

# PLANT INSPECTION IN MISSOURI

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Plant inspection work has been carried on in a systematic manner in Missouri since 1913, and it is the object of this report to give a brief summary of the work done since that time and the results accomplished.

The inspection of nurseries in particular has a direct bearing upon the fruit industry, for it is thru the distribution of nursery stock that our most dangerous insect pests and plant diseases have been scattered from one fruit-growing community to another. Unfortunately, it has been only during the last few years that the full value of a systematic annual inspection of nurseries and orchards has been appreciated, with the result that prior to 1913 only those nurseries, which shipped stock, received annual inspection. In the meantime many very serious insect pests and plant diseases have been introduced into the fruit-growing sections of the state. Many of these pests and diseases like the San Jose Scale, crown gall and hairy



Fig. 1.—A good grape nursery in southwest Missouri

root first gained their admission to Missouri on nursery stock. The tax paid to insect pests and diseases by the Missouri fruit growers in the last fifty years has amounted to hundreds of millions of dollars. Much of this loss could have been prevented had the real value of inspection work and the control of insects and diseases been realized sooner.

Several of the more prominent nurserymen and fruit growers of Missouri did realize the value of inspection work and for a number of years before Missouri had an inspection service they secured the assistance of the entomologists of the Agricultural Experiment Station and had their nurseries and orchards inspected annually. However, due to the expense, only the larger and more prosperous nurserymen and orchardists felt that they could afford to have their premises inspected each year.

The need of a good inspection service for Missouri, which would be state wide, and which would reach out to the little nursery men and orchardists as well as the large ones, became so apparent that in 1913 the State Legislature passed a Nursery Inspection Law providing for the inspection of plants by the Missouri Agricultural Experiment Station. This law was approved by the Governor March 27, 1913.

The purpose of the Law is to prevent the further introduction of San Jose scale and other dangerously injurious insects and plant diseases, and to suppress as far as possible those pests which may have secured a foothold in this state. This Law also provides fully for the most careful inspection of suspected plants and for the destruction of badly diseased plants, the distribution of which might result in serious consequences to the farmers and fruit growers of Missouri.

The Nursery Inspection Law further provides that it shall be the duty of the Agricultural Experiment Station at Columbia to seek out, suppress and eradicate San Jose scale and other dangerous insect pests and plant diseases affecting the agricultural and horticultural interests of the State of Missouri. The Agricultural Experiment Station shall make necessary regulations and shall be vested with all the powers necessary to carry into effect the provisions of this Act.

Section 2 of the Law authorizes the official inspectors to enter any grounds or other premises for inspection and eradication of insects and diseases. It further authorizes the Agricultural Experiment Station to carry on demonstrations and experiments dealing with insect control and to give information on the control of insects and plant diseases by lectures and printed literature.

Section 3 of the Law gives the Agricultural Experiment Station authority to inspect from time to time nurseries, orchards, fruit plantations or other property and if dangerous insect pests or plant diseases are found it shall recommend the method of treatment.

Section 4 of the Law provides that each person or corporation in the state engaged in growing nursery stock for distribution shall notify the office of the Plant Inspection Service on or before the first day of July of each year and make application for the inspection of their nursery stock. The Plant Inspection Service must inspect the stock before September 15. Each individual or corporation importing nursery stock from a foreign

country must notify the Plant Inspection Service upon the arrival of the stock.

The Plant Inspection Service shall issue to each nurseryman a certificate of inspection providing the stock has been found free of dangerous insect pests and plant diseases. The certificate is good for one year providing a fee of \$5 has been received for the certificate plus the actual necessary expenses incurred in making the inspection. All shipments of nursery stock originating in Missouri must have attached to it a certificate of inspection from the Plant Inspection Service of Missouri. All shipments of nursery stock originating outside and coming into Missouri must have attached to it a certificate of inspection satisfactory to the Missouri Plant Inspection Service. Annually every nursery or firm outside Missouri shipping nursery stock into Missouri must file with the Missouri Plant Inspection Service a valid certificate of inspection issued by a state or government inspector showing that said stock has been inspected and found free from all dangerous insect pests and plant diseases, together with a statement under oath that no stock will be shipped into Missouri that has not been inspected and certified.

Annually every agent or authorized representative of any nursery or dealer must file with the Missouri Plant Inspection Service a statement under oath that he will offer for sale no stock which has not been duly inspected and certified, together with a copy of the certificate of and proper credentials from the nurseryman or dealer represented.

Annually, each dealer, person or firm engaged in the sale and delivery of nursery stock in Missouri and who is not the authorized representative of any nurseryman must file in the office of the Missouri Plant Inspection Service a statement under oath that he will handle only stock which has been officially inspected and certified. The statement must contain the names of the nurserymen or firms from which stock is obtained. He must also obtain a dealer's certificate from the Plant Inspection Service for which a fee of \$5 must be paid and which is good for one year beginning July 1 of each year. This certificate may be attached to shipments of nursery stock.

Section 5 requires that all shipments of nursery stock must be plainly labeled on the outside with the name of the consignor and consignee and a brief statement of the contents and a valid certificate of inspection. It is unlawful to deliver shipments of nursery stock in Missouri that are not so labeled.

