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## PRACTICAL AND POPULAR ENTOMOLOGY.—No. 6.

### THE STRUGGLE WITH THE CODLING MOTH.

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Everyone recognizes the destructive work of the Codling Moth, but everyone does not know how to fight it. Much has been written about it, for the great loss occasioned by this one insect has compelled not only fruit-growers but also governments to investigate its habits and to determine practicable methods for its control. As a result of the labours of many scientific observers, its life-history is now fairly well known, and its control is now no longer a matter of mere chance. The recent work of Slingerland and Simpson in particular has cleared up many doubtful points in its life-history, so that the careful, intelligent fruit-grower can now rely upon remedies which are practically effective.

Although the "worm" or larva is well known on account of its abundance, the other stages of the Codling Moth are still unfamiliar to most fruit-growers. This is not to be wondered at, for the moth is quite small, and is a very shy creature. Other small moths are frequently mistaken for it, and this probably explains why a few years ago trap-lanterns were thought by some credulous people to be effective agents in their control. As a matter of fact, Codling Moths do not appear to be attracted by lights, and there are but few instances on record where they have been captured by such means.

It is not many years since the eggs of the Codling Moth were first observed and noted. They are very small, and most careful observations are required to detect them. With the first brood they are found most frequently on the leaves, sometimes on the young fruit, but usually on the fruit in the case of the second brood. About ten or eleven days elapse before the young larvæ emerge. Naturally, the majority of the newly-hatched larvæ of the first brood feed on leaf-tissue. Soon, however, they find the fruit, and enter it, usually at the calyx end. The tunnel to the core, the cavity at the core, and the exit tunnel and its plug are too well known to require description. The larva lives within the apple about

twenty days before it emerges to spin its cocoon under some rude protective covering, such as rough bark, cracks, bands, etc. Six days later the larva within the cocoon transforms to a pupa, and two weeks after it has entered the pupal state the moth appears. The average duration of the first generation is about fifty days. In districts where there is but one generation in a year, the larval stage is lengthened to nearly ten months, for the winter is passed as a larva within a cocoon. Where there are two generations the moths emerge in August to deposit eggs on the apple for the second brood of larvæ, which work throughout August and September in the developed fruit. This second brood of "worms" is more destructive than the first, as their ravages are committed on the later and more valuable fruit, often after it has been picked and stored.

From the standpoint of the control of the Codling Moth it is important to know definitely when the moths deposit their eggs, and when these eggs hatch. The observations of many competent entomologists indicate that the egg-laying period may extend over several weeks with both generations of moths.

When we consider the problem of the control of the Codling Moth we must emphasize the importance of these lengthened egg-laying periods, more especially when we bear in mind the habits of the larvæ. It is clear from what has been stated, that the early larvæ may be killed by poisoning the leaves, and by placing poison in the calyx end of the apple; and the second brood may be killed by the spraying of the fruit, for the eggs of this brood are, as a rule, deposited on the fruit.

Experiments carried out both in the East and the West show that a very large percentage of worm-free apples is obtained when two sprayings are made for the first brood of larvæ, and one for the second brood when it is present: the first spraying a few days after the petals fall; the second two or three weeks later; and the third about the middle of August in ordinary seasons. Slingerland lays great emphasis on the first spraying for Eastern conditions, while Simpson is of the opinion that the second spraying is most effective for Western conditions.

A very important factor in successful spraying is the arsenical mixture used. Paris Green has for many years been used successfully by careful sprayers, but with very indifferent results by careless sprayers. If not carefully mixed and agitated Paris Green settles rapidly to the bottom, and much of it will remain at the bottom of the spray barrel when the solution is all sprayed out.

Arsenite of lime, arsenite of soda, and arsenate of lead are now recommended in preference to Paris Green. They are much cheaper and more effective, since they mix readily in water or Bordeaux Mixture.

