CHAPTER VII.

SHADING AND BLIGHT.

In several years experience growing Ginseng, says a well known grower, I have had no trouble from blight when I shade and mulch enough to keep the soil properly cool, or below 65 degrees, as you will find the temperature in the forests, where the wild plants grow best, even during summer days.

Some years ago I allowed the soil to get too warm, reaching 70 degrees or more. The blight attacked many plants then. This proved to me that growing the plants under the proper. temperature has much to do with blight.

When fungus diseases get upon wild plants, that is plants growing in the forest, in most cases it can be traced to openings, forest fires and the woodman's ax. This allows too much sun to strike the plants and ground in which they are growing. If those engaged, or about to engage, in Ginseng growing will study closely the conditions under which the wild plants flourish best, they can learn much that they will only find out after years of experimenting.

Mr. L. E. Turner in a recent issue of “Special Crops” says: We cannot depend on shade alone to keep the temperature of the soil below 65 degrees—the shade would have to be almost total. In order to allow sufficient light and yet keep the temperature down, we must cover the ground with a little mulch. The more thoroughly the light is diffused the better for the plants. Now, when we combine sufficient light with say one-half inch of clean mulch, we are supplying to the plants their natural environment, made more perfect in that it is everywhere alike.

The mulch is as essential to the healthy growth of the Ginseng plant as clothing is to the comfort and welfare of man; it can thrive without it no more than corn will grow well with it. These are plants of opposite nature. Use the mulch and reduce the shade to the proper density. The mulch is of the first importance, for the plants will do much better with the mulch and little shade than without mulch and with plenty of shade.

Ginseng is truly and wholly a savage. We can no more tame it than we

can the partridge. We can lay out a preserve and stock it with Ginseng as we would with partridges, but who would stock a city park with partridges and expect them to remain there? We cannot make a proper Ginseng preserve under conditions halfway between a potato patch and a wild forest, but this is exactly the trouble with a large share of Ginseng gardens. They are just a little too much like the potato patch to be exactly suited to the nature of Ginseng, The plant cannot thrive and remain perfectly healthy under these conditions; we may apply emulsions and physic, but we will find it to be just like a person with an undermined constitution, it will linger along for a time subject to every disease that is in the air and at last some new and more subtle malady will, in spite of our efforts, close its earthly career.

One Year's Growth of Ginseng Under Lattice Shade.

Kind readers, I am in a position to know thoroughly whereof I write, for I have been intimate for many years with the wild plants and with every shade of condition under which they manage to exist. I have found them in the valley and at the hilltop, in the tall timber and the brambled "slashing," but in each place were the necessary conditions of shade and mulch. The experienced Ginseng hunter comes to know by a kind of instinct just where he will find the plant and he does not waste time searching in unprofitable places. It is because he understands its environment. It is the environment he seeks—the Ginseng is then already found. The happy medium of condition under which it thrives best in the wild state form the process of healthy culture.

Mr. Wm E. Mowrer, of Missouri, is evidently not in favor of the cloth shading. I think if he had thoroughly waterproofed the cloth it would

have withstood the action of the weather much better. It would have admitted considerably less light and if he had given enough mulch to keep the soil properly cool and allowed space enough for ventilation, he would not have found the method so disastrous. We will not liken his trial to the potato patch, but to the field where tobacco is started under canvas. A tent is a cool place if it is open at the sides and has openings in the top and the larger the tent the cooler it will be. Ginseng does splendidly under a tent it the tent is built expressly with regard to the requirements of Ginseng.

In point of cheapness a vine shading is yet ahead of the cloth system. The wild cucumber vine is best for this purpose, for it is exactly suited by nature to the conditions in a Ginseng garden. It is a native of moist, shady places, starts early, climbs high and rapidly. The seeds may be planted five or six in a “hill” in the middle of the beds, if preferred, at intervals of six or seven feet, and the vines may be trained up a small pole to the arbor frame. Wires, strings or boughs may be laid over the arbor frame for the vines to spread over. If the shade becomes too dense some of the vines may be clipped off and will soon wither away. Another advantage of the wild cucumber is that it is very succulent, taking an abundance of moisture and to a great extent guards against excessive dampness in the garden. The vines take almost no strength from the soil. The exceeding cheapness of this method is the great point in its favor. It is better to plant a few too many seeds than not enough, for it is easy to reduce the shade if too dense, but difficult to increase it in the summer if too light.

This disease threatens seriously to handicap us in the raising of Ginseng, says a writer in “Special Crops.” It does down, but is giving us trouble all over the country. No section seems to be immune from it, tho all seem to be spraying more or less. I know of several good growers whose gardens have gone down during the last season and this, and they state that they began early and sprayed late, but to no decided benefit. What are we to do? Some claim to have perfect success with spraying as their Supposed prevention.

Three years ago I began to reason on this subject and in my rambles in the woods, I have watched carefully for this disease, as well as others on the wild plant, and while I have now and then noted a wild plant that was not entirely healthy, I have never seen any evidence of blight or other real serious disease. The wild plant usually appears ideally healthy, and while they are smaller than we grow in our gardens, they

are generally strikingly healthful in color and general appearance. Why is this so? And why do we have such a reverse of things among our gardens?

I will offer my ideas on the subject and give my theories of the causes of the various diseases and believe that they are correct and time will prove it. At least I hope these efforts of mine will be the means of helping some who are having so much trouble in the cultivation of Ginseng. The old saw that the "proof of the pudding is in chewing the bag," may be amply verified by a visit to my gardens to show how well my theories have worked so far. I will show you Ginseng growing in its highest state of perfection and not a scintilla of blight or any species of alternaria in either of them, while around me I scarcely know of another healthy garden.

A Healthy Looking Ginseng Garden.

To begin with, moisture is our greatest enemy; heat next; the two combined at the same time forming the chief cause for most diseases of the plant.

If the soil in our gardens could be kept only slightly moist, as it is in the woods, and properly shaded, ventilated and mulched, I am sure such a thing as blight and kindred diseases would never be known. The reason for this lies in the fact that soil temperature is kept low and dry. The roots, as is well known, go away down in the soil, because the

temperature lower down is cooler than at the surface.

Here is where mulch plays so important a part because it protects the roots from so much heat that finds its way between the plants to the top of the beds. The mulch acts as a blanket in keeping the heat out and protecting the roots thereby. If any one doubts this, just try to raise the plants without mulch, and note how some disease will make its appearance. The plant will stand considerable sun, however, with heavy enough mulch. And the more sun it can take without harm, the better the root growth will be. Too much shade will show in a spindling top and slender leaves, and invariable smallness of root growth, for, let it be borne in mind always, that the plant must derive more or less food from the top, and it is here that the fungi in numerous forms proceed to attack.

The plant will not grow in any other atmosphere but one surcharged with all kinds of fungi. This is the natural environment of the plant and the only reason why the plants do not all become diseased lies in the plain fact that its vitality is of such a high character that it can resist the disease, hence the main thing in fighting disease is to obtain for the plant the best possible hygienic surroundings and feed it with the best possible food and thus nourish it to the highest vitality.

I am a firm believer in spraying of the proper kind, but spraying will not keep a plant free from disease with other important conditions lacking. Spraying, if heavily applied, is known as a positive injury to the plant, despite the fact that many claim it is not, and the pity is we should have to resort to it in self-defense. The pores of the leaflets are clogged up to a greater or less extent with the deposited solution and the plant is dependent to this extent of its power to breathe.

Coat a few plants very heavily with spray early in the season and keep it on and note how the plants struggle thru the middle of a hot day to get their breath. Note that they have a sluggish appearance and are inclined to wilt. These plants are weakened to a great extent and if an excess of moisture and heat can get to them, they will perhaps die down. Another thing: Take a plant that is having a hard time to get along and disturb the root to some extent and in a day or two notice spots come upon it and the leaves begin to show a wilting. Vitality disturbed again.

The finest plants I have ever found in the woods were growing about old logs and stumps, where the soil was heavily enriched with decaying

wood. A good cool spot, generally, and more or less mulch, and if not too much shade present. Where the shade was too dense the roots were always small. I have in some instances found some very fine roots growing in the midst of an old stump with no other soil save the partially rotted stump dirt, showing thus that Ginseng likes decaying wood matter. Upon learning this, I obtained several loads of old rotten sawdust, preferably white oak or hickory and my bed in my gardens is covered at least two inches with it under the leaf mulch. This acts as a mulch and natural food at one and the same time. The leaves decay next to the soil and thus we supply leaf mold.

