3 Bulletin 64. June, 1901.

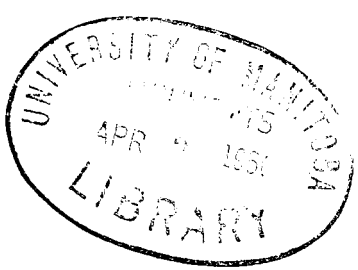
The Agricultural Experiment Station

OF THE

Agricultural College of Colorado.

# PRESS BULLETINS,

Nos. 1 to 11.

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Fort Collins, Colorado.
1901.

# THE AGRICULTURAL EXPERIMENT STATION,

## FORT COLLINS, COLORADO.

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## Press Bulletins.



*Press Bulletins 1 to 11, 1899-1901.*—This series of bulletins was intended to spread information where promptness was requisite, or the matter not sufficient to justify a bulletin in the regular series. The editions have been small and the distribution made according to the subject matter. Some of the series were expected to be of ephemeral interest. The demand, however, has been continuous, and the editions of several having been exhausted, it is thought well to reprint the series and send to the regular mailing list.

BULLETIN No. 1, SEPTEMBER, 1899.

# THE SUGAR-BEET CATERPILLAR.

BY CLARENCE P. GILLETTE.

The horde of caterpillars that have been devastating the beet fields during the past two weeks, between Palisade and Grand Junction, and that have occurred in small numbers from Grand Junction west towards Fruita, require the prompt attention of all interested in the success of the sugar beet culture in the Grand Valley, that the loss to this year's crop may be quickly checked and that severe losses for the coming year may be averted.

During the early part of the week (August 14th to 16th) the writer visited many beet fields in company with Mr. C. E. Mitchell and others, for the purpose of determining the nature and extent of the injuries, the length of time the attack is likely to continue, what remedies it will be best to apply, and other points of importance concerning the caterpillar.

The insect was found in the fields in all stages of development, except the egg. The caterpillars varied in size from those that did not exceed a sixteenth of an inch to the fully grown individuals that measured from an inch to an inch and a fourth in length. A large proportion were half grown or more, and many had changed already to the chrysalis or pupa state, just beneath the surface of the ground.

The fact that there are still many small worms makes it certain that the attack will continue to some extent to near the end of the present month (August). A quantity of the chrysalids were placed in suitable receptacles, and from them several moths, which are the adult insect, have appeared at this writing. The females are found to be heavily laden with immature eggs, and it is highly probable that within a few days these eggs will be deposited on or about the beets for a succeeding brood of worms. It is greatly to be hoped that the moths now hatching are only belated individuals of the second brood and that another full brood will not appear this summer. However this may be, not a day should be lost in beginning the work of destroying the

caterpillars now upon the beets. If the present brood is allowed to mature, it means a greatly increased number of caterpillars to contend with next year. It is with insects as with plants. The greater the number allowed to mature this year, the greater will be the quantity of seeds sown, and the larger will be next year's crop. The old adage, "A stitch in time saves nine," is more than doubly true when dealing with the destruction of insect life.

The closest watch should be kept during the next two or three weeks for the appearance of small worms. If none seem to be present, look carefully among the small and tender leaves at the base of the large ones, where they may be found.

## REMEDIES.

A moderate number of friendly insects were found about the beets. These were lady-beetles, Aphis-lions and ground-beetles, all of which were probably preying to some extent upon the small caterpillars. Birds were very scarce in the beet fields; the crow seemed to be doing more than any others of the feathered tribe to destroy the caterpillars. It is plainly evident that the natural enemies are far too few to be of much service at present in keeping this insect within proper bounds. Artificial measures must be adopted to save a good partial crop of sugar beets over the eastern portion of the plantations about Grand Junction this year, and without these measures the crop over the whole valley may be largely a failure another year.

The caterpillars can be destroyed. The writer used both Paris green and kerosene emulsion, with satisfactory results, while at Grand Junction. The emulsion is more expensive and needs to be applied very thoroughly to give good results. The caterpillars should be thoroughly wet with it. This remedy would be specially useful on those fields where the caterpillars are very abundant and of large size and where the tops of the beets have been nearly or quite devoured. The chief benefit from destroying these caterpillars will be to lessen the number of the next brood.

By closely watching for the first appearance of the caterpillars when they are small, and then promptly and thoroughly treating the beets with Paris green or other arsenical poison, it is believed that the pest can be quite easily kept in check.

The poisons may be applied in a watery spray in the proportion of a pound of poison to 100 gallons of water.

Apply with force in a fine spray, and be thorough, but do not continue the spray in one place until the drops run together and carry the poison with them off the leaves. Where small patches are to be treated, a very simple method is to mix one pound of Paris green with about 20 pounds of common flour, and apply by dusting the mixture over the plants. This is readily done by placing a quantity of the poisoned flour in a small cheese cloth sack, which is held in the hand and shaken over the plants as the operator walks down the row of beets. This application can be best made when there is no wind and when there is a dew or rain upon the leaves to make the poison and flour stick.

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No. 2, APRIL, 1900.

## COLORADO SUNSHINE.

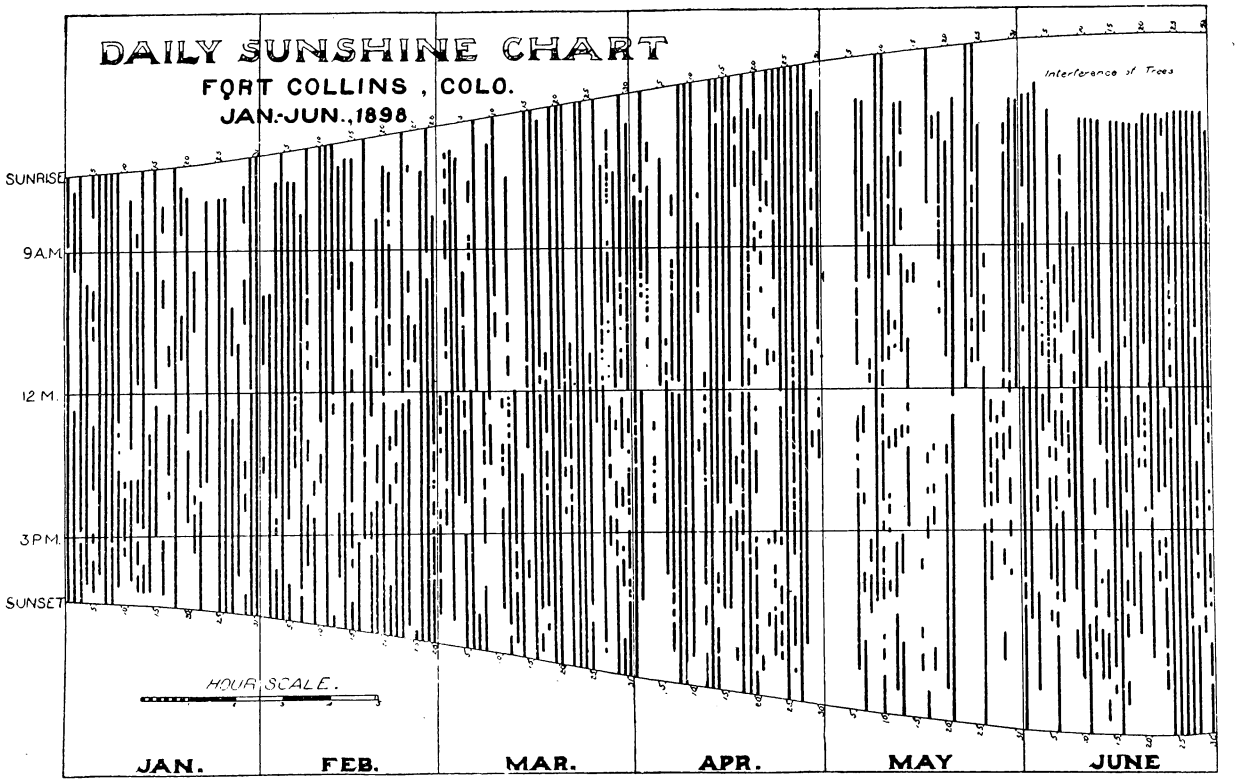
BY L. G. CARPENTER.

