

KENTUCKY FRUIT NOTES

W. D. Armstrong, Horticulturist, Editor

Notice.—The next issue of this bulletin will appear in October.

PEACH TREE BORER AND HOW TO CONTROL IT

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One of the most serious pests of peach trees in Kentucky is the peach tree borer. Trees of every age are attacked and in many peach orchards most of the trees are infested within a year or two after planting. Borers injure peach trees near or below the ground level by tunneling under the bark and more or less girdling the tree. Young trees are more apt to be girdled while older trees become stunted and sickly and produce a poor crop. An infested tree usually has roughened bark near the base of the trunk and a mixture of jelly-like gum and borer excrement will be found over the wounds in the base of the tree.

Life Cycle. The adult peach tree borer is a clear winged moth which flies during the day and looks much like a wasp. In Kentucky, adults begin to appear in June and eggs are laid from late June until September. Eggs are deposited on the trunk or limbs of peach trees, on nearby weeds and trash, or on the ground. The eggs hatch in about 10 days. One peach borer moth is said to lay an average of 400 eggs. Young borers hatch from the eggs and burrow into the peach bark at or near the base of the tree. There they feed greedily and soon reach a considerable size. As many as 90 borers have been found by federal entomologists in a single six or seven year old tree but the usual number is from two to ten. The

writer has cut as high as 34 borers from a one year tree.

Large borers pass the winter in their feeding burrows while many of the smaller borers make winter cells in the bark of the trees. Borers begin feeding again in the spring and complete their growth. In late spring, full grown borers enclose themselves in silk-like cocoons, usually located at the ends or a little past their old burrows. Here borers go through the pupal state and in due time the adult peach tree borers emerge.

Control with PDB

The best known way of controlling peach tree borer was discovered in 1919 and consists of using a material called paradichlorobenzene (PDB). PDB is a white, crystalline material that looks like coarse salt and smells something like moth balls. When PDB is placed about a tree it gives off fumes that are heavier than air which sink into and saturate the soil slowly killing the peach tree borers.

The following dates for treatment generally hold for this State: In eastern Kentucky, apply PDB during the last two weeks in September; in central Kentucky from late September to early October; and in western Kentucky, in October. Treatment is delayed until fall to avoid infestation by borers hatching from eggs laid late in the season. For the PDB treatment to be effective, the soil temperature should be about 60°F. or above and the soil should be comparatively dry. Tree injury may result from PDB applied during hot weather. Growers should use this information when

deciding on what days to make treatments.

Growers often ask if peach tree borers cannot be treated with PDB in the spring. In Kentucky, spring treatment has not given satisfactory control. In the spring, the soil warms up slowly. By the time the soil is warm enough to liberate the fumes of the PDB., borers have done much injury and may be deep in their burrows.

Dosage. Trees six years of age or older should receive one ounce of PDB. On four and five year trees and unusually large and sturdy three year trees, $\frac{3}{4}$ ounce should be used. In Kentucky, two and three year old trees have been safely treated with one-half ounce of PDB. If growers choose to apply PDB to one year trees, the dosage should not exceed $\frac{1}{4}$ to $\frac{1}{3}$ ounce per tree. In measuring out PDB, use a small bottle or tin box holding the right amount.

Method. To prepare a tree for treatment, remove grass and debris from around the trunk and smooth off the ground. If borers are working much above ground level, draw in some fresh soil and pack it down firmly around the trunk so that the earth is approximately level with the highest borer. Next, place the PDB in a ring around the tree about one inch from the trunk but not nearer. After this, sprinkle a shovelful of well pul-

verized soil over the crystals, from above, in a way to avoid pushing them against the bark. Then place six or seven additional shovelfuls of dirt around the tree and pack it to form a cone. With average fall conditions, most of the PDB will evaporate in four to six weeks killing 90 to 100 per cent of the borers. Cool weather and rain hinder evaporation. In any case, it is best to remove the mounds around the trees five to six weeks after treatment. If mounds are left over winter, tree injury may occur.

