

How To Kill The Beetle

The Asiatic and Japanese Beetles and Their Control on Golf Courses

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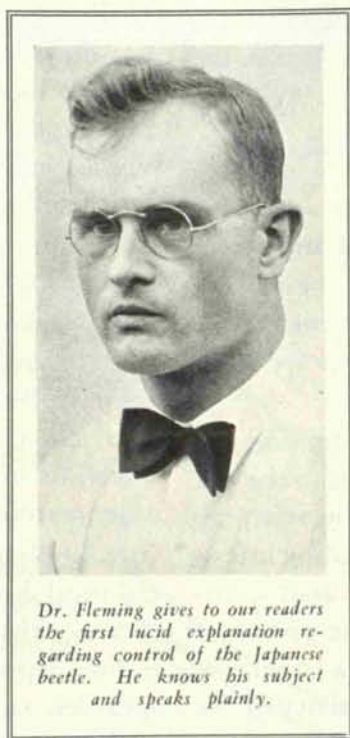
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THE Japanese beetle, *Popillia japonica* Newman, the Asiatic beetle, *Anomala orientalis* Waterhouse, and the Asiatic garden beetle, *Autoserica castanea* Arrow, have become established at several localities in the northeastern part of the United States. The larvae of these beetles feed on the roots of grass and, where abundant, have caused severe damage to turf.

Poisoning turf with lead arsenate was developed by the Bureau of Entomology to control larvae of the Japanese beetle and it has since been found to be effective in protecting turf from injury by the Asiatic beetle and the Asiatic garden beetle.

The adults of these beetles appear in early summer and begin to deposit eggs, preferably in well-kept lawns and golf courses. The period of oviposition extends throughout July and August. The eggs hatch in a few days and the young larvae, or grubs, begin to feed on roots and humus immediately below the surface of the ground.

The depth at which the larvae continue to feed in the soil during the active season is dependent upon the moisture; when the soil is moist, they are close to the surface but when the upper layer of the ground becomes dry, they burrow downward until a satisfactory degree of moisture is reached. The larvae grow rapidly, causing more damage as their root-consuming capacity increases, and become



Dr. Fleming gives to our readers the first lucid explanation regarding control of the Japanese beetle. He knows his subject and speaks plainly.

fully developed in the early fall.

The most pronounced injury to turf usually appears in the fall, particularly if the season is dry. As cold weather approaches, the larvae burrow deeper into the soil where they remain relatively inactive during the winter. In the spring they return to the surface, feed for a few weeks and then transform into adult beetles.

The density of the larval population in turf varies considerably with the season and the local conditions. In years where there is considerable rainfall during the summer, the infestation is more uniformly distributed than in periods of drought. In dry summers there is a tendency for the beetles to deposit eggs in the moister portions of the turf.

The larvae are usually found in large numbers in open grasslands but only rarely are many found in turf which is shaded.

NATURE OF INJURY

WHEN the root system of grass is damaged by feeding of these larvae, the turf may not be able to draw a sufficient supply of nutrients and moisture from the soil to maintain a good sward. It has been the general experience that with careful attention a good sward can be maintained even though there be in each square foot of turf 11 to 16 larvae of either the Japanese beetle, or the Asiatic beetle, or 16 to 22 larvae of the Asiatic garden beetle.

If the growth of the grass is retarded by unfavorable environment, low fertility, or lack of moisture, a larval population of these densities is sufficient to cause extensive damage. It is impossible to maintain a good sward even under favorable conditions when these larvae are more numerous.

The appearance of turf suffering from injury by these larvae is similar, in the early stages, to turf retarded by an inadequate supply of moisture or nutrients. If a portion of this turf is examined and a large number of these larvae are found, one may be certain that the larvae are causing the damage. As the injury becomes more extensive, the aerial portion of the grass is often completely severed from the roots. Turf which is seriously damaged by these larvae is soft and spongy because of the extensive burrowing of the insects immediately below the surface of the ground.

HOW LEAD ARSENATE CONTROLS THE BEETLES

LEAD arsenate which is used for the treatment of turf, is a white, fluffy, impalpable powder. It has been found that the lead arsenate on the market which satisfies the standard requirements of the chemical, when used as an agricultural spray, is satisfactory for the treatment of grass.