Section 6 provides that any owner of an orchard or fruit plantation or dealer in plant products can request the Plant Inspection Service to inspect the same, and as soon as convenient the Plant Inspection Service must make the inspection and issue a certificate to the facts disclosed by the inspection.

Section 7 provides the penalty for violating the Nursery Inspection Act. The penalty of violating the Nursery Inspection Act is a fine of not less than \$25 nor more than \$100 for each offense, together with the cost of procedure. The prosecuting attorney shall prosecute violators of the act.

Section 8 defines the terms "nursery stock," "dangerous insect pests" and "plant diseases."

Section 9 provides for the enforcement of the Nursery Inspection Act which is placed under the supervision of the director of the Agricultural Experiment Station and he is empowered to appoint a chief inspector and such additional assistants as may be necessary to execute the provisions of the Act.

Under the provision of the Nursery Inspection Law, Dr. Leonard Haseman, Entomologist of the Agricultural Experiment Station, was appointed Chief Inspector and since 1913 the provisions of the law have been carried out under his direction.

Every state in the Union maintains a nursery inspection service of some type and the nursery inspection service of Missouri closely cooperates with the officials of the different states especially as regards the shipping of nursery stock to and from those states and Missouri.

The Federal Government also maintains a large inspection service



Fig. 2.—Inspecting evergreens in a Missouri nursery

which is under the control of the Federal Horticultural Board. The Federal Board regulates the importation of all kinds of plants, seeds, etc., including nursery stock from foreign countries, and also makes rules and regulations when necessary regarding interstate shipping of nursery stock, etc.

The Missouri Plant Inspection Service cooperates in every way possible with the Federal Board in furthering the eradication of dangerous insect pests and plant diseases and in preventing the introduction of new ones. Every year, Missouri nurserymen and florists import large quantities of nursery stock from foreign countries, especially France, Belgium and Holland. The Federal Horticultural Board requires that all imported stock be inspected upon arriving at its point of destination. Officials of the Missouri Plant Inspection Service inspect all of this foreign stock which comes into Missouri.

## PLANT INSPECTION, 1913

As soon as the Plant Inspection Law was passed and approved by the Governor, the director of the Agricultural Experiment Station appointed the Chief Inspector and plans were at once begun for carrying out the requirements of the Law.

Most of the inspection for 1913 was made during July and August by Dr. Leonard Haseman, Chief Inspector, and T. J. Talbert, Assistant in Entomology, and B. Szymaniak, Assistant in Horticulture, who had been deputized to assist with the work.

During the months July, August and September, 1913, 125 nurseries were inspected, of which 114 were certified as being free from injurious insect pests and plant diseases. Twenty-three nurseries were found to be infested with San Jose scale. A total of 3,000 acres of nursery stock was

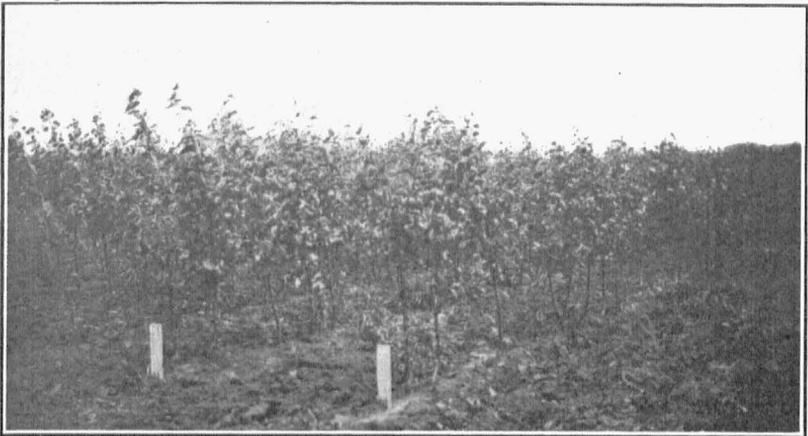


FIG. 3.—Good two-year-old apples of which hundreds of acres are grown in Missouri every year

inspected; located in 44 different counties. Also during the year 500 cases of imported stock containing over 500,000 plants were inspected.

Inspection Certificates to the number of 114 were issued by the Plant Inspection Service and 78 certificates were issued to dealers in nursery stock. One hundred and nineteen permits were issued to growers in other states who desired to ship nursery stock into Missouri and 377 permits were issued to agents or representatives of nurseries who desired to sell stock in Missouri.

As previously stated, twenty-three nurseries were found infested with San Jose scale and steps were immediately taken to clean up these infestations. Also, in connection with the nursery inspection work, a considerable acreage of orchard was inspected. Every attempt possible was made to determine whether or not the San Jose scale was present in orchards dangerously near nurseries. In many cases it was found near the nursery blocks and when in dangerous proximity the nurseryman was required to

take due precaution in preventing the spread from the orchards to his nursery stock. Owners of such orchards were given orders to clean them up and in most cases steps were taken at once to destroy infested trees and shrubs.

Due to the fact that '23 nurseries and a large number of orchards were found infested with San Jose scale an educational campaign, as provided for in the Nursery Inspection Law, was inaugurated in the fall of 1913. Where a nursery was found infested with scale the nurseryman was required to destroy all infested plants including trees and shrubs and to treat all stock subject to infestation with hydrocyanic-acid gas.

