

## The Control of Insects in Sod Culture Peach Orchards

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Looking at a map of Indiana, which shows the areas set aside for reforestation, one will observe a great number of such projects in the south-central counties. Here a large part of the land area has been eroded until it is unfit for general farming. Still more thousands of acres are being farmed in such a manner that within a few years they will be almost worthless. The growing of peaches has contributed its part toward the loss of our land.

For years growers have been taught that clean cultivation is necessary in growing peaches regardless of whether or not the land is rolling or relatively level. Accordingly, where the orchards have been planted on rough land the productive period of the land is often limited to the life of one peach orchard. However, during the last few years through studies in progress we have learned that very remunerative peach crops may be grown on land kept in sod. This work is being carried on at the Fruit Insect Research Orchard of the Purdue University Agricultural Experiment Station at Orleans, Indiana, and was undertaken in order to study its effect upon insect populations and their control.

First to be considered in growing peaches in sod is the availability of moisture and soil fertility maintenance. During the past three years Gage Elberta peaches planted in 1941 and maintained under sod culture have shown no signs of drought. Through the application of a pound of nitrate a year for each year of age of the trees in 1949 this orchard began to show evidence of too much nitrogen.

Two diseases which thrive under sod conditions in peach orchards are brown rot and scab. Brown rot especially has been a problem in sod or even weedy orchards. This is caused to a great extent by the fallen peaches which cannot be easily picked up and destroyed. Our present work is showing that if sod and weeds are kept cleaned out from beneath the trees, over the area just large enough that all dropped peaches fall on clean ground where they may be easily seen and removed, this peach disease remains a very minor one. Cutting the sod from beneath the trees only permits the growth of grass over the remaining areas of the orchard. To keep the area beneath the trees clean the ground will need to be hoed at least twice during the summer season and the drops picked up periodically. The cost of the operation in this study has been found to be 65 cents per tree for trees returning a crop which sold for almost \$14.00. Under such treatment and for the past several years not more than two sprays have been

applied for brown rot control and these have become more necessary against scab than to control brown rot.

Two insect pests which have in the past given considerable difficulty in control whether the orchard is in sod culture or not are the plum curculio and the Oriental fruit moth. Lead arsenate with plenty of lime or chlordane applied as suggested in the Indiana spray schedule will control the plum curculio very satisfactorily. The Oriental fruit moth has ceased to be a problem of importance where DDT sprays can be applied at intervals of five to six days during the third brood of the insect.

Spider mites on the peach orchard became a problem for the first time in 1949. Only one spray application of parathion applied August 2 was needed for excellent control. This spray was put on when the mite count averaged 30 per leaf. A portable Bean sprayer was used. The operator drove down each tree row and before spraying the outside of the tree he sought an open place under it and without going under sprayed the opposite side of the tree from beneath. No particular effort was made to be certain that every part of the under side was hit. However, inasmuch as this operation was carried out in each row both sides of the under part of the tree was sprayed. Examinations indicated that the mite population was kept under control.

The tarnished plant bug and pentatomids, which cause cat-facing of fruit, present what is at present the only remaining threat in sod culture of peaches. The insects which cat-face the fruit are certainly more destructive under sod conditions than under clean culture, however, the type of vegetation which surrounds the orchard seems to be more important than sod within the planting. As we have studied this problem it has been found that fruit damage is greater in years in which the fruit set is light and when alfalfa or clover instead of corn is planted in adjacent fields. Under conditions existing at this station the tarnished plant bug causes greater damage than do the pentatomids.

In 1949 thinning was finished on June 14. At that time, all the cat-faced peaches were removed. Between this date and August 6, the percentage of peaches injured by lygus and pentatomid bugs was as great as it had been before thinning time. About June 6 the dimpling caused by tarnished plant bugs stopped and from that time on points of attack on the fruit were marked by exudes of wax. Often these hardened wax exudes stand out pedestal-like a quarter of an inch or more from the fruit. In other instances the wax flattens out on the surface of the peaches and dries hard and shiny.

Caged lygus bugs were put over uninjured peaches each week beginning May 14. When they could be found, pentatomid species were likewise caged separately over the uninjured fruit. The date when the pentatomids no longer cat-face peaches is not certain because it has often been impossible to find these insects when needed for caging. Lygus bugs are rather difficult to collect and cage without injury to the insects. Often the caged bugs died the same day they were put on the fruits. Observations of insects which lived in cages one or more

TABLE I. Injury, if any, caused by caged bugs.

Date confined to cages over peaches	Lygus	caused injury	Pentatomids	caused injury
May 17	X	yes	X	yes
May 25			X	yes
May 27	X	yes		
June 2	X	yes		
June 6	X	yes		
June 14	X	yes		
July 6			X	No
July 19	X	yes		
Aug. 6	X	No	X	No
Aug. 12	X	No		

days were the only ones recorded. Table I gives the data gathered by this method.

Here the evidence indicates that injury by lygus does not occur after mid-July and that injury from pentatomids may stop as early as June 1. Field studies corroborate in some ways the cage studies.

An acre block of Gage Elberta trees planted seven rows one way and six the other were used to determine the severity of the attack by cat-facing insects. Counts were made by selecting the corner trees first. From each of these 100 peaches were examined for cat-facing injury. When these four trees were finished four others were selected. The position of the second four was two trees in from the corner ones toward the center of the block. This was repeated on two more which were at the center of the acre block. After these counts were completed, the record showed that trees which carried a very light load were not comparable with those carrying a full crop of peaches.

The following half dozen tree records show how uniformly catfacing increased in as many locations in the orchard before thinning.

Individual tree counts recorded as percent cat-faced fruits:

Counts taken May 14.....	8	7	4	13	16	9
Counts taken June 8.....	17	13	13	34	28	15

Thinning was finished on June 14. In the thinning operation every cat-faced peach was removed insofar as this was possible. A count of the number of cat-faced peaches was taken on August 16 using the same trees from which the counts of May and June had been made. The average number of peaches cat-faced per 100 each time counts were made were:

May 14	June 8	June 14	August 16
12.3	15.7	injured peaches removed	19.1

Thus it is seen that cat-facing injury in the field as in caged tests continued well after thinning time—June 8. To control this type of injury a chlordane schedule was used. Here again cages were used to determine the effectiveness of the spray on both kinds of insects and incidentally on curculio. The insects were caged over the foliage and fruit as soon after spraying as the foliage was dry. The results obtained indicate that the kill of both curculio and lygus is practically 100 percent when 2.5 pints of 40 percent chlordane per 100 gallons is used but that only about half the pentatomids die. The study shows that a higher concentration of chlordane, another insecticide or a shorter interval between sprays is needed if effective control against cat-facing is effected. Inasmuch as cat-facing injury this past season has exceeded by far any other year since our studies began and since this is the first year chlordane has been used without being accompanied by lead arsenate and lime to control curculio it may be that lead arsenate-lime combinations have in the past been responsible to some extent for the lighter attack by cat-facing insects.