This leaf mold is a natural requirement of the plant and feeds it also constantly. A few more leaves added each fall keep up the process and in this way we are keeping the plant, wild, which we must do to succeed with it, for Ginseng can not be greatly changed from its nature without suffering the consequences. This is what is the matter now with so many of us. Let's go back to nature and stay there, and disease will not give us so much trouble again.

One more chief item I forgot to mention was the crowding of the plants together. The smaller plants get down under the larger and more vigorous and have a hard struggle for existence. The roots do not make much progress under these conditions, and these plants might as well not be left in the beds. And also note that under those conditions the beds are badly ventilated and if any plants are found to be sickly they will be these kind. I shall plant all my roots henceforth at least ten inches apart each way and give them more room for ventilation and nourishment. They get more chance to grow and will undoubtedly make firm root development and pay largely better in the end. Corn cannot be successfully cultivated in rows much narrower than four feet apart and about two stalks to the hill. All farmers know if the hills are closer and more stalks to the hill the yield will be much less.

At this point I would digress to call attention to the smallness of root development in the woods, either wild or cultivated, because the trees and tree roots sap so much substance from the soil and other weeds and plants help to do the same thing. The shade is not of the right sort, too dense or too sparse in places, and the plants do not make quick growth enough to justify the growing under such conditions, and while supposed to be better for health of plants, does not always prove to be the case. I have seen some gardens under forest shade that blighted as badly as any gardens.

So many speak of removing the leaves and mulch in the spring from the beds. Now, this is absolutely wrong, because the mulch and leaves keep the ground from becoming packed by rains, preserves an even moisture thru the dry part of the season and equalizes the temperature. Temperature is as important as shade and the plants will do better with plenty of mulch and leaves on the beds and considerable sun than with no mulch, dry hard beds and the ideal shade. Roots make but little growth in dry, hard ground. Pull your weeds out by hand and protect your garden from the seng digger thru the summer and that will be your cultivation until September or October when you must transplant your young roots into permanent beds, dig and dry the mature roots.

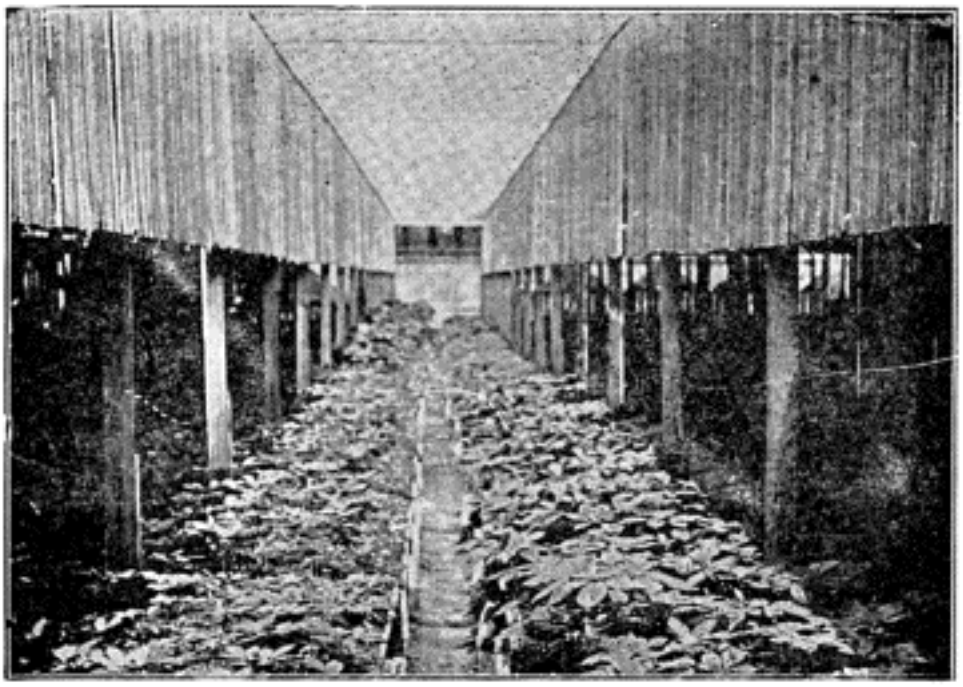
SHADING.

That Ginseng must have at least some shade is a foregone conclusion but just the exact amount it needs is still debatable. From long experience I find the more sun it has up to the point of turning the foliage from green to a reddish or bronze cast the better will be the root growth. In New York state, we have found that much less than seventy-five per cent of shade would allow so much sunshine as to turn the leaves to a sort of bronze green and sometimes a yellow and seriously injure the plant. Farther south, I think, the shade should be greater than here. For practical all around work about eighty per cent shade is about right for this climate. If the shade is too dense, you will get more seed and less root growth.

Good results have been secured from tree shade, selecting deep rooting trees. but the tendency of all trees to throw their fiber roots up into the mellow and enriched soil is so great that we hesitate to advise plant of trees for this purpose, Should our growers, however, decide to adopt the Korean plan of lifting and resetting their gardens every year, the objection to the rootlets from the trees would be overcome as they would be kept back by the constant digging up of the beds. There is in my mind no question but green shade is the coolest of any shade ever used. Some resort to vines, especially the wild cucumber and grape vines. The wild cucumber is too late here in coming to a point where it really shades. The grape vine is objectionable as it saps the ground worse than tree shade does. The majority of growers adopt lumber in some form, varying from a lath to inch lumber. For lath shading a series of posts are usually set in the ground and these support a framework on which panels of lath are placed. These panels are made in various ways and

sizes. Some are made by nailing lath on strips four feet long and still others on strips much longer. Of course, the framework should be made according to the length of panel used. If your lath are one and one-half inches wide the space between each lath should be close to one-half inch. This lath shading in the north where there is liable to be heavy snows, would break it down. Care should be used to have all shading at least six feet above the ground as low shading makes the garden too hot and causes blight and other diseases. Lath is also woven with wire, as used by some farmers for fencing. When used this way it is made in long rolls and rolled out on the framework overhead. Some of the older gardens were shaded with brush and even old fence rails have been used with success. Other hinge their lath panels to a horizontal scantling, fast at the top of the posts, and in summer hook the bottom of one series of panels to the bottom of the next, making the shade in the form of the letter V, the lower point of the V coming in the path and the posts from which the panels are suspended coming in the center of the beds. In winter these panels are unhooked and allowed to swing beside the posts to which they are hooked or tied to prevent swinging in the wind. This shade allows of a sun bath in summer as it is very quickly lowered or raised. This shade is known as the Hetrick shade and I think is patented.

