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Home College Series.

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INJURIOUS GARDEN INSECTS.



By BYRON D. HALSTED, Sc.D.

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And what a young man may do in this respect, a young woman, and both old men and old women, may do.

NEW YORK, Jan., 1882.

J. H. VINCENT.



## INJURIOUS GARDEN INSECTS.

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A MORE extended knowledge of the noxious and useful insects is an urgent need of the every-day farmer and gardener. There are annually destroyed by insect foes hundreds of millions of dollars' worth of field and garden crops that might be in large part saved by a more familiar acquaintance with the habits of these pests.

Successful farming is a continuous warfare with bugs and beetles, borers and grubs, worms and maggots. A noted writer says: "If he that makes two blades of grass to grow where only one grew before is a benefactor to mankind, he that protects both from needless destruction is not less a benefactor. Therefore, while it is not within the power of man to wipe injurious insects from the face of the earth, he may limit the destruction of property they cause; and it is to the farmer's interest, and is his duty, to wage a united war against them, knowing no to-morrow in its prosecution, but killing and destroying wherever and whenever possible, and employing every means in his power."

Insects in their perfect forms are distinguished from all other classes of related animals by having six legs, and usually, but not always, wings. The body of the insect, as a butterfly, bug, or beetle, is divided into three parts, namely: the *head*, in which are the organs of sight and other senses; the *thorax*, or middle part of the body, to which the legs and wings are attached; and the *abdomen*, or third and rear division, containing the organs of reproduction. The more highly developed insects have four quite distinct stages in their existence. The first is the *egg*; second, the *larva*, or "worm" state; third, the *pupa*, or chrysalis condition, when the insect is usually inactive; and last the *imago*, or perfect.

insect. The egg state is usually of short duration, hatching, in some species, being accomplished within a few hours after the eggs are deposited, while the eggs of other species require weeks and months for hatching. Many kinds of farm and garden pests pass the winter in the egg condition, among which the tent caterpillar, that defoliates the orchards so rapidly in spring, is a good example. The eggs of this insect are deposited in clusters on the small twigs, in the form of a band, and may be seen in this condition on any winter day when the trees are free from snow. In fact, this is the best time to seek the glistening rings of eggs, and destroy them before they hatch out into the greedy worms or caterpillars. Unlike most other forms of eggs, those of insects are not easily injured by extremes of heat and cold.

The next stage of the insect bears several names, depending somewhat upon the order to which it belongs. They are all *larvæ*, but those of beetles are usually called *grubs* or *borers*. Thus the larva of a may-beetle is the white grub, so injurious to the lawn and garden. The apple-tree borer is the larval state of a beetle, etc. The *larvæ* of the moths and butterflies are frequently called caterpillars or worms. Thus the army-worm is a state of a moth, as is likewise the canker-worm and hosts of others. The larva is the growing stage of the insect, and usually during this state it eats voraciously, and when feeding on any farm or garden crop may do much destructive work.

After the larval stage is passed the insect goes into the pupa state, and remains dormant for a time. Many injurious insects descend from the trees and other forms of vegetation, and go under-ground to pass the inactive state of pupation. From this condition the mature or perfect state of the insect comes forth, and the cycle of changes or transformations is completed.

With this as a brief and general view of the structure and nature of insects, let us pass to the consideration of some of

the more destructive pests of the vegetable garden. First in the alphabetical order of the plants—*crioceris asparagi*—infested is the beetle that feeds upon the asparagus. This insect came from Europe, and was about twenty years ago introduced into the United States, where it has since caused the loss of many thousands of dollars to the growers of asparagus on Long Island and other localities. The beetle is of a deep blue color, with a brick-red, central body. The “worm” is of a dull ash color. The beetle passes the winter under loose bark, etc., and soon after the asparagus starts to grow in spring it comes out and lays the first brood of eggs. These eggs hatch in about a week, and the first brood of “worms” are at work by the middle of June. They feed on the younger parts of the stems first, and if these are not sufficient the whole asparagus plant suffers. About two weeks later the larvæ or worms descend into the ground, and there pass into the inactive or pupa state. From these cocoons a brood of beetles appear, which lay eggs and produce a second crop of worms in mid-summer. The beetles from these worms come out in September, and with them the two cycles of transformations during the season are completed. Those asparagus growers who have had the most success in destroying this pest recommend hoeing up all the young seedling plants upon the asparagus bed in early spring. This forces the mother beetles to lay their eggs upon the old shoots, and as these are soon cut no eggs are left to hatch out. If it were not for the asparagus, that has run wild in many localities, it would not be a difficult matter to eradicate this insect. It is evident that the wild asparagus should be cut down and rooted out.

