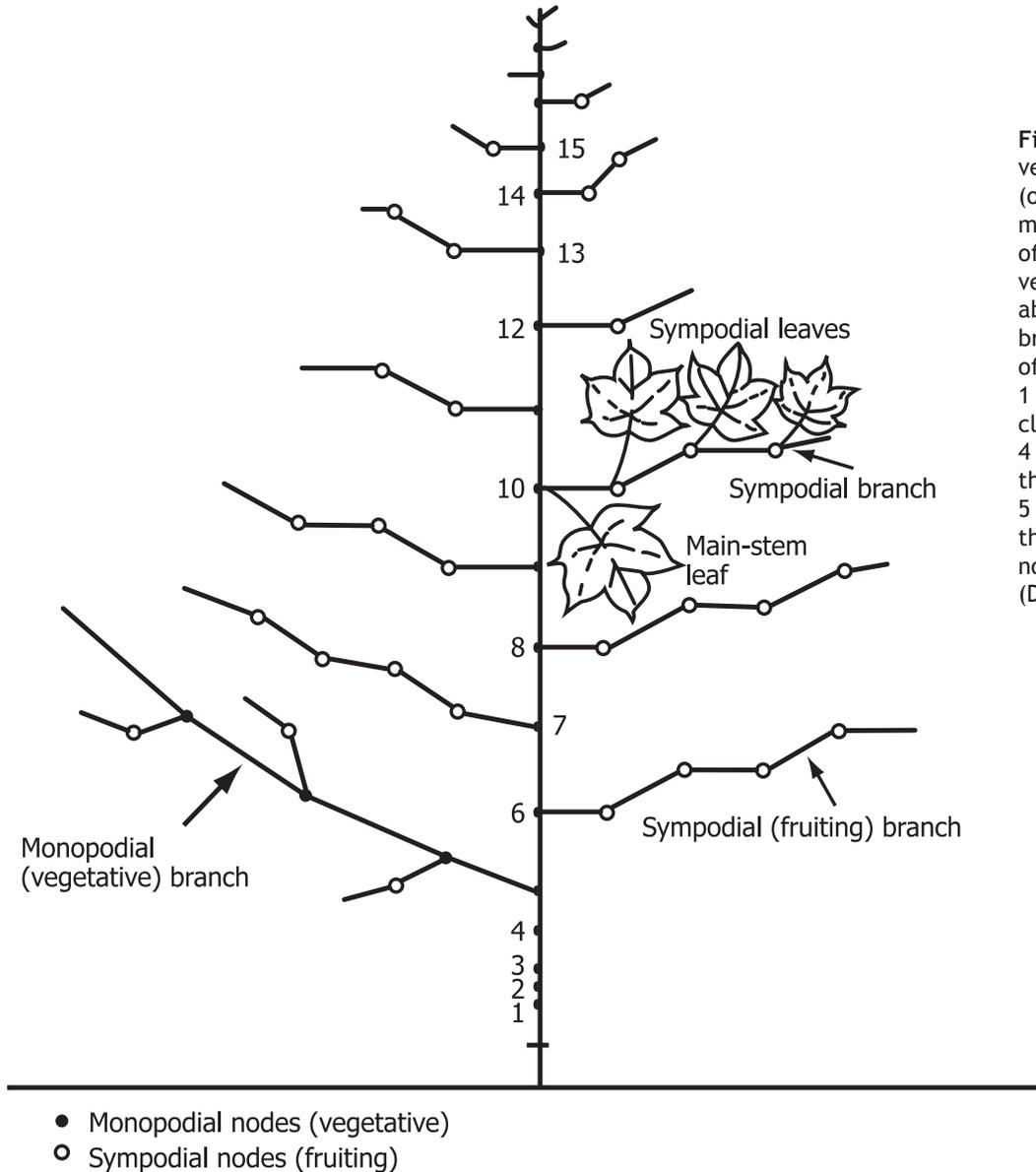


## SHOOT Development

### *Main stem and branches*

The cotton plant has a very prominent main stem that consists of a series of nodes (points of leaf and bud development) and internodes (length of stem between nodes). The main stem will continue to grow, producing new nodes and internodes indefinitely, consistent with an indeterminate growth habit. The main stem is erect and supports a spiral arrangement of leaves and branches. Branches develop from a bud located at a node in a location immediately above where the leaf joins to the main stem. Two types of branches are produced – vegetative and fruiting. Vegetative branches are structurally similar to the main stem. They normally arise from the main stem near the ground and grow in an upright position. The number of vegetative branches produced depends primarily on environment and plant spacing.

