



# Fungus Diseases and Why

A practical discussion of plant life in all its phases. How plants feed and live and die.

By J. E. CANNADAY, Chairman

Green Committee Sedalia Country Club, Sedalia, Mo.

*Editor's Note—With the approach of the hot summer months this splendid article by Dr. Cannaday is extremely timely and of great value.*

SURELY we learn more by comparing what we do know, to that which we do not know. Having had years of experience in the practice of medicine, and then taking up floriculture, and still later taking charge of the greens at the Sedalia Country Club, my only hope is, by reason of my experience in two other lines, which the average greenkeeper does not have, to provoke some thinking from a different angle on the part of greenkeepers.

The greenkeeper is concerned about the diseases of turf grasses for a very short period of the year. Whereas it is a never ending battle with the grower of flowers or vegetables, especially under glass. The florist is challenged continually to prevent the diseases of plants usually of a fungoid nature.

The losses to the floral industry would be staggering, if it were possible to make a definite accounting of the damage done by these diseases. Realizing that it may appear far-fetched to compare the diseases of animal life, and even man, to the diseases of plants, undoubtedly there is a very close analogy. By comparing the two, we learn that which will help us in both. Both the florist and the greenkeeper are vitally interested in

two forms of vegetable life. One they want, the other they often get without wanting. The former is the grass, or turf, for the greenkeeper, the other, diseases which are of a fungoid nature, or probably all the results of the action of fungi.

## Animal vs. Vegetable Life

THE more we study the two classifications of life (animal and vegetable) the more we see that there is not the great differences from a physiological standpoint, that the casual observer usually thinks. One author has put it, "living matter is the same wherever you find it." Plants do the same work for their existence as animals. The physiology of both is very closely related.

Undoubtedly, we get a better understanding by comparison. In the plants the perpetuation of not only the life of the plants, but all animal life is a very beautiful illustration of the order of things and it is well for us to consider them. Both the florist and the greenkeeper are striving to keep in the same path.

The two forms of life which are of interest to the greenkeeper or the florist have one special distinction. One group contains chlorophyll, the substance in the leaves and tissues which gives the green color. The other does not contain chlorophyll. And they only live on the organic matter left by the action of chlorophyll in a previous generation of plants.



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The casual observer may consider the latter group as having no use in the order of things, when in reality they are just as essential for the existence of all life as the former group. One could not live without the other. All forms of plant life depend upon the work done by this green substance, called chlorophyl, and all forms of animal life exist only on the results achieved by this action of chlorophyl.

It is interesting to observe that the leaf is the only laboratory where the raw products of sunlight, air, water and a very meager amount of mineral matter are converted into organic matter. Name an industry in which man is interested that does not depend on the work done by the leaves of plants. The basis of life, then, is the action of chlorophyl, and the basic principle of all industry.

### Life Depends on Four Factors

**A**LL forms of life, whether animal, or vegetable, grow and thrive only when the four factors of sunlight, humidity, temperature, and food are evenly balanced for the particular type of life in question. Just as soon as we get an uneven balance with one or more of the above factors, then we are departing from a condition which will keep that form

thriving and growing. As soon as its growth is stopped, the other law, or the other part of the law of life, comes into action and the tissue starts a period of decomposition or destruction.

Now, let us consider the human body that we may try to get a better understanding of turf grasses, with which the greenkeeper is concerned or blooming flowers with which the florist is concerned. The health of a person is very closely related with the four factors of sunlight, temperature, humidity and food.

Strange as it may seem, if the temperature of the human body either drops or rises a few degrees, life is soon extinct unless that temperature is brought back to normal. If there is a change of moisture or a change in the supply of oxygen, great disturbances will arise, and if this disturbance is prolonged, it is only a short time until the other principle of life is brought into effect, and the body is destroyed.