Control with Ethylene Dichloride

Recently federal entomologists developed a new material, ethylene dichloride (EDE) emulsion, as a control for peach tree borer. This material has several advantages over PDB since it is easier to apply, safer on young trees and can be used later in the fall and also in the early spring. At Lexington, in the fall of 1938, ethylene dichloride emulsion applied late in November gave satisfactory control while PDB gave very poor control.

It is possible for the grower to prepare ethylene dichloride emulsion by using a cold water soluble, potash fish oil soap. However, it is probably much better for the grower to buy one of the ready mixed emulsions now on the market.

Method. The amount of ethylene dichloride emulsion to use and the

Dosage and Dilution Table for Ethylene Dichloride Emulsion

Age and Size of Trees	To make 10 gallons of diluted emulsion for use on different age trees Use:		Strength of the Diluted Emulsion	Dosage of the Diluted Emulsion for Each Tree
	Water	50 percent Stock Emulsion		
	Gallons or Parts	Gallons or Parts	Percent	
Six years and older..... (Average size and larger trees.)	5	5	25	$\frac{1}{2}$ pint
Six years and older (Small size trees.)	6	4	20	$\frac{1}{2}$ pint
Four and five years	6	4	20	$\frac{1}{2}$ pint
Three years	7	3	15	$\frac{1}{2}$ pint
Two years	7	3	15	$\frac{1}{4}$ pint
One year	$8\frac{1}{2}$	$1\frac{1}{2}$	$7\frac{1}{2}$	$\frac{1}{8}$ pint

dilution varies for different aged trees. The dilutions and amounts found most satisfactory are given in the accompanying table.

EDE emulsion is applied by pouring the correct amount on the lower part of the peach tree trunk and the soil just around it. When the ground is loose and level no preparation of the soil before treatment is necessary. Sometimes cupping the soil about the trunk to prevent run-off or loosening the soil around the trunk will give better results. After treatment place several shovelfuls of dirt against each tree trunk to prevent surface evaporation of the EDE. A tin measuring cup, marked for one-fourth and one-eighth pints is very useful for applying the emulsion.

Discussion

Where growers are getting good control with PDB, it is suggested they continue to use that material.

Where growers were unable to apply PDB at the proper time or where growers wish to make early spring treatment, EDE emulsion is suggested for trial. It is suggested that EDE emulsion be applied, preferably, at the times recommended for PDB. In case EDE emulsion is used in the spring it is suggested that treatment be made before April 1.

Caution: Since the prepared EDE emulsion you buy may be of a strength greater than the 50% used in the table, be sure to follow the manufacturers' directions for that particular brand.

ETHYLENE DICHLORIDE AGAIN

Usually there are some sad experiences connected with the use of most any new method or material in insect or disease control. This is true in many cases because of the lack of understanding of the newer material, its preparation and use. Sometimes these cases of injury are due to soil and climatic conditions and occasionally to the method or material not being perfected.

One Western Kentucky grower bought five gallons of the pure ethylene dichloride this spring and emulsified it according to directions. This was applied in late May to about 1,000 Elberta trees that were starting their second growing season. Strength and dosage for two year old trees was used. As a result of the treatment, it

appears that a number of these trees have been killed or injured. The most likely cause of injury was that the material was used too strong. Two year dosage was used and the trees were just starting their second growing season and will not be two years old until this fall. The two year dose is four times as heavy as the one year dose (refer to dilution table). Other possibilities are that the hot weather increased the injury and that the material was not completely emulsified. Studies are being made of this case. It is suggested that those using the EDE treatment buy the prepared emulsion and dilute it according to manufacturer's directions instead of trying to emulsify it at home.

WANTED—500 STRAWBERRY GROWERS

W. W. MAGILL

What kind of plant food or fertilizer does your berry field need to help it produce 200 crates of No. 1 strawberries per acre? I believe you are more interested in this information than any one else for with it you could probably invest \$10.00 per acre in August or early September in the needed plant food and sell your berry crop next May for \$40.00 net per acre more than you will otherwise get. This would return you 400% on your investment and at the same time more than half of the plant food supplied would still be in your soil.

The Experiment Station soil men and your county agent know that all western Kentucky soils respond favorably to superphosphate on strawberries and also to a reasonable amount of nitrogen applied now (late August). The nitrogen is needed especially where no legume has been turned under in the rotation, but we do not know the exact amount your farm needs.

