Agricultural Bureau of South Australia.

SPRAYING

FOR

FUNGUS and INSECT PESTS.

SYNOPSIS OF LATEST PRACTICES.

RESULTS OBTAINED BY
ANGASTON EXPERIMENT COMMITTEE.

PAPERS BY
MR. W. C. GRASBY AND MR. W. F. SNOW,
&c., &c., &c.

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INSECT AND FUNGUS PESTS OF THE ORCHARD AND VINEYARD.

Synopsis of Latest Remedies Employed.

At a recent meeting of the Central Agricultural Bureau, it was decided to issue a circular for fruit-growers, giving a summary of the latest information on the subject of the treatment of fungus diseases and insect pests.

The Angaston Experiment Committee have provided a short *resumé* of the results of their operations last season in connection with the peach-tree curl-leaf (Exoascus deformans), and shothole fungus (Phyllosticta circumcisa) affecting apricot, almond, cherry, and other fruit-trees. Mr. W. F. Snow has kindly prepared a few notes upon the treatment successfully adopted for the suppression of anthracnose (Sphaceloma ampelinum) affecting vines very seriously in some parts, and the editor of the *Garden and Field* has courteously placed at the disposal of the Bureau several articles giving the latest results arrived at by the various Experimental Stations of the Department of Agriculture, &c., of the United States of America.

Communication from the Angaston Experiment Committee.

The fruit-tree diseases which have been successfully coped with by the Angaston Experiment Committee are apricot scab (Phyllosticta circumcisa) and peach curl-leaf (Exoascus deformans). Three remedies were tried, viz., eau celeste, ammonia copper carbonate solution, and Bordeaux mixture, all of which proved equally effective on the peach curl-leaf. The Bordeaux mixture was found to give the best results on the apricot scab, and it is also very much cheaper than the others.

The Bordeaux mixture was made as follows:— Dissolve 6 lbs. of bluestone in one gallon of hot water, in a stone, brass, or wooden vessel, slack 4 lbs. of lime in 4 gallons of water for 12 hours. Pour off all the lime-water and reject the sediment, add the bluestone solution, and for winter solution dilute with 6 gallons of water, or for summer solution dilute with 17 gallons of water. From one to one and a-half gallons were found to be sufficient for an ordinary-sized tree.

Two applications of winter and one of summer solution proved sufficient. Spraying should be commenced during the early part of August, and

repeated at intervals of a fortnight, the third application being with the summer solution.

For small orchards the Knapsack pump is quite efficient; approximate price, £3 10s. For large orchards a cask carried in a cart and fitted with a force-pump, with spray nozzles and hoses attached, is necessary. We can safely recommend Chapman's spraying machine, with patent spray nozzle and automatic stirring apparatus; price, complete, £4 15s. Sulphate of copper can be obtained at any of the wholesale druggists, at 20s. per cwt. The worst trees in a diseased orchard were selected for the experiments. A peach-tree which was sprayed with Bordeaux mixture remained perfectly free from disease, whilst an adjacent tree which was left untreated as a test lost all its foliage and produced very little fruit owing to the effects of curl-leaf. With regard to the apricots sprayed with this mixture, the foliage showed merely slight traces of shothole, the fruit being clean and marketable, whilst both leaves and fruit of unsprayed trees were badly affected.

WALTER SAGE.
FRED. C. SMITH.

THEORY AND PRACTICE OF SPRAYING.

BY W. C. GRASBY.

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A BUSINESS MATTER.

No animal or plant is free from its peculiar enemies or diseases which we usually associate with death. Disease is not death but life, and is Nature's method of keeping her balance even. In the cultivation of crops man places his intellect above the ordinary working of Nature, and it is not to be wondered that she makes big efforts to restore her balance. There is no chance about these things, and he must devise plans to make her assist him in keeping them uneven. We must first learn what a disease is, then find the remedy. This is what science does for us. The practical man has to consider the matter from a business point of view, and decide whether it will pay to apply the remedy.

A mother does not consider the cost when it is a question of saving her child from disease, for love rules; but when a farmer has an injured horse, and finds that it is likely to cost more to cure it than to get another, he considers it cheaper to shoot it.

This is precisely the way we wish our fruit-

growers to consider the question of spraying. There is, of course, the important fact that no man has a right to allow a disease to exist in his garden which is likely to be a source of danger to his neighbors, but beyond this it is a matter of business only. Will it pay? Will the extra amount or superior quality of the fruit obtained, cover the cost of materials and labor, and leave a margin of profit? It has been proved to pay in America over an extent of orchards and vineyards besides which ours are as a drop in a bucket, and *we believe spraying will pay in South Australia, and leave a good profit.*

THE THEORY OF SPRAYING.