In the matter of orchard practice the Arsenic Compounds should always be used along with Bordeaux Mixture, to form a combined fungicide and insecticide against both the Apple Scab and the Codling worm. In small orchards a good hand-power spray-pump is all that is needed to apply the solutions, but in large orchards "power-sprayers" are strongly recommended. The high pressure which is developed allows the use of two lines of hose operating 8 to 12 nozzles. With such an outfit the time required to spray even a very large orchard is reduced to a minimum. Besides, the fineness of the spray leads to more effective work.

The presence of the San Jose Scale, the Grape Rots, the Apple Scab and the Plum Rot in the fruit-regions of Ontario has compelled our fruit-growers to spray. As business men they have been forced into the use of power-sprayers, and this year has witnessed the introduction of the power-sprayer, with the abandonment of the hand-power outfit as a "back number."

As an aid to spraying for the control of the Codling Moth, banding of trees is still practised in many sections. Although this method is quite effective when it is properly looked after, it is worse than useless—it is actually harmful—when the bands are not examined regularly every ten days through June and July for cocoons. Moreover, banding is an expensive treatment when the time required for the fixing of the bands in place, and their examination every ten days, is taken into consideration. It might be preferable to give an additional spraying instead.

There are some remedies which are of little or no value. Simpson places the following remedies in this class: Moth balls hung up in trees; smudging with ill-smelling compounds; plugging the trees with sulphur; plugging the roots with calomel; trap-lanterns; and baiting the moths with vinegar and molasses.

The fruit-grower is aided greatly in his struggle with the Codling Moth by several friends. Our birds especially are great helpers. The Chickadee, the Downy Woodpecker, Nuthatch, Bluebird, Swallows, Sparrows, and Wren, are all valuable, and their presence in the orchard is very desirable.

There are also several minute insects which prey upon the Codling Moth.

Finally, besides all this, the fruit-grower can do much to lessen his losses by what is known as clean farming. This is shown in the appearance of his orchard, as a result of pruning, removal of rubbish, careful cultivation, and manuring. By such means he may increase the productiveness by securing better fruit, free from scab and worm-hole.

#### A NEW CECIDOMYIID ON COTTON.

BY D. W. COQUILLETT, WASHINGTON, D. C.

During the past winter Dr. L. O. Howard received specimens of a Cecidomyiid from Sir Daniel Morris, Director of the Imperial Department of Agriculture for the West Indies, with the statement that the larvæ live in the cambium layer of cotton plants. Up to the present time no representative of this family has been recorded as depredating upon cotton so far as I am aware, and at the request of Sir D. Morris the species is duly characterized herewith:

*Porricondyla (Epidosis) gossypii*, new species.

Antennæ of male longer than the head and body together, composed of about twenty-one joints, of which the first two are sessile and scarcely longer than wide, the remaining joints, except the last one, with a bulbous basal portion bearing a whorl of bristly hairs and a narrow apical part, the latter being slightly shorter than the thickened part of each joint. Antennæ of female about two-thirds as long as the head and body combined, composed of twenty-six nearly sessile joints, the first two joints somewhat conical, the others constricted in the middle, the third joint the most strongly so, each succeeding joint less constricted. Wings hyaline, third vein (the apparent second vein) strongly curved and ending below the extreme tip of the wing, small crossvein very oblique and weakly sigmoid. Colours yellow, the sternum and greater part of mesonotum brown, head blackish, antennæ of female and the enlarged portions of those of the male brown, the constricted portions of the male antennæ white, legs dusky-whitish. Length, 1.5 mm.

Described from several dry and shriveled specimens of both sexes. Type No. 8399, U. S. National Museum. From Barbados, West Indies.

The full-grown larvæ are yellowish-white, the median portion chiefly orange-red; the skin is smooth except on the under side, where there are many minute tubercles arranged in about six irregular transverse rows on the median portion of each segment. The breast-bone is yellow, cylindrical, and with a small knob at the anterior end. The larvæ live beneath the bark of cotton plants, without forming galls.

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