The Bean-weevil (*Bruchus fabæ*) causes much trouble to the market-gardener. This is an American insect, and is wide-spread throughout the Union, doubtless feeding upon many sorts of wild beans or plants closely related to the cultivated sorts. The larval or worm-state of this insect

much resembles that of the weevil infesting the pea, to which it is closely related. The parent beetle deposits her eggs upon the outside of the young pod; the grubs, when hatched, eat their way into the young beans, where they live, destroying the material stored up for the nourishment of the future bean-plant. When the grub first enters the bean it cuts a hole close up to the skin or hull of the bean to prepare the way for the escape of the weevil. When the grub has reached its full size it goes into the pupa state, and remains dormant until spring, and usually makes its escape about planting-time. Often as many as a dozen eggs are deposited by the mature weevil in a single bean. The germ of the buggy-bean is usually left untouched, and will grow, though only feebly, because deprived of its necessary food. We have seen beans that were covered with mature beetles in the fall, but it is unusual for the weevil to make its appearance until the following spring. There is but one help for this serious pest, which is for all gardeners in a neighborhood to plant sound beans. It is a matter in which individual effort can do but little. One person may plant only sound beans, while a neighbor who is less careful will supply him with an abundance of weevils. This is a case where co-operation among farmers would help greatly. If all resolve to plant no buggy-beans, the evil, if not entirely checked, would not increase at its present rapid rate.

The cabbage is the next insect-infested plant on the list of garden vegetables, and it is troubled by a number of species. The first of importance are the Cabbage Butterflies. These are easily recognized by the wings being generally white, green, or yellow underneath, and broad and entire on the edges. The caterpillars are cylindrical and sparingly clothed with short hairs. The Rape Butterfly (*Pieris rapæ*) was introduced from England about twenty-five years ago, and has become thoroughly naturalized in this country. The larvæ or "worms" are an inch and a half long, pale green,

with a yellow stripe on the back. The eggs are laid on the under side of the leaves, and the worms bore into the heart of the cabbage and do much damage. The insect hibernates in the pupa state. The second brood of butterflies appears in June, and the worms pupate in September, and remain in this state until the following spring. The butterflies of this cabbage pest often occur in large numbers. A case is on record of the sun being obscured for a distance of many hundred yards in the middle of the English Channel by the flight of these butterflies from France to the British Isles.

A second cabbage pest is known as the Pot-herb Butterfly, (*Pieris oleracea*), and closely resembles the one already described. To destroy either of these insects one must take advantage of their habits. By placing boards among the infested cabbages a short distance from the ground the caterpillars may be caught as they descend to pass into the pupa state. The butterflies are slow fliers, and may be caught with nets. A wire hoop with a bag of mosquito netting, fastened at the end of a long handle, is quickly made, and in the hands of children will catch many of the mature insects as they fly about the cabbage field. One female thus secured means the destruction of a large number of eggs. To kill the worms that are already at work pyrethrum powder has been used with satisfactory results. This substance is not poisonous to man, like Paris green, and can be used with safety. Some have found hot water most effective. The cabbage plant will bear without injury for a short time water hot enough to destroy the worms. The temperature should be 160 degrees, and as the water will cool during the application allowance should be made for this.

There are many other insects injurious to the cabbage. A noted writer on insect pests says: "No sooner are the young cabbages above ground in the seed-bed than they are often attacked by several species of flea-beetles. By these jumping little pests the seed leaves are frequently riddled so full

of holes that the life of the plant is destroyed; and they do not confine themselves to the seed leaves, but prey to a considerable extent also upon the young rough leaves. After the plants are set out the larva of a very small insect is found upon the roots, in the form of a tiny, elongated, six-footed worm. Through the operations of this subterranean foe the young cabbages, especially in hot, dry weather, often wither away and die; and even if they escape this infliction, there is a whole host of cut worms ready to destroy them with a few snaps of their powerful jaws; and the common white grub, as we know by experience, will often do the same thing. Suppose the unfortunate vegetable escapes all these dangers of the early period of its existence, at a more advanced stage in its life the stem is burrowed into by the maggot of the Cabbage-fly, (*Anthomia brassicæ*), the sap is pumped out of the leaves in a stream by myriads of minute plant-lice covered with a whitish dust, and the leaves themselves are riddled full of holes by the tiny larvæ of the Cabbage Tinea, or devoured bodily by the large fleshy larvæ of several different owl-moths."

