Study Jap Beetle Control Methods

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(Part Two—Conclusion)

PRELIMINARY work on diseases of the Japanese beetle was started about 1933 and extensive field studies have been in progress from 1935 to the present time. Of the diseases known to be working against the beetle, two spore-forming bacteria seem of most importance. These organisms first known as Types A and B have now received the names *Bacillus popilliae* and *B. lentimorbus* respectively. Type A has in most cases given the best results and hence its use has been stressed.

This organism is exceedingly resistant to adverse temperature and moisture conditions and has successfully been held without its host for over six years either dried on a glass slide or held in soil. This great viability, of course, makes it of extreme importance in uncontrolled field conditions. It is now known that when once the organism is established in the soil, it will remain viable indefinitely regardless of the presence or absence of the host. If grubs are present they become diseased by ingesting the organisms along with the soil while eating the grass roots. Hence the greater the larval population present, the quicker the build-up of disease will be. It is possible within two years to infect the soil by this natural build-up to the point at which any grub will be unable to develop beyond the larval stage. It is doubtful if any biological agency can eradicate the host completely, but our hope has been to reduce soil populations to the point where no turf injury will occur. This desire now appears satisfied, since in plots established since 1935 only an occasional beetle emerges.

Birds Spread Disease Organisms

In areas supporting heavy larval populations there is a tendency to attract birds. The feeding of birds on diseased grubs is an ideal way of wholesale spread of the disease organism. Chickens, birds, and warm-blooded animals, including man are not affected by the organism. Observations have been made in which every other grub eaten by the robins and starlings was diseased. Under conditions of this nature one can readily see how rapidly the disease can be spread since each spot on which their droppings fall will start a new focal point of infection.

Reductions of over 95% within a single year have been demonstrated in field plots as well as in areas of natural build-up. Some 263 field plots have been treated under varying types of soil and moisture conditions from Connecticut to North Carolina along the east coast, and during the past season as far west as Cleveland, Ohio. Due to exceptionally gratifying results, the Bureau of Entomology alone, and in cooperation with various state agencies, has undertaken a colonization program whereby the organism is placed throughout the heavily infested area much the same as parasites have been distributed.

Possibility of Its Culture

Before discussing the colonization program now under way, some idea of the method of obtaining the material seems desirable. Although this bacterium has not been successfully cultured on an artificial medium, enough progress has been made to indicate the possibility of its culture. In the absence of such a means it is now necessary to dig healthy grubs during the fall and spring. These are held in storage at about 50°F until time permits their inoculation. Standard inocula are prepared and by means of a hypodermic needle mounted on a stationary block, each grub is inoculated with a known amount of this suspension. Grubs, after inoculation, are placed in individual cells of soil and held for 10 to 12 days at 86°F. During this storage period, the grubs become diseased and their blood appears milky due to the presence of the spores. Grubs held for this length of time will average between 2 and 3 billion spores each and prior to death may contain over 5 billion spores. After this storage period the grubs are removed from their cells and held in a refrigerator until several thousand are available. These are then run through a meat grinder and mixed with talc, so that each gram of talc will contain 100 million spores. This spore dust is thoroughly dried and is now ready for distribution in the field.

Since great quantities of material would

**GSA Convention Paper.*

be required to cover an area completely, the method now in use is to spot dust an area and allow natural build-up of the disease to take place by the grubs present in the soil. For this distribution work, an ordinary hand corn plaster is used. The container on the planter is filled with standardized spore dust, and the operator then walks along using the planter much as a walking stick. The planter is adjusted to release 2 grams of the material each time it is tripped and by tripping every four paces, an area can be quite accurately treated at 10 foot intervals.

During 1941 the Bureau has treated most of the government reservations throughout the heavy beetle area. A total of over 4,000 acres in army camps, national cemeteries and naval reservations has been treated by the Bureau. In the treatment of these places, the organisms have been placed at intervals of 10 feet on lines 20 feet apart.

In the cooperative Bureau-State programs, treatments are usualy made at intervals of ten feet each way. Approximately one-half acre is treated in each plot, and the proximity of the plots varies according to prearranged schedules in the state concerned. To date, the Bureau, either alone or in cooperation with various states, has aided in the distribution of almost 18 tons of spore dust, on over 21,000 acres, throughout 11 states and the District of Columbia.

Distribution of material in this manner will of course not immediately solve the problem, but it is hoped that by helping nature, the time required for ultimate control of the beetle will be reduced many years.

Some work has been attempted to determine the susceptibility of native white grubs to this organism as well as to a similar type known to affect closely related grubs. It seems entirely possible that effective control of other infestations of larvae may be possible by one or more of these spore forming bacteria.

Golfers' Calendar Tells How Late Golf May Be Played

DON BUSH, pro at the Johnson City (Tenn.) CC, has sent his members a Golfers' Calendar showing how late daylight lasts at Johnson City throughout the golf season by the War-Time clock.

Bush's calendar shows by weeks how late golf may be played in daylight on the course. In one column is the week and on the same line is the time given under a column head of "Play Golf Until."

The entries for May 31-July 4, herewith, are illustrative.

May 31-June 6	8:50 p. m.
June 7-13	8:55 p. m.
June 14-20	9:00 p. m.
June 27-27	9:00 p. m.
June 28-July 4	9:00 p. m.

Don has his instruction and shop advertising message on the bottom of the card. He encloses the card with a letter which reads:

Dear Golfer:

Many of us have been wondering how golf will fit into the war picture. During the last war more golf was played during the war than before, and the slogan was "Keep Fit." It would seem our duty, as civilians, to keep our health and nerves in good shape, and as many of you know, golf can do just that for you, in addition to the relaxation and fun it provides.

The new "war" time affords us an extra hour of daylight each day and should greatly increase the play by business men whose golf is limited to after-office-hours and week-ends. For your convenience, I am attaching a small calendar giving the time of sunset each week during the golfing season as we are anticipating many of our members will play week-day afternoons and after supper during the summer months.

The Government has stopped the use of new rubber in golf balls, and there is certain to be a definite shortage in supply. Fortunately I have a rather good stock of balls at the present time and suggest that you set aside now what you will need for the season. We all should use balls conservatively as it is definitely possible that the time will come when no new balls will be available.

As your Professional, it is my duty to help you in any way I can to enjoy the game and to see that there is available to you the finest clubs and accessories and to help you acquire a good swing through sound instruction. The members of this club have been extremely loyal to me in the purchase of clubs, balls and lessons, and I hope I may continue to deserve this loyalty by being willing to do anything and everything I can to make the hours you spend at the club a real pleasure.

Please call on me.

Sincerely,

Don Bush.