L. B. Hetrick, Shade in Position. (Patented).

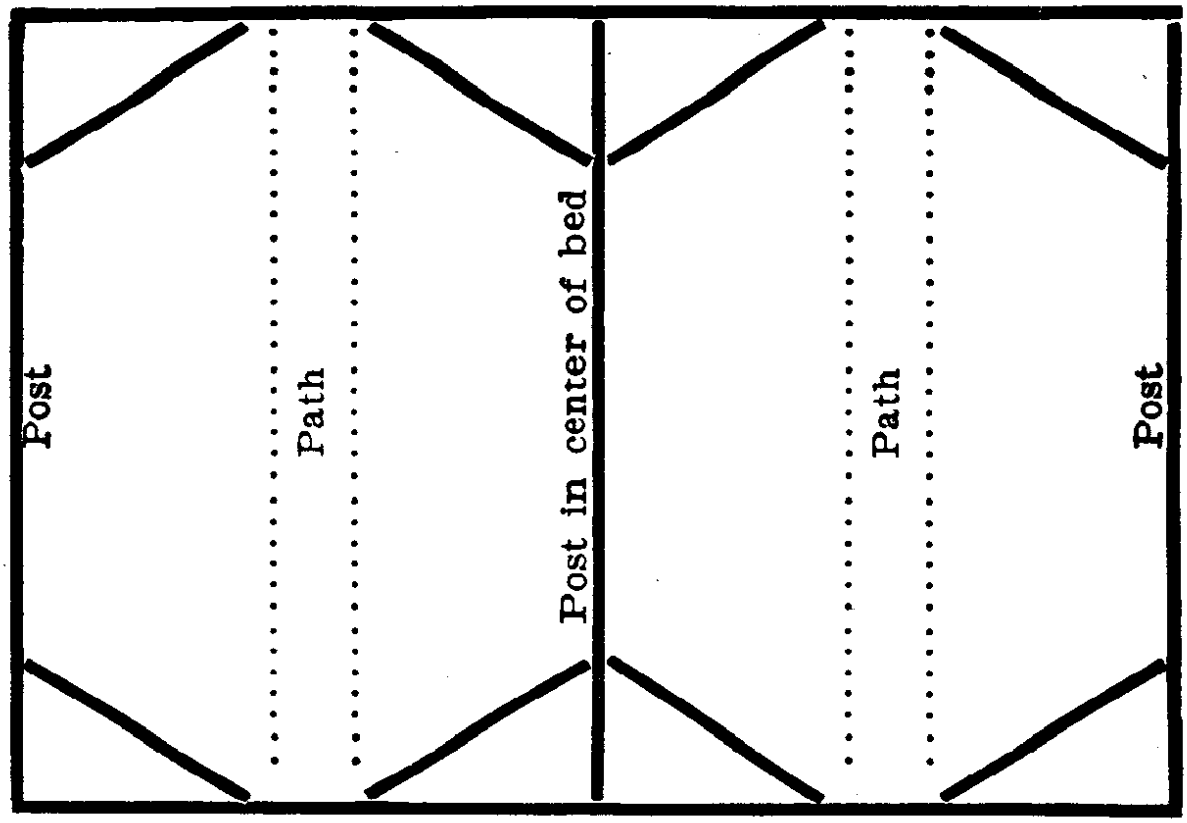


L. P. Hetrick, Shade Down for the Winter, or to Give Beds a Sun Bath to Dry Them Out, or During a Dry Spell to Let the Entire Rainfall From a Passing Shower Fall on the Plants.

Tree Shade. Garden of Mr. M. C. Grossclose.

In the March number of Special Crops for 1912, Joseph Hines describes his shade, which is similar to the Hetrick shade, but not patented. We give his letter.

End View of Beds.



The above is a rough illustration of the way I shade my Ginseng garden.

I make my beds four feet wide and highest in center of beds, making the paths lower than the surface of the ground and about 18 inches wide.

The posts are set before the beds are made, the tops of the posts being seven or eight feet above the surface of the ground and set 8 feet apart, running lengthwise of the beds, and all posts in the center of the beds, out of the way of wheelbarrow going through the paths. The posts will be 5 1/2 feet apart, running crosswise from bed to bed.

For the framework on top of the posts, to support the shade, I use strips of boards 3 or 4 inches wide and 1 inch (or more) in thickness, nailing the strips that run crosswise of beds, first, 2 or 3 inches below top of

posts and then the strips that run lengthwise of beds to the top of posts resting the bottom of these strips on the upper edge of the strips that run crosswise. Then lay a board, flat, on top of the posts, across both ends of your beds and run a two-strand cable or fence wire over the center of your paths, letting the wire rest on the boards that run crosswise of beds. Each end of the wire will be fastened to the boards which are nailed on top of the posts, crossing the ends of the beds, and should be drawn sufficiently tight to prevent the wire sagging too much.

The shade, or covering, is in sections, 4 feet long and 2 feet 8 or 9 inches wide, one side being hooked to the board which runs over the center of the bed and the other side is hooked up to the wire which runs over the center of the path. The shade may be unhooked from the wire in the fall and allowed to hang during the winter, avoiding the danger of breaking down when loaded with snow and permitting the sun to shine on the beds during the fall and spring when the shade is not required.

I use no side boards around my beds as I consider them a needless expense, a convenient harbor for snails and very much in the way of cultivation.

My experience in Ginseng culture has not been very extensive, and I do not recommend my method of shading to anyone who knows of something better. I am attending this convention hoping to learn something to my advantage, and we have been advised to come prepared to give, as well as take, and if I have an idea of any value to others they are welcome to use it.
Yours very truly,

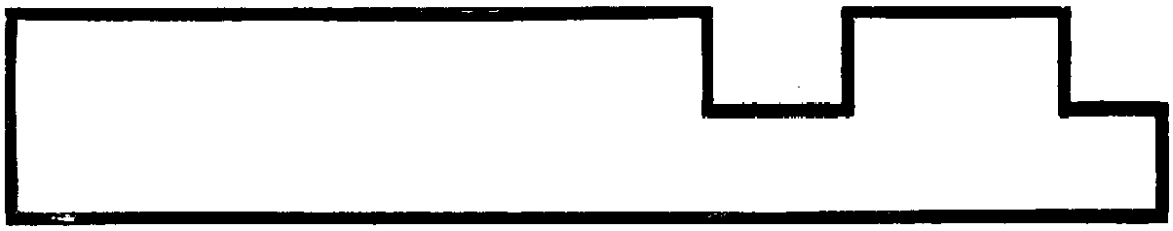
Athens, Pa. JOSEPH HINES

A GOOD SHADE

The time for planting is here again and many growers will be building additions to their gardens or re-arranging their old shade. The writer gets many inquiries relative to shading, and most of our questioners ask for the best shade. Now, I am not qualified to tell you which of many good schemes for shading is the best, and in fact, it is quite possible that what would be the best shade for me would not be the best somewhere else. Nearly all the soils near Skaneateles are of a heavy loam. Very little sand and very little heavy clay soils. But in practically all our fields

here after a heavy rain the soil will crust over, and in very dry weather, if not mulched or cultivated, will crack open so you can put your fingers in the open crevices. With plenty of humus in the soil and under shade this soil retains moisture and becomes at times quite water soaked. This is quite apt to happen in June and July, just the time when blight is the most prevalent. This shading, you will notice, is so arranged as to carry most of the rainfall into the paths. That is what we need here.

You will see by the picture that this method of shading, uses a series of shed roofs all facing one way, and the high or open side should face the north. We arrange our beds east and west; starting on the south side of the first bed we attach a 2 x 4 scantling to a line of posts set firm in the ground. This row of posts is for the fence that goes around the garden, but we use it to attach the first support for the roof. After this first row of posts no more are used save at the ends of the beds, where again we attach the roof supports to the posts. The uprights that support the roof are 2x4 inch, eight feet long, made something like this:



The notches are cut into the upright two by four inches to receive the pieces on which the roof boards are nailed. There are two lines of stringers on each upright after the first one, the upper line-has the upper part of the roof of one bed nailed to it, and the lower line has the low side of the roof of the next bed nailed to it. Each upright is set upon a common brick and is not let down into the ground at all. The uprights stand just in the edge of the bed. The low side of the roof boarding is allowed to project over the lower stringer just enough so the line of uprights may stand in the edge of the bed and still the drip from the roof falls in the path.

The uprights being eight feet long, gives six feet in the clear from the top of the beds to the lowest point of the shading. And, of course, in our soil the paths are six or eight inches below the top of the beds. Then we have two feet from lower to upper stringer, and on this two feet of open space we depend for ventilation. This open space, as we have already said, opens to the north, and as it is all open and the roof slants up to it, it makes an ideal manner of getting rid of the warm air. Of course, you

all know warm air rises as it comes up to the underside of the roof boards, it very naturally follows them up until it comes to this open space and then passes out.

We use hemlock lumber, one inch thick by four inches wide and eight feet long and place these boards about one and one-fourth inches apart. The roof boards being eight feet long and one side of the roof two feet higher than the other side makes our beds about seven feet wide from one row of uprights to the next, and with the path out of this we have a bed not over six feet where the plants stand. This is easily reached for weeding. The uprights are braced by nailing a 1 x 4 inch board at an angle of forty-five to both the upper and lower roof stringers. This makes the posts stand upright and at the same time supports the roof stringers so there is no danger of snow breaking it down, even though the garden is in a snowy country. We have had drifts between two and three feet deep on our shading of this kind, but have never had any breaks. This shade is rather costly but not as much so as one would first think. In this locality a ten-foot fence post will cost you from twenty-five to thirty cents and in this shading, as a 2 x 4 scantling is all that is used, the cost is only about ten cents for each post or upright. Again, the length of the roof boards (8 feet) is the cheapest length of lumber we have. It being one inch thick gives it strength and stiffness as well as durability. We have found that this high shade with the ventilation it gives and the fact that it throws a large part of the rainfall into the paths, makes a garden almost blight proof without spraying.

