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## DESCRIPTION OF THE CORN PLANT

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Before discussing the methods of the culture of corn we must know something of the plant itself. We must, in fact, be intimately acquainted with the plant and all its parts, their structure and something of the functions they perform. The method of growth must also be known in order to develop the desirable characters and to gradually eliminate the more undesirable characters.

This circular is divided into five divisions. Each division takes up a part of the corn plant and describes it in detail.

### A. The Roots:

When a kernel of corn germinates there is produced, first, a root from the tip end of the seed. A few hours later the stem will appear at the upper end of the germ sprout. At nearly the same time two roots will be sprouting from about the medium point between root and stem. These are the "temporary" roots and maintain the plant for a short time. When the corn plant is about six to ten days old, whorls of permanent roots begin to develop at a point about one inch below the ground surface. The seed may be planted 1 to 5 inches deep, but the permanent roots develop at about the same distance below the surface.

Corn root studies, at several Experiment Stations, indicate that the permanent roots first spread sidewise for about nine to twelve days, when they will have reached a distance of 16 to 18 inches from the plant and will be confined mostly to a zone between 3 and 6 inches below the surface. From this time on the root system rapidly extends downward as well as sidewise, at 18 days reaching a depth of about 12 inches and at 27 days a depth of 18 inches, with a lateral extension of 24 inches. By the time the corn plants are two months old,

when they are 5 to 6 feet high and coming in tassel, the lateral spread of roots has a radius of about 4 feet and penetrates the soil to a depth of 3 to 4 feet. The number of roots continues to increase until the plant is mature, when they fully occupy the upper 3 to 4 feet of the soil.

The depth to which roots may penetrate is somewhat dependent on the character of the soil, as is shown by the Colorado Station. In the hard black adobe soil, the roots were limited mostly to the upper 12 inches, while on another heavy soil, containing much clay, they penetrated only 24 inches.

#### Distance of roots from the surface

At a distance of six inches from the plant the upper roots are usually about 3 inches below the surface, sloping gently to 4 or 5 inches deep at a distance of 2 feet from the plant. However, when there is abundance of moisture in the surface, feeders may come within 2 inches or less. Distance from the surface seems to be controlled by the presence of sufficient moisture, and also by the degree of shading, since roots are very sensitive to light. Late in the season, when the soil is well shaded, roots will be found very near the surface; but ordinarily during the growing season, they are 3 or 4 inches below. The method of planting may also exercise some influence on the depth of upper roots. At the Kansas Station, where the root systems of "listed" corn were compared with those of surface planted, the upper roots of the former were found to average about 1 inch deeper during the cultivating season, especially near the plant, thus permitting deeper cultivation.

#### Parts of the Corn Roots

Corn roots are classed as primary roots, brace roots, lateral roots and hair roots. The primary roots have their beginning at the base of the stem. They are 20 or 30 in number and 4 to 6 feet in length. The lateral roots are numerous small roots thrown off from these, and they again may produce other laterals. Their number is very large and may average several hundred to each main or primary root. In length they vary from less than one inch to one or two feet. The root hairs are microscopic in size, single-celled, and infinite in number. They are borne on the main roots in their earlier growth, and on all the laterals. They are the absorbent organs and do not grow to be roots.

The total weight of the corn roots, which varies considerably, has been found to be 12 to 15 per cent of the total weight including the ear. The total length of the roots, laid end to end of a single corn plant, would be, on the average, about one half mile.

#### B. The Stem, or Stalk, of the Corn Plant

The stem of a corn plant differs from that of other cereals such as wheat and oats, in the fact that it is solid and filled with pith, while the others are hollow. Each stem is made up



of nodes and internodes. The nodes are the projecting rings around the stalk at intervals, while the internodes are the spaces between the nodes. The internodes are slightly flattened or grooved on the side next to the leaf.

When an ear is developing the internode beside it is greatly flattened or becomes curved in to make room for the developing ear. The growing points of the cornstalks are located at the base of the internodes, just above the node. If the leaf sheath is removed from a growing cornstalk and the base of the internode is examined, it will be found to be slightly enlarged, rather soft in texture, and dark green in color. It is here that new cells are formed which increase the length of the internode and cause the plant to become taller. Growth of the stem takes place at the base of all of the internodes, thus causing the corn stalk rapidly to increase in height.

Frequently tillers, or suckers, spring up from the nodes just below the surface of the ground. Sometimes they produce ears. Thin planting favors the growth of tillers.

The height to which the stalk grows depends much on fertility of the soil and other environmental factors. It is a matter of common observation to find plants in bottom land several feet taller than those on the hillside, even in the same field. When conditions for growth are favorable the plants grow taller than when forced to grow under unfavorable conditions of soil and climate. As a rule, it may be said that the longer the growing season the taller the cornstalks. Thus, in the southern part of the corn growing regions of this country the corn grows quite tall, the ears often being carried above a convenient height to husk, while in the northern section the plants are much shorter, with the ears often not more than 2 or 3 feet from the ground. There is a difference in varieties too. Some varieties naturally grow taller than others even when grown side by side. Usually, early maturing varieties have comparatively short stalks while late maturing varieties grow taller. Some change in the average height of stalk of a variety may be made by selection. Selection of seed from the taller stalks will, after a few years of selection, increase the average height of the plants. Likewise a selection for small stalks may reduce the average height. The growing of corn of a convenient height to harvest is within the possibilities of corn growers if they will but select seed from the plants of the desired height.