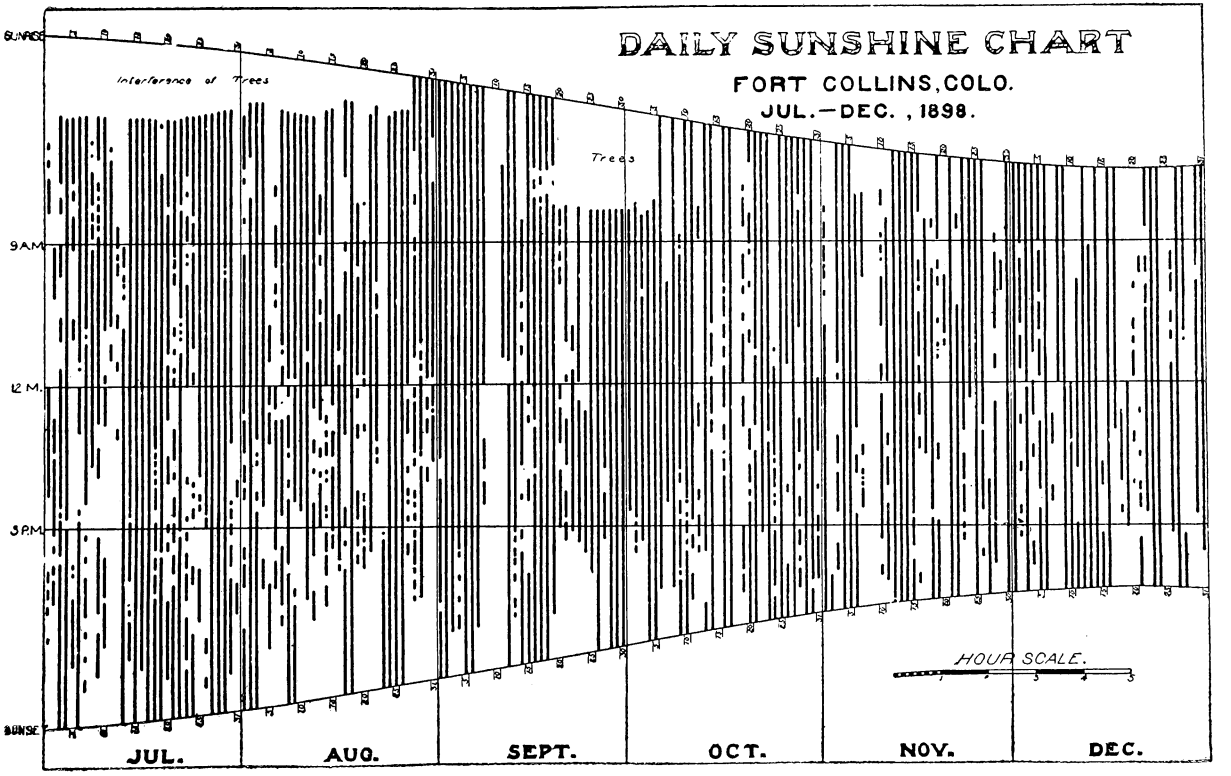
The important effect of sunshine on plants, their growth and development, their aromatic oils, the color of their flowers, and the quality and color of their fruit, is well known. That it has an equal influence on the spirits and health of man, is also well recognized. In general it has a beneficial influence on useful plants, while destructive to injurious ones, as molds, fungi, and bacteria. It is one of the most potent germicides. Most diseases cannot spread in the presence of sunshine.

The following charts showing the sunshine day by day, throughout two years, are of more than passing interest, both from an agricultural and a sanitary standpoint. The record is made continuously at the Experiment Station.

The full lines show the sunshine. The breaks in the lines show when the sunshine was interrupted by clouds passing over the sun. The diagrams show at just what hours the sun shone on each day of these two years. Attention is called to the few days without some sunshine. May was the rainy month in 1898.

The record for 1897 is on one-half the scale of that of 1898.


DAILY SUNSHINE CHART
FORT COLLINS , COLO.
JAN.-JUN., 1898
Interference of Trees
SUNRISE
9 A.M.
12 M.
3 P.M.
SUNSET
HOUR SCALE.
JAN.
FEB.
MAR.
APR.
MAY
JUNE


