

Disease  
in the  
Vegetable Kingdom.  
by  
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Class of 1893.

## Disease in the Vegetable Kingdom.

My object in presenting this compilation and original research on a subject of so great importance to the agricultural and horticultural world of today is not to give a full knowledge of the innumerable diseases affecting plant life, nor give a definite understanding of any one class of such diseases, but my object is to present the subject in a very general way so that one may be the better qualified to recognize as diseases many derangements in plant growth which now he beholds vaguely and passes by with no further knowledge of the nature of such deformations.

It is very probable that from the time plants first made their appearance they had their enemies - both organic enemies, such as derive their sustenance at the expense of plant life, and inorganic destroyers, or those arising from a varied climate. About the earliest possible records of these enemies we have is the fossil remains of insects which are known to be closely related to such insects of the present day as are the most destructive enemies of the plant world. A very good example

of this is the caterpillar - the larva of the butterfly. In the age of man, so far back as we have any record, we know that many of the cultivated vegetables, fruits and grains were often attacked by blasting, mildew, rats and many other like maladies, but as the science of botany was unknown at that time, these were not recognized as occurrences in nature but were looked upon as the judgments of God in limiting man's food supply for a greater or less period of time, because of his wandering from the teachings of his God. Many such ideas are prevalent even at the present day among the more ignorant classes, and it is not uncommon to meet with a person who has been unfortunate in the failure of crops who can account for it all in just some such superstitious manner. Many formations, or deformations which now are known as diseases were considered by the ancients as spontaneous outgrowths, in some way connected with the gods, and by the earlier botanists as abnormally differentiated cell formations; and it was not till the middle of the present century that any definite research was made with a view to bringing the fungous plants into any kind of a system.

Before passing to the general treatment of my subject it might be well to define just what is meant by disease as herein used. The word disease is applied to all maladies and morbid states of the body. It is now defined by medical writers to mean a derangement of the normal functions of any part of the body, thus being used almost synonymously with the term disorder. Normal means according to a standard or rule, and the harmonious working together of the functions of all parts of the body, according to the normal or standard, gives us what we know as health. But as here used and as used most commonly by botanists throughout the world, "Disease may be defined as those disturbances of the structure and functions of the plant which actually threaten the life of the plant." The effects on the diseased plants have been revealed by the microscope which detects in the vessels and cells of the plant the seat, the cause and the progress of disease. From such investigations it has been found that diseases arise from several very different sources, and for sake of system plant diseases are here arranged into three great classes. - First. - Those which result from mechanical injury; Second. - Those produced by

flowerless parasitic plants: Third.- Those arising from improper or insufficient plant food.

Taking up the first class we find a natural division here between those mechanical injuries arising from flowering plants and those arising from the action of animals great and small.

Of the injuries received from flowering plants, perhaps the most common ~~are~~ those caused by the Dodder or Cuscuta species. This plant is common throughout the world and especially is it common in many species all through the Mississippi valley. It will be recognized as a smooth, leafless, salmon colored vine; trailing about sun flowers, iron woods, new growths of willows and a host of other plants, stretching across from one branch to another and from one plant to another, in many places covering large areas. The seed of the Dodder germinates in the soil exactly as a clover seed germinates, but when the delicate stem begins to cling to the stalks of alders and stronger plants of other species about it it is arranging itself to live upon their food. It sends forth saalike beards (haustoria) which force their way into the tissues of the victims or host-plant and there absorb the sap which it regards as its legitimate

plunder. The parasite first strangles the plant on which it climbs and then having preserved the demand for sap in the upper portion or strangled part it takes to itself all the food which was intended to nourish that portion — adding insult to injury.

In the flower growing countries this plant is of great injury to the stems of the floss, holding them in a firm grasp, living upon their life. In the authors experience he has observed acres after acres of alfalfa ruined by this inaffessive looking little plant. Such another parasite, though not so destructive, is the Mistletoe of Christmas loss. This grows in this country upon cottonwoods, oaks, pines and a few other trees.

Under the head of mechanical injuries received from animals undoubtedly the most common is the work of insects. "Insect work" is of such common occurrence and generally so readily recognized that I need not go into detail as to just how they may be determined, but to impress more emphatically the fact that these injuries are a form of disease mention will be made of a few of the more common destructive kinds. What person has not noticed great webs completely enveloping a limb of some cottonwood

or walnut tree and on closer examination has found it full of caterpillars intent on devouring to the last remnant every particle of the green foliage of the limb. These caterpillars migrate from one part of the tree to another seeking what they may devour until in a very short time the tree is so badly defoliated that it is decidedly sickly in its appearance and since its breathing and digesting organs are destroyed it is almost certain to die. Oaks are especially subject to a diseased condition in the outgrowth of "galls" caused by the sting of an insect in depositing its eggs. Similar galls are to be found on a great many plants - especially woody ones - and on the wild rose they sometimes assume a very beautiful shape and clustered together and of brilliant colors they very strikingly resemble some form of fruit. Another notable disease of this kind is to be seen in the enlarged petioles of cottonwood leaves, which when broken open are found to contain myriads of small gnats in all the various stages of development. Similar leafgalls are found on the hickory, crabapple, elms and many others. One of the most curious insect diseases is that in which the leaf is all ruined and between the