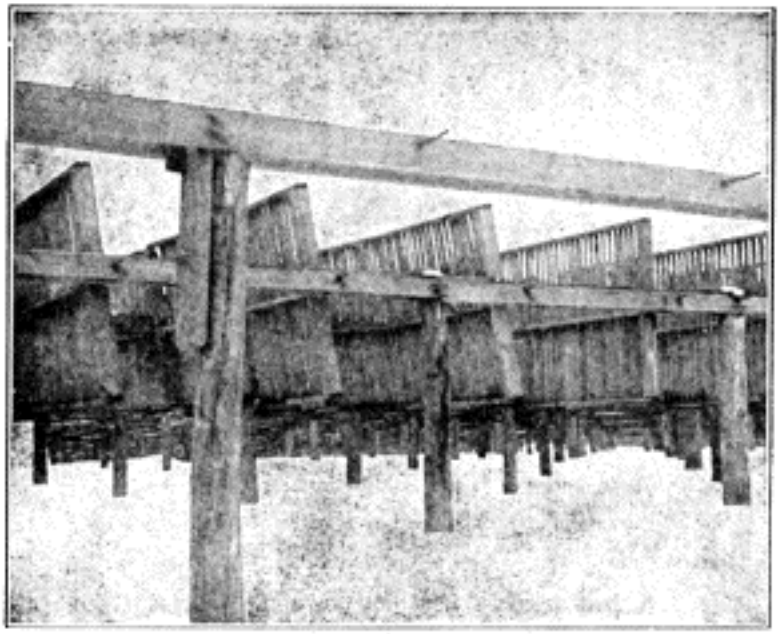
I think the Hetrick shade also gives all the advantages of this shade that we have described, but aside from that I know of no shade that suits our soil and climate as well. I should imagine that a sandy soil would not require that rainfall to be turned to the paths the same as our soil does. No matter what the soil or what the shade, good drainage is absolutely essential.

EDITOR.

There is also another shade which the writer esteems very highly. This was described in Special Crops, September 1912, as follows:

Cloth has been used as shading material, largely in the form of burlaps stretched over a framework. Any shading of this nature, however, will ruin any garden, from lack of ventilation. I was in a garden of two acres, once, all shaded with burlaps, both on sides and top and it was so

warm in there and the air so humid, that I absolutely had to get out of the garden or faint. About two weeks after that I learned that the plants had all gone down with blight, and a little later, still, a heavy wind storm took the burlaps all off and ended this useless shade. No material that shuts out the air is desirable. The only way that I know of that a cloth shade can be used is to draw pieces of cloth through the meshes of wire netting. The same result may be accomplished by weaving through the meshes cat tail flags, or, for that matter, almost anything that will stand the weather. The wire makes the foundation and I can well believe, for a flat shade, this to be the peer of any, both in efficiency and cost.



A Section of a Michigan Ginseng Garden, Showing a Shading as Handled in Winter. A Very Favorable Shade.

CHAPTER VIII.

DISEASES OF GINSENG.

The following is from an article on "The Alternaria Blight of Ginseng" by H. H. Whetzel, of Cornell University, showing that the author is familiar with the subject:

SUSCEPTIBILITY OF GINSENG TO DISEASE.

The pioneer growers of Ginseng thought they had struck a "bonanza." Here was a plant that seemed easily grown, required little attention after it was once planted, was apparently free from all diseases to which cultivated plants are heir and was, besides, extremely valuable Their first few crops bore out this supposition. No wonder that a "Ginseng craze" broke out and that men sat up nights to figure out on paper the vast fortunes that were bound to accrue to those who planted a few hundred seeds at three cents each and sold the roots in five years at $12.00 a pound. Like many other grow-wealthy-while-you-wait schemes, nature herself imposed a veto. Diseases began to appear. The prospective fortune shrunk, frequently dried up and blew away or rotted and disappeared in the earth. Several factors contributed to this result:

1. The removal of a wild plant from its natural habitat to an entirely artificial one.

2. The encouragement by the application of manures and cultivation of a rapidity of growth to which the plant was by inheritance an entire stranger, thus weakening its constitution and depriving it of its natural ability to withstand disease. Cultivated roots in three years from the seed attain greater size than they often would in twenty years in the woods.

3. The failure in many cases to provide conditions in any degree approximating the natural habitat, as, for example, the failure to supply proper drainage that is in nature provided by the forest trees whose roots constantly remove the excess of rainfall.

4. The crowding of a large number of plants into a small area. This, in itself, is more responsible for disease epidemics than perhaps any other

factor.

Of all the twelve or fifteen, now more or less known, diseases of this plant one in particular stands out as the disease of Ginseng. Altho one of the latest to make its appearance, it has in three or four years spread to nearly every garden in this state and its ravages have been most severe. This disease is the well known Alternaria Blight.

Diseased Ginseng Plants.

THE MOST COMMON AND DESTRUCTIVE DISEASE OF GINSENG.

The disease manifests itself in such a variety of ways, depending upon the parts of the plant attacked, that it is difficult to give a description by which it may always be identified. It is usually the spotting of the foliage that first attracts the grower's attention. If examined early in the morning the diseased spots are of a darker green color and watery as if scalded. They dry rapidly, becoming papery and of a light brown color, definite in outline and very brittle. With the return of moist conditions at night the disease spreads from the margin of the spot into the healthy tissue. The disease progresses rapidly so that in a very few days the entire leaf succumbs, wilts and hangs limp from the stalk. If the weather is wet, the progress of the disease is often astonishing, an entire garden going down in a day or two. Under such conditions the

leaves may show few or no spots becoming thruout of a dark watery green and drooping as if dashed with scalding water. All parts of the top may be affected. The disease never reaches the roots, affecting them only indirectly.

CAUSE OF THE DISEASE.

The disease is the result of the growth of a parasitic fungus in the tissues of the Ginseng. This fungus is an Alternaria (species not yet determined) as is at once evident from an examination of its spores. These are in size and form much like those of the early Blight Alternaria of Potato. These spores falling upon any part of the plant above the ground will, if moisture be present, germinate very quickly, sending out germ tubes which pierce the epidermis of the host. These mycelium threads ramify thru the tissues of the leaf or stem as the case may be, causing death of the cells. From the mycelium that lies near or on the surface arise clusters or short brown stalks or conidiopheres on the apex of which the spores are borne in short chains. The spores mature quickly and are scattered to healthy plants, resulting in new infections. Only one form of spores, the conidial, is at present known.

That the Alternaria is a true parasite and the cause of the disease there can be no doubt. The fungus is constantly associated with the disease. Inoculation experiments carried on in the botanical laboratory this summer show conclusively that the germ tube of the spore can penetrate the epidermis of healthy Ginseng leaves and stems and by its growth in such healthy tissue cause the characteristic spots of the disease. This is of special interest as it adds another to the list of parasitic species of genus long supposed to contain only saprophytes.

Upon the general appearance of so destructive a disease, one of the first questions of the growers was “where did it come from?” Believing that it was a natural enemy of the wild plant, now grown overpowerful under conditions highly unnatural to Ginseng, I undertook to find proof of my theory. I visited a wooded hillside where wild Ginseng was still known to exist. After half a day's diligent search I obtained seventeen plants of different ages, one of which showed spots of the Blight. Examination with the microscope showed mycelium and spores of the Alternaria. Unfortunately I did not get pure cultures of the fungus from this plant and so could not by cross inoculations demonstrate absolutely the identity of the Alternaria on the wild plant with that of the cultivated. So far, however, as character of the spots on the leaves, size and form of

the spores are concerned, they are the same. This, I believe, answers the question of the source of the disease. Introduced into gardens on wild plants brought from the woods, it has spread rapidly under conditions most favorable to its development; namely, those pointed out in the earlier part of this paper.

The wind, I believe, is chiefly responsible for the dessemination of the spores which are very small and light. Not only does the wind carry the spores from plant to plant thruout the garden, but no doubt frequently carries them for longer distances to gardens near by. The spores are produced most abundantly under conditions favorable to such dissemination. During moist, cloudy weather the energies of the fungus are devoted to vegetative growth, the spreading of the mycelium in the host tissues. With the advent of bright sunny days and dry weather mycelium growth is checked and spore formation goes on rapidly. These spores are distributed when dry and retain their vitality for a long period. Spores from dried specimens in the laboratory have been found to germinate after several months when placed in water. The disease might also be very readily carried by spores clinging to the roots or seeds, or possibly even by the mycelium in the seeds themselves. The fungus very probably winters in the old leaves and stems or in the mulch, living as a saprophyte and producing early in the spring a crop of spores from which the first infections occur.

SUMMER HISTORY OF THE DISEASE.