The diseases of the orchard may be divided into two classes—1, insect pests; 2, fungus diseases. In this article we will only consider the second class, among which are the black spot or apple scab, the apricot scab or shot-hole fungus, and peach curl-leaf. As everyone knows what these mean we shall not trouble about scientific names.

What is a fungus? A fungus is a plant of a very low order. It has no flowers, and it possesses none of that green coloring matter (chlorophyll) which makes trees green and enables them to obtain their carbon from the air. A mushroom is a fungus; so are the moulds on old boots, or on jam, or stale bread; so are red rust and smut; so are grape mildew, peach curl-leaf, apple scab, and apricot shot-hole. It must not be thought for one moment that what we are saying is mere theory. As much is known about *what the apple scab is* as about what the apple tree itself is. The only difference is that studying the former one has to depend entirely on the microscope. A wheat-plant, or a gum-tree, is produced from seed only when the conditions of soil, warmth and moisture, are favorable. The seed which contains the life germ may lie dormant for a long time, and grow as soon as these conditions are found, but if you kill the seed-germ, it won't grow. The same applies to a fungus such as the apricot scab. It is produced from a life-germ, and only grows when the conditions are favorable; but it will lie dormant for a long time until they are favorable, and unless it be killed will then grow.

Althougth the apple scab fungus (or any other fungus) does not produce flowers, and therefore has no true seeds, their place is taken by spores, the growth of which is a most interesting microscopical study. The spore of the apple scab can be planted on an apple, and if the conditions of

warmth and moisture are favorable, in a very short time it grows into a tiny plant, sending a network of threads into the skin and producing the black spot or scab on the surface. We don't *think* this, we have done it, and so have hundreds of others before us.

If what we have just written as to what the apple scab or apricot shot-hole is be kept in mind, there will be no difficulty in understanding why spraying is advocated. The number of spores produced by a fungus is something enormous. During the season they grow at once, but at the end of the season a "resting spore" is produced which is specially constructed to remain dormant for a long time—it may be many years—until favorable conditions arise. During the winter months these resting spores are lodged in crevices of the bark, and especially in the folds of the buds. The theory of winter spraying is to kill these spores before the buds open and they have an opportunity of growing. It is simply a new application of a practice which no one thinks of omitting in the case of wheat. Every farmer pickles his wheat in a fungicide to kill the spores of smut. It adds to the expense, for he has to buy bluestone and go to extra trouble, but he knows he may lose a lot of his crop if he does not. As we can't pickle an apple, pear, or apricot tree, the spray pump has been devised to apply the fungicide. We have been asked why we should have scab badly one year and not another? The reply is just for the same reason that the same ground produces a good crop of wheat one year and not another, although the seed may be sown just the same. A fungus must have moisture, and thus we find that in moist years or moist situations apple scab is worst.

PRACTICE.

The *Garden and Field* has long and persistently advocated spraying, and has published the most approved formulæ many times. Professor Galloway, the great American vegetable pathologist, in his latest bulletin, recommends the three following solutions:—

Bordeaux Mixture is simply a solution of common bluestone mixed with limewater. The bluestone, or sulphate of copper, kills the fungus, and the lime lessens any danger to the tree, and also sticks it on to the twigs for a longer time. It is made as follows:—Dissolve 6 pounds of bluestone in 8 gallons of hot water, using a wooden vessel. In

another vessel make a milk of lime by stirring up 4 pounds of *fresh* lime in 5 gallons of water. When the milk of lime is cool mix the two together in this way—First, pour the copper solution into a barrel having a capacity of 45 gallons; then slowly add the whitewash, pouring this through a piece of branbag, to strain out the bits of stone, &c. Before using the mixture, nearly fill the barrel with water. It is very important that *fresh* lime be used.

The only difference between this formula and the one we published in August last year is that there is nearly twice as much water. It has been found that the weaker solution gives as good results, and will not cost ½d. a gallon.

Ammoniacal Carbonate of Copper Solution is made by dissolving 5 ounces of carbonate of copper in 3 pints of ammonia water having a strength of 26 per cent. When all action has ceased dilute to 45 gallons of water. It is a better plan to make the solution of copper in ammonia beforehand, and keep it in tightly-corked bottles; then all that is necessary is to add a pint of solution to 15 gallons of water as required. This is the same as we recommended last year. Messrs. Faulding & Co. keep the stock mixture made according to our formula, and as copper carbonate dissolves much more easily when first made, it will probably be found cheaper and more convenient to get it from them.

