour of chlorophyll-

containing tissues. Chlorophyll was first isolated by Joseph Bienaime Caventou and Pierre Joseph Pelletier in 1817.

CHLOROPHYLL AND PHOTOSYNTHESIS

Chlorophyll is vital for photosynthesis, which allows plants to absorb energy from light. Chlorophyll molecules are specifically arranged in and around photosystem that are embedded in the thylakoid membranes of chloroplasts. In these complexes, chlorophyll serves two primary functions. The function of the vast majority of chlorophyll (up to several hundred molecules per photosystem) is to absorb light and transfer that light energy by resonance energy transfer to a specific chlorophyll pair in the reaction centre of the photosystems.

The two currently accepted photosystem units are Photosystem II and Photosystem I, which have their own distinct reaction centre chlorophylls, named P680 and P700, respectively. These pigments are named after the wavelength (in nanometers) of their red-peak absorption maximum. The identity, function and spectral properties of the types of chlorophyll in each photosystem are distinct and determined by each other and the protein structure surrounding them. Once extracted from the protein into a solvent (such as acetone or methanol), these chlorophyll pigments can be separated in a simple paper chromatography experiment and, based on the number of polar groups between chlorophyll a and chlorophyll b, will chemically separate out on the paper.

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Corresponding Author

Dr. Om Prakash Singh*

Assistant Professor, Department of Botany, R.K.S. College, Dalmianagar, Rohtas, V.K.S.U., Ara, Bihar