Here is a suggestion for you as a berry grower. It will not cost you over 50 cents in cash and not over one half day's labor. I would like 500 berry growers to give it a trial, regardless of how the berry fields have been fertilized.

DIRECTIONS: Weigh out five pounds of superphosphate (20%) and apply broadcast on a row fifty steps (50 yards) long. On the second row, apply ten pounds on a row fifty steps long. On the third row, apply five pounds of superphosphate and two

pounds of nitrate of soda or sulfate of ammonia. On the fourth row, apply only two pounds of nitrate of soda or sulfate of ammonia. On the fifth row, no treatment.

Apply these fertilizer applications when the plants are dry. Where you apply the nitrogen, take the extra precaution of brushing or sweeping the row of berry plants with an old broom or a handfull of tall green weeds.

When harvest time comes, start five of your best pickers on these five rows and ask them to tell you the number of quart cups they get on this fifty yard row. Your packing shed foreman can make a record of their statements. If you will report to your county agent that you are conducting such a demonstration we will provide you with a simple card for recording the yield comparison and will also visit your farm during harvest.

The "no treatment" or check row will be the most valuable row in the demonstration so be sure to have a "no treatment" row. Repeat on another five rows if possible.

BITTER ROT ON APPLES

W. W. MAGILL

The hot temperatures and high humidity of late July were quite favorable for the spread of Bitter Rot in Kentucky orchards. As early as July 15 I observed attacks of the Rot in Jefferson, Henderson, Rowan, and Fleming Counties. The following varieties are among the more susceptible to the disease: Grimes, Golden Delicious, King David, Gano, and Jonathan. The disease is first observed on the side of the apple most exposed to the sun and appears as a well discolored spot. The rotted spot is distinctly sunken and sharply defined. When one half inch in diameter, small black dots appear at irregular intervals beneath the skin in the sunken areas. These dots may be arranged on concentric rings, and become fruiting bodies or spores of the disease. These spores are spread throughout the tree and to near-by trees by flies, rain and wind. It spreads on the apple even more rapidly than brown rot on peaches. It may appear and spread in the orchard any time from July to October. A series of hot wet days in August or early September may bring about a very sudden attack.

Crops can be destroyed in less than a week.

CONTROL: Spraying with 4-6-50 bordeaux is a preventative. Lime sulphur is not effective. In sections of orchards where the Bitter Rot has appeared in past years, growers are urged to be on the alert and examine the area carefully every few days for the first appearance of the Bitter Rot on the apples. Carefully pick and carry out all the fruit showing the infections and follow with a bordeaux spray at four day intervals in the infected areas. Often one tank of bordeaux will cover the necessary area. During winter remove all mummied fruit and fruit stems from the trees to prevent a carry-over.

NICOTINE-BENTONITE SPRAY FOR CODLING MOTH

During the past several years much has been said and written about the problem of getting away from the use of arsenate of lead for control of codling moth in apples. The usual arsenate of lead spray programs have failed to give adequate control in many Kentucky orchards. This program has also caused considerable spray injury to the foliage, and has caused many growers to go to the trouble of washing their fruit before selling.

Apparently one of the most satisfactory arsenical substitutes is a combination of nicotine and other materials. There are several combinations using nicotine as a base with which a protective coating can be built up on the expanding fruit. One of these is a so called fixed nicotine that is purchased in the dry form. Another form, that has been used for several years in Indiana and which is being used this year for the first time by a large apple grower at Henderson, is the Nicotine-Bentonite tank-mixed combination that has been giving a very fine control of codling moth.

This combination was developed by United States Department of Agriculture workers and is getting much attention. The program calls for the use of the usual spray applications up through the calyx and first cover spray, using the usual amount of arsenate of lead in combination with a fungicide. This is for the purpose of getting a deposit in the calyx to prevent worms entering there later and

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for disease control. From this time on the nicotine schedule is used.