Eau Celeste.—Dissolve 2 pounds of copper sulphate in 8 gallons of rain-water. When completely dissolved, add 3 pints of *strong* ammonia. If the liquor be at all milky, add more ammonia until it is clear, then dilute to 45 gallons. Messrs. Faulding also supply this.

How and when to spray.—Beyond the approved rule that the trees should all be carefully sprayed when the buds are swelling, very much will depend on the judgment of the grower. A second application should be made about a fortnight after the buds burst, or just after the flowers fall. After this much depends on the weather. If it be moist, spray often; if it be warm and dry, there is not much necessity. We don't consider regularity so important as judgment based on the above principle.

Mr. Galloway places *Eau Celeste* or *Am.-Cop.-Carb.* first for apple scab, and *Bordeaux Mixture* first for pear scab and grape mildew. The Angaston

Experiment Committee found that Bordeaux mixture gave the best results for the least outlay. It will be noticed that they recommend a very much stronger solution than Professor Galloway, who has found the weaker and cheaper compound to answer as well in America.

Californian orchardists use the following mixture very extensively—

LIME, SULPHUR, AND SALT REMEDY.

For winter use upon deciduous trees—Unslaked lime, 40 lbs.; sulphur, 20 lbs.; stock salt (rock salt), 15 lbs.; water to make 60 gallons.

The following directions must be carefully followed—Place 10 lbs. of lime and 20 lbs. of sulphur in a boiler with 20 gallons of water and boil over a brisk fire for not less than one hour and a half, or until the sulphur is thoroughly dissolved. When this takes place the liquor will be of an amber color. Next place in a cask 30 lbs. of unslaked lime, pouring over it enough hot water to thoroughly slack it, and while it is boiling add the 15 lbs. of salt. When this is dissolved add to the lime and sulphur in the boiler and cook for half an hour longer, when the necessary water to make 60 gallons should be added.

SPRAYING A REMEDY FOR INSECT PESTS.

[Written by W. C. Grasby for *Garden and Field*, and placed by him at the disposal of the Agricultural Bureau].

A gardener in the Mount Lofty district whose crop of cabbages had been destroyed by the "club," while lamenting the disabilities of the gardener and orchardist, remarked, "Every blooming thing has got a disease now; even the stringybarks are diseased." "Yes," said a listener, "and things that don't bloom get 'em too." Then a discussion took place as to the cause of the numerous diseases, but into this question it is not our purpose at present to enter. To what extent cultivation lowers the vitality of plants, and thus renders them more liable to disease does not affect our present purpose any more than whether prevalence of insect pests is due to the destruction of their natural enemies, such as birds. Neither is it at present desirable that we should discuss the extent to which an insect naturally living on one species of plant will leave that and become a pest to another more highly cultivated, and presumedly, therefore, more easily available to its wants. These

are all important matters, but the object of the present article is to place before our readers the *why* and the *how* of one of the *proved methods* of dealing with existing pests.

We will first speak of the why, then the how, and then give some of the practical results obtained in America.

THE THEORY OF SPRAYING INSECTICIDES.

When dealing with fungus diseases last month we showed that the practice of using fungicides depended on a knowledge of the nature of fungus diseases. The same principle applies when dealing with insect pests; but we have to consider quite a different series of facts. We need not remember or even use uncommon scientific terms; but it is important that we clearly understand a few facts of natural history before we can hope to deal successfully with insect pests. It is a great pity many people are prejudiced about science because some men hide a little knowledge by a great display of technical terms, useful in their place, but not necessary in daily life. It is necessary, for example, to keep in mind that an insect passes through three stages of existence, which are illustrated by a caterpillar which grows to the full size, and changes into a brown apparently dead chrysalis, which again changes into a moth or butterfly. A beetle was first a grub, than a chrysalis, and then became a beetle. Sometimes the different stages look quite different, as in the case of the grub and the beetle, or a maggot and a blowfly; but in other cases they look much alike, as in the case of a locust, where the only easily noticed differences between a young one and an old one are size and absence of wings. It is very important to remember this, because there is nearly always one stage of an insect's life when it is more or less helpless, and can be comparatively easily destroyed. All growth of an insect takes place in the first two stages, the perfect insect devoting its energies to reproduction. Most insects also commit most of their ravages during the earlier stages. One must know the different appearances which an insect assumes in order that he may know which is the more helpless stage, it being sound warlike policy to attack the enemy at his weakest spot.