DAILY SUNSHINE CHART
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SUNRISE
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12 M.
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SUNSET
HOUR SCALE.
1
2
3
4
5
JUL.
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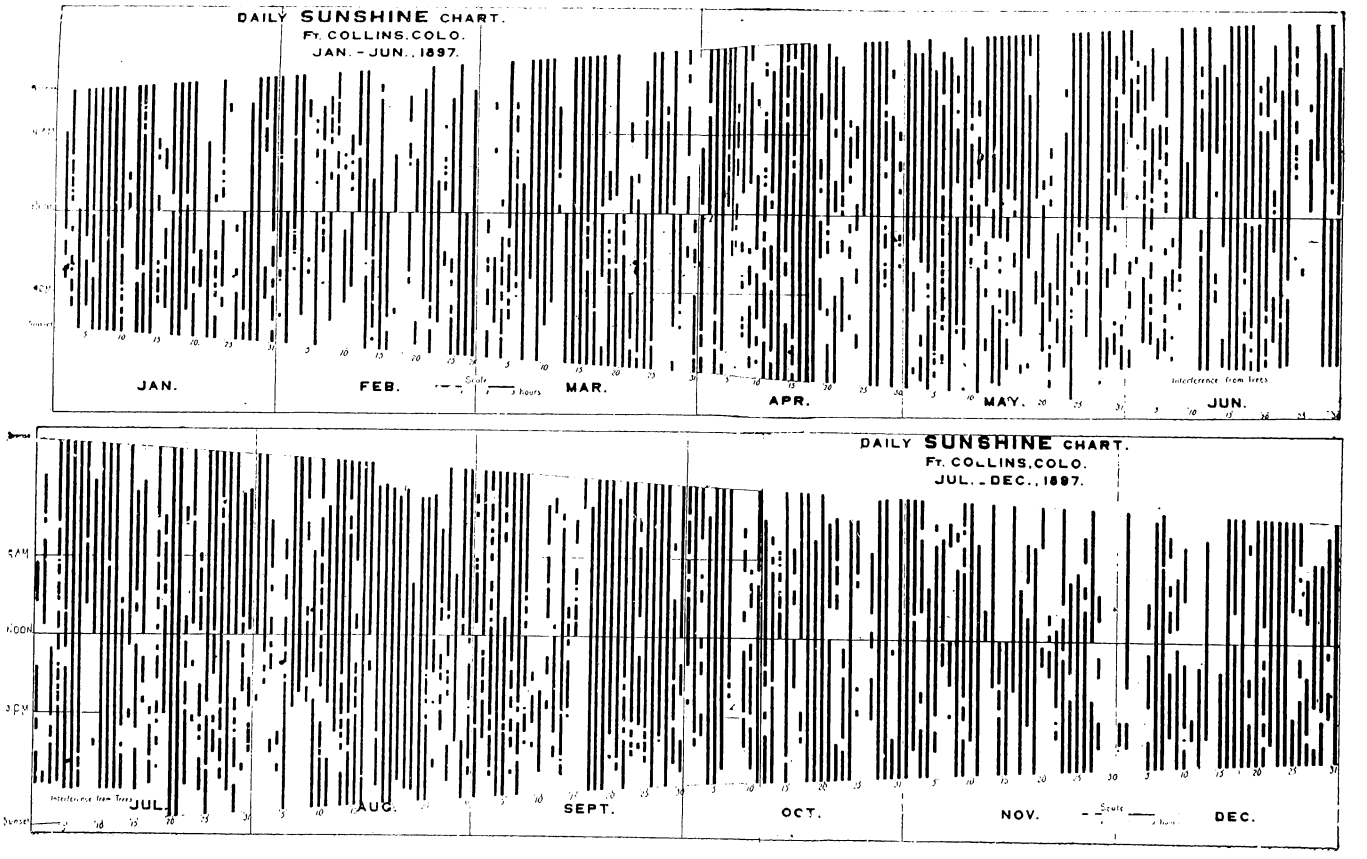
DEC.


DAILY SUNSHINE CHART.
Ft. COLLINS, COLO.
JAN. - JUN., 1897.
JAN.
FEB.
MAR.
APR.
MAY.
JUN.
Interference from trees
Scale — 1 hours
DAILY SUNSHINE CHART.
Ft. COLLINS, COLO.
JUL. - DEC., 1897.
Sunrise
9 AM
NOON
3 P.M.
Sunset
JUL.
AUG.
SEPT.
OCT.
NOV.
DEC.
Interference from Trees
Scale — 1 hours

No. 3, MAY, 1900.

# THE BEET ARMY-WORM.

BY CLARENCE P. GILLETTE.

The caterpillar which did so much injury to sugar beets in the vicinity of Grand Junction last year will doubtless appear again this summer. While the insect has long been known to entomologists, last year was the first that it has ever been reported doing serious harm to any crop.

While the life habits of the insect have never been studied, it seems probable, from what the writer could learn of it last summer and fall, that it has two broods in the course of a year. The caterpillars that were so abundant during August last year entered the ground and then appeared again as moths in September. There were few enemies to destroy the caterpillars and the moths hatched in enormous numbers. These moths, like house-flies and mosquitos, seek every available place of protection from winter's storm and cold that they may live (hibernate) until spring. When vegetation starts the moths, laden with eggs, go in search of beets or other plants furnishing suitable food, to deposit their eggs and thus provide for an early brood of worms. If ten per cent. of the fall brood of moths survived the winter, there is serious danger that beets will fare worse this summer than they did last, unless growers are early on their guard to make thorough and timely application of effectual remedies. Just here let me warn all against experimenting with new or patent remedies which some friend or vendor may think entirely satisfactory. Use such remedies very cautiously and sparingly at first, or do not use them at all.

From what could be gathered last summer, it seems that there was a first brood of caterpillars at about the time for thinning the beets, which, in some cases, destroyed most of the plants after thinning.

## REMEDIES.

Experiments tried last summer proved that the common poisons, Paris green, London purple, and white arsenic, will destroy the caterpillars if well distributed upon the beets. These poisons may be applied dry or in water. If the caterpillars appear upon the beets while the

latter are small, I believe the best method of application is to mix one part by weight of Paris green or London purple with twenty parts of common flour, and then dust the mixture over the plants before sunrise in the morning. In this strength a light dusting will be sufficient. The early application is recommended, because the leaves have then a slight amount of moisture upon them, which helps to hold the flour and poison. Just after the leaves are moistened by a shower is also a good time to make the application.

To apply the poison, make a small cheesecloth sack about five inches in diameter and ten inches deep. Fill it with the mixture of poison and flour and walk along a row of plants shaking the sack over them. This can be done quite rapidly when one has learned how, is economical of poison, and does not require wheelbarrow or wagon to carry pump and tank.

When the plants become large, as in case of treatment for the second brood, it will probably be better to use a barrel or tank and spray pump.

If a spray is used, apply either Paris green or London purple in the proportion of a pound to 100 gallons of water and add two pounds of fresh lime for each pound of poison. The lime should be slaked and strained through a cloth to take out lumps. Then use a nozzle that throws a fine spray, and do not continue the application in any place long enough so that the drops sprayed upon the leaves will run together and flow off, carring the poison with them.

If white arsenic is used, prepare according to the following directions:

Put two pounds of white arsenic and eight pounds of sal soda together in a dish and boil for twenty minutes in two gallons of water, and keep as a concentrated solution. *It is extremely posionous and should be placed at once where there is no possibility that children or domestic animals can get it. Also, label it "poison" in large letters.*

Then, in each 40 gallons of water, first slake four pounds of lime and then add slowly one quart of the concentrated solution while the whole is being stirred. The mixture is then ready for application, as in the case of Paris green. The lime should be strained through a cloth to take out the lumps.

I am advising the use of these poisons somewhat stronger than is common, but the experience of last year makes it seem advisable to do so.

Growers should keep the closest watch of their beets this year, in order not to let the caterpillars get the start of them. I hope to be notified of any appearance of these worms or other injurious insects promptly, and shall be glad to do all in my power to aid those who are anxious to save their crops from the attacks of such pests.

No. 4, JUNE, 1900.