Also scale-infested orchards were selected at Sikeston, Boonville, Willard, Pierce City, Jackson, Hannibal and Alexandria and during the fall of 1913 and early spring of 1914 spraying demonstrations were held at these places for the control of the scale. In this work no effort was made to spray large orchards in each locality but only a portion of an orchard. Just enough spraying was done to show the fruit growers who were not familiar with scale control just how it should be done. At these spraying demonstrations, meetings were held at which methods of controlling insects and diseases were described. Also the best methods of planting, pruning, cultivating, selecting the site and other practical subjects of orchard management were given consideration. The results obtained from these demonstrations were quite satisfactory and led to the purchase by many fruit growers of sprayers and spraying material and the production of cleaner and better fruit. The results of this work are given in detail in Missouri Experiment Station Bulletin 132, "The Control of San Jose Scale in Missouri."

The results of the first year's work of nursery and orchard inspection showed clearly that a number of the nurserymen and many fruit growers faced the problem of eradicating that most serious of nursery and orchard pests, the San Jose scale, and also that the Plant Inspection Service had a big task before it in helping in this work of keeping Missouri orchards free from injurious pests and diseases in the future.

#### PLANT INSPECTION 1914-1915

During the year 1914-15 the inspection work was done by Dr. Leonard Haseman, Chief Inspector and Mr. T. J. Talbert, Deputy Inspector. A total of 135 nurseries were inspected of which 113 were certified. The acreage of nursery stock in Missouri in 1914-15 was 2551 located in 44 different counties. Five hundred and forty-nine cases of foreign stock received in 13 different counties were inspected. These 549 cases contained nearly 600,000 plants. One hundred and thirteen certificates of nursery inspection were issued; sixty-four dealers certificates, ninety-four growers permits and 249 agents permits.

Eleven more nurseries were inspected in 1914 than in 1913. These nurseries existed in 1913 but due to the fact that 1913 was the first time that a systematic inspection was ever attempted it was almost impossible to locate every nursery in the State. These nurseries which were located and inspected for the first time in 1914 were small ones and not widely known.

Also some of them were infested with San Jose scale. A total of twenty-three nurseries were found to be infested in 1913 while in 1914 the number infested was twenty-seven. Many of the nurseries which were found infested in 1913 had been thoroughly cleaned up but as a large percentage of the nurseries inspected for the first time in 1914 were found infested the total number of infested nurseries was higher than in 1913. As in 1913 the amount of foreign stock received in 1914-15 was large and a great deal of time was spent in inspecting it.

The results of the nursery inspection work in 1914-15 showed that the problem of eradicating the San Jose scale from the infested nurseries was indeed a great one and plans were made to push with increased vigor the work of eradication.

### PLANT INSPECTION 1915-16

During the summer of 1915 the inspection work was done by A. H. Hollinger, Assistant in Entomology who was appointed to fill the vacancy caused by the resignation of Mr. Talbert, and by K. C. Sullivan and J. H. Shepherd who were appointed deputy inspectors for the summer. All these were under the direction of Dr. Haseman, chief inspector. The scope of the work was greatly enlarged in 1915 and a large acreage of orchards were inspected in practically every county of the state.

Of the 173 nurseries inspected in 1915-16, 161 were certified. Two thousand six hundred and two acres of nursery stock was inspected in forty-six different counties and 489 cases containing 325,106 foreign plants were inspected in fourteen different counties.

One hundred and sixteen nursery inspection certificattes; eighty-seven dealers certificates; 125 growers permits and 300 agents permits were issued by the Plant Inspection Service in 1915-16.

It will be noticed that in 1915-16, 173 nurseries were inspected as compared to 135 in 1914-15. This increase was due to the fact that many of the strawberry growers in Southwest Missouri who had exceedingly fine beds wished to sell and ship plants and in order to meet the requirements of the different states had their plant beds inspected.

Twenty-four nurseries of the 173 inspected were found to be infested with San Jose scale while in 1914 twenty-seven nurseries out of 136 inspected were infested. This reduction of scale-infested nurseries was due largely to the efforts of the Inspection Service and its ability to cooperate with the nurserymen in a just and fair manner. Altho the nursery and orchard inspection service has police power, at no time was it necessary to use this power in connection with the San Jose scale clean up work. The scale clean up work was conducted as an educational project and in every case the nurseryman was glad to do his

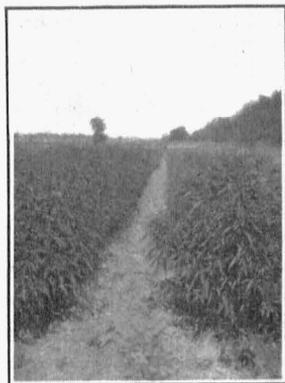


FIG. 4.—Looking down the row of a block of seedling peaches. These are peaches ready to bud

part. Where a nursery was found to be infested with San Jose scale or any other dangerous pests or diseases, the owner was immediately told of the existing conditions and given instructions as how to proceed in order to bring about their eradication. Usually the nursery was visited the second time in the digging period and all infested stock was condemned and burned and the remainder treated either with hydrocyanic acid or a miscible oil dip, and as is shown, this work was very effective.