In any attempt to destroy insect pests it is important that we should know how they obtain their food and how they breathe, because these facts determine the nature of the insecticide to be

used. Insects are either provided with jaws operating sideways (opposite way to ours), as in the case of beetles and locusts, or with sucking tubes like plant lice and scale insects. The former or masticulating insects eat the leaf or other part of the plant attacked, and therefore if a coating of poison be applied they partake of it with their food, and are killed. This is why London purple or Paris green are used for Codlin-moth and caterpillar or beetle pests. The non-masticulating or sucking insects, however, insert their tubes into the substance of the plant and suck out the life juices. Paris green will not hurt these, and therefore the insecticides used depended on other principles.

An insect has no lungs, but breathes through small holes or tubes along each side of its body. If these be stopped up the insect dies.

The second mode of destroying aphides, scales, and such suctorial insects is therefore to apply a substance such as resin compound, which will form a varnish over the body, and thus kill them by suffocation. The third method is to apply a substance which "kills by contact." This will answer for many of both classes of insects, and as the substances used (kerosene is the most simple and generally used), are mixed with some soapy substance, the destructive effect is thereby greatly increased.

The Best Insecticides.

We will only mention the three which have proved to be the most useful, when applied in conformity with the above principles.

KEROSENE EMULSION.

For apple, orange, peach, rose, cabbage and all other *aphides*, which are commonly known as "*blight*," this insecticide is unequalled. It is also one of the best remedies for orange round scale, red spider, and many other insect pests. It is probably the best general insecticide known, as it kills by contact, and is therefore effective for many mandibulate (eating with jaws) as well as the non-masticulating insects mentioned above.

Kerosine, 2 gallons	or	Kerosine, 2 pints.
Pure soap, ½ lb.		Pure soap, 1 oz.
Water, 1 gallon		Water, 1 pint.

Dissolve the soap in the water and add it boiling hot to the kerosene. Churn the mixture violently by means of a force-pump or large syringe, until (in 5 or 10 minutes) a thick cream-like emulsion is formed which thickens on cooling, and adheres

without oiliness to the surface of glass. *The agitation is the most important operation—it must be violent.*

This gives a 67 per cent. kerosene emulsion. For use add one part emulsion to 10 parts of water (soft if possible), and apply with spray-pump. The writer has a small tin of emulsion made from the above formula, in the early part of last November, and although it has evaporated about one quarter, the mixture is quite stable, not a particle of the oil having separated out.

RESIN WASH.

For many non-masticating insects, such as scale insects, this is very effective, as it stops the breathing tubes, and gums the insects to the leaf. It has been largely tried about Adelaide.

Resin, 4 lbs.; soda crystals, 3 lbs. Dissolve the soda in three pints of boiling water. Powder the resin, and add gradually to soda solution while boiling. Stir until dissolved. Add boiling water sufficient to make 36 pints of solution. Considerable care is necessary in making it, or the resin will not dissolve.

For scales add one part solution to six parts of water, and apply with a spray pump.

For aphis one part solution to 10 parts water, and apply with spray pump.

Apply in dull weather, or in the evening; but not in rainy weather.

THE ARSENITES: LONDON PURPLE AND PARIS GREEN.

"These poisons are of the greatest service against all masticating insects, as larvæ and beetles, and they furnish the most satisfactory means of controlling most leaf-feeders, and the best wholesale remedy against the Codlin moth. Caution must be used in applying them on account of the liability of burning or scalding the foliage."

"The poisons should be thoroughly mixed with water, and applied with a force-pump and spray nozzle. In preparing the wash, it will be best to first mix the poison with a small quantity of water, making a thick batter, and then dilute the latter and add to the reservoir or spray tank, mixing the whole thoroughly. When freshly mixed, either London purple or Paris green may be applied to apple, plum, and other fruit-trees except the peach, at the rate of 1 pound to 150 to 200 gallons, the latter being recommended for the plum. A little lime-water added renders the mixture less liable to 'scald' the leaves."

