

ORNAMENTAL GEOPHYTES AND THEIR PROPAGATION

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Geophytes are plant species that survive not only by seed but also by specialized underground storage organs which function to store food reserves, nutrients, moisture for seasonal growth and development and thus, ensure the survival of the species. Collectively, the ornamental geophytes include both monocotyledonous and dicotyledonous species and are commonly called 'Flower bulbs'. However 'Bulb' can be applied to all geophytes whether they are bulbous, tuberous or herbaceous. Those ornamental plants which have specialized modified underground stem structures to overcome the unfavourable environmental conditions are known as bulbous ornamentals. Bulbous flowers have recently picked up manifold for commercial venture globally. A large quantum of material is being imported from Europe especially from the Netherlands every year for the production of cut flowers for domestic and international market. The import of bulb has increased recently threefold over the eighties. The expansion of area and production in the cultivation of Gladiolus, Tulip, Asiatic and Oriental hybrids of lilies are outstanding since 1991. Globally, there are around 50,000 ha area under bulbous crops out of which more than 18,000 ha area is in the Netherlands. Bulbs are the major propagating material traded in the global market. Nearly 74% of the global trade in floriculture sector is contributed by bulbs. Tulip is the single largest

bulbous crop in the trade with (543 million flowers), followed by lily (157 million flowers), alstroemeria (143 million flowers), freesia (132 million flowers), and iris (89 million flowers).

Propagating Materials: Propagation is the production of more plants by seeds, cuttings, graftings, bulbs, corms, tissue culture etc. Various specialized modified underground structures are the means of propagation in case of bulbous plants like:

- Bulbs
- Corms
- Rhizomes
- Stem Tubers
- Tuberous roots
- Tuberous stems
- Tubercles
- Bulbils
- Pseudo stems

These specialized structures are used for propagating the ornamental bulbous plants. Micro propagation is also followed.

Bulb: It is a specialized organ growing below the soil or occasionally protruding above it. A true bulb is a specialized underground complete miniature of a plant encased in fleshy modified leaves called scales. True bulbs are of two types:

Table 1 : World-wide area for bulb cultivation

Country	Hectares	Type of bulb crop
The Netherlands	20,921	Tulip, Lily
UK	4,660	Narcissus, Gladiolus, Tulip
France	1,289	Lily, Tulip, Iris, Gladiolus, Dahlia
China	1,281	Narcissus, Lily, Tulip
USA	995	Narcissus, Tulip, Gladiolus, Lily, Iris
Japan	883	Lily, Tulip, and Gladiolus
Israel	456	Narcissus, Ranunculus
Poland	335	Tulip, Lily, Narcissus, Gladiolus, Dahlia
New Zealand	258	Tulip, Lily, Zantedeschia, Iris, Freesia
Chile	240	Lily, Tulip
South Africa	200	Hippeastrum, Nerine, Lily, Tulip
Brazil	200	Gladiolus, Hippeastrum
Germany	190	Tulip, Gladiolus, Narcissus, Crocus
Belgium	185	Begonia, Lily
Denmark	60	Tulip, Narcissus
Argentina	47	Gladiolus, Tulip

Table 2 : The true bulbs are commercially propagated through various structures

Structure	Description	Examples
Offsets	Bulblets when grown to fully developed size are offsets and are used to multiply	Daffodil, Tulip, Bulbous Iris
Bulblets	Meristems developed in the axils of scales to form miniature bulbs are bulblets	Lilium.
Bulbils	The aerial bulblets produced in the axil of leaves are bulbils	Lilium
Stem cuttings	Stem cuttings are prepared shortly after flowering is over	Lilium
Scales	Single or twin scales are used to multiply	Lilium and Amaryllis
Scoring	Basal plate cut pieces are used to multiply. Bulb cut pieces in to four or eight so that every piece has at least one bud.	Amaryllis, Daylily Hyacinth and Tulip
Scooping	Removal of entire basal plate by scooping out. The cut end is treated with rooting hormone and planted in soil to produce a number of miniature bulbs	Amaryllis, Hyacinth
Leaf cuttings	Leaf cutting used to multiply	Football lily, Hyacinth and Muscari
Micro-propagation	Terminal/lateral bud eyes, bulbils, bulblets, scales or any unspecified organs from bulb or shoots are taken to multiply plans aseptically in almost all true bulbous plants.	