In addition to the regular nursery inspection work the Plant Inspection Service in 1915-16 for the first time did a large amount of orchard inspection. The inspection of permanent orchards is one of the most important projects of the Plant Inspection Service and until this time no definite information had ever been obtained as to the prevalence of dangerous insect pests and diseases in the orchards of Missouri. This was especially true with ref-

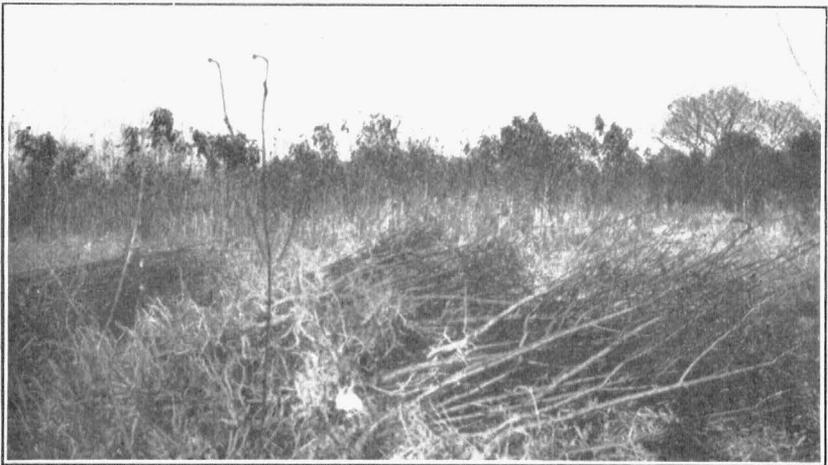


FIG. 5.—A lot of scale-infested nursery stock which was condemned by the Plant Inspection Service

erence to the San Jose scale. Before this time the San Jose scale had been found in a number of commercial orchards but no one knew just how generally it was scattered over the state. The object in making an inspection of the orchards in all sections of the state was to find out definitely just how great a foothold the more serious insect pests, especially San Jose scale, and plant diseases had obtained in Missouri. Therefore, during the year 1915-16, 118 orchards composing a total of 1,967 acres located in sixty-nine counties were visited by inspectors from the Plant Inspection Service and carefully examined.

Thirty-nine or practically a third of the orchards inspected were found to be infested with San Jose scale, some very bad, others very slightly. Whenever an orchard was found to be infested with San Jose scale or any other pest or disease, instructions were given regarding the eradication of the pest or diseases. It is a well known fact that an old orchard is an ideal place for such pests as the San Jose scale to breed from year to year

and unless it is thoroughly cleaned up will serve as a source of infestation for an entire community and in the long run may cause a loss of thousands of dollars. In case an infested orchard was found near a nursery, additional emphasis was placed upon the necessity of cleaning up the premises. It is gratifying to state that in practically every case the fruit growers were more than willing to cooperate with the Plant Inspection Service in every way in order to get rid of dangerous pests and diseases. That most dangerous of orchard pests, the San Jose scale, is widely distributed over Missouri and the Plant Inspection Service has a gigantic task before it in cleaning up and preventing a further spread of this pest. A task which will require both a great deal of time and a great deal of money, but which in the end will amount to very little as compared to the returns which can be obtained from a clean and healthy orchard.

The results of the inspection work in 1915-16 showed very conclusively that the Missouri Plant Inspection Service was rendering a great service to the nurserymen and fruit growers of the State by locating and helping clean up infestations of dangerous insect pests and diseases.

#### PLANT INSPECTION 1916-17

During the year of 1916-17 the nursery inspection work was carried on by Dr. Leonard Haseman, chief inspector and C. V. Vinson and K. C. Sullivan, deputies. The work was conducted in the same manner as the year before, except very little orchard inspection work was done due to insufficient funds necessary for carrying on such work.

One hundred thirty nurseries were inspected located in forty-seven different counties of which 107 were certified. The total acreage of nursery stock growing in Missouri in 1916-17 was 2,860. Three hundred eighty-nine cases of imported stock containing 570,766 plants were inspected in eleven different counties. One hundred seven certificates of nursery inspection; sixty-seven dealers certificates; 101 growers permits and 182 agents permits were issued in 1916-17. Twenty-two nurseries were found to be infested with San Jose scale, being two less than in 1915-16.

The report for 1916-17 shows that the numbers of scale infested nurseries was gradually being decreased. The clean up work in 1916-17 was carried on as in 1915-16.

#### PLANT INSPECTION 1917-18

The work of the Plant Inspection Service was carried on in 1917-18 by Dr. Leonard Haseman, chief inspector and A. H. Hollinger and K. C. Sullivan, deputies.

One hundred twenty-three nurseries were inspected and 103 were certified. The nurseries inspected were located in forty-five different counties and included a total of 2,035 acres. Forty-four cases of imported stock containing 425,849 plants received in seven different counties were inspected. Fifteen nurseries were found infested with San Jose scale as compared to twenty-two in 1916-17. This noticeable decrease in scale-infested nurseries was due largely to the untiring efforts of the Plant Inspection Service.