Fruiting branches develop from buds on the main stem or from vegetative branches (Figure 12) and are defined by the presence of floral buds (squares), flowers and fruit (Figure 13). Once fruiting has begun, fruiting branches tend to be produced at each successive main-stem node. The first fruiting branch is normally produced at the sixth or seventh node above the location of the cotyledons on the main stem.

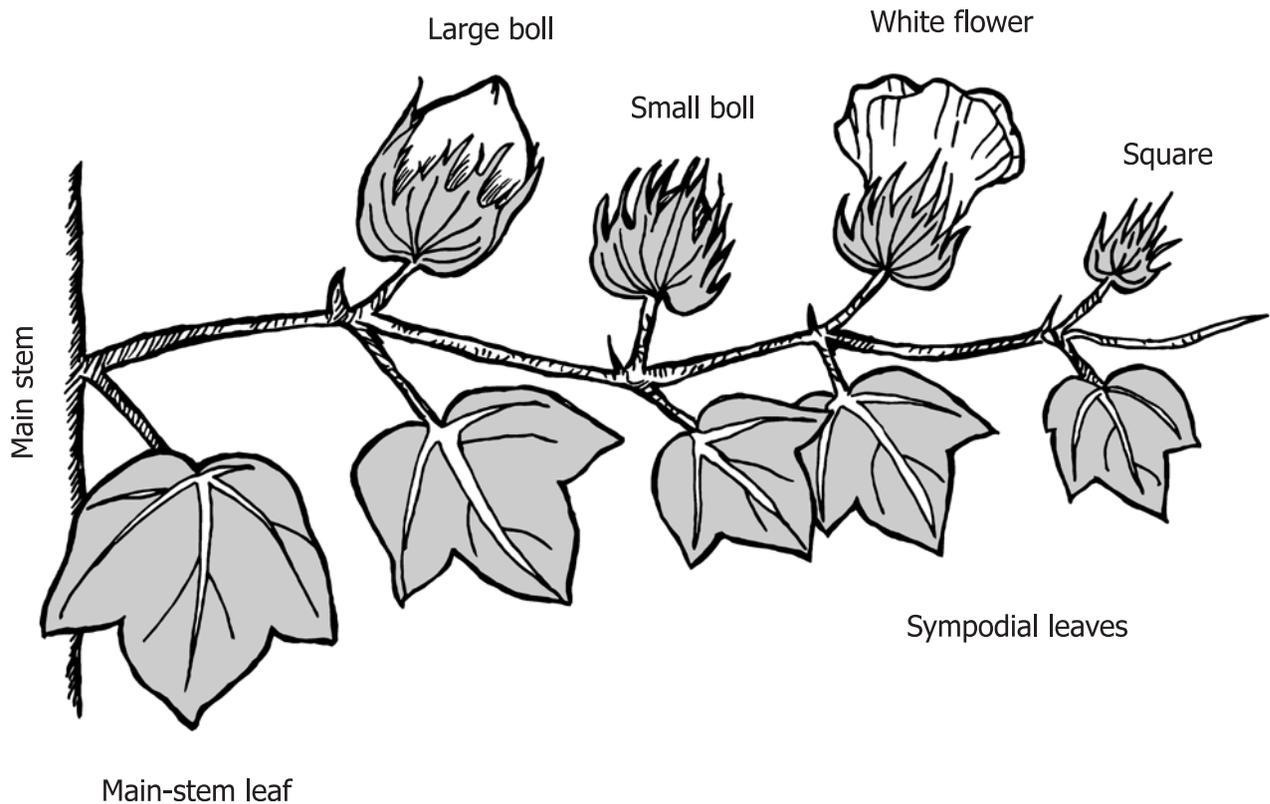


**Figure 12.** Development of vegetative and reproductive (or fruiting) branches from the main stem. The first 5 nodes of the main stem all produce vegetative branches. Nodes 6 and above all produce reproductive branches. Branches that form off of vegetative branches (nodes 1 to 5) are reproductive. For clarity, branches from the first 4 nodes have been omitted and the vegetative branch and node 5 are drawn extending away from the main stem rather than in its normal upright orientation. (D. Oosterhuis)

### Leaves

There are three main types of leaves: cotyledons, prophylls, and true leaves (Figure 14). The kidney-shaped cotyledons from the original planted seed are usually about two inches wide. The prophylls are the first leaves that develop on

a branch and are inconspicuous, usually about 0.2 inches long. The true leaves vary in shape from entire to deeply lobed, depending on the developmental stage and variety. The first true leaves formed on the cotton seedling are usually heart-shaped, whereas subsequently formed leaves are

