

Are you my Mother?

Rutherford County Master Gardner May Podcast

Handout Sources

From Handout: <https://studylib.net/doc/25363040/food-storage-organs-handout>

Flowering plants make food (sugars) during photosynthesis. Sugars are translocated to other plant parts, converted to starch, lipids (oils) and proteins and stored. Some of the food is used for growth and development and in activities that require energy.

Importance of Food Storage in Living organisms

Storage as a means of:

- overcoming the need for continuous food intake or manufacture
- providing for periods of scarcity
- providing for special functions, such as, production of sexual or vegetative reproductive structures, development of embryos.

Storage in Plants

The storage areas are usually plant parts modified as under-ground storage organs, but other plant parts above ground can also act as storage organs.

Storage in Plants occur in:

- vegetative organs (roots, stem, and leaves) and
- reproductive structures (fruits and seeds).

Types of Vegetative Organs

Root - Carrot / sweet potato

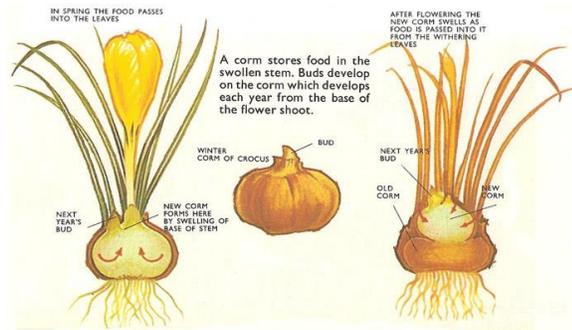
Stem - Ginger, potato

Leaf - onion & garlic

Modified stems

Stems that act as food-storage organs include corms, tubers, and rhizomes

- **Corm**
 - A short, thickened, underground stem surrounded by a protective papery leaves (leaf scales). Examples: eddo, dasheen, both of which stores starch.
 - A **corm** is a swollen stem base containing food material and bearing buds in the axils of scale-like remains of [leaves](#) of the previous season's growth. Corms occur, for example, in crocus and gladiolus.



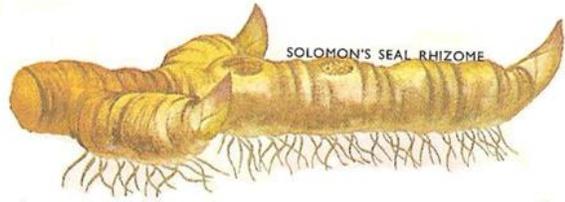
- **Stem Tuber**

- An underground swollen leaf or stem. Will have buds that sprouts new leaves Examples: Irish potatoes, yam (which mainly stores starch)
 - The potato, for example, is a **stem tuber**. It swells at the tip of a slender underground stem (or **stolon**) and gives rise to a new plant the following year. In stem tubers new plants develop from the **buds**, or eyes, growing in the **axils** of the scale leaves. Stem tubers are propagated by sections containing at least one eye.

- **Rhizomes** = a swollen, horizontally growing underground stem. Adventitious roots and contractile roots grow from the rhizome. Examples ginger, which stores starch and oils

Sugar cane has a swollen stem growing **above ground**. It stores sucrose. It is cultivated in many tropical countries. It is of great economic importance.

- Another is **rhizomes**, which are horizontal underground stems found in some **vascular plants**, such as mint, irises, the water-lily, and many grasses. Rhizomes do not always store food but when they do they are quite thick (Fig 3).
- Rhizomes, also called **rootstock**, may be enlarged for storage, of accumulated starch, or may function in vegetative **reproduction**. They last for several years and new shoots appear each spring from the axils of scale leaves. Rhizomes differ from roots in having nodes, buds, and scale-like leaves.