The Codlin Moth.—"With the apple, in spraying for the Codlin moth, at least two applications should be made—the first after the falling of the blossoms, or when the apples or pears are about the size of peas, and the second a week or ten days later. The first brood of the Codlin moth lays it eggs in the flower end of the young apple, and the worms upon hatching gnaw their way into the interior of the apple, and on sprayed trees get poisoned in so doing, an infinitesimal amount being sufficient to destroy so minute a worm. The second spraying is for the purpose of destroying the larvæ hatching from eggs, which may be laid after the first spraying; as the arsenic is gradually washed off by rains."—*Riley.*

As the arsenites will not dissolve, it is necessary that the mixture be kept constantly stirred.

Some Results of Spraying.

The following quotations are given to show how great faith the Americans, who are undoubtedly a thoroughly practical people, have in the efficacy of spraying.

Referring to shothole fungus of the apricot, Mr. Lelong, the Secretary of the California State Board of Horticulture, says:—"Many growers have felt the attacks of this fungus but slightly owing to late spraying in the spring of the year with lime, salt and sulphur remedy, as well as with other solutions into which fungicides have been added, such as sulphate of copper, sulphate of iron, &c. To secure good results the remedy should be applied just as soon as the buds begin to swell, weaker applications being made during the growing period of the tree."

Dr. J. A. Lintner, Ph.D., New York State Entomologist, in his last report on the injurious and other insects of the State of New York, says:—"Judging from present indications, the force-pump is destined for the future to play a prominent part in our operations against the insects of the orchard and garden, especially the former. The ease with which the Codlin moth can be controlled . . . and apples grown of full size (the elements permitting), of perfect form, rich in color, of highest flavor, and of resistance to early decay are a sufficient attestation of its value. When we add to this, that by its aid we hope soon to be able to bid defiance to the plum curculio, and control the ravages of almost every insect that feeds on the

foliage of our fruit-trees, and of a large number of those that attack the products of our gardens, I feel justified in saying that no orchardist or horticulturalist can afford to do without a force-pump—it would be costly neglect. Insecticidal spraying, compared with old methods of fighting insects, is the gatling gun in comparison with the old flint-lock musket.

Mr. Galloway, Chief of the Division of Vegetable Pathology, United States Department of Agriculture, says:—"Probably in no other country in the world is spraying for fungus diseases of fruits practised to the same extent as in the United States. Five years ago practically nothing was known of the subject. . . . Now, at a fair estimate, probably no less than 50,000 fruitgrowers are engaged in this work. From the Atlantic to the Pacific, from the Great Lakes to the Gulf, the methods recommended by the Department are practised every year."

The same authority says in answer to the question, *Does it pay to spray?* "This question is answered by facts. No work that did not carry merit with it would have had such a phenomenal growth . . . It may be stated that last season 250 grapegrowers in different parts of the country made a series of observations with a view of obtaining some definite information as to the value, in dollars and cents, of the recommendations made by the Department in the treatment of grape diseases. The facts reported by these men show that, over and above all expenses, their actual gain from the treatment of black-rot and powdery-mildew was in round numbers 37,000 dollars."

The following extracts from a paper read by Wm. Stahl, of Quincy, Ill., U.S.A., before the Twenty-sixth Annual Meeting of the Kansas Horticultural Society at Beloit, Kansas, December 9, 1891, fully supports the official reports of the American officials:—

I can speak of spraying from experience—an experience in this line, believe, as extensive as that of any person in the country. I first experienced in spraying eight years ago. Then, as now, I was extensively engaged in buying and shipping fruits as well as raising them. That year the black rot of the grape was very bad in the localities from which I usually shipped this fruit. In fact, about the only marketable grapes that I found that year were on the strip of sandy ground between the bluffs and the

river at Nauvoo, Ill., a point that for forty years has been the center of a noted grape-growing neighborhood. That year the rot ruined the crop on the upland, bluff lands. The grapes on the sandy strip just spoken of were so profitable to the growers as well as to me that I was set to experimenting to prevent rot. Among other things I tried spraying. But I did not get the right remedy until the season of 1888; that season I sprayed in a small experimental way with Bordeaux mixture. The results were such that the next season I made my experiments with it more extensive. That year it was clearly demonstrated to me, and to some of the neighboring vintners, that I had found the remedy I had so long sought. The result was that in 1890 quite a number of us sprayed, and yet a greater number sprayed the past season, while the past season we did the work better, as the result of increased confidence and experience. Let others speak of the results. Says the *Nauvoo Rustler*:—

"All are satisfied as to the virtues of spraying, as many who have not sprayed vines this season have lost from 80 to 95 per cent. of their crops from the rot, while those that sprayed did not lose more than from 1 to 5 per cent. The efficiency of spraying apple, peach, cherry and plum-trees has been established also among our horticulturists, and hereafter the spraying of their trees will no doubt be general, as all concede that the secret of success has not only been discovered, but also demonstrated before their very eyes."

