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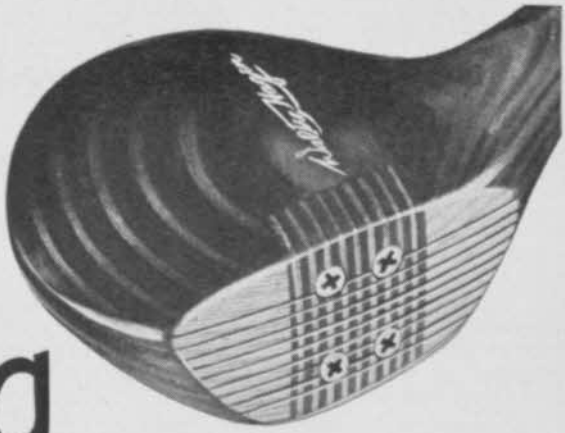

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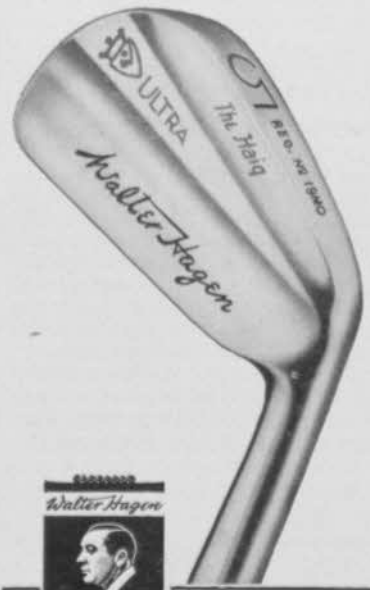

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Chlordane Controls Japanese Beetle Larvae in Turf

By WALTER E. FLEMING, U.S.D.A.

Chlordane is one of the most effective and valuable materials for control of Japanese beetle larvae. It kills faster than DDT or lead arsenate. It is not affected seriously by conditions in the soil and grasses are tolerant of it.

This is shown by experiments begun in January 1947 and continued in 1948.

Relative Toxicity

A study was made of the relative toxicity of chlordane, DDT, and lead arsenate to larvae of the Japanese beetle. Chlordane was intimately mixed with soil at rates ranging from 0.5 to 10 pounds per acre, DDT at 5 to 50 pounds per acre, and lead arsenate at 500 and 1,000 pounds per acre. Third-instar larvae were introduced into each treatment, and at intervals the numbers of dead and living larvae were determined. It was found that pound for pound chlordane was considerably more toxic than DDT and lead arsenate.

Duration of Effectiveness

Turf treated with lead arsenate or DDT has been practically free of Japanese beetle larvae for 5 years. To be practical, therefore, a treatment with chlordane should be effective for at least 2 years. To determine the period of effectiveness of different amounts of chlordane, the material was intimately mixed with soil at rates ranging from 8 ounces to 25 pounds per acre. The death rate of the larvae was determined for each treatment, immediately after the application of the insecticide and at intervals up to 102 weeks. When the insecticide had been freshly applied, complete mortality was obtained with 2 or more pounds of chlordane per acre in 1.3 weeks, with 1 pound in 2.6 weeks, and with 8 ounces in 3.8 weeks. The 8-ounce treatment had lost some of its effectiveness in 4 weeks after application, the 1-pound treatment in 8 weeks, the 2-pound treatment in 20 weeks, and the 5-pound treatment in 40 weeks. The 10-pound treatment showed no significant change in the rate at which larvae were killed in 102 weeks. It was evident that a practical treatment would require approximately 10 pounds of chlordane per acre.

Since slight differences in the manufacturing and processing of chlordane might affect the insecticidal action, a study was made of two 5-percent dusts which had been made from the technical product of the two principal manufacturers. Each material was applied to soil at rates equivalent to 5 and 10 pounds per acre, and 500 larvae were introduced into each treatment. After 4 days the average survival in the 5-pound treatment was 17.2 percent with one material and 18.4 percent with the other. In the 10-pound treatment the survival was 9.8 percent with both materials.

Chlordane dusts from four sources were tested in the field in 1947 and in 1948 with no difference in effectiveness. It was evident that any differences in the manufacturing and processing of the chlordane did not affect its value for control of Japanese beetle larvae.