The Striped Beetle annually destroys thousands of dollars' worth of cucumber vines in the United States. The mature beetles make their appearance early in the season, and at once commence their work of destruction. By crawling through the cracks in the earth, made by the sprouting seeds, they reach and destroy the young cucumber, melon, and squash plants before they reach the surface of the soil. Soon after the vines that have escaped the beetles get well to growing they suddenly begin to wilt and die. When the roots of these are examined they are found pierced with small holes. The author of this mischief is a little white worm about a third of an inch long. These worms are the young of the striped beetle, so troublesome on the young plants shortly before, and were hatched from eggs deposited near the roots. After a month of eating, the worms retire to the

earth and make smooth, walled cavities in which they pupate. In about two weeks the mature beetle comes forth. There are two or three generations or broods each year. A large number of remedies have been used, but there is none better than inclosing the young vines in small boxes covered with mosquito netting or light cloth on the top. Some make light lath frames, covered with netting. Paris green may be sprinkled on mixed with flour, or white hellebore may be used. If the beetles are kept off there will afterward be no worms at the roots.

The Pickle-worm (*Phacellura nitidalis*) is the young of a moth, of a yellowish brown color, and is indigenous to our country. The worm begins its destructive work in mid-summer by boring cylindrical holes into the cucumbers. This causes the fruit to soon rot. The worms are gross feeders, and come to full growth in three or four weeks. When about to transform they leave the cucumbers and spin a white cocoon in some out-of-the-way place, where they pass the winter, though some of the moths appear in late autumn. The vines should be looked over in early summer, and the worm-eaten fruit picked and fed to swine, or the pests destroyed on the spot.

The Melon-worm is not a new comer, having been described as a native of this country over a hundred years ago. The worms are of a yellowish green color, about an inch and a quarter in length. They feed upon the leaves, vine, and young fruit, causing destruction wherever they go. They coil up the leaves by means of a web to form a shelter where they undergo their transformations. The number of broods in a season is not known, but it is ascertained that the insect winters in the chrysalis state. As a remedy it is best to plant the melons as early as possible, so that they may ripen and be out of the way of the most destructive brood. The use of insecticides and hand-picking are the leading remedies.

The Onion-fly (*Ortalis flexa*) was first described in 1830.

This pest is black with white stripes, and about one third of an inch in length. There are two broods. The maggots destroy the onions, reducing the bulbs to a rotten mass. A worse pest is the Imported Onion-fly, (*Anthomyia ceparum.*) This fly deposits her eggs in May or June on the leaves while the plants are small. The maggots soon hatch and work their way down to the base of the bulb, where they feed for about two weeks and then leave the onions and turn into the pupa. A second brood soon issues to lay eggs, and continue the destructive work. Onions that are attacked soon turn yellow, and should be removed at once from the bed. If this is thoroughly done it will dispose of the maggots that would, otherwise, soon develop into the second brood of flies. The infested onions should be lifted carefully with a knife and burned. There is but little use of applying an insecticide.

The squash and pumpkin belong to the same family of plants with the cucumber and melons, and most of the insects that infest one are found on the others. The Squash-bug appears about the first of June. The mature insect is about half an inch long, rusty black above and ochre below. This insect gives off a characteristic odor when handled, which some have likened to that of over-ripe pears. We have never smelled of a pear so over-ripe as to approach the repulsiveness of the squash-bug. The bugs remain quiet during the day, but at night deposit their eggs by gluing them in patches on the leaves. The eggs soon hatch into young bugs of a pale ash color and rounded shape. They change their skins several times before they reach maturity. In all stages of growth the bugs puncture the squash leaves with their beaks, extracting the juices and causing the foliage to turn brown and finally to die. This pest is readily kept under control by hand-picking. The bugs that first come from their winter quarters should be destroyed before any eggs are laid. The eggs are large and laid in conspicuous patches, and if crushed



the trouble is met before the mischief is done. Further hand-picking will keep the vines from being seriously injured.