# THE CANTALOUPE BLIGHT.

BY H. H. GRIFFIN,

Rocky Ford, Colorado, has long been famous for its cantaloupes. Until of late the industry has moved along at a rapid pace, little disturbed by insects or plant diseases. The blight, or rust, was first noticed on a few patches in 1896. There was an increase of the disease in 1897, more especially on the same fields, but its spread was not sufficient to cause much alarm. There was a vast extension of the disease in 1899 and the severity was much greater. The disease seemed to spread from a few well defined centres and grew less with distance from these centres. Many points in the Arkansas Valley report no injury. All evidence shows that the disease is not caused by any particular soil conditions, mode of irrigation, or peculiarity of climate.

The station began to investigate the question in 1898. Prof. Crandall, in 1899, pronounced the trouble due to a fungus, a new species named by Ellis and Everhart "*Macrosporium cucumerium.*"

Seed taken from diseased melons was planted in 1899 to see if the disease was communicated by the seed. Three rows, each 250 feet long, were planted May 12th. The middle row was sprayed with Bordeaux mixture to test its efficacy as a preventative, or, should the disease appear, for its control. Sprayings were given to the middle row June 22nd, June 30th, July 22nd, July 31st and August 11th. At the time of the first spraying there was no appearance of the blight, but at the time of the second spraying it was noted that "something on the leaves that looked like blight" had appeared. Previous to the 19th of June the weather had been very dry, so that if any infection had been present it is not probable that its spread would have been rapid enough to become apparent. After this moisture was plentiful; seven inches of rain fell in July; 5.14 inches in the week commencing July 14th. These rains submerged the vines and could not fail to wash off the spray. At the third spraying the blight was strongly in evidence. In August 2.22 inches of rain fell and dews were prevalent. A decided benefit was derived from the sprayings made after the 22nd of July. The sprayed vines held up comparatively well, and

the fruit was of good quality. On the unsprayed vines the fruit ripened prematurely; they were insipid in taste, and it could be detected from which vines they were picked. The sprayed vines remained green and in a growing condition for two or three weeks after the others had succumbed. The plants grown from diseased seed did not seem to be more susceptible than those grown from seed from healthy vines.

Other experiments were inaugurated in the latter part of July on a more extensive scale. Both the Bordeaux mixture and an ammoniacal copper carbonate solution were used on different vines at each place. The first spraying with the Bordeaux mixture was given July 27th and the last August 18th. The carbonate was first used August 4th and and the last spraying was made August 18th.

The test was made on seven rows, each 275 feet long, the vines that were sprayed remaining in good condition fully ten days after the others were gone. The melons ripened slower, in better condition, and were of uniformly good quality.

The results from the carbonate were not so pronounced as from the Bordeaux mixture. The results from the above work were so promising that it was tested on a still more extensive scale. About ⅛ of an acre of melons belonging to Senator Swink were sprayed. About one acre was sprayed for Mr. John Deweese, and one and three-fourth acres for Mr. C. S. Fenlason. Only one application was made at these places. These sprayings were done late in the season, when the blight was spreading rapidly. These melons were surrounded by others that were blighting badly.

The work confirmed the result of the other trials. Mr. Fenlason sold 300 crates of good melons from his sprayed field.

The virtue of the spraying lies largely in the ability of the melons to ripen properly, *i. e.*, to perfect the quality; the benefit is not alone to the vine.

It took 22 pounds of bluestone to spray the vines at Mr. Fenlason's, which were very large. The estimated cost was $6.75 per acre. Had the work been done earlier the cost would have been much less.

### APPEARANCE OF THE DISEASE.

The cantaloupe blight is caused by a true parasitic fungus. To the casual observer the first appearance is a large number of small brown spots upon the leaves in the

center of the hill. If the younger leaves are examined, it will be seen when the fungus is at work some time before the brown spots make their appearance. It can be seen when the leaf tissue has been eaten away, and when the injured tissue dies the brown appearance occurs. These brown spots grow larger as the fungus kills the tissue, until they become so numerous as to envelop the whole leaf; it appears as though struck by frost. It is surprising how quickly the spray will prevent the enlargement of these spots upon the leaf. At the time spraying is required the melon vine is making quite rapid growth, which necessitates spraying at intervals in order to cover the new growths.

HOW THE ACTION IS PERFORMED.

It can be readily seen that if some material is put upon the leaves that will kill the fungus, without injuring the host plant, the desired action is performed.

No fear need be felt that the bees will be poisoned. A number of hives stood near one of the fields treated, but no dead bees were found nor could it be seen that any injury resulted to them.

From the work of this season, we can advise that two or three spraying be given should the weather conditions prove favorable for the spread of the disease. If a dry season occurs perhaps the disease will not develop to any injurious extent.

From our present knowledge we should say that the first spraying should be done about the middle of July, followed every ten days until two or more are given, depending upon the weather. It would be well to follow the first rains of July with a spray.

Directions for making Bordeaux Mixture for use upon cantaloupes:

Dissolve 6 lbs of bluestone.
Slack 4 lbs. of fresh lime.

When the lime has become cool strain off the milk, adding it to the bluestone. Add water until there are 40 gallons.

No. 5, JULY, 1900.

# THE RUSSIAN THISTLE AS FORAGE.

BY J. E. PAYNE,

In many localities, the Russian thistle threatens to take possession of the land, in spite of all efforts of public-spirited people to keep it in check.

In neighborhoods where it has taken possession of the land, it seems best to ask—Can it be used for the benefit of the people whose land it has invaded?

The value of the Russian thistle has never been tested by a feeding experiment at any Experiment Station so far as we know, but the Minnesota Station has analysed the plants in various stages of growth. The following, copied from the Experiment Station Record, page 553, Vol. 6, gives the substance of Bulletin No. 34 of the Minnesota Experiment Station:

"When young the thistle is claimed to have a high food value, especially for sheep, which, some claim, are attracted to it merely on account of the salt which it contains. The chemical analysis shows a large percentage of ash material, amounting to nearly one-fifth of the dry weight of the plant. This is a serious objection to its use as a fodder plant, on account of the alkaline nature of the mineral matter present. One favorable point, as shown by analysis, is the large amount of nitrogenous matter present, being as much as there is in clover or rape. Before the development of the thorns, there is not much fibre present; at this time the plant is more valuable as a food than when mature. When the plant is ripe, the fibre and mineral matter make up half its composition, and although rich in nitrogenous matter, the former elements greatly reduce its feeding value

"The ash analysis shows that the weed has strong foraging powers, there being large amounts of potash and lime taken up by the plant. The draft which the plant makes upon the sodium in the soil is a benefit to alkali lands. The amount of sodium present varies greatly with conditions, showing that the plant is able to adapt itself to the alkaline conditions of the soil. From the time the thorns are out until the plant matures it takes up a large amount of sodium from the soil, and only small amounts of other materials, hence it makes the heaviest draft upon its soil while in an immature state, after which it takes but little essential plant food."

The following testimony concerning the use of Russian thistles as a food for stock has been gathered from men who have had more or less experience in feeding it:

"Cattle eat Russian thistles, but they are poor feed."