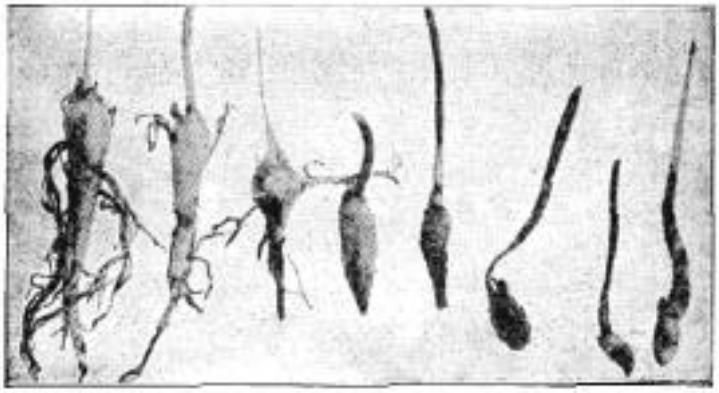
Altho it is on the foliage that the disease first attracts the attention of the grower, it is not here that it really makes its first appearance in the spring. The stem is the first part of the plant to come thru the soil and it is the stem that is first affected. The disease begins to show on the stems very shortly after they are thru the soil, evident first as a rusty, yellow spot usually a short distance above the surface of the soil or mulch. The spot rapidly increases in size, becomes brown and finally nearly black from the multitude of spores produced on its surface. The tissue of the stem at the point of attack is killed and shrinks, making a canker or rotten strip up the side of the stem. Such stems show well developed leaves and blossom heads giving no evidence of the disease beneath. Occasionally, however, the fungus weakens the stem so that it breaks over. Growers have occasionally observed this “stem rot” but have never connected it with the disease on the leaves later in the season.

Broken — "Stem Rot"

It is from the spores produced on these cankers on the stem that the leaves become infected. The disease begins to appear on the leaves some time in July and by the middle of August there is usually little foliage alive. Infection frequently occurs at the point where the five leaflets are attached to the common petiole. The short leaf stems are killed causing the otherwise healthy leaflets to droop and wilt. This manifestation of the disease has not generally been attributed to the Alternaria. The seedlings are frequently affected in the same way causing what is sometimes known as the "top blight of seedlings."

From the diseased leaves and stems the spores of the fungus find their way to the seed heads which at this time are rapidly filling out by the growth of the berries. The compact seed heads readily retain moisture, furnishing most favorable conditions for the germination of any spores that find their way into the center of the head. That this is the usual course of seed head infection is shown by the fact that it is the base of the berry on which the spots start. These spots, of a fusty yellow color, gradually spread all over the seed which finally becomes shriveled and of a dark brown or black color. Spores in abundance are formed on the diseased berries. Affected berries "shell" from the head at the slightest touch. This manifestation of the disease has long been known as "seed blast." If the berries have begun to color the injury from the disease will probably be very slight. The "blasting" of the green berries, however,

will undoubtedly reduce or destroy the vitality of the seed. There is a strong probability that the fungus may be carried over in or on the seed.



End Root Rot of Seedlings.

The roots are only indirectly affected by this disease. The fungus never penetrates to them. Roots from diseased tops will grow perfectly normal and healthy plants the following season. It is in the leaves of the plant that practically all of the substance of the root is made. The bulk of this substance is starch. The destruction of the foliage, the manufacturing part of the plant, long before it would normally die means of course some reduction in the growth and starch content of the root. However, it seems probable that the greater portion of root growth is made before the blight attacks the foliage. This seems borne out by the fact that even blighted seedlings usually show nearly as good growth and bud development as those not blighted. In the case of older plants this is probably much more true as the latter part of the season is devoted largely to growing and maturing the berries. The Alternaria blight is dreaded chiefly because of its destructive effects on the seed crop.

PREVENTIVE.

The first experimental work on the control of this disease so far as I know, was carried out by Dr. I. C. Curtis of Fulton, N. Y. Having suffered the total loss of foliage and seed crop during the season of 1904, Dr. Curtis determined to test the efficacy of the Bordeaux mixture the following season as a preventive of the blight. The success of his work, together with this method of making and applying the mixture is given by him in Special Crops for January, 1906.

Extensive experiments in spraying were carried out during the past season by the Ginseng Company at Rose Hill, N. Y., under the direction

of the writer. During 1905 their entire seed crop was completely destroyed by the blight. Losses from the same disease the previous season had been very heavy. During 1905 they had succeeded in saving a very large proportion of their seedlings by spraying them with the Bordeaux mixture. Encouraged by this they began spraying early in the spring of 1906, just when the plant began to come thru the ground. This was repeated nearly every week during the season, the entire ten acres being sprayed each time. On account of poor equipment the earlier sprayings were not as thoroughly done as they should have been, and some disease appeared on the stalks here and there thruout the gardens. A new pump and nozzles were soon installed and all parts of the plant completely covered. Practically no blight ever appeared on the foliage. There was some loss from “blast of seed heads” due to a failure to spray the seed heads thoroughly while they were filling out. The seed heads were doubtless infected from the diseased stalks that had not been removed from the garden. A very large seed crop was harvested. The formula of the Bordeaux used at Rose Hill was about 4-6-40, to each one hundred gallons of which was added a “sticker” made as follows:

Two pounds resin.

One pound sal soda (Crystals).

One gallon water.

Boiled together in an iron kettle until of a clear brown color. It is probable that more applications of Bordeaux were given than was necessary, especially during the middle part of the season when little new growth was being made.

From these experiments it is evident that the problem of the control of the Alternaria Blight of Ginseng has been solved. Thorough spraying with Bordeaux mixture begun when the plants first come thru the ground and repeated often enough to keep all new growths covered, will insure immunity from the blight. Thoroughness is the chief factor in the success of this treatment. It is, however, useless to begin spraying after the disease has begun to appear on the foliage.

To the President and Members of the Missouri State Ginseng Growers' Association.

GENTLEMEN—In response to a request from your secretary, I was sent early in August to investigate your Ginseng gardens, and, if possible, to give some help in checking a destructive disease which had recently appeared and had in a short time ruined much of the crop. Thru the aid of some of your association, at the time of my visit to Houston, and since that time, I have been furnished with valuable data and specimens of diseased plants.

The summer of 1904 was marked by a very abundant rainfall. The shade of the arbors kept the soil beneath them moist, if not wet, for several weeks at a time, This moist soil, rich in humus and other organic substances, formed an exceedingly favorable place for the growth of fungi. Gardens under dense shade with poor drainage, suffered the greatest loss. All ages of plants were attacked and seemed to suffer alike, if the conditions were favorable for the growth of fungi,

SYMPTOMS OF DISEASE AND NATURE OF THE INJURY.

Between the first and the fifteenth of May black spots having the appearance of scars appeared on the stems of the Ginseng plants. All ages of plants were attacked. The scars increased in number and grew in size, sometimes encircling the stem.

The first indication of injury was seen when one leaflet after another turned brown; from them the disease spread down the petiole to the main stalk. Other stalks were attacked so badly that they broke off and fell over before the upper portions had even become withered. After the loss of the top from this disease the crown of the root was liable to be attacked by fungi or bacteria, causing decay. I found little of this in the gardens at Houston. The greatest loss caused by this disease lies in the destruction of the seed crop.

I have succeeded in isolating and studying the fungus which causes this disease. The fungus belongs to the genus Vermicularia and occurs on a number of our common herbaceous plants. I found it near Columbia this autumn on the Indian turnip. The fungus lives beneath the epidermis of the Ginseng plant; breaking the epidermis to form the black scars in which the spores, or reproductive bodies, are produced. The spores when ripe are capable of germinating and infecting other plants.

TREATMENT.

Fortunately this disease can be effectually checked by the use of Bordeaux spraying mixture.

DAMPING-OFF DISEASE.

Another source of loss was in the damping-off of young plants, The fungus which causes this disease lives in the surface layer of the soil and girdles the plants at the surface layer of the ground, causing them to wilt and fall over. The trouble can be largely avoided by proper drainage and stirring the surface layer, thus aerating and drying the soil.

THE WILT DISEASE.

By far the most destructive and dangerous disease remains to be described. It made its appearance about the first week in July, causing the leaves to turn yellow and dry up; the seed stem and berries also dried up and died before reaching maturity. This was the disease which caused the greatest loss; whole plantations often being destroyed in a week. Neither the Bordeaux spraying mixture nor lime dust seemed to check its ravages.

I have succeeded in isolating the fungus which is the cause of this destructive disease and have grown it in the laboratory in pure cultures for nearly five months. Cultures were made by scraping the dark spots on diseased stems with a sterile needle and inoculating sterilized bean pods or plugs of potato with the spores scraped from the stem. In two or three days a white, fluffy growth appears on the bean pod which rapidly spreads until it is covered with a growth which resembles a luxuriant mould. I have also isolated this fungus and made cultures from the soil taken from diseased beds.

The fungus belongs to the genus Fusarium and is probably identical with the fungus which is so destructive in causing the wilt of cotton, watermelon and cowpeas, and which has been carefully studied by Smith and Orton of the United States Department of Agriculture.

TREATMENT.