There is a Borer (*Egeria cucurbitæ*) that destroys vigorous squash vines after they have made considerable growth. This borer is closely related to that of the peach-tree. The female moth deposits her eggs upon the vine near the root, and the young borers soon hatch, and penetrate to the interior of the stem, when they eat away so much of the substance as to cause the death of the plant. The work of this pest is so hidden from view that its presence is not known until the mischief is done. Among methods of capturing the insects is the placing of sheets of sticky paper about the vines to catch the moths. If the borers are found while still young they can frequently be cut out and not materially injure the vine. It is well to draw the earth up closely around the lower part of the stem, upon which the eggs are deposited when this portion is exposed.

The tomato comes next in the list of garden vegetables. This belongs to the same family with the potato, and is attacked by several of the same insects. These will be treated under the latter. The Cut-worm (*Agrotis telifera*) destroys many tomato plants when they are first set out. Wrapping a piece of paper around the lower part of the stem of the plant, the lower edge reaching below the surface, and the upper extending an inch or more above it, will prevent the attacks of this greedy grub.

The caterpillar of the Boll-worm, so injurious to the cotton-plant and Indian corn, proves a great pest to the tomato in the Western States. It eats into the green fruit and causes it to rot.

The leading insect enemy to the leading garden crop is the Colorado Potato-beetle, (*Doryphora 10-lineata*.) This pest is so well known, both as to its habits and destructive power, that little need be said on these points. At the time of the discovery of this insect by Mr. Say, a zoölogist to a govern-

ment expedition in the North-western Territories in 1819, it was little thought it would become the great enemy of the potato fields in all sections of the country. It was there confined in its feeding to some kinds of wild plants that are closely related to the potato. In 1861 it was reported as being troublesome to the potato in some parts of Kansas, since which time it has traveled eastward until it reached the Atlantic coast a few years ago. It was not a migration, as is the case with some insects, but a simple spreading. Having found a new feeding-plant in the Irish potato, it readily spread from one section to another where this plant is cultivated until it is now wide-spread. The last brood of the beetles pass into the soil and hibernate until spring, when they come forth and the females deposit their orange-colored eggs in clusters upon the under-side of the potato leaves. The eggs hatch in a few days, and the young "bugs" begin at once to feed voraciously upon the surrounding foliage. After about two weeks the fat and greasy grubs descend to the earth, or under sticks or stones, and remain for about ten days, to come out perfect beetles. From two to four broods are produced during the season, so that there is almost a constant supply of the "beetles."

The remedies for the potato-bug are numerous. Scores of substances have been used, but Paris green and London purple are the most effective. These compounds of arsenic are used in both the dry state and mixed with water. One pound of the powder, mixed with twenty of flour, and dusted on the foliage when wet, is a sure remedy. It is generally considered better to stir the poison, a tea-spoonful to a pailful, in water, and apply the mixture with a watering-pot. As the poison is not soluble, it must be stirred up frequently to keep it from falling to the bottom of the vessel. Kerosene has been successfully used as an insecticide for the scale insect in orange groves, and it may be it will prove as effective in the potato field. A cheap grade of the kerosene is

made into an emulsion with sour milk, and applied in a spray, much diluted.

There are several natural enemies to the potato-beetle that tend to keep the pest reduced in numbers. Among the leading of these are the lady-birds or lady-beetles, tiger-beetles, and a mite, (*Uropoda Americana*.) This mite sometimes occurs so abundantly as to completely cover its victim, and it soon perishes.

The Potato Stalk Borer (*Gortynia nitida*) burrows in the larger stalks of the potato, and also in the stems of other plants, as the dahlia, aster, etc. It is fond of the cocklebur, and it would be considered a friend if it worked on this vile weed alone. The borer leaves the potato stalks in July and descends into the ground, when it passes into the pupa state. The moth or perfect insect comes forth in August or September, and passes the winter in some secluded place. When a vine is found wilted it should be examined, and the borer killed.