### Over-feeding Causes Disease

**U**NDoubtedly, the greatest cause of disease in the human body is over-feeding, and I firmly believe that this same prin-





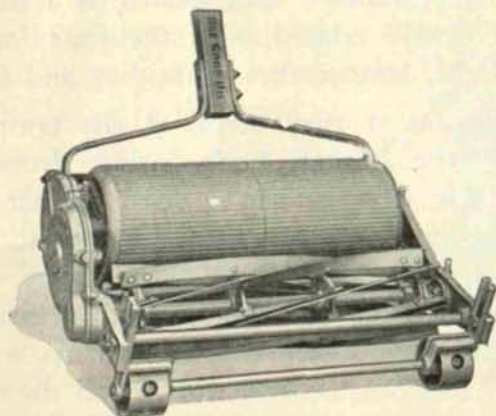
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ciple of over-feeding is the greatest contributing cause for disease in the turf grasses or of flowers. It is plain to us that a healthy, vigorous person, consumes more food than the sickly.

This same principle is applicable to grasses and flowering plants. Undoubtedly all forms of life vary in degrees of virility, or health. We know it does in the human, we know it does in grasses and flowering plants. Even the disease germs must vary in virility. It is common knowledge that epidemics of sickness vary in virility, and by that we mean, the small plants which produce sickness when in the body, vary in virility.

That we may get a better understanding of plants, let us remember that a normal healthy person takes air into the body eighteen times a minute. Yet we take food normally, three times a day. Make the comparison to plants. Only about three or four percent of the growth of a plant is made through the root system, the rest of the growth comes from the air by action of the leaf.

It seems that the greenkeeper or florist does not bear these two facts in mind. It seems that the florist or greenkeeper is over stressing food in the form of fertilizer. If we would know how much the growth of plants comes directly from the root system, take one hundred pounds of vegetable matter and burn it. The thin layer of ash will give it to you quite accurately.

The other substances because of their gaseous nature go back into the air, and only the elements taken by the root system remain. We get a very vivid optical illustration of this principle when we stop the human from breathing for a few minutes or let the same individual do without food. Life would be extinct in a few minutes without air, and it would require many days to make life extinct without food.

### Plants Feed Only in Sunshine

WE MUST further remember that plants feed very little, if at all, in cloudy weather. The leaf which does the larger portion of the building, does its work only in sunshine. A florist knows very well the danger of trying to feed plants in a spell of



cloudy weather. Here is a thought for the greenkeeper.

The problem for the florist in this respect of feeding, in cloudy weather is a much larger one than it is for the greenkeeper in our latitude. The florist keeps his plants growing the year around, whereas, the greenkeeper is only required to have good plant action a portion of the year.

All know quite well what will happen when a human body contains food in the intestinal canal, which is not available. Isn't it reasonable then, that unhealthy conditions will set up in the soil, when the roots of turf grasses are surrounded with a quantity of food which they cannot use.

Who knows the chemical reaction that takes place in the soil when quantities of unavailable food is in the soil. We must learn that fertilizers are not all of it. I grant that it is not an easy task to know just how much food or fertilizers plants will take, but we must remember, that sickly plants cannot take the amount of food that healthy plants can.

You must remember too that the plants we desire to grow are utterly helpless to take food from the soil, unless it has been broken down, or made available by the action of very minute plants in the soil, which are known as soil bacteria. They must do their work first, or the plants cannot thrive.

### Water-logged Soil Kills Bacteria

**WE MUST** remember too, that these soil bacteria are classified as aerobia. This group of plants can only thrive in the presence of oxygen as found in the air. All florists and greenkeepers soon learn, that if the soil in which our plants are growing, has the spaces between the particles of soil filled with water, that the plant soon sickens. Shut the air off entirely by getting the soil "water-logged" and these soil bacteria suffocate, which can be compared to drowning in animal life. This emphasizes the importance of drainage, that we do not drown "the cooks."

If you do not provide exits for this free water, fertilizers and everything else is of no avail. The question naturally arises then, under what conditions does the root system

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of plants work best. To illustrate this, if you take a cup of marbles and then fill the cup with water, you have the spaces between the marbles, filled with water. Place a screen over the cup and pour the water out, each marble will be coated with a film of water.

