

ALL YOU NEED TO KNOW ABOUT BULBS, CORMS, TUBERS, TUBEROUS ROOTS AND RHIZOMES

How plants adapt to stress of drought, freezing

Bulbs, corms, tubers, tuberous roots and rhizomes all arose as responses to a common problem: how to get through stressful periods of drought or freezing - which is effectively drought, too, as frozen water's useless to roots. The impressive variety of solutions is testimony to the power of natural selection, the process that has given life its amazing diversity.

All those geophytes are underground food storage organs that plants - mainly herbaceous perennials - use to get through lean times. But the different kinds grow from different structures and tissues, and evolved independently in various lineages. It must be a very good strategy.

True bulbs occur only in monocots, the division of flowering plants that includes lilies, irises, palms, grasses and orchids. All true bulbs have a basal plate of hardened stem tissue surrounded by a cluster of fleshy scales, which are modified leaves, where the food is stored. The plant's roots and shoots grow from the basal plate. Bulbs typically grow underground, but there are exceptions: The walking onion produces miniature bulbs in its flower head.

Some true bulbs, such as tulips, daffodils, hyacinths and Dutch irises, are tunicated (consisting of a series of concentric layers), with the scales completely enveloping the basal plate. Papery outer scales keep the bulb from drying out. Familiar example: an onion. True lilies (genus *Lilium*) and some close relatives have imbricated (overlapping) bulbs, with loosely overlapping outer scales; these need to be kept moist before planting. Both kinds produce new bulbs, called "increases," from lateral buds near the basal plate.

Other monocots including gladioluses, freesias, brodiaeas and crocuses have corms, "solid bulbs" without the onionoid rings of a true bulb. A corm develops from the base of a stem. Some have tunics formed from the dried bases of the previous season's leaves. Like true bulbs, corms have basal plates from which the roots grow. Unlike bulbs, they're only good for one growing season; successor corms form around the top of the old one. Taro and water chestnuts are edible corms.

Tubers are also stem-derived but lack a basal plate or a tunic-like covering. Buds scattered over the tuber's surface (the "eyes" of a potato) can give rise to shoots or roots. Caladiums, oxalises, arums, anemones and bleeding hearts are tuberous ornamentals. Many of the classic root vegetables are tubers: potato, true yams (although not sweet potatoes), yuca, Jerusalem artichoke, jicama. Tubers are built to last and may grow larger over the years.

Tubers are not to be confused with tuberous roots, which are actual roots that store nutrients. Like corms, they're limited to one growing season, during which they grow their replacements. Dahlias are tuberous-rooted ornamentals; they reproduce from buds at the top of the root or the base of the stem. Sweet potatoes are also tuberous roots.

Some sources classify plants with fleshy roots as another category: the likes of peonies, daylilies, carrots, parsnips and radishes.

With rhizomes, we're back to the modified-stem trick, but growing horizontally. Most of the irises have rhizomes, as do callas, cannas and lilies of the valley. Other rhizomes have culinary uses: ginger, turmeric, galangal (aromatic medicinal rhizome of certain eastern Asian plants such as Ginger family).

This is adapted from an article written by Joe Eaton and Ron Sullivan.
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