THE CORN EARWORM

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In discussing methods of controlling the corn earworm, it is important to know the type of infestation that exists in the area. It is well known that heavy infestations of earworm are much more difficult to control than are light infestations. For example, prior to 1956 in the Yakima Valley, we normally practiced no control whatever on the first half of the harvest schedule. Two applications applied during the silking period proved sufficient to control the worms in the latter half of the schedule. By contrast, the earworm has become so much more severe that now it is necessary to begin control measures with the very first planting of corn and by mid-season it takes a four-application program to achieve anything like a satisfactory degree of control. I feel that the main reason for this increase in infestation in the Yakima Valley has been the large increase in the field corn acreage in the last five years. There is approximately ten times the acreage of field corn in the area now than was grown prior to 1955. Since earworm control is rarely practiced on field corn, its effect is to act as a vast rearing system to develop generation after generation of earworm moths into the Valley. Our moth catches in black light traps have similarly increased at least five-fold, in the last five years.

Considering the type of damage caused by the earworm and its effect on the product used in canning and freezing, the injury is primarily of three types: tip injury, side entry, and cobs with few or no kernels. This type of damage is the result of reduction in pollination by worm feeding which clips silks while the ear is in an immature stage. The latter type of injury is of course, the most severe and is probably the most easily prevented by applications prior to silking time. The elimination of tip injury is the most difficult to prevent entirely.

The corn earworm over-winters in the Yakima Valley and probably Columbia Basin, in considerable numbers which is different than most of the corn growing areas of the United States. Its life cycle is something like this: It over-winters in the pupal stage, emerges as a moth in late April or early May, which lays eggs that hatch into the first generation larvae that feed undoubtedly on weeds. The larvae become full grown in three or four weeks, go down into the ground where they pupate and the second generation moths emerge in mid-June. These moths mate and lay eggs, usually on corn tassels, and the generation of larvae that hatches is commonly referred to as tassel worms. This cycle is repeated at least twice more so that we have three and possible a partial fourth generation in this area. Since each moth has been known to lay between 500 and 1,000 eggs, it is not hard to see how the tremendous moth population can develop by the third generation in this type of increase.

The most vulnerable stage in this life cycle from the standpoint of cultural practices, is the pupa at the bottom of a silk limed tube from three to six inches below the soil surface. Without distrubance, the moth can readily emerge from this tube to proceed with its life cycle. Most any type of cultivation such as disking or plowing destroys this tube and prevents the rather fragile moth from emerging. Since fall plowing is a common practice for corn growing in this area, it is assumed that a vast majority of over-wintering pupae are destroyed in this manner. The only one surviving would be those in the ditch banks, field margins, and other areas not disturbed. In mild winters it is conceivable that some of the pupae would end up near the soil surface so that the moth could get through the light layer of soil and escape that way. However winter temperatures approaching zero probably destroy these surface pupae. Birds normally account for their share of these pupae that are disked up near the surface also. Actually the combination of the fall plowing, freezing, and bird predators, normally destroy most of the over-wintering pupae, which leaves a very low population of earworm moths to emerge in the spring.

Their normal ability to increase, however, explains their overwhelming numbers in late August and September. It has been calculated that the survival of one moth per acre whose offspring goes through three succeeding generations, would be able to provide enough moths to deposit at least one egg on every ear of corn on that acre. The eggs themselves are most easily observed in the latter part of the season when they are normally more common. They are about the size of a pinhead, being somewhat pumpkin shaped and with striations or markings similar to a pumpkin. Eggs are usually laid on the corn silk, but late in the season they may be found anywhere on the plant.

At the present time there are only two chemicals that have shown a practical usage for earworm control and these are DDT and Sevin. Two others that are less effective but registered for this use are Malathion and Diazinon. Sevin is slightly more effective than DDT at the same concentration when applied as dusts by ground equipment. More impressive however, is the fact that Sevin applied by air is almost as effective as the same amount applied by ground. By contrast, DDT applied by air is practically useless for earworm control. The ability of Sevin to function by aerial application is just one of several advantages of this material. Ground equipment is expensive, has limited use for other purposes, and is difficult to operate in irrigated fields. Sevin has the added advantage of being fully cleared for foliage used on alfalfa, pasture, and other dairy feeds. This is of considerable value where corn is grown adjacent to pasture and alfalfa fields as it frequently is.

The methods of control vary with the type of infestation from early to late season and the timing has to be varied with the temperature. In the early part of the season when the infestation is light, it is not unusual to get good control with two applications spaced six or seven days apart. Later in the season, however, when the infestation builds up, it is necessary to apply a pre-silking application to prevent the tassel worms from entering the ear. This would have to be followed with two and eventually three more applications spaced four and five days apart to make sure there is an adequate cover of insecticide on the emerging silks. Since it takes from three to five days for the earworm egg to hatch, the interval between applications must necessarily be geared to hatching time. It is common practice to stretch this interval one or possibly two days and gamble on a low percentage of worm entry in the interests of economy. Obviously, a three-day interval would provide maximum protection but with the type of infestation encountered in Eastern Washington, this would mean five to eight applications which is not economically feasible. Actually, the degree of control attained should be a blend of worm-free ears obtained by field control and a moderate number of wormy ears to be trimmed at the plant. This ratio is reasonable because some trimming is always necessary because of bird feeding, misshapen ears, etc. There is little doubt that four applications of Sevin is pushing the cost of earworm control to the point that the economics of corn growing in Eastern Washington are severely strained.

In conclusion, I would like to emphasize the point that in my opinion, earworm control is more of an art than a science. There are too many variables to be considered to set up a definite program as being workable at any and all times. I realize this statement is of little comfort to anyone contemplating the problem for the first time. That this is a fact is, I believe, verified by reviewing the history of earworm research. Through the years, the earworm has been one of the most expensive insects in the world because of its heavy damage to corn, cotton, tomatoes, and other crops, and the tremendous amount of money appropriated for studies of control methods on this variety of plants.