It will be seen from this brief description of the fungus that it is an exceedingly difficult disease to combat. Living from year to year in the soil it enters the plants thru the roots and spreads upward thru the water-conducting channels. It does not once appear on the surface until the plant is beyond recovery. Obviously we cannot apply any substance to kill the fungus without first killing the plant it infests.

There is but one conclusion to be drawn, viz.: That application of fungicides will not prevent the wilt disease.

There are, however, two methods of procedure in combating the disease: First, the use of precautions against allowing the fungus to get started; second, the selection and breeding of varieties which will withstand the disease.

From the very first the arbor should be kept free from all possible infection by the wilt fungus.

Gardens should be small and located some little distance apart, then if one becomes infected with the disease it can be taken up before the disease infests a larger territory. If the roots have reached merchantable size they had best be dried and sold, since they are likely to carry the disease when transplanted. If they are transplanted they should be carefully cleaned and reset without bruising.

Proper drainage is very necessary for a successful Ginseng garden. It is advisable to locate the garden on a gentle slope if possible. In all cases the ground should be well drained.

The belief of many that the death of the Ginseng was due to the wet season was without foundation, because the fungus develops best in soil which is continually moist and shady. This also accounts for the well-known fact that all rots, mildews and rusts are worse in a rainy season than in a dry one.

Ample ventilation must also be provided in building the arbor. Many arbors are enclosed at the sides too tightly.

The Beginning of Soft Rot.

The material used for mulching should be of a sort which will not contaminate the garden with disease. Some fungi will be killed if the ground is allowed to freeze before putting on the mulch.

The second and, to my mind, most promising mode of procedure lies in propagating a variety of Ginseng which will be resistant to the wilt disease. In every garden, no matter how badly diseased, there are certain plants which live thru the attacks of the disease and ripen seeds. These seeds should be saved and planted separately, the hardiest of their offspring should be used to propagate seeds for future planting. By thus selecting the hardiest individuals year after year it will be possible in time to originate a variety of parasitic fungi. There seems to me to be more hope in developing such a resistant variety of Ginseng than in discovering some fungicide to keep the disease in check.

BORDEAUX MIXTURE.

It is surprising that any considerable number of farmers, horticulturists, Ginseng growers, etc., are ignorant of a preparation so necessary as Bordeaux for profitable cultivation of many crops. The following is taken from Bulletin 194 of the New Jersey Agricultural Experiment Station. The advice given in this paper recently by Professor Craig is repeated and emphasized. Every farmer should have the bulletins issued by the experiment station of his own state and have them within easy reach at all times.

Bordeaux mixture derives its name from the place of its discovery, Bordeaux, France. It consists of copper sulfate, which is commonly called blue vitriol or bluestone, fresh lime and water.

Formulas used-Several strengths of the mixture are used under different conditions:

1. (2:4:50)	Copper Sulfate	2 lbs.
	Quick Lime	4 lbs.
	Water	50 gals.
2. (3:6:50)	Copper Sulfate	3 lbs.
	Quick Lime	6 lbs.
	Water	50 gals.,
3. (4:4:50)	Copper Sulfate	4 lbs.
	Quick Lime	4 lbs
	Water	50 gals.
4. (6:6:50)	Copper Sulfate	6 lbs.
	Quick Lime	6 lbs.
	Water	50 gals.

Formula 1 is used for very tender foliage, as peach, plum, greenhouse plants, tender seedlings, etc.

Formula 2 which is a half stronger than the preceding has about the same use but for slightly less tender leaves.

Formula 3 is the formula for general use on apples, pears, asparagus, grapes, tomatoes, melons, strawberries, etc.

Formula 4 is the strongest formula that is often used. It is considered best for potatoes and cranberries. It may be used on grapes, on apples and pears before blossoming and sometimes on other crops. It was once more commonly used, but, except as here quoted, it is generally being displaced by Formulas 3.

Normal or 1.6 per cent. Bordeaux mixture:

Copper-sulfate (Blue Vitriol)	6 pounds
Quick-lime (Good stone lime)	4 pounds
Water	50 gallons

Six pounds of sulfate of copper dissolved in fifty gallons of water, when applied at the proper time, will prevent the growth of fungi However, if applied in this form, the solution will burn the foliage.. Four pounds of quick-lime to six pounds of copper will neutralize the caustic action. When sulfate of copper and lime are added in this proportion, the compound is Bordeaux mixture.

Weighing of copper and lime at time of mixing is very inconvenient. Bordeaux mixture is best when used within a few hours after being mixed. Therefore a stock mixture of Bordeaux is impracticable. It is, however, practicable to have stock preparation of sulfate of copper and of lime ready for mixing when required.

The lime should be fresh quick-lime and when slaked must always be covered with water to exclude the air. In this manner a “stock” mixture of lime can be kept all summer unimpaired.

Sulfate of copper can be dissolved in water and held in solution until needed. One gallon of water will hold in solution two pounds of copper sulfate. To accomplish this the sulfate should be suspended at the surface of the water in a bag. The water most loaded with copper will sink to the bottom and the water least loaded will rise to the surface. If fifty pounds of sulfate are suspended in twenty-five gallons of water on an evening, each gallon of water will, when stirred the next morning, hold two pounds of sulfate. This will form the stock solution of copper sulfate.

If three gallons of this solution are put in the spray barrel, it is equivalent to six pounds of copper. Now fill the spray barrel half full of

water before adding any lime. This is important for if the lime is added to so strong a solution of sulfate of copper, a curdling process will follow. Stir the water in the lime barrel so as to make a dilute milk of lime, but never allow it to be dense enough to be of a creamy thickness. If of the latter condition, lumps of lime will clog the spray nozzle. Continue to add to the mixture this milk of lime so long as drops of ferrocyanide of potassium (yellow prussiate of potash) applied to the Bordeaux mixture continue to change from yellow to brown color. When no change of color is shown, add another pail of milk of lime to make the necessary amount of lime a sure thing. A considerable excess of lime does no harm. The barrel can now be filled with water and the Bordeaux mixture is ready for use.

The preparation of ferrocyanide of potassium for this test may be explained. As bought at the drug store, it is a yellow crystal and is easily soluble in water. Ten cents worth will do for a season's spraying of an average orchard. It should be a full saturation. that is, use only enough water to dissolve all the crystals. The cork should be notched or a quill inserted so that the contents will come out in drops. A drop will give as reliable a test as a spoonful. The bottle should be marked “Poison.” Dip out a little of the Bordeaux mixture in a cup or saucer and drop the ferrocyanide on it. So long as the drops turn yellow or brown on striking the mixture, the mixture has not received enough lime.

“PROCESS” LIME FOR BORDEAUX MIXTURE.

The so-called “new process,” or prepared limes, now offered on the market, are of two classes. One consists of the quick-lime that has been ground to a powder. The other is the dry water-slaked lime made by using only enough water to slake the quick-lime, but not enough to leave it wet. Practically all of the process lime on the market is the ground quick-lime.

When the hard “stone” lime becomes air-slaked it is evident to the eye from the change to a loose powdery mass. Should one of these prepared limes be to any considerable degree air-slaked , its appearance would be no indication of its real condition.

A simple test for the presence of much carbonate of lime in these prepared limes, can be easily performed, a small amount of lime—$^1/_4$ teaspoonful-dropped on a little hot vinegar, will effervesce or “sizzle” if it

contain the carbonate of lime, acting about the same as soda.

A sample of a new process lime analyzed at this Station showed 30 per cent. magnesia. This came from burning a dolomitic limestone, that is, one containing carbonate of magnesia with the carbonate of lime. The magnesia does not slake with water like the lime and hence is useless in the Bordeaux mixture. There is no easy way outside a chemical laboratory of telling the presence of magnesia.

As a general rule more “process” lime is required to neutralize the copper sulfate than good stone lime. It is always well to make Bordeaux mixture by using the ferrocyanide of potassium test.—Cornell University.

NOTE—Under date of April 30, 1912, the U. S. Department of Agriculture- Bureau of Plant Industry-issued Bulletin No. 250, which treats on “The Diseases of Ginseng and Their Control.” As this bulletin contains late information, growers will make no mistake by sending 15 cents (coin) to Superintendent of Documents, Government Printing Office, Washington, D. C., asking for Bulletin No. 250, which treats on diseases of Ginseng and their control.

Many growers now claim that Pyrot is better than the Bordeaux mixture.

CHAPTER IX

MARKETING AND PRICES.

As the market value of dry roots depends partly on the manner in which it is dried, we will include in this chapter the complete handling of the root from the time it is dug.