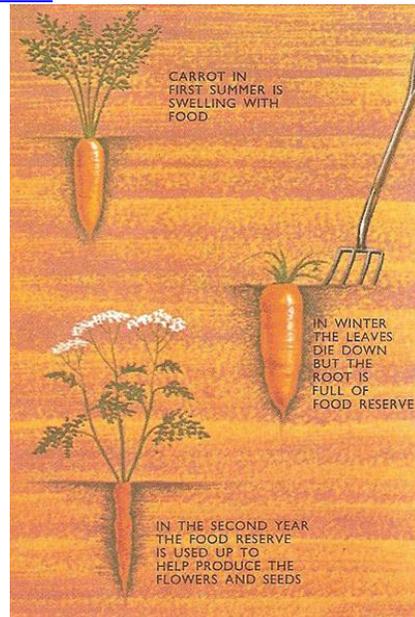
Modified Roots

- Root Tuber = are modified fibrous roots that hold food. They both store starch and very small amounts of protein. Examples: cassava, sweet potato (stores maltose sugar)
 - **Root tubers** are found in, for example, dahlias (Fig 2), the sweet potato, and the lesser celandine. They develop from tiny buds at the base of the plant. They swell as food is passed into them and remain in the ground after the aerial parts have died down. Each tuber and its bud can give rise to a new plant.

[LINK HERE](#)

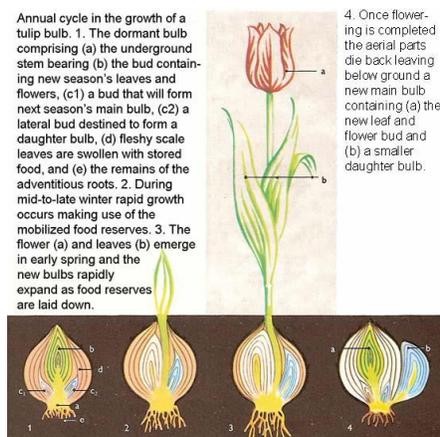


- Taproots = swollen root is the main root. It can be enlarged as food storage organs. Carrots store glucose sugar in the phloem. Examples: carrot, beetroot.
 - Storage in swollen tap roots is common in **biennials** (plants that grow and store food one year and flower and die the next). The carrot is an excellent example. By digging up the carrots at the end of the growing season, humans make use of the food that would have gone to make the next year's growth (Fig 1). [LINK HERE](#)



Modified leaves

- Storage in Leaves
 - All plants store food temporarily in their leaves. Most store starch. Onions, chives (escallion) store sugar.
 - A bulb is an underground storage organ. Bulbs can be considered to be very short stems encased in thickened, fleshy bulb scales (which are modified leaves).
 - In **bulbs**, on the other hand, swollen scale leaves or the swollen bases of the previous year's green leaves contain the food (Fig 5). A bulb is a short, underground storage stem composed of many fleshy scale leaves that are swollen with stored food and an outer layer of protective scale leaves. Small buds between the scale leaves give rise to new shoots each year. New bulbs are produced in the axils of the outer scale leaves. Examples of plants producing bulbs are daffodil, tulip, snowdrop, and onion.



Reproductive structures that store food.

- Storage in Fruits

- Food reserves in fruits are important for:
 - attracting animals which disperse their seeds.
- Fruits and seeds contain varying amounts of:
 - carbohydrates, fats, proteins, vitamins, minerals and water
- Parts of the fruit which stores nutrients include:
 - The wall (pericarp) and receptacle of fruits Mango (*Mangifera indica*) the West Indian cherry store sugar in the mesocarp
 - Sugar is stored in the hairs of the endocarp in the orange (*Citrus sinensis*)
- Seeds
 - Seeds have food stored in the endosperm or cotyledons.
 - Seeds are, of course, supplied with food reserves that enable the young plant to establish itself until it can begin to manufacture its own food.
- Have two possible sites for food storage:
 - Cotyledon (peas, beans, nuts, cocoa) OR
 - Endosperm (corn, rice, coconut)
- Storage in Seeds
 - Provide food for young developing embryos for early growth, since young plants are unable to make their own food until they form green leaves and are able to photosynthesis.