We know that plants thrive and grow best, only when there is a film of water on the particles of soil. It is very hard for either the florist or the greenkeeper to have this perfect state of film water at all times. If there is too much, air cannot enter, and the soil bacteria do not thrive, and the cell tissues of the plants become gorged with water, and a soft growth sets up, which is not at all healthy.

## The Question of Watering

**I**F THERE is not enough water to produce this film around the particle of soil, growth is arrested. Undoubtedly, less trouble will arise with an arrested growth, by the latter reason than the former. The question of overwatering then is very important for the florist and greenkeeper alike.

Now comes the question of the transpiration of plants, which means the throwing off of water, through the leaves principally. This flow of water serves as a means of transportation for the various compounds used in the growth of plants. Transpiration bears a close relation to sunshine, and air wash—the movement of air around the leaves.

Plants do not transpire as freely in a cloudy spell of weather; certainly then, we should not water as freely in cloudy weather. All greenkeepers have seen the beads of moisture on the tips and edges of leaves in the morning after a night of no wind. In greenhouses the florists do not have currents of air around their plants and this condition of free water on the leaves of his plants will throw terror into his heart about as quickly as anything.

The greenkeeper has a dual trouble here, in this subject of watering. If the green is not soft enough to hold a back spin or niblick shot, the players will yell loud and long. The florist soon learns that he must let his soil dry out occasionally, not bone dry of course, and we are led to believe from this reckoning that if we would keep our putting



greens healthy, we must let up on the watering, from time to time.

I have had experiences with only one golf course, and that one is in central Missouri. And what I am going to say may not apply to all courses. I have seen brown patch on our fairways but I have never seen the grass killed with it. And while I may be in error, I have attributed it to the fact that fairway grasses have more vitality because of this drying out of the soil at times, as we do not water our fairways.

### The Law of Life

AS I SEE it, there is a very definite law applicable to all forms of life, which may be stated as follows. When you have the favorable "set up" of sunlight, humidity, air and food, with temperature, a strong, healthy form of growth will result. Whenever this balance of the four or five principles above is broken, then disease starts. And then the other factor of this principle of life follows. The other forms of small plant life start their work of destruction, that the various elements in that form of life will be liberated to be used over and over again.

It is a continual process of growing, reproducing its form of life, dying, decomposition, that nothing is lost, and on and on. This law is just as applicable to our own body as it is to the other forms of organic matter. The undertaker with his formaldehyde can only hold in obedience, this law, for a very short time. What a mess it would be if this law could be interfered with. We should not worry however, as it cannot be. The whole thought then is, for the grower of vegetable crops to keep them healthy, and actively growing. We must bear in mind however that this cannot be prolonged always.

The grower has but one problem, and that is, in so far as he can, keep an evenly balanced equation of sunlight, heat, moisture, and food in the form of air and minerals. The more we understand these simple principles the better the results.

The question of feeding is a big one, and it is really hard to solve. We need to but recall the great reduction in the mortality

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rate of infants, to know that much can be learned about proper feeding.

### Manure is Dangerous Food

UNDOUBTEDLY it is much safer for the grower to err on the sides of under-feeding rather than over-feeding. Now the question of food for plants comes up. I am convinced that we have depended too much on animal manure, largely because it was the line of least resistance. Animal manure is a very varying compound. It is an extremely complicated chemical mixture, and to my mind a very dangerous compound.

I believe the florist and greenkeeper will eventually find out that we can make a much better plant food, if we will depend upon the decomposition of the green crops instead of animal manure. I am convinced that the losses to the floral industry, because of the improper use of animal manures, is astounding.