### C. The Leaves

A leaf grows out from each node of the stalk. The number of leaves, therefore, will be determined by the number of nodes in the stalk. As a rule, tall plants have a greater number of nodes than small, short stalks, although the greater height of tall plants may be due to a greater length of the internodes. The number of leaves on a growing corn plant varies from ten to twenty. Usually not more than twelve or fourteen are growing at one time, because those from the lower nodes seldom grow during the later stages of the plants life. Usually,

they wither and dry up because of the dense shade produced by those that grow higher up the stalk, and they are frequently broken off during cultivation.

The leaf is made up of several parts which may easily be distinguished by examining a leaf from a growing plant. The part which grows out from the node and encircles the internode above it is called the sheath. The broad expanse of leaf that extends out at an angle from the stalk is called the blade. At the point of union of the blade and the sheath is a thickened portion known as the hinge. Growing up from the top of the leaf sheath for a short distance and encircling the internode is a thin, membrane known as the rain guard. The rain guard is to prevent the rain from running down the leaf blade and carrying small particles of dust and dirt down between the sheath and the stalk. If it were not for the rain guard, dirt would be carried down between these parts and would then interfere with the movement of the sheath around the stem when the wind moves the blade.

The function of the leaves is that of affording a place where the mineral elements taken up by the roots in the soil may be combined by the action of sunlight in the presence of chlorophyll, the green coloring matter in the leaf, with carbon dioxide from the air taken in through the leaves in the building up of chemical compounds necessary for plant growth. The leaves give off the excess of water taken up by the roots after the mineral elements which were in solution have been used in the building up of the plants tissue. The leaves also are the breathing organs of the plant, which breathes as animals do, taking in oxygen and giving off carbon dioxide.

The area of the leaf surface exposed by a single corn plant is surprisingly great. It has been estimated from calculations made from average plants, that the leaf area is about 20 square feet! Thus, with a good stand of plants, the leaf surface exposed by an acre of growing corn is between five or six times the area on which the plants stand, or, between 5 to 6 acres. At maturity about 20 per cent of the weight of the plant is leaf, although earlier in the period of growth the per cent of leaf is greater. The decrease during the ripening period is due in part to the transfer of food to the developing ear and in part to the loss of the lower leaves. Selection for wide leaves may result after a few years in the development of wide leafed strains, which would increase the percentage of leaf to total dry weight. Such plants would be well adapted for forage or use in the silo. Experiments, however, have shown that wide leafed types of corn do not produce a greater yield of grain than is obtained from types having leaves of average width.

#### D. Flowers.

The term flower, to many people, brings to mind only the showy blossom parts of ornamental plants or fruit trees. The term, however, is also correctly applied to the tassel and silk with other parts of the undeveloped ear of the corn plant. The flower may be defined as the sexual organs of a plant, together with their adherent parts. Corn carries its flowers on two separate and somewhat distinct parts of the stalk, differing in this respect from the other grains such as wheat, barley, etc



The male, or staminate, flower is borne in the tassel at the top of the main stalk. The tassel is made up of a central part, with from eight to ten lateral branches coming off from points near its base. The flowers are produced in pairs and are surrounded with glumes or bracts, which in wheat and other small grains is called the chaff. The male flower is made up of a long, thread-like filament which carries a tiny bag called the anther at its end. Within the anther develop the pollen grains. When the flower is mature the filament rapidly elongates, pushing the anther out and dangles it over the edge of the glumes. At this time the anther bursts open and permits the pollen grains to escape and be carried away by a slight breeze.

The female flowers of the plant are located on a short stem in the axil of a leaf and later develop into the ear. A female flower is composed of an ovary and the silk which grows from the top of the ovary and extends out beyond the husk of the young ear. The ovary, if fertilized by a pollen grain, later develops into a grain of corn. The silk has, at its outer end, a feathery stigma which is covered with sticky substance to catch and hold the pollen. The silks from the lower ovaries or what later becomes the grains at the butt of the ear, are the first to appear beyond the husk, and are usually the first to become fertilized, so that the first kernels to appear on the ear are at the base of the cob.

## E. The Ear

When the fertilized ovules develop on the central axis, called the cob, the ear results. There are from five hundred to one thousand kernels on an ear; a fair size ear probably having about eight hundred kernels on it. The ear is carried at the end of a short branch called the shank, which grows out from a node on the stalk between the leaf sheath and the stalk. The shank is made up of several short internodes from each of which grows a leaf, of which only the sheath remains, called the husk, and these, overlapping, cover the ear. When the nodes are close together in the shank the ear stands upright, but if they are far apart, resulting in long internodes, the tip of the ear at maturity points downward.

In South Dakota usually only one ear develops on each stalk. However, two ears per stalk are not uncommon. Frequently, two, three or even four ear shoots start to grow, but only one, or occasionally two, develop ears. The top one develops first and if it is removed the one below grows to maturity. Some varieties frequently develop two ears. Many attempts have been made to develop strains of corn that would normally produce two ears, but little success has resulted from these efforts. As will be discussed more fully in the paragraph on the rate of planting, the fertility of the soil, the rate of planting and other environmental factors largely determine the number of ears produced. The number of rows on an ear is, to some extent, a variety characteristic, which may be modified by selection but it has been found that there is no correlation between the number of rows on the ear and the total yield of corn.

References: "Corn Culture", Ohio Extension Service; "Corn Crops," Montgomery.