Comparison of Formulations

In the spring chlordane was applied to turf as a dust, a suspension in water, and an emulsion at the rate of 10 pounds of the chemical per acre to compare the effectiveness of the different formulations. The dust contained 5 percent of chlordane. The suspension was prepared by adding 25 pounds of 40 percent wettable powder and the emulsion by adding slightly more than 10 pounds of emulsion concentrate to 1,200 gallons of water. Within 3 weeks the average reduction in population was 66 percent with the dust, 68 percent with the suspension, and 65 percent with the emulsion. The next brood of larvae was eliminated by mid-September in all of the treatments. The application of the dust or the suspension late in September caused a reduction of 93 percent in 3 weeks. Chlordane was equally effective when applied to turf as a dust, a suspension, or an emulsion.

Influence of Temperature

The temperature of the soil modifies the speed of action of chlordane, DDT, and lead arsenate. The lowest temperature at which larvae are sufficiently active to be poisoned by these materials is important in that it limits the period of effective use in the spring and in the fall. It has been determined by experiments at different temperatures that 40° F. is the

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approximate temperature above which chlordane, DDT, and lead arsenate will affect the larvae. At temperatures above 40° the rate of poisoning increases progressively with the temperature. With these materials the larvae are killed four times as fast at 80° as at 50°.

Effect of Soil Characteristics

Eighty representative soils were collected from different areas in Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Virginia, North Carolina, and Ohio to determine the effect of the various soil characteristics on the insecticidal action of chlordane. Chlordane was intimately mixed with these soils at a rate equivalent to 10 pounds per acre. Third-instar larvae were introduced into each treated soil and the time required to kill them was determined. The length of this period for different soils, or groups of soils of different characteristics affords a basis for determining the influence of some of the more important variables.

The average time required to kill third-instar larvae in the 80 soils was 1.3 weeks. The time ranged from 1 week in Mahoning silt clay loam and in Painesville silt loam from Ohio to 2.7 weeks in Menlo loam from Connecticut. However, with the exception of the treatments applied to the Menlo loam and to Croton silt loam from New Jersey, there was no significant difference in the rates at which chlordane killed the larvae. The type of soil seemed to have little influence on the effectiveness of chlordane.

When the soils were grouped according to their natural drainage, the data revealed that in most cases a slightly longer period was required to kill larvae in poorly drained soils than in well drained, adequately aerated soils, probably because of the higher content of organic matter in the poorly drained soils. Larvae move less when searching for food in soils rich in organic matter than in soils made up largely of mineral aggregates, and have less opportunity to encounter particles of the insecticide.

When the soils were grouped according to their texture into sands, gravelly loams, shale loams, sandy loams, loams, silt loams, silty clay loams, and clay loams, the speed with which the larvae were killed was found to decrease only slightly with the increase in the proportion of silt and clay in the soils. The average time in the sands was 1.25 weeks and in the silt loams and clay loams 1.49 weeks. The texture of the soil seemed to be relatively unimportant.

The different series of soils tested vary widely in chemical composition. The results suggest that the mineral aggregates in these various series of soils had little influence on the effectiveness of chlordane, but in series relatively high in organic matter the insecticidal action was retarded.

Control of Japanese Beetle Larvae

In the spring of 1947 chlordane was applied to established turf at Blairstown, N.J., and Orange and New London, Conn., in the fall of 1947 at Northampton and Deerfield, Mass., and Moorestown, N.J., and in the spring of 1948 at Moorestown, N.J. and Philadelphia, Pa. Applications were made at the rate of 10 pounds of the chemical per acre. Surveys have been made periodically to determine the effect of the treatment on larvae of the Japanese beetle. The results obtained at these widely separated localities have been uniformly good, and may be summarized briefly as follows: A treatment applied in March, when the larvae were inactive, caused a reduction in the population of 12 percent in 5 weeks, 87 percent in 9 weeks, and over 90 percent before the larvae started changing to beetles. A treatment applied the middle of May caused a reduction of 65 percent in 3 weeks and more than 90 percent in 4 weeks. A treatment applied in September, while the larvae were active, caused a reduction of more than 90 percent within 3 weeks, but a treatment applied late in October, when the larvae were relatively deep in the soil and beginning to hibernate, did not reduce the population to this extent until the following May.

Treatments applied in the spring or fall were very effective against the larvae of the next brood, which hatched from eggs the following July and August. Treatments applied in New Jersey and Connecticut in the spring of 1947 eliminated the 1947-48 and the 1948-49 broods by mid-September. Treatments applied in the fall of 1947 in New Jersey and Massachusetts and in the spring of 1948 in New Jersey and Pennsylvania eliminated the 1948-49 brood by mid-September.