Another noticeable fact was the decrease in acreage which was due largely to the war which caused a decrease in demand for nursery stock. When the demand became less the nurserymen naturally planted a smaller acreage. Also many of the Missouri nurserymen for patriotic reasons lessened their acreage of nursery stock and grew a large acreage of wheat and corn which was badly needed at that time.

#### PLANT INSPECTION 1918-19

During the year 1918-19 all of the nursery inspection work was done by Dr. Leonard Haseman and K. C. Sullivan with some assistance by T. J. Rosa, Jr., Help was very scarce and also the number of nurseries to be inspected was less than ever before, due largely to the war.

Ninety-six nurseries were inspected, of which number ninety were certified. A total of 1,313 acres located in forty different counties were inspected. One hundred twenty-seven cases of imported stock containing 314,631 plants were inspected in nine different counties. Ninety certificates of nursery inspection, thirty-five dealers certificates; 111 growers permits and ninety-two agents permits were issued.

The report of 1918-19 shows very conclusively the effect of the war upon the nursery business in Missouri in both the number of nurseries and the total acreage of stock. Due to the decrease in the demand for nursery stock and the scarcity of labor, many of the smaller nurseries closed down altogether and the larger ones cut down the acreage.

In 1918-19 only two nurseries were found to be infested with San Jose scale and those but slightly. In 1913 when the Missouri Plant Inspection Service began to function, twenty-three nurseries were found to be infested. Taking into consideration the fact that San Jose scale is about the hardest insect known to eradicate, the Inspection Service really feels it had accomplished a great deal of good in the short time which it had been working.

Up to this time the Missouri Plant Inspection Service had been maintained entirely by fees paid by the nurserymen. This source of income could be relied upon, but it was entirely inadequate to carry on the work of nursery and orchard inspection properly in the state. In 1917 the State Legislature, realizing the importance of the nursery and orchard inspection work, made an appropriation of \$5,000 to be used in furthering the work. This appropriation, however, was not made available. In 1919 the State Legislature again made an appropriation for the Plant Inspection Service. This time the amount was \$10,000 of which \$2,000 was made available in 1919, thus partially placing the Plant Inspection Service on state support.

#### PLANT INSPECTION 1919-20

During the year 1919-20 the nursery and orchard inspection work was done by Dr. Leonard Haseman, chief inspector and K. C. Sullivan and S. R. McLane, deputies. Also a small amount of work was done by R. S. Springate. As was stated before \$2,000 of the appropriation made by the State Legislature was made available for the work during 1919-20 with

the result that a great deal more good was accomplished than ever before.

Ninety-three nurseries, located in forty different counties, were inspected, eighty of which were certified. A total of 1,469 acres of nursery stock was growing in 1919-20. Sixty-seven cases of foreign stock containing 442,000 plants were received in six different counties and inspected. Eighty nursery inspection certificates; twenty-three dealers certificates; 157 growers permits and 121 agents permits were issued.

During the year 1919-20 eight nurseries were found to be slightly infested with San Jose scale. In every case the nursery infested was in close proximity to a heavily infested orchard and as the season in 1919-20 was favorable for the growth and spread of the scale some of the near-by nurseries had become infested to some extent, but none seriously. As in previous years every precaution was taken to prevent its further spread and to eradicate it from the nurseries and the near-by orchards.

The method most generally used in eradicating and preventing the spread of San Jose scale on nursery stock and the one recommended by the Plant Inspection Service is to destroy all visibly infested stock and treat all other stock, subject to infestation, by either hydrocyanic acid gas or by dipping it in a miscible oil. The hydrocyanic acid gas treatment is more commonly used than the latter. In using this gas this method is followed:

One fluid ounce of sulphuric acid having a specific gravity of at least 1.83 is placed in an earthenware crock, wooden bucket, or tub; then 3 fluid ounces of water are added. In this mixture 1 ounce, by weight, of fused cyanide of potassium, 98-99 percent pure, is added. The above amounts are used for every 100 cubic feet of space. In fumigating tender growing plants, the above formula is too strong and has to be weakened. For dormant trees, mills, elevators and the like the 1-1-3 formula is recommended by both the United States Department of Agriculture and practically all of the state experiment stations.

In fumigating nursery stock an air tight box or house is necessary. The trees are placed in the box or house. The water and sulphuric acid are mixed in an earthen jar and the jar placed in the box or house. The potassium cyanide is then dropped in and the box or house closed just as quickly as possible. The hydrocyanic acid gas which is generated is deadly poisonous and the person doing the fumigating must be very careful not to breathe any of it. It requires about 45 minutes to fumigate nursery stock, although some authorities say that better results can be obtained by letting the stock remain an hour. At the end of this time the fumigating box or house is opened and the gas allowed to escape and in from 15 to 20 minutes the trees can be safely removed.

It is never advisable to fumigate trees while they are damp or wet. It is claimed that under such conditions the gas is more likely to injure the stock. However, the writer's experiments to date fail to corroborate this, though they do show that less scale is killed under those conditions.

Some states require by law that all nursery stock grown within its borders or shipped in from outside nurseries be fumigated, and, as a result, all of the larger nurseries in the United States have constructed special fumigating houses or boxes.