Table 3 : True corm plants are commercially propagated through various modified organs

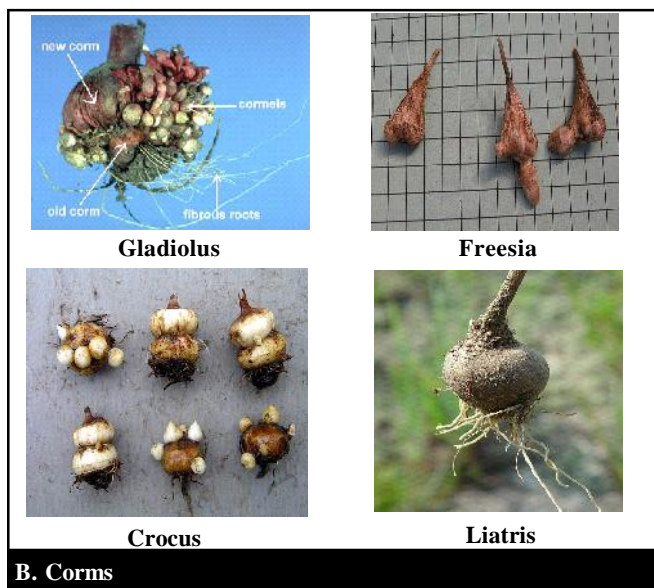
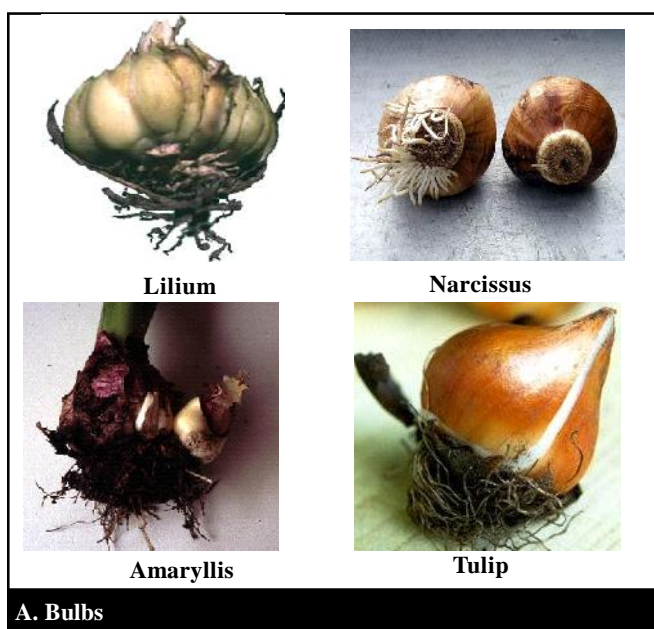
Structure	Description
Cormel	It is the swollen end of stolon with thick papery scales, formed between mother and daughter corms
Cormlets	Miniature corms
Corm division	Each division should have at least one eye which must properly suberize before planting, for which they should be dried in shade
Scoring	Cross cut about half a centimetre is given on the basal plate, which must be treated with rooting hormone before planting
Micro propagation	Terminal/ lateral bud eyes, nodal or inflorescence segments or any unspecified organs from corm shoots are taken to multiply plants aseptically in almost all true corm plants