At one time the Chinese wanted the roots washed white, but for several years past this has not been the case, and, in fact, root washed clean and white is very undesirable. In collecting wild root the digger or collector goes into the woods in the morning, finds an occasional root which he digs and puts into a cloth bag, after shaking off what dirt he can. This stock is added to occasionally through the day and at night he reaches home tired, and the bag of roots, not quite wilted, is laid aside and possibly not washed for a day or two and often never washed. This wilting, in some manner, fastens a dirt color to the root that can never be washed out. This is wild root. and is the way practically all of the wild is handled. The Chinese consider this root the very best and it follows that cultivated root should be made to look as near like the wild as possible. To this end let your roots alone for about a day after digging before you wash them.

In washing, never attempt to use a brush or do any scrubbing, just rinse the dirt off and stop there. This may be done by turning the garden hose on them, if you have a good water pressure, or if you have nothing of this kind, take a bushel basket or wash tub and fill it nearly half full of water and put in some roots letting them soak for a few moments; then stir briskly and remove and allow the water to dry off before putting in either basket or box. The baskets I use are made of galvanized iron and are tight, Never allow a ginseng root to stand long in water as it will become water soaked and never after that dry as white inside as it should.

If the root is to be shipped away to be dried, it is ready as soon as the water from washing dries off. Put the roots loosely into box or barrel and ship at once by express, using no packing. If the weather is warm, it is well to bore a few holes in package for ventilation. Never press the roots in tight as they will heat and start to decay. If the roots are to be dried at home spread them in a warm, airy place. This may be on racks or on the floor of some room. An attic is a very good place, as near the roof of a

house it is usually warm, but be sure to give plenty of air. Allow the roots to remain thus until wilted and, in fact, they may be allowed to complete the drying in this way by turning them over occasionally. After a root is well wilted, if they are sprangly and ill-shaped, they may be bent and tied so the shape will be somewhat improved.

Dug and Dried — Ready for Market.

The essentials of good drying are to start the root so it begins to dry before it sours and after that to dry very slow.

If a root is dried fast, the outer shell becomes dry and set or firmly fixed before the inside drys and so forms a shell on the outside that is hard and smooth, but if at least a month is given for drying, the inside of the root dries and as it shrinks, draws the outer shell with it and leaves the skin more wrinkled than if dried quick; and again, in rapid drying the center will show some color instead of breaking white. When it breaks it will break like a piece, of glass, where if dried slow, as it should be, the act of breaking will be soft yielding instead of a snap. When the roots are dry, remove all little roots up to one-eighth of an inch in diameter and in case of long sprangles even larger pieces than that should come off. This small stuff is called fiber and sells around $1.00 per pound.

It has been many times stated that three pounds of green root would make one of dry root but this we do not find to be the average. The writer has dried about six hundred different crops of green root, coming to us green, from almost every state in the Union, and from all kinds of soil and all ages of plants. From a carefully kept record of all these crops, I find it takes three and one-third pounds of green root to make one of dry. This applies to fall dug root. Blighted root and root dug in spring or summer takes very nearly four pounds green to make one dry. Roots

from Oregon dry heavy, often going as heavy as one pound to three and occasionally we get close to that from other states but the average is as above stated, three and one-third to one.

Ten years ago, in cultivated root, the market did not want a light spongy root but today that is just what is wanted, as this is what the wild root is. In this connection the reader should carefully go over what we have said as to quality in another chapter. Log, slim roots, roots that are very heavy and hard, smooth skinned roots, and roots that are sprangly are not wanted and the price of such is low.

Before offering your roots to a dealer, be sure they are perfectly dry, not simply dry outside, but be absolutely dry clear through. Even when thus dry, it will take up moisture in a warm rainy day, so it will have to be re-dried, either by the weather changing or by artificial beat. I have known root to take on one pound for every tell during a warm rain. Before sending to market the root should be so dry that it will break before bending. You ask why this special care to have it so very dry? The answer is that the destination of this product is China and in going there it has to cross the ocean and its disposition to take on moisture and to guard against other dangers it is sealed up air tight before being shipped. If not perfectly dry it will mould long before the three months would elapse in which it would reach China. This root is too high in price for the consumer to buy water with it even if it could cross the big pond in a moist condition. If the dealer has to sell it perfectly dry he must buy it so.

The grower often feels grieved because a dealer docks him for the moisture, but he should not as the dealer has to have it dry before he sells it. The grower should see to it that his root is absolutely dry and then he need stand no shrinkage in that regard. There is, however, always some shrinkage in shipping as the handling and loading and unloading of packages will break off more or less of the fibers and these are lost or have to go at a less price.

It is not always advisable for the grower to remove the fiber. This may well be left to the dealer as he knows just how much should come off as the grower might remove more than he need to and thus lose. On all cultivated root the fiber must finally come off but wild root is still sold with adhering fibers.

Root is not fit to dig and dry for market before it is five years old and

usually it should be much older than that.

It is not a difficult task to properly dry ginseng roots but at the same time a difference of a dollar a pound can easily be made. If dried a little too slow dark spots will appear on the outside of the root and if broken the inside of the root shows dark in these places where the root has soured instead of drying. If dried a little too fast, the center of the root colors.

After the root is dry it should be stored in a dry room and carefully covered to keep it from light and dust. Ginseng dried in the sun does not have as mild and pleasant a flavor as that dried in the shade. The question of driers is one that each individual should solve for himself. The man who has but a few bushels of roots can dry them nicely on his attic floor or about the house somewhere, while the man with a large garden should have a good dryer.

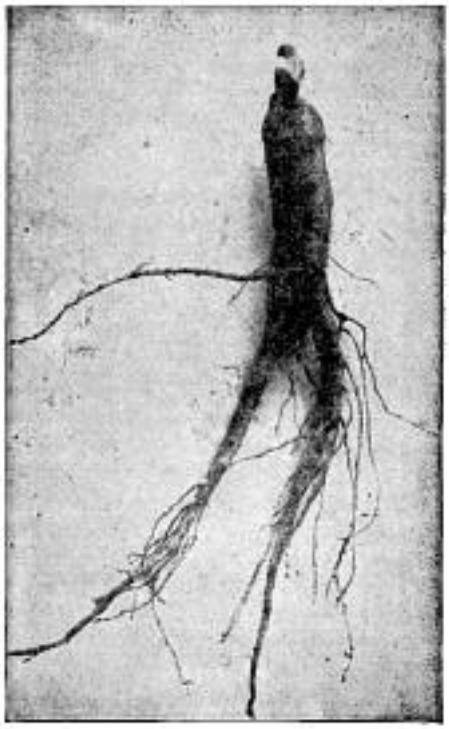
It is about as hard to tell what the color demand will be as it would be to tell in advance what the fashion in women's bonnets would be. The demand for color of root at one time was white, then the next season it changed to almost black, or the color given by very dark soil. For three or four years the demand has not changed and calls for a medium dark root. This may be gray, gray brown or a yellow brown, such as yellow clay will give. I think growers would be safe not to pursue an extreme dark or light, but a middle course.

In boxing or barreling dry root for shipment great care should be used to have the package full so as to avoid moving about and breaking the roots. A good practice is to crumple up some newspapers, put them in bottom of box, put the root in and gently shaking the box, cause the roots to settle down as much as they will and then with more crumpled papers fill the package as full as possible. This will hold the roots in place and save many pieces of roots and many necks from being broken and lost.

The following table is made from the official report of the United States Department of Commerce and Labor and is not entirely complete for the last year (1913).

Years.	Pounds.	Average price.	Total value year's export.
1858	366,053	$0.52	$193,736
1868	370,066	1.02	380,454
1878	421,305	1.13	497,247
1888	308,365	2.13	657,358
1889	271,228	2.33	634,091
1890	223,113	2.71	605,233
1891	283,000	3.39	959,992
1892	228,916	3.51	803,529
1893	251,205	3.15	619,114
1895	233,236	3.54	826,713
1896	199,436	3.86	770,673
1897	179,573	4.71	846,686
1898	174,063	3.66	638,446
1899	196,196	3.98	782,540
1900	160,101	5.20	833,710
1901	149,069	5.38	801,672
1902	154,063	5.55	856,515
1908	151,985	5.23	796,008
1904	131,882	6.45	851,820
1905	146,576	7.30	1,069,849
1906	160,949	7.30	1,175,844
1907	117,696	6.90	813,023
1908	154,180	7.21	1,111,994
1909	186,257	6.82	1,210,179
1910	192,406	7.48	1,439,434
1911	153,999	7.06	1,088,202
1912	155,308	7.20	1,119,301
1913	221,901	7.50	1,665,731

The student of this table will notice that the increase in price has been much more rapid than the decrease in quantity. It seems probable that American Ginseng growers will never again face quite so severe a set-back as that of 1905, which was produced by the cry that cultivated Ginseng was inferior to wild roots and would not prove acceptable to Chinese importers and consumers-for investigation has revealed the fact that the Chinese themselves cultivate Ginseng to some extent and experience has shown that, for several years, the average price for good American cultivated roots has been nearly as high as wild root.