At the present time a form of sodium cyanide which is stronger than potassium cyanide is being substituted for the latter. Due to the fact that the sodium cyanide is stronger than the potassium cyanide a slight change has to be made in the formula, otherwise the method of using it is exactly the same. The formula recommended when using sodium cyanide is one ounce of sodium cyanide, 1½ ounces sulphuric acid and two ounces of water. Sodium cyanide is much cheaper than potassium cyanide and gives just as good results and is therefore coming into general use.

As previously stated, the use of a miscible oil for treating nursery stock which has been subject to infestation by San Jose scale is practiced to some extent by some nurserymen and good results have been obtained. In case a miscible oil is used, a tank or vat is constructed large enough to allow the dipping or complete emersion of the top of the trees to be treated. The oil is used at a strength of one gallon of the oil to twelve or fifteen gallons of water and the stock to be treated is completely emersed except the roots, immediately removed and allowed to drain and dry.

In 1915 a number of experiments were started at the Missouri Agricultural Experiment Station to determine the most practical, efficient and cheapest method to use in controlling scale on nursery stock with the least possible injury to the plants. The results of this work will appear in a separate publication.

Unfortunately only \$2000 of the \$10,000 appropriation made by the State Legislature was made available for use in 1919-20 and this was not made available until very late in the year. However, this sum made it possible for the inspection service to carry on its work to a much greater extent than would otherwise have been possible.

Due to the increase in price of railroad fares, hotel accommodations, labor etc., it costs the Inspection Service just about twice as much to do the same amount of work as it did four years ago. Thus it would have been practically impossible for the inspection service to have carried on its work without this additional help.

### PLANT INSPECTION 1920

During the year 1920 the inspection work was done by Dr. Leonard Haseman, chief inspector and K. C. Sullivan, S. R. McLane and G. A. Tumbleson, deputies. Due to the fact that \$5000 of the \$10,000 state appropriation was made available the work of the Plant Inspection Service was enlarged. A very important phase of the work which is being carried on in addition to the nursery and orchard inspection is the inspection for the European Corn-borer, which will be discussed later.

The following 100 nurseries were inspected during the summer of 1920:

#### NURSERIES INSPECTED 1920-21

Aroma Plant Company, Seligman  
Bennet, B. F., Seymour  
Bellefontaine Cemetery, St. Louis  
Birch, F. A., Neosho  
Crumly Brothers, Monett  
Calvary Cemetery, St. Louis  
Cameron Nursery, Cameron  
Case Nursery, Case

Chapman, W. C., Higbee  
Clever Nursery Company, Clever  
Crotsenburg, C. N., Carthage  
Davis, E., Seligman  
De Soto Nursery Co., De Soto  
Dobbs, Earl S., Anderson  
Elk Horn Nurseries, Noel  
Ely, H. S. & Company, Neosho

- Eastridge and Landis, Neosho  
 Ellisville Nursery, Ellisville  
 Farmers Nursery, Chillicothe  
 Fairview Nursery, Bethany  
 Fort, J. T. Nursery Co., Kansas City  
 Flowers, F. A., Carthage  
 Gibson's Ozark Nursery, Springfield  
 Golden City Nursery Co., Golden City  
 Howell County Nursery, West Plains  
 Hatzfeld, L. H., Goodman  
 Halava Nursery, Hillsborough  
 Hall, W. S., Hannibal  
 Hardy-Field Nursery & Seed Co., Kansas City  
 Hendricks J. O., Seligman  
 Hermann Grape Nursery, Hermann,  
 Jablonsky, A., Ovillete  
 Jones, Elva A., Anderson  
 Jenkins, H. W., Boonville  
 Kansas City Peony Gardens, Kansas City  
 Kaupp Floral Company, Nevada  
 Kelsey Nurseries, St. Joseph  
 Lamberth, O. H., Sarcoxie  
 Linn, F. B., Louisiana  
 Litson Nursery, Nevada  
 Ludwig, Henry, Pochontas  
 Luke's Nursery, Lowry City  
 Model Nursery, Poplar Bluff  
 May Brothers Nursery, Sedalia  
 McCurdy, J. F., Marshall  
 McCartney, E. W., Neosho  
 Morris, Miss Mary, Neosho  
 Murray Nurseries, Oregon  
 Norton, A. L., Clarksville  
 Neosho Nursery Co., Neosho  
 New Haven Nurseries, New Haven  
 Old Reliable Nursery, Kansas City  
 Ozark Nursery Co., Seligman  
 Osage County Nursery, Aud  
 Oronogo Flower Garden, Carterville  
 Park Floral Co., St. Joseph  
 Pasteau Nursery, St. Louis  
 Peyton Nursery, Boonville  
 Piedmont Nursery, Piedmont  
 Pinehurst Floral Co., Pleasant Hill  
 Polster Nursery, Warrenton  
 Rausch, Charles, Monett  
 Ragan, O. P., Ridgeway  
 Rau Floral Co., St. Joseph  
 Rhoeder Nurseries, Osceola  
 Reed, Homer, Louisiana  
 St. Louis Park Dept., St. Louis  
 St. Louis Water Dept., St. Louis  
 Sanders Nursery Co., St. Louis  
 Schnell, Henry, Glasgow  
 Schreier, A., Neosho  
 Seligman Plant Co., Seligman  
 Sedan & Mt. Grove Nursery Co., Mt. Grove  
 Swope Park Nurseries, Kansas City  
 Sommers Nursery, St. Joseph  
 Stanley Nursery, Campbell  
 Stark Bros. Nursery & Orchard Co., Louisiana  
 Southwest Golden Nurseries, Bolivar  
 Sunny Slope Seed Farm, Independence  
 Taiclett, F. A., Neosho  
 Teas Nursery, Carthage  
 Taos Nursery, Taos  
 Thull, J. A. & Sons, Chamois  
 Vallenweider, C., Seymour  
 Valhalla Cemetery, St. Louis  
 Wiseman Nursery, Springfield  
 Wallace, R. F., Logan  
 Waldbart, A. & Sons, St. Louis  
 Westport Nursery Co., Kansas City  
 Watson, J. G., Seligman  
 Wallace Nursery, Farmington  
 Walker, Rolla, Neosho  
 Wayman, H. S. & Son Nursery, Princeton  
 Weber, H. J. & Sons Nur. Co., Nursery  
 Westover Nursery Co., St. Louis  
 Wild, Gilbert Nursery, Sarcoxie  
 Wild Bros. Nursery Co., Sarcoxie  
 Wilson John L., Anderson  
 Young C. & Sons Co., St. Louis, Mo.