CHAS. HACKENBERGER,
Burlington, Colo.

"Cattle will eat Russian thistles in large quantities. They physic cattle."

THOMAS SEAMAN,
Wallet, Colo.

"Cattle eat Russian thistles. They seem to do well on them."

ELMER BROWN,
Wallet, Colo.

"I am feeding my bulls, which I keep up, Russian thistle hay. Consider it good feed when cut before the thorns harden."

SAMUEL P. SHAW,
Lamborn, Kansas.

"During the winter of 1899-1900, I fed a part of my cattle millet, and the remainder, about 40 head, Russian thistle hay. Those fed Russian thistles wintered fully as well as those fed millet. Fed none except during storms. Fed Russian thistles to those that were the best rustlers."

LEO THOMAN,
Burlington, Colo.

"In June, 1895, my cows fed on young Russian thistles. I never made better butter nor more of it than I did that month."

A. C. WILLS,
Lamborn, Kansas.

"My sheep eat Russian thistles, both green and dry. I think a patch of Russian thistles worth as much, for sheep feed, as the same area in grass."

WM. LANG,
Cheyenne Wells, Colo.

"When I first began farming here, when wheat failed I had no feed for stock. Now, when wheat fails, Russian thistles take posession of the ground. I cut these and winter my cattle on them."

JOSEPH RUBY,
Thurman, Colo.

The investigation has not been carried far enough to warrant us in recommending the Russian thistle as a hay plant when there is plenty of other forage. But the above testimony convinces us that those whose land is occupied by the thistles should cut some and try them as a feed for stock.

No. 6, DECEMBER, 1900.

# A SO-CALLED BLIGHT CURE.

BY CARL H. POTTER,

The "Woodbury Blight Cure" as its name implies, is a proprietary article that has recently been placed on the market. This "cure" is guaranteed to be a certain remedy for the blight of apple and pear trees if used as directed, and a destroyer of insect pests as well. Two mixtures are sold by the company controlling the cure, a body wash and a summer spray. The claims for the remedies and the directions for their use, as set forth by the company, are as follows: *

"The body wash should be used at least once during the season, preferably early in the spring on account of sun scald, but of immense benefit any time in the year.

"The summer spray should be used at least three times during the season for the cure of the blight and the destruction of insect pests. It should be used after, or during, every severe electrical storm for an insurance against the twig blight.

"Spray the first time when the trees begin to leaf, again from the middle to the last of July. Follow these directions carefully, and we will guarantee a cure for blight and the practical destruction of the codling moth and other injurious insects. The spray is beneficial and will promote a strong, healthy growth in all plant life, more especially on roses and vines. It will destroy slugs and green flies in the green-house."

On account of the fact that a large sale of such cure had been made, and that many inquiries had come to the Station, it seemed proper for a trial to be made.

June 29, 1898, a number of bearing apple trees in the Station orchards were selected and prepared for trial. Four distinct series or lots of trees were treated, while the others, as similar as it was possible to select them, were wholly untreated. These entered the test merely as checks with which to compare the trees that were treated. All of the trees to which the remedies were applied were recorded as class "A," while the untreated, or check trees, were class "C."

The different series of trees comprised summer, fall, and winter apples, and varied from very slight affection of the twigs to quite severe cases of blight, in which many of the smaller limbs were entirely diseased, the blight even forming large and more or less concentric patches on the

* From printed directions provided by the company.

larger limbs about the bases of the smaller ones. The trunks were not very badly affected by blight, yet there was plenty present for a test. Those trunks that were rough, whether in class "A" or class "C," were thoroughly scraped before treatment.

On the afternoon of June 29th the trunks and the lower portions of the limbs, to a height of about four feet from the ground, of the trees of class "A" were treated to an application of Woodbury's "wash," the material being applied with a stiff paint brush. About one quart of the mixture was used for each tree.

The following afternoon, June 30th, the same trees were thoroughly sprayed with the "spray mixture." The mixture was used double strength, as the directions recommended where an early spraying had not been given. The material was thoroughly stirred and then diluted to the strength of $\frac{4}{5}$ of a quart of "wash" to $4\frac{4}{5}$ gallons of water. Five gallons of this diluted mixture were used on each tree, the services of one man being constantly required to agitate the liquid in the box of the spraying pump. Blighted parts received especial attention.

August 13th all of the trees in class "A" were sprayed as before, except that the spray or "cure" was used as diluted in the proportion of one part of spray to 49 parts of water. November 15th the trunks of all the trees in class "A" were washed as before.

April 18, 1899, the trunks were again painted with the wash, a very thorough job being done. The trees were entirely dormant.

April 21st. Trees sprayed as per directions. Still dormant.

July 19th. Trees again sprayed as per directions.

This completed the application of the remedies to the trees. They had been used nearly two seasons, and were carefully and conscentiously applied. Frequent and careful observations of the trees were made, not only during the two seasons named, but extending through the season just closed. *We have not been able to detect, in any way, the slightest benefit to the trees as result of the use of these materials.*

Concerning the value of the spray as an insecticide, Prof. Gillette makes the following statement:

"I have tes'ed the 'Woodbury Blight Cure,' summer spray, upon both leaf-eating and sap-sucking insects, and in no case did it seem to have any injurious effect upon the insects treated Leaves thoroughly wet with the solution were eaten by insects which afterward matured in perfect condition."

No. 7, FEBRUARY, 1901.

# THE SEEPAGE MEASUREMENTS OF THE EXPERIMENT STATION.

BY L. G. CARPENTER.

One of the effects due to irrigation that is noticed in all countries is the seepage water which returns from irrigation and enters the streams. This is so much that streams may be drained dry and, within a short distance, again have an appreciable quantity of water.

At the suggestion of Hon. B. S. LaGrange, President of The State Board of Agriculture, and at that time Water Commissioner of District No. 3, a measurement was made in 1885 of the Poudre River by the State Engineer's office, and two others were made in 1889 and 1890. In 1891 the Experiment Station took up the matter to investigate in detail the amount and the laws of the increase. Such measurements have since been carried on annually on the whole length of streams in the State, from their exit from the mountains to the State line. These include the Cache a la Poudre, the South Platte, the Big and Little Thompson, the St. Vrain and Left Hand creeks, Boulder and South Boulder, Clear Creek, Bear Creek, the Arkansas from the mountains above Canon City to the Kansas State line, the Rio Grande from near Creede to the New Mexico line, and the Conejos. Of these, measurements have have been made for four years on the Arkansas and for five years on the Rio Grande, and the others for varying times.

It has been the intention to extend these measurements to other parts of the State as soon as time and means permitted. During the past year, 1900, the measurements were begun on the Western Slope, and were made on the Uncompahgre River from Ouray to Delta. These measurements have required every foot of the streams to be passed over, every headgate visited, every stream that leaves the river, as well as those which flow into it, to be measured. This has required the traveling over, in detail, of very nearly one thousand miles of river during the past season, and from six to eight hundred miles for each of the past four years. In all, some five thousand miles, at least, of river measurements have been made.

