



The parts of a plant are clearly labeled in this drawing.

Introduction

The key to successful indoor gardening is to understand how warm-season annuals produce food and grow. Plants, vegetables, and flowers, whether cultivated indoors or out, have the same requirements for growth. Plants need light, air, water, nutrients, a growing medium, and heat to manufacture food and to grow. Without any one of these essentials, growth stops and death soon results. Indoors, the light must be of the proper spectrum and intensity; air must be warm, arid, and rich in carbon dioxide; water must be abundant but not excessive; and the growing medium must contain the proper levels of nutrients for vigorous growth. When all these needs are met consistently at optimum levels, optimum growth is the result.

Annual vegetables and flowers normally complete their life cycle within one year. A seed planted in the spring will grow strong throughout the summer and will flower in the fall, producing more seeds. The annual cycle starts all over again when the new seeds sprout the following year. In nature, plants go through distinct growth stages. This chapter delineates each stage of growth.

Life Cycle of Annual Vegetables and Flowers

After three to seven days of germination, plants enter the seedling growth stage, which lasts about a month. During the first growth stage, the seed germinates or sprouts, establishes a root system, and grows a stem and a few leaves.

Germination

During germination, moisture, heat, and air activate hormones (cytokinins, gibberellins, and auxins) within the durable outer coating of the seed. Cytokinins signal more cells to form and gibberellins to increase cell size. The embryo expands, nourished by a supply of stored food within the seed. Soon, the seed's coating splits, a rootlet grows downward, and a sprout with seed leaves pushes upward in search of light.



Delicate root hairs on this germinated seed must not be disturbed.



Strong healthy seedling emerges from a Jiffy™ cube. The sprouted seed was carefully inserted into a hole with the taproot pointing down.

Seedling Growth

The single root from the seed grows down and branches out, similar to the way the stem branches up and out above ground. Tiny rootlets draw in water and nutrients (chemical substances needed for life). Roots also serve to anchor a plant in the growing medium. Seedling should receive 16–8 hours of light to maintain strong, healthy growth.



Strong healthy roots are vibrant white.



This tomato seedling was recently transplanted into a bigger pot.

Vegetative Growth

Vegetative growth is maintained in most plants by giving them 16–24 hours of light every day. As the plants mature, the roots take on specialized functions. The center and old, mature portions contain a water transport system and may store food. The tips of the roots produce elongating cells that continue to push farther into the soil in search of more water and food. The single-celled root hairs are the parts of the root that actually absorb water and nutrients. Without water, frail root hairs will dry up and die. They are very delicate and easily damaged by light, air, and klutzy hands if moved or exposed. Extreme care must be exercised during transplanting.



You can see a small growth tip emerging between the branch and stem in this delicate tomato seedling.

Indoor Gardener's Bible



Basil seedlings grow exceptionally fast once they develop true leaves.



Cucumber seedlings grow exceptionally fast. You will have to give this vining plant a trellis for best production.



Colorful leaves make this peperomia a big hit in the garden.

Like the roots, the stem grows through elongation, also producing new buds along the stem. The central, or terminal, bud carries growth upward; side, or lateral, buds turn into branches or leaves. The stem functions by transmitting water and nutrients from the delicate root hairs to the growing buds, leaves, and flowers. Sugars and starches manufactured in the leaves are distributed throughout the plant via the stem. This fluid flow takes place near the surface of the stem. If the stem is bound too tightly by string or other tie-downs, it will cut the flow of life-giving fluids, thereby strangling and killing the plant. The stem also supports the plant with stiff cellulose located within the inner walls. Outdoors, rain and wind push a plant around, causing much stiff cellulose production to keep the plant supported upright. Indoors, with no natural wind or rain present, stiff cellulose production is minimal, so plants develop weak stems and may need to be staked up, especially during flowering.

Once the leaves expand, they start to manufacture food (carbohydrates). Chlorophyll (the substance that gives plants their green color) converts carbon dioxide (CO_2) from the air, water, and light energy into carbohydrates and oxygen.