Of the above list of nurseries nine were found to be slightly infested with San Jose Scale. The year 1919-20 was one of the most favorable years known in Missouri for the propagation and spread of San Jose Scale and in some of the nurseries it was found for the first time in 1920. Every nursery found infested is being reinspected at the time the stock is dug and every effort is being made to completely eradicate the San Jose scale from every nursery in Missouri.

In 1920-21 there was a total of 1681 acres of nursery stock growing in nurseries in forty-two different counties. The counties having the largest acreage were Newton, Lawrence, St. Louis, Pike, Buchanan and Franklin. There was practically 200 acres more of nursery stock growing in 1920-21 than in 1919-20. This seems to indicate that like a great many other industries the nursery and orchard industry in Missouri has entered upon a period of prosperity and that in the future a still larger amount of nursery stock will be grown and a greater acreage of fertile Missouri soil will be planted to orchards.

#### REPORT OF THE EUROPEAN CORN BORER INSPECTION WORK

During the summer of 1920 a careful search was made for the European Corn borer in Missouri under the direction of the Missouri Plant Inspection Service. The work was done by K. C. Sullivan, S. R. McLane

and G. A. Tumbleson, deputies, under the direction of Dr. L. Haseman, chief inspector. The European Corn borer, a pest of European origin has gained a foothold in Massachusetts and New York and is causing very serious damage. Besides attacking corn it is also a pest of over 100 other plants including many which are classed as nursery and green house plants. Its favorite food plant however, is corn and should it gain a foothold in the middle western states in the corn belt it would practically revolutionize agriculture. Just recently this pest was found in Eastern Ontario, Canada and a little later a large area in Western Ontario was found to be infested. This brings it within a short distance of Detroit, Michigan and dangerously near the corn belt. In one field in Ontario it caused a commercial loss of twenty or twenty-five percent and should it continue to spread down into the corn growing states where the seasons are longer it would undoubtedly cause a much greater loss. This pest was probably brought to the United States in 1909 on Hungarian broom corn and as a quantity of this imported broom corn was shipped to and used in Missouri broom factories it is possible that this destructive pest may already be present in Missouri. One of the first acts of the Missouri Plant Inspection Service in 1920 was to promulgate a quarantine prohibiting the shipping into Missouri any plants or plant parts from the known infested areas in the east upon which the pest might gain entrance. This was done in order to prevent if possible any future introduction of the European Corn borer into Missouri. In addition to this a large amount of inspection work was and is being done especially in the vicinity of broom factories. If the European Corn borer has already found its way into Missouri, which is not at all improbable, it is necessary that it be found and eradicated as quickly as possible. As some of the broom corn imported from Hungary was used by Missouri broom factories in 1909-10 one of the first things that the Plant Inspection Service did was to locate and get in touch with these broom factories and later an inspector was sent to each factory and a thorough inspection was made of corn fields and especially sweet corn fields, in the vicinity of the factories. Also some inspection work was done in the vicinity of some Corn Cob Pipe factories. The corn-cob pipe factories obtain corn cobs from widely separated communities in the state and it was not at all unlikely that the pest might be brought to the factory in corn cobs and later escape to the corn fields near the factory. For this reason inspections were made in some of the communities near pipe factories.

Inspections were made at the following places: Jefferson City, Washington, St. Charles, St. Louis, Ste. Genevieve, Bland, Windsor, Canton, and Chillicothe.

At the above named places thorough inspections were made in many cases requiring several days. Whenever possible the inspector called upon the proprietor or manager of the broom factory and in every case the broom factory officials were more than glad to do everything in their power to help in the work. Besides the inspection work done at the above named places many corn fields were inspected in other parts of the state at different times during the summer.