The mixture used at present contains one pint of nicotine sulfate solution, five pounds of bentonite and one quart of soybean oil to 100 gallons of water. The bentonite costs about one cent per pound and the soybean oil about six cents per pound. When these three are mixed according to instructions the nicotine is absorbed by the bentonite and "fixed" so that when it is sprayed on the fruit a protective covering is deposited.

Growers that are trying this material are highly pleased with its control of codling moth, in comparison to near-by arsenate of lead blocks. The foliage on the nicotine trees is also much larger and some growers report that the fruit sizes up earlier and larger. With this spray there is no problem of an arsenical residue at harvest.

There is one serious drawback to this Nicotine-Bentonite program and that is the fact that any of our fungicides for control of summer diseases cannot be used with this combination. When this is done the nicotine is liberated and a coating is left on the fruit that is harmless to the worms. This is particularly serious where a grower has a bitter rot or blotch problem and where other summer diseases need sprays. Much effort at present is being used to develop satisfactory fungicides that can be used with this material.

Growers that are trying this material for codling moth say that it is easy to tell when all parts of the tree have been hit with the mixture and that this prevents the operator from wasting so much material as is often done with other mixtures.

The development of this and other spray practices is being watched carefully by apple growers.

A 1938 SCALE EXPERIENCE

HERMAN YOPP

Paducah, Ky.

In spite of what we thought was a fairly good orchard spray program our 40 acre Elberta orchard showed a considerable amount of live scale in the

early summer of 1938. This scale multiplied rapidly until severe damage was being done to the trees by harvest time. During the two weeks following harvest the injured limbs and trees yellowed up a great deal and thousands of the young crawling scale could be seen on practically every tree. It was plain that very severe damage would be done to the trees before fall if something was not done to check the increase of the scale.

We had some summer spray oil on hand and after consulting with Extension Service and Experiment Station representatives some preliminary spray tests were run. These results seemed satisfactory, so during the later part of August the entire orchard was sprayed thoroughly with a 2½ percent strength summer oil emulsion. After the spraying was done we found fewer of the young crawling scale and the oil also seemed to kill a good number of the partly matured scale. However, we could find a very few of the fully mature scale that we thought the spray killed. After the spray was applied the orchard seemed to improve in condition and the trees went through the early fall in good shape and held their foliage in a normal way.

As soon as the leaves had fallen and dormant spraying was safe we put on a fall application of 3 percent winter oil emulsion and made every effort to cover ever crack, crevice and twig. This was followed in the spring by another complete application of 3 percent winter oil emulsion to which a 6-6-100 bordeaux was added for leaf curl control. During the winter some of the heaviest infested limbs died and were removed. In the spring growth was resumed in a normal manner and indications to date point to a normal season. At the present time the trees are growing rapidly and are carrying a crop of fruit that is considered very satisfactory for the season. It looks like the scale has been brought under control by this concentrated late summer and winter program and we are looking forward to many more crops of peaches from these trees that were faced with almost certain death if this insect had not been controlled.

FARM AIR COOLED STORAGE FOR APPLES

W. W. MAGILL

Retired refrigerator cars for air and ice cooled storage of fruits on the farm has passed the experimental stage in parts of Michigan and northern Indiana. We feel that many fruit farms in Kentucky can also solve their farm storage problems very economically by purchasing such storage. The average size refrigerator car will hold approximately 900 bushel field crates. The cars are bought up in quantities by some wrecking companies and the fruit grower buys them direct from such sources. These cars sell at from \$125.00 to \$250.00 each, depending on the general mechanical condition of the car and will be rolled to your nearest railroad side track for eleven cents per mile from freight yards near Chicago and other points.

The fruit grower makes arrangements with a local dealer in scrap iron to remove all surplus iron from the cars and to buy the iron at the prevailing price. This scrap iron is cut away with an oxyacetylene torch. A Michigan fruit grower sold approximately 20,000 pounds of iron at \$9.00 per ton, bringing a total of over \$90.00 which more than paid the cash expense of moving the car from the railroad siding to his farm.

After the car trucks are removed, the car is loaded onto a special wooden wheel moving truck, like those frequently used for moving heavy road machinery such as steam shovels, etc. Such moving equipment can be arranged for at a fair price in several of our Kentucky cities. The car, loaded ready to move from the railroad to the farm will weigh about twelve tons and can be drawn to the orchard with a farm tractor with rubber tires.

