Insect pest - the potato moth

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THE POTATO MOTH
(Gnorimoschema operculella, Zell.)

The potato moth is almost a world-wide pest and one which under favourable conditions can cause great havoc to both growing and stored potatoes. The term “potato fly” is almost universally applied to this pest by growers, but the insect is a true moth and so the name fly is quite inaccurate.

The adult moth is an inconspicuous creature measuring only a little over $\frac{1}{4}$ in. across the spread wings. The front pair of wings are grey and slightly speckled with darker markings. In some lights they exhibit a distinct metallic sheen. The hind wings are a uniform light grey and fringed with extremely fine hairs.

LIFE HISTORY
From 100 to 300 tiny white eggs may be laid by each female and, under field conditions, these will be laid on the underside of the leaves or upon exposed tubers. The eggs may take from five days to several weeks to hatch according to weather conditions.

The fully-fed caterpillar is pale greenish-white in colour, measures a little over $\frac{3}{4}$ in. in length and takes about 17 days under favourable circumstances to reach the pupal stage. Before pupating, the caterpillar spins a light silken cocoon and these cocoons may be located, according to whether potato tops or tubers are infested, either in curled dry leaves, protruding from feeding tunnels, in the eyes of potatoes, attached to the sides of bags in which potatoes are stored or under clods in the field. The length of the pupal period is a little over a week under good conditions, but may be protracted for a month or more.

Fig. 1.—Potato Moth (magnified six times)
Photo, Virginia Experiment Station Bulletin.

TYPE OF INJURY
In Growing Plants.
In the case of foliage infestations, the young caterpillars quickly eat into the leaf and feed between the upper and lower surfaces causing colourless parchment-like
Fig. 2.—The upper picture shows potato leaflets showing various stages of "mining" by potato moth caterpillars. In the lower picture, terminal injury to young potato plants is shown.

Photo, Virginia Experiment Station Bulletin.
patches to appear. From the leaves, the caterpillars may work down the leaf stalks into the stems causing various portions of the plant to wilt and die.

In Tubers.

When tubers are attacked, the caterpillars usually commence working near an eye and the first indication of trouble is often the appearance of black specks of excreta in this region. When the attack is of some standing, irregular worm-like tracks may be seen beneath the potato skin showing the feeding movements of the caterpillars, and the cutting of the tuber will reveal deep tunnels running in all directions.

HABITS AND SEASONAL OCCURRENCE

The potato moth is nocturnal in its habits and so is often overlooked when light infestations only are present. In the field, the eggs laid are mainly upon the growing tops, but if any tubers are exposed or any deep cracks allow the moths to penetrate the soil, then the developing potatoes may be attacked.

It is undoubtedly during dry summer conditions that the potato moth is most destructive for it is then that the life cycle is completed most quickly and that the dry, cracked soil provides the most ready access to the subterranean portion of the plant. Not only will the moths enter cracks in the soil in search of tubers, but when through drought and "grub" attack, the potato tops wither and die, the caterpillars will leave the drying foliage and crawl under the clods to attack the crop waiting to be dug.

CONTROL

In the Field.

Cultural Methods.

Tubers should be planted as deeply as possible so that, in the event of soil cracks, moths and caterpillars will not have easy access, and so that developing tubers will not break surface as they grow and mature.

The constant hoeing and cultivation of the ground and the hilling up of the soil along the rows will also prevent cracking and keep the tubers well protected. A plentiful water supply is probably the main cultural factor in checking the pest, for moist soil seldom cracks and offers considerable resistance to penetrating "grubs" or moths and is usually favourable to sturdy plant growth.

For the foregoing reasons it is mainly summer grown potatoes that are severely attacked. Cold moist soil is so detrimental to the development of the pest, that even when infested tubers are planted under such conditions, little fear of subsequent losses need be feared.

Chemical Treatment.

The growing crop should be sprayed or dusted with DDT as soon as moth activity is observed. A bad infestation of caterpillars in the tops will not only affect adversely the general growth of the plants and so reduce the yield but will also provide large numbers of grubs to attack the tubers as they lie on the ground after digging. Dust or spray preparations may be used to treat field crops. If dust is used, a 2% mixture is recommended at from 25 to 50 lbs. of dust per acre, depending on the size of the plants and the severity of the infestation. Where a spray mixture is applied, a 0.1% preparation is suggested at up to 100 gallons to the acre. If a low volume spray unit is used, however, a good cover can be obtained with 10 gallons. If a 20% DDT emulsion is used for low volume spraying, 2 pints of emulsion per acre will be required for a ½ lb. application of actual DDT. The emulsion can be diluted in accordance with the output of the spray unit.

Where large plants are badly infested with moth or conditions are favourable for moth breeding, treatments, whether dust or spray, should provide for 1 lb. of actual DDT per acre. On small plants and where infestations are light, less DDT may be effective.

In Store.

After being dug, potatoes should be bagged and removed from the field as soon as possible. If they must be left out overnight, the bags should be sewn and turned upside down to make it increasingly difficult for wandering moths to reach the tubers. On no account should potato tops be used as is so often the case, to cover the mouth of the filled bag awaiting sew-
Fig. 3.—Left: Severely infested tuber cut to show potato moth larvae in tunnels. Right: External view of potato moth injury. (Magnified by two.) Photo, Virginia Experiment Station Bulletin.

ing, for caterpillars will quickly leave the wilting foliage and crawl down to be a future trouble in the stored potatoes.

The tubers may be dusted in store with 2% DDT or proprietary derris dust.

How to Dust Tubers.

(a) Dust the empty bag on the inside either by means of a dusting machine or by hand, and as the tubers are introduced further puffs or handfuls of dust should be added. Using this method, up to ½ lb. of dust is required per bag.

(b) A convenient method of applying dust is to gather potatoes into a bucket before bagging. An ounce of dust should be placed in the bottom of each tin, and as each bucketful is tipped into the bag the dust will be spread through the tubers. A few ounces of dust should be sprinkled into the mouth of the bag before sewing.

(c) When the tubers are dug and whilst lying on the ground they may be covered with a film of dust applied by means of a hand dusting machine at the rate of 20-25 lbs. per acre. The potatoes may then be bagged in the ordinary way.

The storing of potatoes in bags previously dipped in 2% D.D.T. emulsion and allowed to dry will also reduce the chance of moth infestation.

Important: Do not use a DDT dust stronger than 2%.

Do not use BHC or “Gammexane” dust, or composite dusts containing BHC, as this material may taint the tubers.

Residue Hazards.

Tests carried out in conjunction with the Department of Public Health and the Government Chemical Laboratories have shown that no dangerous residues will be present on potatoes treated in accordance with the above instructions.

Fumigation.

Where a severe infestation is feared in stored potatoes the tubers may be fumigated in any gas tight container such as a tank, room or drum, with carbon bisulphide. The liquid fumigant gives off a heavier-than-air gas and so should be applied to the top of the potato stack. Pieces of bagging soaked in the liquid may be placed on the stack or the fumigant allowed to evaporate from shallow trays. The amount of fumigant required is 2 lb. per thousand cubic feet of space or for small lots about two tablespoonsful to the bag. If serious gas leakages are suspected, then more fumigant should be used. The potatoes should be kept sealed for at least 24 hours. If treatment is being given in the summer months and a tank or drum is being used, a shady spot should be chosen otherwise the potatoes may be scorched and “cooked” by the heat.
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