epidermal layers leaving only the skeleton and external covering of the organ so necessary to the life of the plant. This form prevails more largely in the smaller succulent plants though not at all uncommon with trees and shrubs. Affecting our cultivated fruits and vegetables, the mention of a few representative types will call to the memory of an observer countless other similar diseases. The plum weevil causes the fruit to fall before normally mature and the codling moth similarly affects the apple. Orange growers suffer from the scale insect, the phylloxera, so well known to European vinedressers, is one of the most destructive of insects. Attacking the roots of the vine it causes a diseased condition in them which deranges their function for procuring mineral food for the plant and as a consequence it dies. In this way vast vineyards have been entirely killed out. Potato plants fall an easy victim to the rapacious attack of the Colorado potato-beetle. Beans, peas and many grains are the homes of little weevils. Cabbage is the food of plenty for the little flea-beetles, and many many of our vegetables perish in early youth - the victims of the deadly cutworm. These will



show merely as illustrations of such common diseases, but besides these more common kinds I would include a class which with some persons would be more open to criticism. In this class of diseases produced by mechanical injuries should be placed all wounds caused by bruises or by the pruning knife, all losses of sap occasioned by pruning or otherwise, and numerous affections arising from violence in transplanting. The fact that many plants do suffer severely in health from such causes is indisputable and my definition of what constitutes a disease most surely includes them.

The second group of plant diseases comprises all those produced by flowerless parasites. Various and numerous as the insect diseases are this class of diseases caused by lower plant forms is equally destructive and probably represented by more forms. Like so many other plant diseases some of these have been known for years though not recognized as diseases. The rusts and smuts of cereals have long been a pest to the farmer and the rotting of figs and grapes the horror of the horticulturist. Although so numerous and of such great importance space will permit me to enumerate but a few of the more common and destructive forms. The

rust of grains already mentioned is a very common example in all countries. It receives its name from the color its spores impart to the blades and stems of the grain in its earlier stages. Toward the time of ripening of the grain, however, this rust changes its color to intense black. As to its origin there has long been and in some places and with some people there is now a prevalent opinion that it is produced in a similar manner to the common rust of iron - viz, exposure to very moist air. While these conditions do produce it yet the action is very different from the chemical action on the iron. The truth was not known till the "rust" was examined under the microscope when it was found to be one of the innumerable parasitic plants included under the extensive head of Fungi. Smuts of oats, wheat and corn are other common diseases of the farm crops.

Ergot is not only a diseased condition of some grasses but is to be shunned in the feed of animals since it contains a deadly poison. When eaten it has a very serious effect, - in small quantities producing abortion in pregnant females and in larger amounts causing death in either sex. Of fruits that suffer most from this class of diseases there are many.

The grape leaves are affected with downy mildew and the fruit itself with the rot. Cherries, plums and peaches are soon destroyed by brown rot which, being very contagious spreads rapidly and is accordingly destructive throughout an orchard.

In the last grand division are placed those diseases arising from improper or insufficient plant food. In general appearance these approach more nearly the conditions recognized as diseases in the animal kingdom and perhaps are identified more than any other form, by the general public as a diseased condition of the plant.

From a physiological point of view death may result from starvation or from suffocation; the process in either case may be partial and gradual or immediate and complete. A pot plant which has been neglected in its demands for moisture will very soon show the effects. The leaves wilt and hang as if lifeless and in fact soon become so unless water is furnished them through the plant. A plant grown in poor soil will be weak and sickly and never mature to a robust healthy individual. The life, vigor and usefulness of a tree may be greatly prolonged by the proper application of food either in cultivation which

brings new food to the feeding roots or in the application of fertilizers. In the material the plant takes into its system it may become severely poisoned just as in animal life. This is more commonly the case in gases rather than in liquid food. In great cities where the air is full of gases it is next to impossible to grow most plants and such as do cling to life are very usually abnormal in growth. To this group of diseases may well be added those arising from sudden change of temperature or even in a more gradual change; from electric shocks, sunstrakes, strong corrosives and the like. These destroy life by disorganizing the protoplasm, breaking up the tissues, and arresting the natural movements. They cause death by destroying the machinery or paralyzing its action.

In conclusion it may be stated that the gradual effect produced by such injurious agencies as noxious vapors from kilns or factories or by insects or parasitic fungi are precisely the same as those produced by starvation or suffocation. They all work together. Defection or insufficient nourishment renders the plant liable to the attacks of parasitic organisms

which prey upon its juices and deprive it still further of nutritive support. A mechanical injury received by the plant such as a bruise or cut is very liable to like parasitic attacks. It seems to be clearly demonstrated throughout vegetable life that no one malady is allowed to act alone but one induces another until such a complicated state exists that it is difficult to determine the most vital one and consequently which to fight most vigorously in an effort to save the plant.

It is not difficult for us to understand the nature of a diseased animal body. Disease symptoms are known to almost - probably, every one. So, if we consider the fact that plants too are living beings, organized and each organ with a function to perform, and all subject to the same natural laws that govern the animal life, it is not a hard matter to understand that they must naturally be subject to disorders which actually threaten their lives.

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