Chlordane at the rate of 10 pounds per acre is very effective for the control of Japanese beetle larvae in turf, reducing the infestation faster than either DDT or lead arsenate. It is not known how long the treatment will keep turf immune from injury by these larvae, but present indications are that it will be effective for 2 to 3 years.

Control of White Grubs

Some information was obtained on the effectiveness of chlordane in controlling white grubs of other species associated with the Japanese beetle, although only a few grubs of other species were found in the experimental plots.

(Continued on page 98)

Tee line of the new Golf Driving Range at the Univ. of Minnesota adjoining the university golf course which, according to Les Bolstad, Golf Coach, provides the ideal facility for class and group instruction. A marked increase is reported in the number of students playing golf who have gotten their start on the practice tee.

The University of Minnesota Opens A Driving Range

By OTIS DYPWICK

When Frank G. McCormick retires on June 30 from his duties as director of the department of physical education and athletics at the University of Minnesota he will leave as a monument to his regime the finest athletic plant possessed by any university or college in the world.

One of the most recent additions to these tremendous facilities to be conceived and constructed under McCormick's direction is a golf driving range. It adjoins the beautiful University of Minnesota 18 hole golf course just north of the cities of St. Paul and Minneapolis and about two miles from the main campus in Minneapolis.

In getting the true picture of the entire project—planning, construction, purposes, operation, upkeep, management, finances, problems, advantages, and significance to the student body and teaching progress—it is necessary to present the views, reactions, and comments of the four men most directly involved with the driving range.

They are Frank McCormick; Dave MacMillan, manager; Les Bolstad, golf professional, coach, and class instructor; and Marshall Ryman, business manager of athletics.

I'd like to be able to inject at this early point assurance that the driving range venture has been nothing but smooth sailing—a joy and pleasure to all involved. But this wouldn't be a true picture.

Let me hasten to assure you, however, that as the first full season of operation approaches, the sour notes of frustration and error are becoming more and more a memory.

The presence of this worthy and popular facility can be credited to Frank McCormick's conviction that an educational institution owes EACH STUDENT on its rolls recreational opportunities within his or her field of interests and physical and time limitations.

In McCormick's own words: "Our pri-

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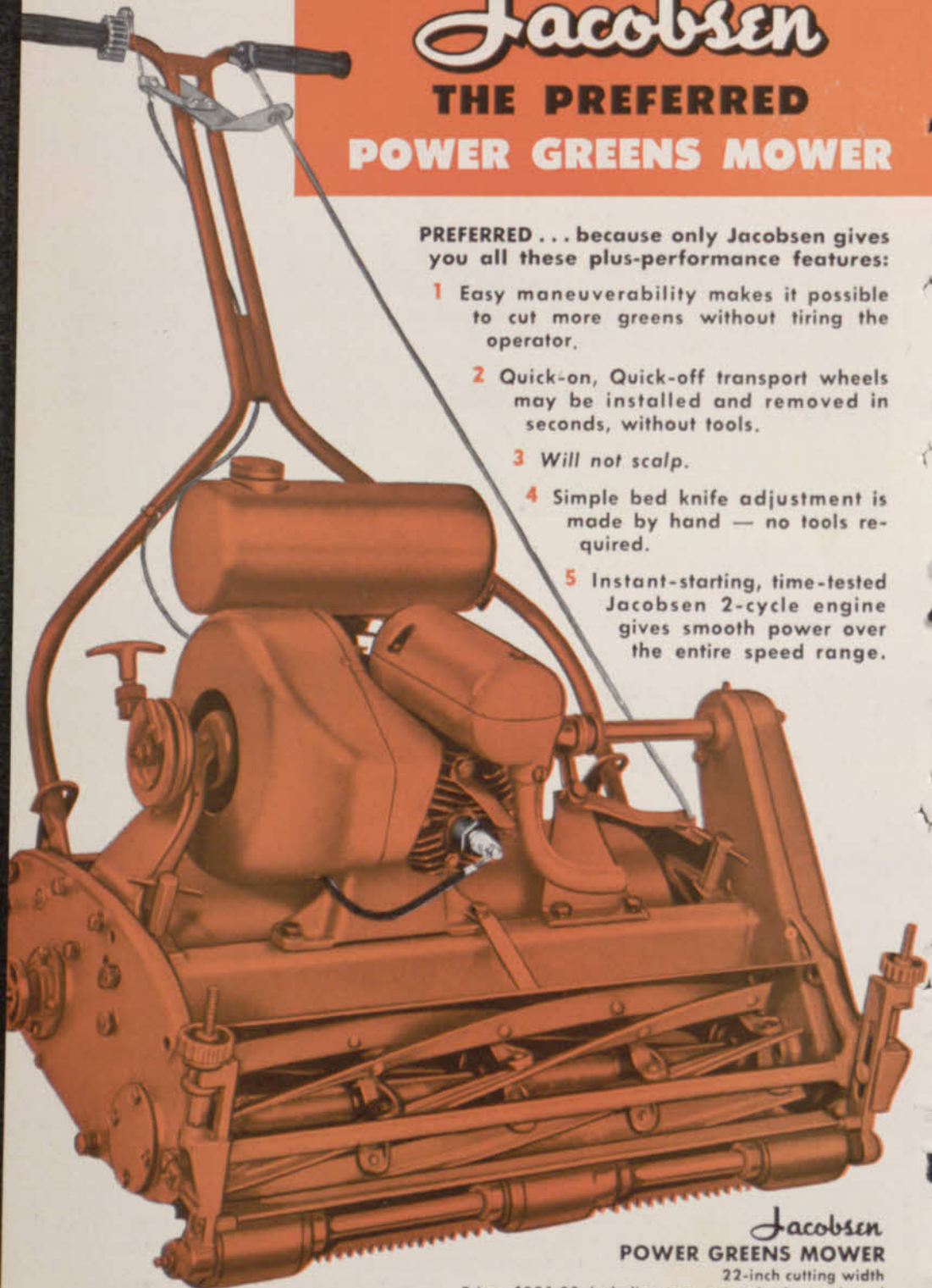