The application of lead arsenate to turf does not prevent the adult beetle from ovipositing in the soil, but it destroys the larvae after hatching from the eggs. A larvae while burrowing and feeding infests some soil. If the soil contains sufficient lead arsenate, the larva will eventually die. The period of time required for the larva to consume a lethal dose of the poison is dependent upon the activity of the insect and the concentration of lead arsenate in the soil.

It is apparent that the greater the concentration of lead arsenate in the soil, the shorter the interval before the larvae obtains a fatal dose. The larvae, however, eat very little after the arsenic begins to affect them and soon become flabby and discolored.

When the lead arsenate is distributed only through the upper layer of soil some of the larvae may continue to live for several months before consuming a fatal dose of the poison, because they may remain most of the time below the poisoned layer of soil. The application of lead arsenate has proved to be a practical method for reducing the density of the larval population below that which causes

serious damage to turf, although it is rarely exterminative except in the case of a light infestation.

APPLICATION OF LEAD ARSENATE TO TURF

IT is possible to protect turf from injury by building up a poisoned layer of soil at the surface. An application of lead arsenate at the rate of 5 pounds to 1000 square feet of surface, before oviposition, has been found to reduce a light infestation of less than 11 larvae to a square foot, so that damage did not occur, but it is necessary to apply the chemical at the rate of 15 pounds to 1000 square feet to assure protection when 40 or more larvae are found in each square foot of turf.

Chemical analyses of treated turf in different localities between Boston, Mass., and Cape Charles, Va., show that only a small part of the arsenical applied to the surface penetrates below three inches and that the most of the poison remains in the upper inch of soil. It is possible, therefore, to apply the treatment of 15 pounds in one application, or gradually build up a poisoned layer of this concentration by successive applications of lesser amounts.

To obtain the necessary uniform distribution over the surface these small quantities of lead arsenate must be *diluted*. It is largely a matter of personal choice whether the chemical is applied in water, or in a dry state mixed with sand, soil, or other material.

In applying the lead arsenate with water, the chemical should be mixed with the smallest volume of water that can be used to give a uniform distribution without flooding the turf. With power sprayers, satisfactory results have been obtained with a mixture of one pound of lead arsenate to two gallons of water, and in some cases with a concentration of one pound to one gallon of water. It should be applied in a fan-shaped spray with a pressure of 250 to 300 pounds.

A power sprayer is usually too heavy to take on to the turf; therefore most of the liquid treatments have been applied by placing the sprayer at the most advantageous position and laying one or more lines of hose to the area to be treated. After the spray is applied, the turf should be well watered to wash the chemical off the grass before it dries.

When lead arsenate is applied in the dry state by hand, it should be mixed with about twenty-five times its volume of moist sand or soil. When applied with a spreader or distributing machine the

diluting material should be dry, finely ground and free from a tendency to clog. Satisfactory mixtures for applying in commercial distributors can be made by mixing one part of lead arsenate with two parts of activated sludge and four parts of sand. Tankage may be substituted for the activated sludge.

THE USE OF FERTILIZERS

TURF treated with lead arsenate can be fertilized with manure, ammonium sulphate, sodium nitrate, potassium chloride, superphosphate and the organic fertilizers such as bone meal, cottonseed meal, activated sludge and tankage. The use of lime is not recommended, unless required to correct soil acidity, because it has been found to reduce the insecticidal value of the treatment.

It is advised that the inorganic fertilizers be applied separately from lead arsenates, particularly during the growing season, because in some cases some injury has resulted to the grass.

GROWTH OF GRASS IN POISONED SOIL

GRASS seed in poisoned soil is normally somewhat slower in germinating, the foliage is darker and the growth slower during the first few weeks but when the grass is established, there is little difference in appearance from a good sward in unpoisoned soil. Kentucky blue grass, red top, perennial rye grass, Chewing's red fescue and white clover grow satisfactorily in soil containing lead arsenate.

PERIOD OF EFFECTIVENESS

IT is difficult to predict the period of time that turf treated with lead arsenate will be protected from injury as this will depend upon the amount of poison applied, the soil conditions, and the density of the larval population. It is expected, however, under normal conditions, that an application of 15 pounds to 1000 square feet of surface will protect the grass for at least five years.

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