A report, giving the results of investigations up to that date, was issued in Bulletin 33. This discussed the relation of the seepage to the area irrigated and to the amount of water applied, as well as the rapidity of the flow of the waters under ground, and showed that the value of this source of water supply amounted to several hundreds of thousands of dollars.

This bulletin has been very widely quoted. The more recent measurements have been given in the annual reports of the Experiment Station, and in the report of the State Engineer. Bulletins discussing these measurements, and comparing them, will soon be issued by the Experiment Station.

In addition to these measurements the Experiment Station has also made hundreds of miles of measurements on canals to determine the amount of loss by seepage from canals, the means of preventing the seepage, and the means of protecting lands from such damage. It is studying the character of the water used in irrigation, the amount of water used in irrigation, and other phases of the irrigation question.

No. 8, APRIL, 1901.

# POTATO FAILURES.

BY W. PADDOCK AND F. M. ROLFS.

The Experiment Station has received a number of inquiries from potato growers in various sections of the State in regard to the failure of the potato crop in certain seasons. These failures seem difficult to explain, since there is little blight in evidence, and they occur with experienced growers as well as with beginners, and on soil that would seem to be in a good state of fertility. In some instances the vines are said to have made a luxuriant growth and remained green until late in the season, but when digging time came the tubers were found to be much under size. In other instances a large growth of vines were found to have set an abnormal number of tubers which failed to develop.

At first thought it would seem that some of the elements necessary to the growth of the potato plants were lacking in the soil, and this may be true in some instances, but it will not explain all the failures. Certain fungi or plant diseases have been found to be abundant on the potatoes in various parts of the State, which may have something to do in producing these conditions. One of these diseases has been known in America as a potato disease * less than a year, though it has undoubtedly been present in our potato field for a long time. In Europe it is considered to be one of the most destructive potato diseases. The fungus does not confine its attacks to potatoes alone, but is found in a great variety of plants, including alfalfa, clover and sugar beets.

The disease attacks the potato plant just below ground, cutting off free communication between foliage and tubers. In extreme cases the plants may be killed, and much of the so-called late blight or early ripening of the vines may be due to this disease.

The fungus lives over winter on the stems and tubers of the potato, and on various other plants. The fungus adheres to the tubers in the form of dark patches which resemble bits of soil, and which vary in size from that of a mere speck

* Dugger and Stewart, Bulletin 186, p. 17, N. Y. State Experiment Station, and Bulletin 186, p. 63, N. Y. Cornell Experiment Station.

to areas a half inch or more in diameter. The fungus does not injure the potatoes directly, but it detracts from the appearance of the tubers when offered for sale. But the important point is, that when infected potatoes are planted the fungus is planted with them, and thus the disease is propagated year after year.

The fact that the fungus attacks the roots of alfalfa complicates the treatment, since alfalfa is commonly used in the rotation of crops. If potatoes free from the disease are planted on land which has been in alfalfa within two years, the chances are that the crop will be affected, providing there has been any of the fungus on the alfalfa plants. The length of time that the fungus will live in the soil is not known. German authorities state that it will persist for at least three years. Neither has the kind of crop which should be grown on infected land to starve the fungus been definitely determined; however, it is not known to attack our common cereal crops.

It is too early to recommend a line of treatment to overcome the above conditions, since the cause of the trouble is not positively known, but potato growers who have been troubled in this way may find it profitable to take certain sanitary precautions. Such measures consist in planting potatoes, on land on which potatoes, beets, alfalfa or clover have not been grown for at least three years, and potatoes that are free from disease should be used for planting. If there is reason to suspect that the seed potatoes are infected with fungi, they may be treated with corrosive sublimate or formaline, as is recommended for potato scab.

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**Formulæ for Treating Diseased Seed Potatoes.** *

Corrosive sublimate.....1 ounce
Water.....8 gallons

Dissolve the corrosive sublimate in one gallon of hot water, then dilute with seven gallons of water. Allow the potatoes to soak one and one-half hours. When dry they may be cut and planted, though it has been found to be a good practice to treat the potatoes a week or more before planting, since the treatment may retard germination if done just before planting.

Corrosive sublimate is a deadly poison, and it should be used in wooden or earthen vessels, since it corrodes metals.

Formaline.....8 ounces
Water.....15 gallons

Soak the potatoes two hours in this solution, preferably but a short time before planting. This solution is somewhat more expensive than the corrosive sublimate treatment but has the advantage of being non-poisonous, and it may be used in any kind of a vessel.

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* Jones, L. R., and Edson, A. W., Vt. Sta. Bul., 85.

No. 9. APRIL, 1901.

# SUNSHINE FOR 1900.

BY L. G. CARPENTER.

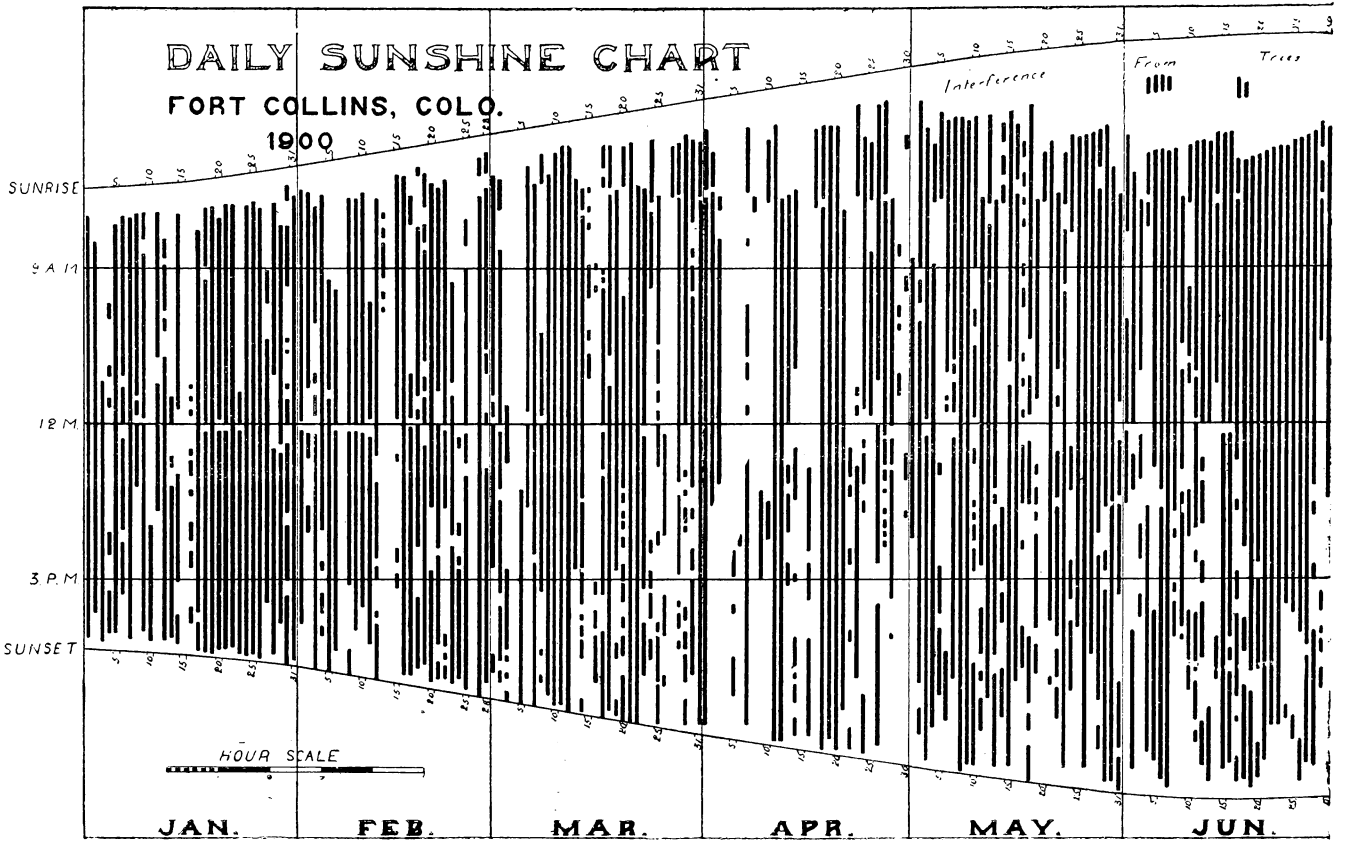
While the pleasure afforded by a sunny day is of common experience, the value of sunshine as an element in the climate, whether from the standpoint of health or spirits or of agriculture, is not often given the importance it deserves. Until recently no attempt has been made to record the amount or intensity, even in those places specially interested in agricultural meteorology.