At no place was the European Corn borer found and the Missouri In-

spection Service feels that up to the present time it has not made its way to Missouri. However, as the European Corn borer is a new pest in the United States and as it was probably present in Massachusetts and New York about ten years before it was found it is still possible that it may be present in Missouri. For this reason the Missouri inspection service is doing everything possible to find it if it is present and during the summer of 1921 still further inspection will be made.

The European Corn borer is a medium sized moth the male of which has a wing expansion of about one inch, the female a little more. The front wings of the male are reddish brown while the hind wings have a greyish tinge. The front wings of the female are of a dull yellowish color streaked more or less with brown while the hind wings are grayish brown in color. Under Missouri conditions the adult would probably appear early in May. Soon after eggs would be deposited upon corn and other host plants and in June the greenish colored caterpillars would appear. When the caterpillar becomes full grown it is brownish or pinkish in color, from one fifth to an inch long with dark spots and tubercles on its body and has a brown shiny head. It is the caterpillar or larvae stage of the insect that causes the injury. It is a boring insect and burrows within the roots stalk, ear and tassel of the corn plant causing a weak, sickly plant and poor pollination. The pest and its work is easiest to detect just after the tassels appear. It passes the winter as a full grown caterpillar within its burrow in the host plant. The present known method of control consists of destroying the plant in which the pest is wintering or by utilizing it in some manner. Where corn is used for ensilage or the fodder is shredded the caterpillars are destroyed. Clean culture also helps to keep the pest down. In Massachusetts and New York where the insect is bad, large sums of money have been spent in collecting corn stalks, weeds and etc., during the fall and winter and burning them in order to destroy the caterpillar. The Missouri Plant Inspection Service is doing everything in its power to keep this destructive pest out of Missouri.

### SWEET POTATO INSPECTION

During the past few years the Sweet Potato weevil has become a very serious pest in some of the Southern States also some fungus diseases such as black rot, foot rot, and dry rot have caused a large amount of damage to sweet potatoes with the result that many of the Southern States have promulgated rules and regulations governing the inspection and transportation of both seed sweet potatoes and sweet potato plants. The sweet potato weevil is not present in Missouri and the Plant Inspection Service intends to keep it out, however, some of the sweet potato diseases have been found in certain sections of Missouri to some extent but not serious.

Some of the states of the south on account of the sweet potato weevil and the sweet potato diseases will not allow either seed sweet potatoes or sweet potato slips to enter their state without first being inspected. Every year hundreds of bushels of Missouri grown seed potatoes and thousands of Missouri grown slips are shipped south and for the past two years the Plant Inspection Service has been called upon to inspect these seed pota-

toes and slips. The sweet potato industry in Missouri is growing rapidly each year and it is just as important that this industry be protected from the attack of dangerous insect pests and plant diseases as any other. The Plant Inspection Service is performing a real service to the sweet potato industry of the state by inspecting large quantities of both seed and slips.

Certificates were issued to the following sweet potato growers during the year 1919-20:

Bushman Company, Poplar Bluff  
 Davis, Silas, Poplar Bluff  
 Davis, W. D., Poplar Bluff  
 Ely & Company, H. S., Neosho  
 Peterson, H. W., Poplar Bluff

Schilser, Fred, Poplar Bluff  
 Shull, C. A., Neosho  
 West, W. G., Poplar Bluff  
 Walker, W. A., Neosho

## OTHER IMPORTANT INSECT PESTS AND PLANT DISEASES

Some of the dangerous insect pests and plant diseases which the Missouri Plant Inspection Service is watching closely and which have not as yet been introduced into Missouri are the Gypsy moth, the Brown tail moth, the Bean Lady beetle, the Cotton Boll weevil, the Pink Cotton Boll worm; the white pine blister rust, chestnut blight and others.

The Gypsy moth and Brown tail moth are insects of European origin which have caused millions of dollars of damage to fruit and forest trees in the New England States and during the past year new outbreaks of the Gypsy moth have been discovered in New Jersey and Pennsylvania. Both of these pests are very common in Europe and have in recent years been sent to the United States in shipments of nursery stock. During the spring of 1920 a shipment of apple seedlings from France arriving in Missouri was found to harbor nests of the Brown tail moth. In inspecting the stock the nests were found and destroyed and the shipment fumigated thus possibly preventing an outbreak of the insect in Missouri.

The Bean Lady beetle is a dangerous insect which is very common in the Western States. It feeds upon beans and related plants. Recently it was accidentally introduced into Alabama where it has rapidly spread over a large area of the state and caused serious losses.

The Cotton Boll weevil has spread from Mexico over practically the entire cotton growing region of the United States but has not as yet gained access into Missouri.

The Pink Cotton Boll worm just recently has been found in Texas and Louisiana where it is causing very serious damage and large sums of money are being spent in an effort to eradicate it. It was introduced from Mexico and is the most serious cotton pest known.

Both the white pine blister rust and the chestnut blight have caused very serious losses in the eastern part of the United States and on account of these diseases it is unlawful to ship certain kinds of nursery stock subject to infection from the infected regions.

The Missouri Plant Inspection Service is watching closely these and other dangerous insect pests and plant diseases with the object in view of keeping them out of Missouri, and is working towards the control and eradication of those pests and diseases that are present.