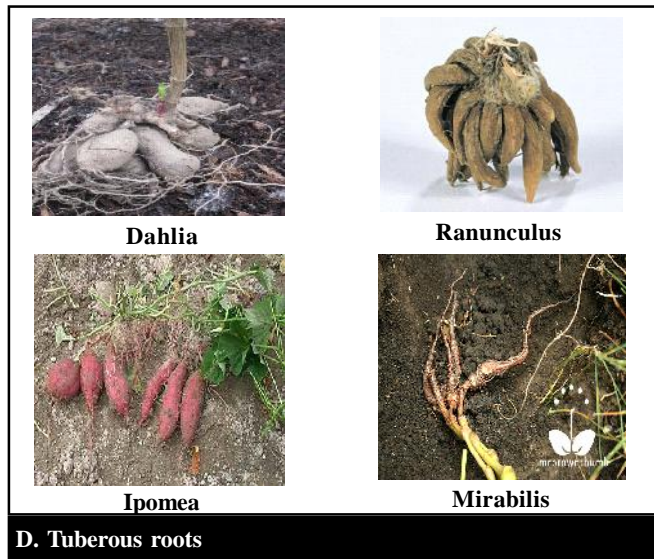
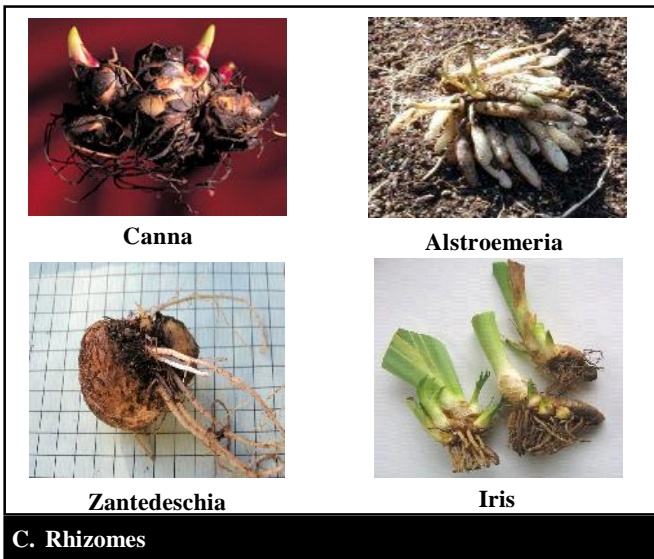
Tunicated Bulbs: When fleshy scales are tightly packed, completely encircling those within and are typically enclosed in a papery tunic, which covers and protects the bulbs from surface damage and drying e.g. Narcissus, Tulip, Hyacinth etc.

Non-tunicated Bulbs: When the fleshy leaves are not covered with any tunic and are formed from modified scale leaves e.g. Lilium, Fritillaria etc.

Corm: Corm is a condensed form of rhizome. It is the swollen base of a stem axis which becomes short, compact and is covered by scales like leaves. Corm generally persists for only a single year and is replaced by a new one above it as in Gladiolus, Crocus, Freesia and Liatris.

Rhizome: Rhizome is a specialized underground stem structure in which the main stem axis grows horizontally





at just below the ground surface. e.g. Canna, Zantedeschia, Hedychium, Iris, Convullaria etc. True rhizome plants are commercially propagated through division of clumps, rhizomes, culam cuttings and micropropagation.

Tuber: Tuber is a specialized kind of swollen underground modified stem structure with a terminal and several lateral eyes which function as storage organs e.g. Gloriosa, Tuberous Begonia, Caladium and Musa etc. True tuberous plants are commercially propagated through as well as division of tuber having at least one eye per divided section, which must properly suberize before planting, for which these should be dried in shade. Tubercle, which is a small tuber produced aerially in the axils of leaves in *Bowiea volubilis*.

Tuberous roots: Tuberous roots fleshy swollen roots

that store food material are known as tuberous roots. Tuberous roots are also known as root tubers which are formed as result of massive enlargement of roots instead of stem. Most common example is Dahlia, Ranunculus, Eranthis, Ipomea and Mirabilis etc. Usually method of propagation of tuberous roots is by division of crown so that each section bears a shoot bud.

Stem tuber: A stem tuber is a shorten and much thickened underground stem that function as storage organ. A stem tuber has nodes (eyes) present in a regular order over the surface. Nodes are arranged spirally, beginning with the terminal bud at the end opposite of the stolon. e.g. Caladium, Cyclamen, Begonia etc.

Pictorial view of different propagating material

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