

## The Use of Arsenate of Lead

THE larvae of Japanese and other beetles of Oriental origin as well as the larvae of our native June beetles often cause extensive damage to turf at this season of the year.

In areas where the Japanese and Oriental beetles are very common, such as in the seaboard States surrounding New Jersey, the safest practice to employ in protecting the turf is to apply lead arsenate to the turfed areas. Where the damage is caused by the larvae of some of our native beetles, it may be advisable to treat only the small infested areas. In either case, the question of how much lead arsenate to apply is raised.

Since the lead arsenate treatment is expensive, money is often wasted in applying much more than is necessary to definitely control these pests. On the other hand, money is sometimes wasted in not applying enough arsenate to control the larvae effectively. Often too light a treatment is of no value in controlling the pests, as the poison is not concentrated enough to control them. One-half a treatment will not kill one-half the grubs and may not even have any noticeable effect on lessening the injury.

The larvae of the native beetles usually do not reinfest an area year after year, but only cause damage in certain favorable years. This infestation is usually localized in relatively small spots on fairways and other turfed areas. The damage caused by these larvae is frequently remedied by merely fertilizing the infested areas.

The larvae are killed by taking the poisoned soil into their alimentary system while they are feeding on the grass roots or burrowing through the soil. The age and the activity of the larvae and the concentration of the poison in the soil determine the time required for the larvae to consume a fatal dose.

If there is too light a concentration of the lead arsenate in the soil the larvae may cause considerable injury before ingesting sufficient poison to kill them. However, very little damage is caused after the arsenic begins to affect the larvae, as they practically stop feeding and become flabby and discolored.

The lead arsenate only needs to be distributed through the upper few inches of soil. Some of the deeper burrowing larvae may live for several months before becoming poisoned, but they cause very little damage when they are not within three or four inches of the soil surface.

There seems to be a great variation in the amount of lead arsenate required to control these pests. Some greenkeepers report good control with a treatment of five pounds to 1,000 square

feet; others have not obtained control with as high as 15 pounds to 1,000 square feet.

Tests conducted by scientists of the United States Department of Agriculture have indicated that the amount of lead arsenate required to give effective control varies with the soil type. Soil texture seems to be an important factor. In general, control is obtained with lighter applications on sandy soils than soils of the heavier textures. The total and water-soluble plant food and the acidity or alkalinity of certain soils have been tested to determine their effect on the arsenate of lead treatments. The amount of water-soluble phosphates, calcium and magnesium in the soil are the most important factors other than texture influencing the effectiveness of the treatment. The greater the concentration of water-soluble phosphates and calcium in the soil when the lead arsenate is applied, the more effective is the treatment. Increasing concentrations of soluble magnesium decrease the effectiveness of the arsenate.

Inorganic fertilizers have generally been avoided when lead arsenate has just been applied. Investigations show that certain inorganic phosphates do not decrease but actually increase the effectiveness of the treatment. Any possible toxic effects of the arsenate to the turf may also be overcome by the application of inorganic phosphates.

Applications of lime except to correct excessive soil acidity should not be made, as the lead arsenate is more effective on acid soils and the direct effect of additional calcium is not known.

The application of other inorganic materials should be avoided until more definite conclusions are made as to their influence on the effectiveness of the lead arsenate treatment. These effects are now being studied by the workers in the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture.

The results obtained in some of these investigations indicate that the type of soil to be treated should be given consideration when an application of lead arsenate is to be made. The soil types usually vary greatly from one course to the next, making it difficult to state definitely the least expensive treatment that will give effective control. A safe and economical practice is to make an initial application at the rate of five pounds to 1,000 square feet. This amount gives effective control in the majority of cases. If control of the pest is not secured, repeated five-pound applications should be made until the larvae cause no further injury. The heavy-textured soils, those high in magnesium, or very alkaline soils should be the only ones needing treatments in addition to the original application.