# Economic Entomology.

Graduating Thesis,

by

J. W. Adams.

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K. S. A. C.

# Outline.

Introduction.
Importance of the study.
Method of Study.
"Apple tree pruners"
    Life history, and mode of working
    Method of attacking.
"Potato Stalk Borer"
    Characteristics, and work.
    Remedies (apparant)
"Canker worms"
    Wingless females.
"San Jose Scale"
    Origin
    Distribution throughout the U.S.
    Its appearance and method of work.
    Remedies. (artificial & natural)
Our insect friends.
Conclusion.

In preparing this paper it is not our intention to make it an encyclopedia of general information on the subject of Economic entomology, nor do we expect to give an exhaustive discussion of any particular branch of the subject Our only aim will be to call attention to the great and growing importance of this subject to the farming class in general and especially to the horticulturist

It is of importance because all crops have their insect pests, whose mode of development, time of appearance, and habits of feeding it is to the interest of every farmer, and horticulturist to know that he may be the better prepared to combat them and thus prevent their ravages. It is of growing importance because insects are changing their habits. Insects that formerly fed on wild plants are being forced to seek food among the cultivated plants, because of the destruction of the forest, and the breaking out of the prairie. Again it is of growing importance

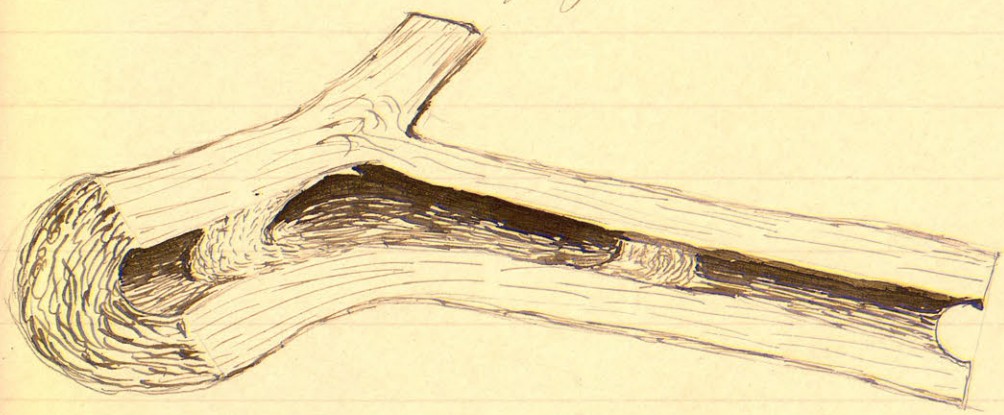
because of the greates distribution of insects due to the shipment of infested nursery stock, and fruit, and other means of transportation.

We should know of these insects that we may avoid distributing them, and that we may attact them in time to save our crops or orchards.

But economic entomology is not wholly devoted to studying ways and meahs of destroying insects without discrimination, for we have valuable allies among their ranks. With these we should become acquainted, that we may encourage and not destroy them.

The study "economic entomology," need not be a drudgery to the farmer but if properly pursued will become intensely interesting. For example we may be walking through the orchard and find the ground under a certain apple tree strewn with twigs. We pick them up and, and observe that they have been gnawed off. If we know nothing of the cause we may look to the tree for the offender.

We find the stubs from which the twigs have fallen but they show no signs of furnishing the hiding place. We then examine more carefully the fallen twig, and find a small hole in the end where it was cut from the tree. We open and find a cavity extending down the twig as shown in the figure. This is a full



size sketch of a section of a twig picked up in the college orchard.

If it be in the autumn or winter we may find hid away in this cavity a small white grub. If it is in the early spring time we may find a pupa or later in the spring, a slender dull brown beetle, sprinkled with gray spots, and having long jointed antennae

Having our interest thus aroused to this insect we go to our reference books on entomology, which every farmer and horticulturist should have in his library, and read all we can find about this insect.

We find it to be the "Apple Tree Pruner" or "Oak Tree Pruner" (Elaphidion Villosum) We find that the adult comes from its hiding place during the month of May or June. The female deposits her eggs one in a place in the axle of a leaf on a young branch. As soon as the larva is hatched it eats its way into the centes of the twig and down toward the main branch. Here it feeds on the pith working its way down toward the trunk of the tree. When the larva gets about two thirds grown it begins to cut the branch from the tree. It gnaws around until it has the branch suported by only a few fibers and the bark. It then crawls back into its hole and corks its hole with chips and fibers of wood, as shown in the figure, and then

goes on feeding on the twig awaiting for it to fall. This is where we first found him. After reading up the discription and life history of an insect at a time when attention has been thus called to it and our curiosity aroused, we can never forget the leading features of it, and we will find it a source of satisfaction as well as being of economic importance to us.