I am not contending that it has no use, but I am contending that we should learn to produce better plant foods. If the grower would choose a location where green crops can be grown, especially the legumes, and

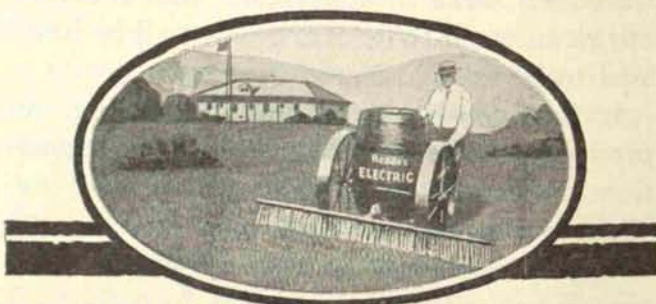
then proceed to produce his feed for plants, by growing these crops and turning them under at the height of the blooming period, I am convinced that he would be pleased with the results.

You will observe, I mention turning them under at the height of the blooming period. The reason is, that undoubtedly we have the maximum of plant elements in the green crops at the blooming period. When they start to fruit or form seed, undoubtedly the elements so consumed, are removed from the plant tissue, leaving an unbalanced form of organic matter, which does not decompose as perfectly.

I have had the experience of not being able to turn a green crop under at the height of the blooming period, and it has convinced me that it is far better to mow the crop and remove it, taking our chances with the next crop. I am not pretending that I know that I am right, but my experience has so convinced me.

### Plant Physiology

Summing it all up, the grower must ac-



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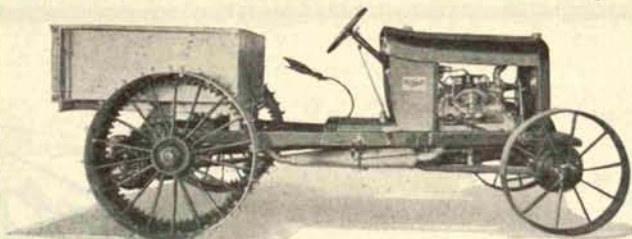
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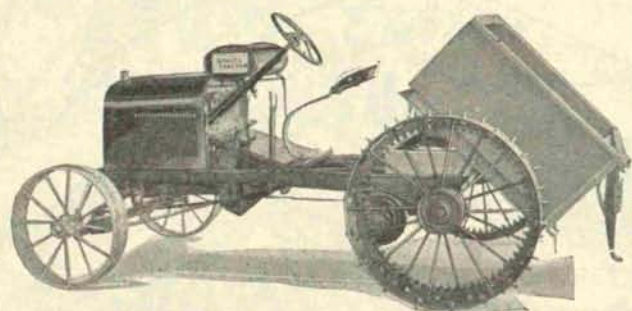
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quaint himself with the action in growth of plants, which is termed plant physiology. This is much easier to say than to do. I have said nothing of the cure for "brown spot", proceeding on the assumption that prevention is better than a cure. The term "brown spot," and "damping off," are terms used by growers, for a perfectly naturally decomposition of organic matter, and is the result of a cause, by an unbalanced condition, of the four or five factors above mentioned.

When this unbalanced condition arises, whether from an immature growth, or an unhealthy growth, it seems that it is a law that that growth should be destroyed, and another start made. It seems to me that we set up favorable conditions of the four or five factors, for the growth of the other small plants, whose duty it is to liberate the component parts for the use of other leaves.

To illustrate this principle, the members of a country club have learned when the set up is favorable, and all of us have seen them on the course, early in the morning

gathering mushrooms before the mower destroyed them. While the members are not concerned about the growth of other fungi, they have learned when a favorable set up comes for the growth of the form that they are interested in.

### **Preventative Measures Necessary**

**THE** grower will use preventative measures, and apply them a day or so before they commence their allotted duty in this plan. The startling thing to me is, that these small fungi have such resisting powers to heat, cold, dry air, etc., to which they are subjected, that they can still hang on to their tiny bits of life, and show up ready to actively do their part in the order of things.

The florist depends upon sulphur more than any one remedy, as a preventative measure. He further realizes the necessity of ventilation, a lower degree of humidity, the changing of temperature, as effective weapons to prevent the growth of fungi. In reality he is making a more favorable set up to throw

*(Continued on Page 34)*



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be the finest and most closely woven of all the turf produced from vegetative planting.