Summarizes the various food storage organs

Storage Organ	Storage area	Example	Type of food stored
Root tubers	Root	Cassava, sweet potato	Starch, small amount of protein
Tap roots	Root	Beetroot, Carrot	Sucrose, Glucose
Stem tubers	Stem	Yam, Irish potato	Starch, small amount of protein
Rhizome	Stem	Ginger	Starch, Oil
Corm	Stem	Dasheen	Starch
Bulb	Leaves	Onion	Glucose

Taken From: <https://www.worldatlas.com/articles/where-do-plants-store-their-food.html>

Where Do Plants Store Their Food?

- Plants mostly store their food sources in their roots.
- Plants generate their own food through photosynthesis.
- The survival of most living species is reliant on plants.

Plants are vital to the circle of life for all organisms on Earth, providing food and oxygen for the survival of most species. Simple sugars like glucose and fructose and starches are stored within the plant to satisfy its own needs and also give sustenance to animal life forms, including human beings.

Unlike animal species, plants are capable of producing their own food and are entirely self-sustaining, making and storing their own sources of energy to promote growth at all stages of a plant's life and develop its structures

How Do Plants Make Food?

The secret ingredient to plant food production is chlorophyll, located in the chloroplasts, found in the leaves. Through photosynthesis, chlorophyll helps convert water, sunlight, and carbon dioxide captured by chloroplasts into sugars to be used immediately or stored. Glucose is the simple sugar manufactured through photosynthesis and is metabolized into different energy forms depending on the specific needs of the plant.

The plant moves water from root to leaf through the xylem, a series of small branching tubes, and after photosynthesis has occurred the sugars created are mixed with water absorbed from the plant's root system and moved through the plant via the phloem. The phloem is responsible for transporting about 80 percent of dissolved sugars created through photosynthesis from leaves to various locations throughout the plant, including the roots and tubers.

Where Do Plants Store Their Food?

Glucose And Fructose

Sugars like glucose and fructose, created through photosynthesis, are typically found in the stalks and fruits of plants, respectively. Glucose, a hexagonal ring of six carbons, is typically found in the stem and is transported through the plant with water and other minerals to encourage plant growth, whereas fructose is the natural sugar found in fruits and flowers.

This carbohydrate, sometimes known as dextrose, is one of the primary molecules responsible for energy in both plants and animals. It is often found in the sap of plants, similar to a human being's blood sugar. Fructose, as its name indicates, is found in fruit and the monosaccharide is often called fruit sugar rather than its scientific name. It can also be found in honey and is classified as the sweetest of all natural sugars.

Starch

When a plant produces glucose in excess, it can be converted into starch and stored, usually in the roots and seeds of the plant, where it is kept as a long-term energy reserve for the plant. Typical starch components found in plants are amylose, which is linear in structure, and amylopectin, which is branched. Both these components are polysaccharides comprised of thousands of sugar molecules and are stored in granules called plastids within plant cells.

Starches are found in seeds because they help feed plants in their embryonic stages, but are most often located in roots. Trees store their food in the tissues of trunks and branches in order to sustain themselves over winter when their leaves have dropped off and food cannot be generated through photosynthesis.

Root vegetables like beets, radishes, carrots, and potatoes, are starch-laden because the plants keep their energy stores underground, out of sight of animals hunting for a meal. Soil also provides a stable environment for energy storage, as it is not as affected by changes in weather, which is why perennial plants tend to store starch below ground, where it can maintain its energy source through winter months until blooming in spring. Plant starch has become a major part of the human diet and is sought after by wildlife as well.

Plants also store starches for future food creation, to provide sustenance in case of cloudier weather when photosynthesis cannot be used to generate glucose. In this case, the plant metabolizes starches in its roots to produce glucose and continue producing energy.

All pictures above taken from <https://www.daviddarling.info/encyclopedia/R/reproduction.html>