A Two Year Old Cultivated Root.

From these figures it is clear that the Ginseng crop is of considerable proportions and steadily increasing. It is classed with chemicals, drugs, dyes and medicines and in its class equaled or exceeded in value by only three things: copper sulphate, acetate of lime and patent medicines. These figure, include, of course, both the wild and cultivated root, A little investigation, however, will soon convince anyone that the genuine wild root has formed but a small portion of that exported in the last three years. This is for the very good reason that there is practically no wild root to be found. it has been all but exterminated by the "seng digger," who has carefully searched every wooded hillside and ravine to meet the demand of the last few years for green roots for planting. Practically all of the Ginseng now exported will of necessity be cultivated. Of all the Ginseng exported from this country, New York State very probably supplies the greater part. It was in that state that the cultivation of the plant originated and it is there that the culture has become most extensive and perfected. The largest garden in this country, so far as known, is that of Drs. Swan and Hertzog, Chardon, Ohio, who have 27 acres of beds in forest shade. The crop is certainly a special one, to be successfully grown only by those who can bring to their work an abundance of time and intelligent effort. For those who are willing to run the risks of loss from diseases and who can afford to

wait for returns an their investment, this crops offers relatively large profits.

It is very simple to prepare a few wild roots for market. Wash them thoroughly; this I do with a tooth or nail brush, writes a Northern grower, as they will remove the dirt from the creases without injury. Only a few roots should be put in the water at once as it does not benefit them to soak.

I have usually dried wild roots in the sun, which is the best way, but never put roots in the hot sun before the outside is dry, as they are apt to rot.

The cultivated root is more difficult to handle. They are cleaned the same as wild roots. On account of size and quality they have to be dried differently. My first cultivated roots were dried around the cook stove, which will answer for a few roots, providing the “lady of the house” is good natured.

Last year I dried about 500 pounds of green roots and so had to find something different. I made a drier similar to Mr. Stanton's plan, i. e., a box any size to suit the amount of roots you wish to dry. The one I made is about two feet by two and a half feet and two and one-half feet high, with one side open for the drawers to be taken out. The drawers are made with wire screen for bottom.

They should be at least two inches deep and two and one-half inches would be better. I bored a three-fourth-inch hole in the top a little ways from each corner and five in the center in about ten inches square, but now I have taken the top off, as I find they dry better.

I started this on the cook stove, but did not like it as I could not control the heat. As I had two Blue Flame oil stoves I tried it over one of them and it worked fine.

They were three-hole stoves, so I laid a board across each end for the drier to rest on. The drier has a large nail driven in each corner of the bottom so that it was four inches above the stove. Then I fixed a piece of galvanized iron about 10x20 inches so that it was about two inches above top of stove, for the heat to strike against and not burn the roots.

At first I left out two of the lower drawers for fear of burning them. I

only used the middle burner—and that turned quite low. I tried the flame with my hand between the stove and roots so as not to get it too high.

In this way I could get a slow heat and no danger of burning, which is the main trouble with drying by stove. It would take from two to four days to dry them, according to size. As soon as they were dried they were put in open boxes so if there was any moisture it could dry out and not mould, which they will do if closed up tight.

In using an oil stove one should be used that will not smoke. Never set the roots over when the stove is first lighted and they should be removed before turning the flame out, as they are apt to get smoked. Do not set stove in a draft.

In packing the dry roots in boxes I break off the fine fiber, then they are ready for market.

Some time prior to 1907, or since cultivated Ginseng has been upon the market, its value has been from $1.00 to $2.00 per pound less than the wild and not in as active demand, even at that difference, as the wild. Today the value is much nearer equal. At first those engaged in the cultivation of Ginseng made the soil too rich by fertilizing and growth of the roots was so rapid that they did not contain the peculiar scent or odor of the genuine or wild. Of late years growers have learned to provide their plants with soil and surroundings as near like nature as possible. To this can largely be attributed the change.

PREPARING THE ROOTS FOR MARKET.

The roots are dug in the autumn, after the tops have died. Great care is taken not to bruise or injure them. They are then washed in rain water, the soil from all crevices and cracks being carefully cleaned away by a soft brush. Then they are wiped on a soft absorbent cloth, and are ready to be dried for market. The roots should never be split in washing or drying. It is of great importance, too, that the little neck or bud-stem should be unbroken, for if missing the root loses two-thirds of its value in Chinese eyes. The roots may be dried in the sun or in a warm, dry room, but never over a stove or fire. Some growers have a special drier and use hot air very much on the principle of an evaporator. This does the work quickly and satisfactorily. As soon as the little fibrous roots are dry enough, they are either clipped off or rubbed away by band, and

the root returned to the drier to be finished. Much of the value of the product depends on the manner in which it is cured. This method is the one usually employed in America, but the Chinese prepare the root in various ways not as yet very well understood in the United States. Their preparation undoubtedly adds to the value of the product with the consumer.

IMPORTANCE OF TASTE AND FLAVOR.

Soils and fertilizers have a marked influence on products where taste and flavor is important, as with tobacco, coffee, tea, certain fruits, etc. This is true of Ginseng in a very marked degree. To preserve the flavor which marks the best grade of Ginseng, by which the Chinese judge it, it is essential that the soil in the beds should be as near like the original native forest as possible. Woods earth and leaf mould should be used in liberal quantities. Some little bone meal may be added, but other fertilizers are best avoided to be on the safe side.

When the chief facts of Ginseng culture had been ascertained, it naturally followed that some growers attempted to grow the biggest, heaviest roots possible in the shortest time, and hence fertilized their beds with strong, forcing manures, entirely overlooking the question of taste or flavor. When these roots were placed on the market the Chinese buyers promptly rejected them or took them at very low prices on account of defective quality. This question of flavor was a new problem to American buyers, for the reason stated and one which they were not prepared to meet at a moment's notice. Hence, there has been a tendency with some exporters to be shy of all cultivated roots (fearing to get some of these “off quality” lots) until they were in position to test for flavor or taste by expert testers, as is done with wines, teas, coffees, tobaccos and other products where flavor is essential.

The grower who freely use soil from the forest and lets forcing fertilizers severely alone, has nothing to fear from defective quality, and will always command a good price for his product.

Ginseng should only be dug for the market late in the fall. In the spring and summer the plant is growing and the root is taxed to supply the required nutriment. After the plant stops growing for the season the root becomes firm and will not dry out as much as earlier in the season. It takes four to five pounds of the green root early in the season to make one of dry; later three and one-half will make one of dry.

In the Ginseng, like many other trades, there are tricks. In some section they practice hollowing out roots while green and filling the cavity with lead or iron. When Ginseng is worth four or five dollars per pound and lead or iron only a few cents, the profit from this nefarious business can be seen. The buyers have “got on to” the practice, however, and any large roots that appear too heavy are examined. The filling of roots with lead, etc., has about had its day.

Seng should be dug and washed before it shrinks; it should then be dried in the shade where the dust and dirt cannot reach it and should not be strung on strings. The roots should be handled carefully so as not to break them up, the more fiber the less the value, as well as size, which helps to determine the value.

The collecting of the root for the market by the local dealer has its charm; at least one would think so, to see how eagerly it is sought after by the collector, who often finds when he has enough for a shipment that he faces a loss instead of a profit. The continual decrease in the annual output of the root should produce a steadily advancing market. The price does advance from year to year, but the variation in the price of silver and the scheming of the Chinamen produces crazy spurts in the price of the root.

Present prices are rather above the average, but little can be predicted about future conditions. Chinese conservatism, however leads us to believe present prices will continue.

The table cannot show for the last two years the exact condition as the range in price has been much greater. Good root has been much higher and poor root much lower than usual. This fall (1913) wild root has reached as high as $10.50 and the best grades of cultivated root has also brought a high price, ranging from $6.50 to $10.00. It oftens happens of late that there will be a great difference in the price offered by different Chinese exporters, Within the last few months, it has several times happened, that one Chinaman would offer $1.50 more per pound for the same root than his fellow exporter would give and perhaps the next day, on another lot varying in shape or color, the offers would be reversed. But the price on low grades has been about alike.