The price, we understand, is \$12.00 per thousand square feet, which means eight bushels of stolons, generally considered enough for fifteen hundred square feet.

Hubbard Nurseries also have a nursery of Washington bent, of the pure Lyman Carrier strain, which while perhaps not having the color and the fine texture of the Metropolitan, is very sturdy and is noted for its power of withstanding brown patch and other fungus diseases.

This Washington bent is also new grass planted last fall and would be particularly ideal for use on tees for short holes where the hardest kind of service is given the turf. In fact the tendency to use bent on tees is growing more and more because of its beautiful appearance and its economy in upkeep.

### Fungus Diseases and Why (Continued from page 17)

vigor into the plants that he desires to grow.

It is only when we know conditions are right for trouble, that we can avoid it, and that offers the best field for us. I feel that we owe much to the sacrificing individuals, who are giving their lives, for our profit and pleasure, in the experimental laboratories.

All of us are finding our lives lengthened, our pleasures increased, by these individuals, whom we sometimes think of as impractical.

As far as doing our work is concerned, they are no more impractical than we would be in doing theirs. They are filling a very worthy place in society, which we cannot commence to estimate in money or comfort.

It is only when we work with them, and tell them what we have found out in our practical work, and then accept and apply what they have found in their work, do either of us make the progress that we should.

### A Big Contract

Probably the biggest contract for vegetative planting ever undertaken is being completed now by the Golf Course Supply Co., Carnegie Ave., Cleveland, O., at the Lake Shore Club, Erie, Penna. The contract calls for 265,000 feet of stolons for planting tees and greens on this new 18-hole layout. The course was designed and being constructed by the American Park Builders, Chicago, in connection with the Andrews Real Estate Co., of Erie. Bent stolons of the Washington strain are being used and A. E. Flack is giving the job his personal supervision.

### Royal York—Canada's New Course (Continued from page 28)

York course and its plans for the future insofar as they affect him. They have accepted its innovations as something which will benefit golf in the Province and spell progress for them as a recognized factor in the sport. The association is to be invited to the course shortly to inspect it and to be guests at a dinner.

In the meantime the Ontario greenkeeper will devote himself to the conditions associated with a spring during which there has been an unusual amount of rainfall. Rainfall and floods have made for a backward year. To a number of greenkeepers, the prevailing condition brings nothing of any moment to cause concern, but a majority charged with the care of courses built on clay soil hope to escape a sudden heat wave which would bake fairways and ruin the grass.

### Bone and Sinew

Bone and sinew (back bone) are necessary to the human element entrusted with the execution of the greenkeepers' order. Necessarily the equipment given this human element must be as strong, or stronger, than they.



ARKANSAS VALLEY GREENKEEPERS  
Chester Mendenhall, Pres., W. R. Moore, Sec'y, and Percy Burks, Vice-Pres.

That is why the Republic Rubber company's "Fairway" and "Tonka" hose do their work so well and so long. They have the "back bone" to be roughed, jerked, pulled and tumbled from place to place without a murmur of complaint—and no kinks, like two wrestlers of equal strength and cleverness, when the days' work is done the verdict is a draw.

### Mowing Greens with Power (Continued from Page 31)

work in the same time and we are saving the labor of two men for one-half day which amounts to quite a saving during a season.

Last year we saved \$2900.00 on labor and I feel that the power mowers have saved quite a percentage of that sum.

I have heard a lot of talk about power mowers packing the greens. Our greens are rather sharp. I have not noticed any difference in packing, nor have I had any complaints on the cutting surface. I feel that we have made a very profitable investment.

We have bought another power mower which will be delivered in the spring to cut our tees and approaches in connection with our fairway tractor and I am sure that we will be able to save a further considerable sum.

### Epitaph

Here lies the body of Kate O'Day,  
For her, life held no terrors  
Born straight-laced, she died that way—

No hits, no runs, no errors.  
From "Toro News."