These cars are insulated equivalent to two inches of block cork which is far more efficient insulation than any of our apple farm storage houses now

in operation in the state. At present costs of building material and labor we are of the opinion that a 900 bushel apple storage house insulated equivalent to the refrigerator car would cost more than twice the price Michigan fruit growers are paying for these used cars.

Precooling: By adding two tons of ice to the car and by using an electric fan for circulating the air, Michigan growers have been able to pull the inside temperature to under 35° when the temperature outside was above 80°. Such varieties as Red Delicious and Grimes could then be kept at sufficiently low temperatures during September and early October.

These cars have also been found very practical where a roadside market for peaches, grapes, melons, berries, cider, apples, etc., is being maintained. Some growers, so situated have built two partitions in the car or divided it into three compartments, one used for precooling, one (the opposite end) for holding, and the center part near the doors for a sales room. Grocers were willing to pay a small premium per bushel or crate for this precooled fruit.

Fruit growers who are interested in knowing more details connected with the purchasing of such farm storage cars may write to Michigan State College, East Lansing, Michigan, and ask for "Refrigeration for Air and Ice Cooled Storage, Preliminary Report", or write to the Department of Horticulture, University of Kentucky, Lexington, Kentucky.

SUMMER FIELD MEETINGS

Princeton—Lexington
Princeton, July 28

A special fruit program was held in connection with the regular field day of the Western Kentucky Experiment Substation at Princeton on July 28. Some 2000 visitors in all crowded the grounds to inspect the crops, livestock, dairy and fruit work in progress

and to listen to the discussions. In the morning a large group was lead on inspection trips through the orchards by Mr. W. W. Magill, Extension Horticulturist. The raspberries and small fruit plantings were visited by smaller groups.

In the peach orchard a study of various degrees of pruning was made. Trees cut back moderately after the crop was lost in 1938 were not carrying as large a crop as trees that were not cut back. The size of the fruit on the cut trees was larger however. Some breakage of limbs in high topped trees was observed. Trees in lespedeze sod and in various types of cultivation were studied. Due to the shortage of rain during July many of the trees carrying a full crop of fruit on thin soil were suffering for moisture. Spray tests were studied. Brown Rot was found in the Hale variety while none was found in the Elberta trees. Four varieties of early peaches, Cumberland, Radiance, Delicious, and Viceroy were ripe and the visitors enjoyed some tree ripened fruit. The Elberta and Hale varieties were a week to ten days from maturity.

The new variety peach orchard planted this spring on terraced land and cultivated on the contour was of much interest. It is planted down to soy beans. The portions that were limed and phosphated in the fall of 1938 are supporting a much heavier bean growth than the untreated portions.

In the apple orchard disease and insect specimens were studied. Lack of pollination was pointed out in this planting which consists of Stayman, Delicious, Winesap, and Transparentes. Cedar rust and quince rust are very bad in this planting which is located near a great many wild cedars. It was pointed out that over 1,000 apples that had been knocked off by these diseases had been picked up to date under one Stayman tree. This tree at present is carrying a light crop and a portion of

this is affected with the same diseases. This is an example of the damage being done by these diseases generally over the state this year.

The raspberry spray test plots were discussed. On the Latham variety the portion that was unsprayed in 1938 lost practically all of the overwintering canes and produced no berries this season. The sprayed portions that received three bordeaux sprays during the summer of 1938 came through in excellent condition and produced a good crop this season. The Flaming Giant variety of raspberries on both the sprayed and unsprayed portions lived through the winter and produced a fair crop. On this variety also the sprayed portion yielded fifty per cent more than the unsprayed portion. It is this ability of the Flaming Giant variety to partially survive without sprays, along with its earliness, that explains why most of the raspberries produced in western Kentucky at present are of this variety.