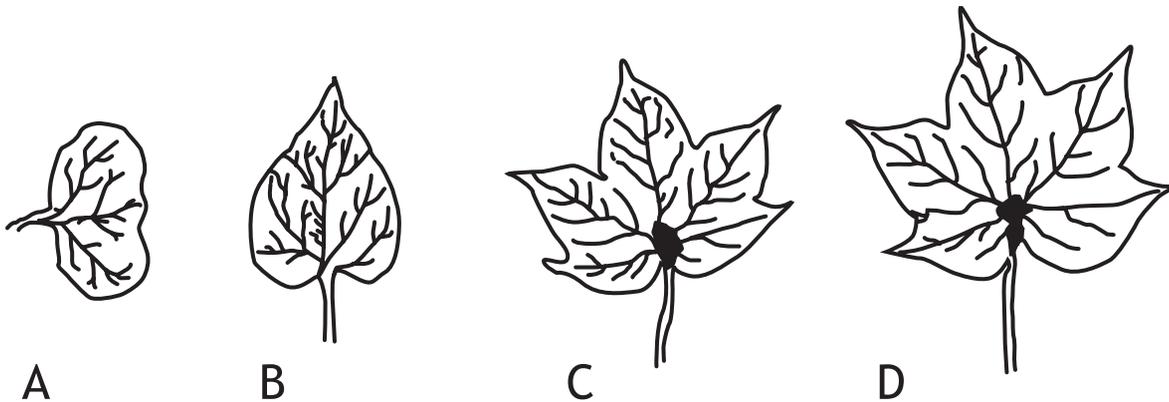


**Figure 13.** Diagram of reproductive fruiting branch illustrating various stages of square, flower and fruit development. (D. Oosterhuis)

lobed. The leaves of U.S. cotton cultivars are usually three- to five-lobed and about four to six inches wide. Cotton leaves generally have a thick waxy outer covering for protection. This layer contains numerous small pores (stomates) for the entry of carbon dioxide for photosynthesis as well as the exit of water vapor for evaporative cooling. Epidermal and glandular hairs are also located on the surface of the leaf.

Growth of true leaves is relatively slow at first compared to root growth, such that at one

month after planting only about four or five true leaves may be unfolded and visible. During the later vegetative period, the emphasis changes to square and flower development. The average life span of a leaf is about 70 days. The large petiole (stalk joining leaf to stem) at the base of the leaf is often analyzed to estimate plant nutrient status. Total leaf area development continues to increase, reaching approximately three to four square yards of leaf per square yard of soil surface in a mature crop.



**Figure 14.** Variation in leaf morphology in cotton. (A) cotyledons, (B) small first leaves on main stem, (C) larger leaves on vegetative branches, (D) largest leaves that develop on nodes of main stem. (D. Oosterhuis)