The Potato or Tomato worm is a well-known injurious insect of the garden. This worm is over three inches long, and bears beautiful markings across the body, and a peculiar tufted horn on its tail. Many persons are afraid to handle these larger worms from an absurd idea that they can sting. When full-grown, in mid-summer, the worm burrows in the ground and pupates. The pupæ are frequently plowed up in old potato land. The peculiar jug-handle appendages at one end is not the tail, but the tongue-case, and contains the long, pliable tongue which the future large and beautiful moth will use in extracting the nectar of flowers on warm summer evenings. The wonderful transformations of insects are here fully exemplified! What are more unlike than the fat, sluggish tomato caterpillars, that voraciously eat the coarse herbage of the potato and allied plants, and the richly colored moth that feeds only on the sweets of flowers?

The presence of the worms is known by the bare stems

they leave and their abundant droppings upon the ground. They should be looked for frequently, and crushed when found. There are some valuable natural enemies; among these is a fly, the larvæ of which, after feeding within the tomato-worm, come to the surface and spin small, white cocoons. Sometimes these are so numerous as to cover the enfeebled caterpillar.

The sweet potato is not attacked by many insects, and these belong almost entirely to the group known as Tortoise-beetles. These beetles are nearly all oval and flat, with the wing covers extended in a manner to at once suggest the shape of the turtle or tortoise. Some of them possess most brilliant metallic colors, and the peculiar power of changing these rich and beautiful tints. The eggs of the Tortoise-beetles are deposited singly upon the leaves of the sweet potato. They are very irregular in shape, usually being furnished with spines.

The most common species found on the sweet potato is the Two-striped Beetle, (*Cassida bivittata*.) The larva is a dirty, yellow white in color, and a quarter of an inch long. After having fed for its natural length of time, it attaches itself to the undersurface of the leaf and pupates. Next to the above, the Golden Tortoise-beetle (*Caurichalcea*) is most common on the sweet potato. This species is a pest on the closely related morning-glory vine and other allied plants. These beetles can be destroyed with Paris green or London purple used as for the Colorado potato beetle, but as they feed on the under surface of the leaves it is not so easy to reach them with the poison. Great care should be exercised when setting out the sweet potato plants that none of these beetles are left to do any damage. It would be well to look for the Tortoise-beetles at the time of hoeing, and kill all that are found.

Among the general insect pests of the garden with omnivorous tastes are the sly nocturnal Cut-worms. They have the

well-known destructive habit of cutting off with their jaws the young plants of various garden vegetables. The several species of cut-worms are the larvæ of night-flying owlet-moths, rarely seen in the day-time. The eggs are deposited upon leaves, etc. When the worms hatch out they descend to the ground, and make a hole in which they hide during the day-time. Most of the cut-worms, when full grown, are about an inch and a half long, dark colored, with light markings and a greasy look.

On a small scale, plants like cabbages, tomatoes, etc., can be protected from the cut-worms by surrounding the young stems with paper for a short distance above and below the ground. Hills of melons, squashes, etc., can be protected by hoops or some similar barrier. It is well to make holes in the earth with a dibble near the plants to be protected, into which the cut-worms may escape at sunrise after their night of foraging, and then be destroyed by another thrust of the dibble. Bunches of straw or grass placed along the rows of melon-hills, and examined daily, will serve to entrap many cut-worms. One gardener thus caught fifteen hundred and thirty-eight worms on a quarter-acre of water-melons before the seed came up, and afterward lost but a single melon plant by the cut-worms. Dr. Oemler, of Atlanta, Ga., states in his work on "Truck Farming at the South," that he captured fifty-eight cut-worms under a single turnip-leaf placed as a trap. His method is to poison the worms by dipping cabbage or turnip leaves in a bucket of water in which a table-spoonful of Paris green has been stirred. These poisoned leaves are laid in rows across the field fifteen feet apart. By repeating this process at intervals of three or four days the field is soon cleared of the worms. The cut-worms are specially injurious in the Southern States, partly due to the fact that the winters there are not sufficiently cold to make the worms dormant, but with every warm spell the worms become active and continue their depredations. The

“much-slandered” crow stands in the front ranks as a natural enemy to the cut-worms, and should be protected rather than persecuted. This sable bird will pull young corn for a short time in late spring, but this is often for the grub or cut-worm that lies at the base of the plant. For most of the year the crow is a firm friend of the farmer, and should be always treated as such.