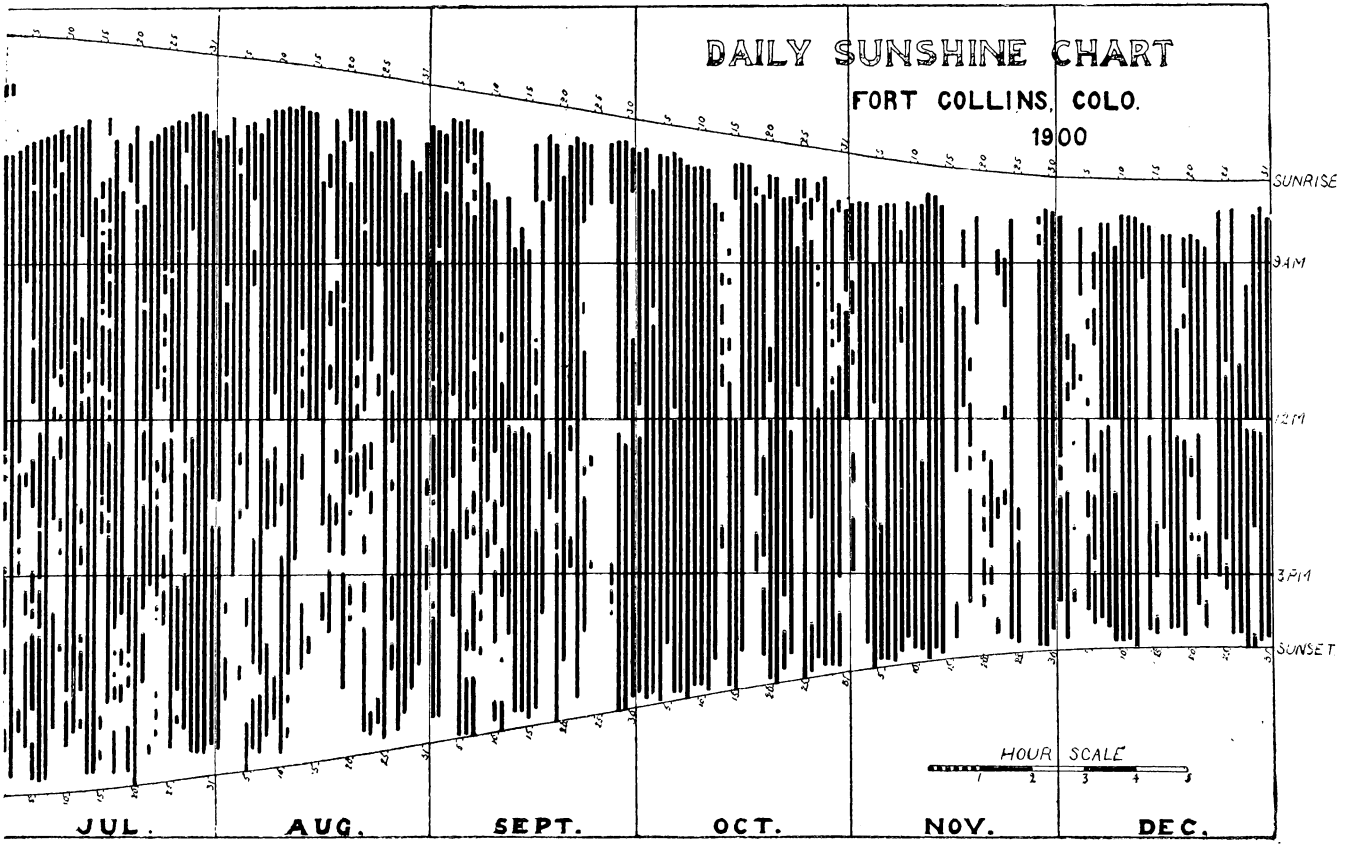
A certain amount of sunlight is recognized as a necessity for plant growth, for without it the development will be absent or unhealthy. With an increase in sunlight there is almost always an improvement in quality, and in the amount of essential oils; or in special qualities, as in sweetness, and an increase in the color of fruits and flowers. There is a decrease in the prevalence of certain diseases with direct sunshine. It has been known from time immemorial that dirt and darkness were conditions favorable for disease, while cleanliness and light were unfavorable. Molds and fungi, and the invisible but perhaps more important bacteria, do not thrive in sunshine. Even in diffused light few bacteria develop, and direct sunshine is destructive to most, if not to all, injurious forms within a short time. Sunshine and the drying action of the air are unfavorable to such forms of life, and are Nature's chief disinfectants.

A sunny climate or a sunny home is thus more apt to give the conditions for such physical health as are necessary to permit of sunny dispositions.

The charts show the amount of sunshine at Fort Collins for 1900, as recorded by an automatic photographic recorder and then transferred to the diagram.

A line is given to each day. The black line shows the duration of the sunshine and the hours at which it shone. When broken or absent, clouds are indicated. The longer the break, the longer the duration of the cloudiness. The diagram therefore shows the exact hours at which the sun shone during the year. It is noticeable that the forenoon had more sunshine than the afternoon, and that the winter months had comparatively little cloudiness. The relative amounts vary in different seasons, as a comparison with the charts in Press Bulletin No. 2 of 1900 will show.