In the afternoon, the Horticulture section presided over by Prof. A. J. Olney, Head of the Department of Horticulture at the University of Kentucky, was attended by about 75 growers from fifteen counties who heard discussions on subjects of timely interest to the fruit grower. Dr. Joe H. Gourley, Chief of Horticulture, Ohio State University, discussed orchard soil management problems, relating experimental results which were of great interest to the assembled growers. He related the fine results that had been had in Ohio using a continuous heavy mulch under apple trees and stated that trials there showed organic matter in soils under mulch remained at a high level but that when clean cultivation was used, the organic matter was burned up in spite of heavy crops of organic matter being turned under. He suggested the use of extra nitrates applied to the sod in orchards and adjoining meadows and lespedeza fields

as a means of growing extra material that could be cut and placed under the trees as a mulch.

In discussing apple pruning, he stated that in Ohio trees that were pruned less produced a total of more fruit of all grades and were larger than heavier pruned trees. As a pruning suggestion he mentioned going in under the trees before harvest and noting the type of wood that bears the small undersized poorly colored fruit. That is the type of wood he suggested taking out at pruning time.

Mr. William Fegenbush, President of Kentucky Horticultural Society and Superintendent of the Horticultural Department of the Kentucky State Fair, discussed standard and new features of the exhibits to be shown this year and urged growers to take advantage of their opportunity to exhibit fruit at the State Fair. Any fruits including apples, peaches, grapes or pears, which mature ahead of State Fair dates (Sept. 11 to Sept. 16), should be shipped to the Kentucky State Fair, care of the Merchants Ice and Cold Storage Company, Louisville, Kentucky. This fruit will be stored at no expense to the grower and will be delivered to the fair grounds by the fair management on the opening day of the fair.

A discussion of the strawberry work was lead by W. D. Armstrong. Partial results of the 1939 mulching work were given. These showed that the heavier mulches caused the berries to be slightly larger and free from grit and caused the ripening to be a few days later. Due to the mild winter there was little damage from freezing even where no mulch was applied. In fields where the rows ran up and down a slope and where the berry ridges were high the early mulch applied at the rate of two tons per acre aided materially in preventing soil washing from the heavy winter and spring rains. The unmulched and late mulched berries were earlier and this fact was a decided advantage this season. The need for this work to extend over several years of various weather conditions was pointed out.

A report of inspection of the Yellows-Free strains of Blakemore plants in cooperative trials with growers showed that none of these plantings have any yellows showing up to date. Growers who plan to plant Blakemore were urged to use only yellows-free plants of known origin.

Lexington, August 4

An interested and enthusiastic group of fruit growers from over central and northern Kentucky met at the Experiment Station Horticultural farm on Friday, August 4 for a Field Meeting. The growers from twenty or more counties were especially interested in seeing the newer hardy peach varieties fruiting. Outstanding among these was the Halehaven, a yellow freestone of high quality, ripe August 1, in the Lexington district. The Vedette, a canadian variety is also showing much promise. These varieties and others are bearing a full crop in spite of temperatures of 18° and 23° for two nights during the blooming season.

In the apples, much interest was shown in the Paducah variety which has a heavy bearing record here over a long period of years. Several of the newer introductions were also of special interest as well as some of the older varieties that are more or less generally overlooked at present. Some interesting examples of top-working and bridge grafting were seen. In the spray plots Dr. Ritcher pointed out a series that had received a nicotine schedule through the season in comparison to others that were sprayed with arsenate of lead. Rosy aphid injury that gave promise of developing earlier in the season did not develop even on the unsprayed check trees.

The Latham, red raspberry planting which is seven years old bore a splendid crop this year and the new canes for the 1940 crop were looking fine. This vigorous condition was brought about by summer bordeaux sprays and heavy applications of manure and nitrate fertilizers. Of the black raspberries the following three varieties are producing good crops, namely: New Logan, Quillen, and Cumberland. The Quillen variety is apparently the most resistant to anthracnose. The Sodus, purple raspberry is outstanding in vigor and productiveness.

The strawberry yields in general were low this year yet the Catskill variety stood out again with a very high yield.

The tour through the grounds was led by Mr. W. W. Magill. Discussions in the field were led by Dr. W. D. Valleau, Dr. P. O. Ritcher, Prof. C. S. Waltman, Prof. A. J. Olney, and Mr. W. D. Armstrong, all of the College of Agriculture.