This knowing the life history of the pest the remedy becomes apparent All that is nessary is to gather the fallen twigs and burn them in early spring. If we knew nothing of the life history of the insect it might multiply so rapidly as to do great dammage, and we would be helpless to hinder it.

I suppose again we are going through the potato field, and see here and there a vine wilting down with no apparent cause. In seeking for the reason we pull up the vine

No insect can be found on the out side. On splitting open the stalk we find a small white grub to be the seat of the trouble. Again going to our books we find it to be the "Potato Stalk Borer" (Trichobaris trinotatus). In the adult state it is a small, ashen gray snout beetle about one sixth of an inch in length. The adult comes out in early summer and deposits eggs on the stalk of the potato, horse weed, gimson, ground cherry, and probably other solanaceous plants. As soon as it is hatched the larva bores its way into the stem, and works downward consuming the interior of the stalk as it goes. The larva pupates and transforms to a beetle late in the summer, but remains in the stalk until late the next spring.

In this case as with the "Apple Tree Prunes" after knowing the life history of the insect we may proceed intelligently to combat it.

It does not come within the scope of this discussion to speak in detail of the "Codlin Moth," "Cut Worm," Plum Curculio" and the hundreds of other destructive insects whose life histories read like myths and whose depradations give the farmer and fruit grower so much anxiety, but there is one feature of the "Canker Worm to which I wish to call attention as it illustrates so nicely the value of our knowing the life history of insects. The adult female of the canker worm is wingless She pupate in the ground and so must crawl up the trunk of the tree to deposit her eggs. This gives us a chance to intercept her progress by tacking a wire net around the trunk of the tree as the sketch tries to illustrate. It has been found that the moth will not crawl over this, but perish in the attempt

to get through.

Of the new insects we have to deal with, there is probably none of more importance than the "San Jose" or "pernicious scale". Bulletin No 3 New series - U.S. department of agriculture - Division of Entomology gives a complete history and discription of this scale insect, so far as it has been worked out. From it I take the following notes. Outside of the U.S. this insect is only known in three localities. These are Chili, Australia, and Hawaii. Its origin is not known. Our first knowledge of its presence was in 1870 when it was discovered in San Jose Valley, in California, whence its name. From here it spread quite rapidly until at present it is known to be in most of the fruit growing state of the west. Our first knowledge of its presence in the east was in 1893, when it it was discovered in Virginia near Charlottesville. The attention of the department of entomology at Washington was

called to it, and before the close of the following yeds it was found at many point throughout the east and South. Its head quarters was found to be in two New Jersey nurseries. It is not known to be in Kansas, but in as much as nursery stock from inffested localities has been scattered broadcast over the country it is in all probability here and the sooner we find it the better. As to the habits and appearance of the insect I will speak briefly. It infests practically all deciduous fruit trees, including many small fruits, and it works on all parts of the plant including the fruit. An infested twig appears to be covered with a grayish slightly roughened deposit.

Fortunately this scale insect is not without its insect enemies, the most important belonging to the "Lady Bird Family." It is also subject to fungous diseases. Many remedies, mostly washes to be

aplied to the infested trees have been tried with more or less success, so that the insect is not dreaded by fruit growers as when it was first discovered.

Of our many insect friends any of which would furnish material for an interesting paper, I will mention but one. This is a member of the "Pentatomidae Family". I call attention to it, not because of its greates importance but because its work has been brought so forcibly to my attention, and because I have been unable to find in book or bulletin more than mere mention of it.

In the summer of 1896, I was working with Mr. J.E. Payne on the "Rain-Belt Experiment Station", in Colorado. Early in the summer the adult "Colorado Potato Beetle" were observed to be very thick, so thick in fact that they came near destroying our potatoes before the plants got started. Seeing this great number of the beetles we naturally looked

forward to the hatching time when we expected the nine to be utterly destroyed. But much to our surprise the larvae did not appear. We found abundance of the eggs but very seldom a larva. After a time we found a little triangular red and black, or white and black bug about one half inch long and about three eighths of an inch wide, the red and white markings being in the shape of triangles, on the back, preying upon the larvae just as they hatched. By experimenting with them we found that they attacked the larva at any age before pupating. This insect has effectualy cleared that part of the country of "Colorado potato beetle.

I believe enough has been said to show the value of economic entomology to the farmer, and that the study may be made a most delightful pastime for the farmer and his boys. May the time soon come when many of our farmer boys will have a chance to study the world of life about them.