DAILY SUNSHINE CHART
FORT COLLINS, COLO.
1900
SUNRISE
9 A M
12 M
3 P.M
SUNSET
Interference From Trees
HOUR SCALE
JAN.
FEB.
MAR.
APR.
MAY.
JUN.


DAILY SUNSHINE CHART
FORT COLLINS, COLO.
1900
SUNRISE
9 A.M
12 M
3 P.M
SUNSET
HOUR SCALE
1 2 3 4 5
JUL.
AUG.
SEPT.
OCT.
NOV.
DEC.

No. 10, APRIL, 1901.

# CONCLUSIONS RELATIVE TO THE CULTURE OF SUGAR BEETS.*

BY W. P. HEADDEN.

* This appears as a Summary of Bulletin 63. A Resume of the Publications of the Colorado Agricultural Experiment Station, and is not here reprinted.

No. 11, APRIL, 1901.

# HOW TO FIGHT THE CODLING MOTH.

BY CLARENCE P. GILLETTE.

Many orchardists spray for the codling moth and still grow very wormy apples. The writer knows of an orchard near the Experiment Station that was sprayed with an arsenical mixture three times last summer and in which fully 80 per cent. of the fruit was wormy at the time of picking in September. Another orchard in the same neighborhood was sprayed twice and had less than 2 per cent. of wormy fruit at picking time. What made the difference? Why is it that one man sprays his orchard and has very little wormy fruit and his neighbor, who also sprays, has nearly all of his apples wormy? This is a question often asked and frequently difficult to answer satisfactorily. That a reason exists for the different results there can be no doubt. The object of this paper is to give the best directions that we can at present for the successful treatment of this insect. Perhaps it will explain to some why they have not met with better success in the past.

## WHEN TO SPRAY.

No date can be fixed upon, yet spraying *must be done at the right time* if the best results are to be obtained. The *right time* is immediately after the blossoms fall and before the calces of the forming apples close. If there are belated blossoms on the trees after the great mass of bloom has

fallen, do not wait for them if some of the calces are closing. If the trees do not all bloom nearly together, spray the early blooming trees first and then in a few days spray the others. Repeat the application in one week, or, at the latest, ten days.

### HOW TO SPRAY.

Be thorough with the work. It will take more time and material, but if spraying for this insect will pay at all it will pay best to do the work well. Use a nozzle that throws a medium fine spray, not a mist, and direct it so that the liquid will be thrown *into* every blossom or calx. A misty spray will not carry as well into the blossoms. To make a thorough application, it will be necessary to direct the spray from, at least, two sides of the tree, and if the tree is large, it will be almost necessary to apply from all four sides. In many orchards the trees are so closely set, so large, and poorly pruned, that it is impossible to make a thoroughly good treatment for the destruction of codling moth larvæ.

The one who directs the nozzle for the spraying will find it a great advantage to be elevated as high as the bed of a wagon box at least. If the trees are large, it will be well to use a step-ladder or a dry goods box in the wagon to elevate him still more.

### NUMBER OF APPLICATIONS.

Orchardists differ widely in opinion as to the number of applications that should be made. Some, noticing that the worms are most abundant late in the summer, think that spraying should be continued throughout the season of growth and report excellent results from spraying five or six or more times. However, it is the opinion of those who have tested the matter most thoroughly at the various experiment stations of the country that it does not pay to spray more than twice, if the two applications are properly made at the best time.

### POISON TO USE.

Here again opinions differ. Probably Paris green is as effectual as any if well applied and if the liquid is kept thoroughly agitated during the spraying. Scheele's green would probably be as effectual as Paris green, is cheaper, and remains in suspension in water better. London purple and arsenate of lime are readily kept in suspension in water but are slower in their action than the above mentioned

poisons, and probably less effectual in their death-dealing power. They have the advantage of being very cheap. Arsenate of lead is kept in suspension without difficulty and is remarkable for its adhesive quality and its entire harmlessness to foliage unless used in great excess. It kills slowly and its value for the destruction of the codling moth has not been very definitely determined.

PREPARATION OF THE POISONS.

*Paris green, Scheele's green and London purple* may be used in the proportion of 1 pound to 160 gallons of water. It is best to mix the poison in a small amount of water first and then in the full amount for which it was prepared. For each pound of poison used, add to the water one or two pounds of freshly slaked lime. This will lessen the liability of the poison to burn foliage.

*Arsenate of lime*, by the Kedzie formula is prepared as follows: "Boil two pounds of white arsenic and eight pounds of salsoda for fifteen minutes in two gallons of water. Put into a jug and label 'poison'. When ready to spray, slake two pounds of lime and stir into 40 gallons of water, adding a pint of mixture from the jug."

If this formula is followed, be sure to use a full measure of fresh lump lime, otherwise some of the arsenic will be left in solution in the water and will kill the foliage.

A somewhat simpler method of preparing arsenate of lime is to boil together for three-quarters of an hour 1 pound of white arsenic, 2 pounds fresh lime, 1 gallon water. Use one quart of this to an ordinary barrel of water (about 40 gallons).

If a stock solution of this poison is kept, be sure to label it plainly "poison," and it would be well to put in some kind of coloring matter besides.

If arsenate of lead is employed, use not less than one and one-half pounds to 50 gallons of water. Lime need not be added to this preparation.

If more than two applications are made, do not use the poisons in more than two-thirds of the above strengths after the second treatment.

OTHER REMEDIAL AND PREVENTIVE MEASURES.

*Bandages* of burlap or other cheap fabric placed about the trunks of the trees from the middle of June till September will collect large numbers of the larvæ which gather beneath them for the purpose of changing to the pupa and then

to the moth stage. If these bands are removed once in a week or ten days, quite a large percentage of the worms may be collected and destroyed. A bandage four inches wide and having two or three thicknesses of cloth is of good size and may be held in place by means of a single carpet tack thrust through the overlapping ends into the bark of the tree. A band thus held may be quickly taken off and replaced.

*Gathering and destroying fallen fruit*, either by hand or by means of hogs or sheep turned into the orchard, will help some to keep the codling moth in check, but most of the worms leave the apples before they fall. After apples have lain on the ground for three or four days almost no worms can be found in them.

*Protect cellar doors and windows* with screens wherever apples are kept so that moths hatching in the cellar cannot escape to the orchard.

*Clean culture* and the removal of all rubbish in and about the orchard will make it more difficult for the worms to find a suitable hiding place for the winter.

*Scraping the loose bark* from trunk and branches will also remove many safe hiding places for worms during winter.

No one should be discouraged because he does not meet with as complete success in the use of the above remedies as he had hoped the first year. He who persistently and intelligently uses them through a series of years will be almost certain of a degree of success that will convince him of their value.