What has been my experience has been the experience of many. Doubtless you are familiar with the experimental work in spraying that has been done by the Department of Agriculture and the State experiment stations. So far as I have been able to learn the results of this experimental work has been altogether favorable to spraying. I would not under-estimate the importance and value of this experimental work; I consider it essential to the steady advancement of our agricultural and horticultural interests. Yet, I must confess, I attach a higher value to the mass of evidence that I have collected in the shape of personal letters to me from more than one thousand fruitgrowers that have tested spraying the past season—field tests, not the tests of a few feet, but tests of acres by practical men in the actual business of fruit-growing. It is impossible for me to quote from any

considerable number of these letters. Your time will not permit, nor will it be necessary. But I cannot refrain from giving an extract from the letter of Mr. Frank Wellhouse, of Fairmount, this state, the largest apple-grower in the country. He says :—

"We sprayed about three acres the 15th of April, or just before the buds opened, as an experiment. Our object in this was to kill the canker worm, tent caterpillar and tarnish plant bug, all of which were at work at that time, and we succeeded; but we accomplished the same thing by spraying after the bloom had dropped. Spraying commenced in earnest on the 28th of April, with three machines, and was finished on the 27th of May. We sprayed 160 acres twice, equal to 320 acres once, and 277 acres three times, equal to 831 acres once, or a total of 1,115 acres at a single spraying. To do this we used 60,000 gallons of water and 600 pounds of London purple, and it took 46 days to do the spraying; so that the expense stand thus: Forty-six days with team, at $2·50 per day, $115; 600 pounds London purple, at 10 cents. per pound, $60; total $175; or a little over 15 cents per acre, and about 1½ mills per tree for each spraying. We think we can reduce this expense another year at least one-fourth, and possibly one-third, by fixing our ponds of water more conveniently, and a few other changes. The canker worms were getting too thick in one block of trees, and we entirely destroyed them. The tent caterpillars were numerous in places, and but few of them were left alive. The tarnish plant bugs were thick, and did us serious damage last year, but this year, after we had sprayed the second time, we could not find any of them alive. Full 50 per cent. of the codling moth were destroyed—some observers say 75 per cent."

"For the black rot and mildew of the grape, pear and quince leaf blight, potato blight or rot, &c., the Bordeaux mixture is used.

"To destroy suctorial, or sap-sucking species of insects, including chinch bugs, squash bugs, plant lice, hop lice, bark lice, leaf hopper, aphis, &c., the kerosene emulsion is used.

"It will be noticed that the cost of the mixtures used in spraying is inconsiderable, that they are made of well-known and simple ingredients, that there is not necessarily the least danger in their preparation, and that preparing them is not beyond

the intelligence or capacity of the ordinary individual.

"Mr. S. is not the only one who has found that the thrift, and often the life even, of trees or vines can be saved by spraying. It must be considered that by spraying we get not only larger crops of fruit of better quality, but we add to the thrift and vigor of our orchards and vineyards. It has been my experience that it would pay to spray simply on account of the increased vigor and thrift of the trees and vines."

———:o:———

DISEASE OF THE VINE.

ANTHRACNOSIS ("BLACK SPOT").

By Mr. W. F. Snow.

Unfortunately we have this disease amongst some of our vineyards in a highly-developed form; and, equally unfortunately, in as bad a form as is perhaps known in any part of the world.

The best treatment we at present know of from evidence and practical experience is, *for winter treatment* (and this is the most important):—

Sulphate of iron 3 lbs., dissolved in one gallon of water. Make a small mop of rags or long wool tied to the end of a stick. After the vine has been well pruned back, remove and burn all the cuttings, and apply the solution thoroughly to the whole vine, taking especial care to saturate the scars (made by the disease) with the liquid.

Professors Goethe, Foëx, &c., recommended the application, *for summer treatment*, of a mixture of unslacked lime and pulverised sulphate of iron. For the first powdering the mixture should consist of one-fifth unslacked lime to four-fifths of powdered sulphate of iron. For the second and third application the mixture should consist of three-fifths of unslacked lime to two-fifths of powdered sulphate of iron.

The first dressing should be applied soon after the bursting of the buds, and at intervals afterwards until the ripening of the grapes.

Note!—It is the opinion of the highest authorities that the winter treatment is the most important weapon with which to attack this fungus.

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