The term Wire-worm is applied to the larvæ of several kinds of Spring or Click-beetles. One common species is two inches long, with two large black spots, like eyes, on the back. This beetle, when laid upon its back, will throw itself, with a sudden spring, several inches into the air. The larvæ of this group of beetles are long and slender, suggesting the common name. They remain as worms from three to five years, and sometimes do much damage to garden crops. Plowing the soil late in autumn will bring them to the surface, when the frost may kill them or the birds secure a much-loved prey. Frequent stirring of the soil in late fall and early spring is one of the best means of cleaning a garden soil of all sorts of worms and grubs.

The term Wire-worm is popularly used to include the long and slender “thousand-legged worms.” These have worm-like bodies, but may be quickly distinguished from the larvæ of the Snap-beetles by the many pairs of legs which they possess. These false Wire-worms are of a dark brown or blackish color, and do not undergo the metamorphosis common to the other insects mentioned. These Myriapods often do much damage by feeding upon the roots and under-ground stems of garden vegetables. When they are abundant in the soil it is difficult to grow potatoes. Many of the rough places upon the surface of otherwise healthy potatoes are caused by the false Wire-worms. They may be trapped by placing slices of turnips, carrots, apples, etc., upon the surface of the soil.

Of the insects injurious to garden vegetables, not the least,

but the last to be here mentioned, is the White Grub. In its perfect state this insect is known by several names, the leading ones of which are May-beetle or May-bug, June-bug or June-beetle, and Dor-bug. These clumsy beetles come from the ground in May or June, and are familiar to all in their visits upon the families, especially at evening, when, with the windows and doors open, they beat their heads against the walls, or burn their wings at the lighted lamp. The beetle is about an inch long, of a dark chestnut color, and more or less covered with yellowish down upon the breast. The beetles are injurious to fruit and other trees; but it is fortunate that they do not live long. The females enter the earth, deposit their eggs, and soon die. The eggs hatch in a few weeks, and the young grubs live upon the fine roots of various plants. The grubs do much more damage in their second year. They revel in the strawberry-bed, as well as in the vegetable and flower gardens. The grub is full grown in its third year, and is then a plump, dirty white worm, sometimes nearly as large as a person's little finger. Having reached its full size and done much damage, the grub forms an earthen case or cocoon, and becomes a chrysalid. In May or June the perfect beetle comes forth from this state of inactivity, and the cycle of changes in the life of this insect is complete. As might be expected from the duration of the larval state, the beetles are more numerous one season than another in any given locality. They may be so abundant as to cover the trees, and may be shaken upon sheets and destroyed. The fact that they are attracted by light may be used to advantage. Traps, consisting of lamps throwing a strong light, with a tub of water beneath, have been used with success. There are a number of natural enemies, among which is the crow before mentioned. The skunk is fond of the fat grubs. Swine will get the majority of them out of an infested ground.

There are several other insect pests of the vegetable

garden, but if those herein mentioned are mastered, it will not be difficult to stay the ravages of the others.

The leading works on insects from which information has been drawn in writing this little tract are: Harris's "Insects Injurious to Vegetation;" Packard's "Guide to the Study of Insects;" Treat's "Injurious Insects of the Farm and Garden;" Oemler's "Truck Farming at the South," and the various writings of Professors C. V. Riley, A. J. Cook, J. H. Comstock, C. E. Bessey, and S. A. Forbes. To any one who may wish to pursue the subject further, the above-named books will furnish a large amount of carefully prepared information.

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## INJURIOUS GARDEN INSECTS.

[THOUGHT-OUTLINE TO HELP THE MEMORY.]

1. Importance of the subject? Anatomy of insects: head, thorax, and abdomen? The egg, larva, pupa, imago?
2. List of garden pests? Asparagus-beetle? Bean-weevil? Cabbage Butterflies? Striped Beetles? Pickle-worm? Melon-worm? Onion-fly? Squash-bug? Borer? Potato-beetle? Stalk-borer? Tomato-worm? Tortoise-beetle? Cut-worms? Wire-worms? False wire-worms? White grub? Works consulted and recommended?



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