

DEPARTMENT OF THE INTERIOR

BUREAU OF EDUCATION, WASHINGTON

PART PLAYED BY THE LEAF IN THE PRODUCTION OF A CROP.

The leaves of the garden plants have a very important part to play in the success of the crop. Their work is to make starch, to give off moisture, and to take in air.

Starch is made of water and carbon dioxide. Water is brought to the leaves from the root hairs through special cells. Carbon dioxide comes into the leaves through the stomates, or it is made in the plant as a result of cell activity and brought to the leaves dissolved in water. The green coloring matter of the leaf, called chlorophyll, is able to gather energy from the sun's rays and use it to break up carbon dioxide and water into their elements, and with the aid of protoplasm to rearrange these elements to make starch. Starch is then changed to sugar and transported to all parts of the plant to be made into cellulose, protein, wax, gum, fat, or to be changed again into starch and stored in roots, tubers, stems, or seeds, for future use.

Leaves throw off water through the stomates. This process is called transpiration, and is most active on dry, sunny, windy days. A sunflower 6 feet high will transpire over 1 quart of water on such a day. To prevent losing too much water, corn leaves curl, mullen leaves have hairy covering, cabbage leaves have waxy covering, cucumber leaves wilt, cactus reduces its leaves to thorns. Plants wilt less if transplanted in the evening or on cloudy days and if protected from sun and wind until the roots are established to take in moisture. Cuttings, such as geraniums or roses, should be placed in water several hours before planting; then the large lower leaves should be removed and the cuttings shaded and well watered until roots have developed.

Respiration takes place at all times, not only in the leaves, but throughout the entire plant. The intensity of respiration varies

in different plants and in the same organs of an individual plant in different stages of growth.

In order that the leaves may do their work well, the plants should have room; if they are crowded, the leaves will not receive sufficient sunlight and air. The leaves need also to be protected against insect enemies and plant diseases. A spray of arsenate of lead is useful for killing insects that eat the leaves; tobacco solution for insects, like aphid, that suck the leaves; and Bordeaux mixture for diseases caused by fungi. Diseases caused by bacteria can be partially controlled by watching the plants and destroying immediately all infected ones. Possibly in time resisting varieties can be developed.

Arsenate of lead, either in a powdered or paste form, can be obtained from seed houses or hardware stores. Directions are given on the box as to the method of mixing and the amount to use. Tobacco spray can be made as follows: Put a 5-cent package of smoking tobacco into a 2-gallon pail of water, place on the stove, bring to a boil, cool, and dilute one-half before using. Bordeaux mixture is made as follows: Place 4 pounds of copper sulphate in a muslin bag and suspend in $2\frac{1}{2}$ gallons of water. This makes a stock solution. Slake 4 pounds of quick lime by adding water slowly until the lime crumbles into fine powder; put it into $2\frac{1}{2}$ gallons of water. This is also called a stock solution. When ready to spray, put 1 quart of each stock solution into a pail containing 5 gallons of water, stir thoroughly and spray. Prepared Bordeaux mixture with or without arsenate of lead can be purchased at seed stores or hardware stores. Successful spraying depends upon the thoroughness of the work. The entire plant must be completely covered.

Each school gardener should be familiar with the insect enemies and plant diseases of the garden vegetables, in order that he may be constantly on his guard against them. One school gardener in a southern city lost an entire tomato plant before he knew enough to look for the worm. Chewing insects are usually visible; if not, their presence is evident from the cutting or eating of the leaf. Sucking insects are detected by the curling of the leaves and the presence of the insects in the folds of the leaf. Diseases caused by fungi can be recognized by round discolored spots in the leaves or stems, occasionally by the moldy appearance of the leaves. Bacterial diseases are recognized by the drooping or dropping of leaves without any external indication of cause.

REFERENCES.

All farmers' bulletins can be secured free from the Department of Agriculture, Washington, D. C. All other bulletins can be purchased at a small cost from the Superintendent of Documents, Washington, D. C.

Farmers' Bulletins:

- 157. Propagation of Plants.
- 231. Spraying for Cucumber and Melon Diseases.
- 488. Diseases of Cabbage and Related Crops, and Their Control.
- 507. The Smuts of Wheat, Oats, Barley, and Corn.
- 618. Leaf Spot—a Disease of the Sugar Beet.
- 642. Tomato Growing in the South.

Entomology Bulletins—Technical Series:

- 33. Some Insects Injurious to Vegetable Crops. 10 cents.
- 82. Some Insects Injurious to Vegetable Crops. 10 cents.
- 102. Asparagus Beetles. 5 cents.
- 103. Harlequin Cabbage Bug. 5 cents.
- 104. Common Red Spider. 5 cents.

Cornell University Agricultural Experiment Station, Ithaca, N. Y.:

- Bulletin 283. The Control of Insect Pests and Plant Diseases.
- Circular 19. Late Blight and Rot of Potatoes.

Florida Agricultural Experiment Station, Gainesville, Fla. 117. Tomato Diseases.

Massachusetts Agricultural Experiment Station, Amherst, Mass. 43. Cutworms.

Alabama Experiment Station, Auburn, Ala.:

- Bulletin 172. Black Spot of the Rose Leaf.

Books (these books are technical and need to be used as encyclopedias):

- Nature and Development of Plants. Curtis. Published by Holt. \$2.50.
- Fungus Diseases of Plants. Duggar. Published by Ginn. \$2.
- Insect Pests of Farm, Garden and Orchard. Sanderson. Published by John Wiley & Sons. \$3.
- Economic Entomology. Smith. Published by Lippincott. \$2.50.