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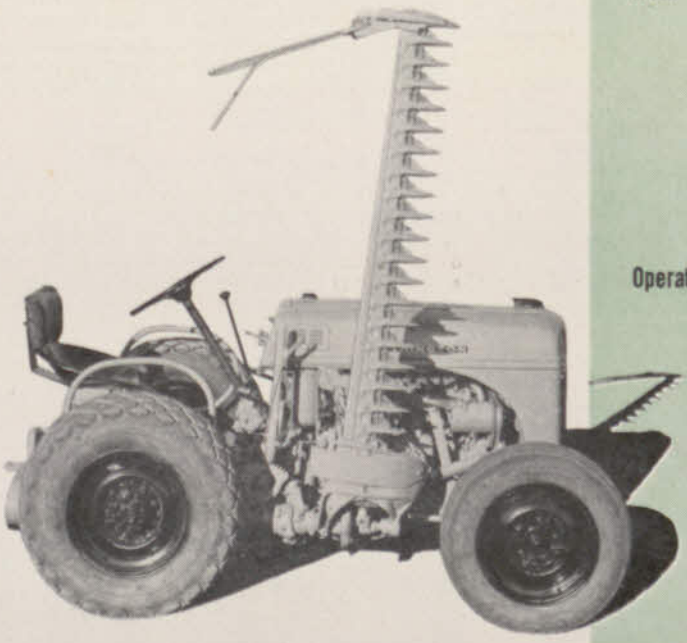

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mary purpose is to make available to a maximum number of students the chance to acquire skills which will open up recreational opportunities to be enjoyed far beyond the time of graduation from college."

Golf Students Increase

Then, more specifically, he points out: "Lack of or limitations in the fundamental skills of golf have kept thousands of people from participating in this sport beyond a certain age, for in the absence of a reasonable degree of skill, their self-consciousness makes them reticent and destroys their desire or motivation. We already see a marked increase in the number of students playing golf, particularly the girls who have gotten their start on the practice tee."

In conclusion, McCormick adds: "This driving tee and range is all part of an integrated plan to encourage participation by students and alumni in the game of golf."

Les Bolstad whose testimony is next to be considered smiles broadly and glows with enthusiasm at mention of the golf driving range.

"Here is the perfect answer to instruction for large groups and classes," says Les. "Now that we have adequate space, the door is now open for us to teach more university students than was ever before possible, and under ideal conditions. A range such as ours gives tremendous impetus to learning and to subsequent participation."

Continues Bolstad, "There is one fact that we must face—large-scale use of the tees by classes of students does have a limiting effect on the revenue. However, this is not particularly serious with us as long as the University can come out in the black on the over-all operation."

In regard to the actual teaching of the fundamental mechanics of the golf swing, Les has this to say: "You cannot by teaching the 'big swing' and talking pattern alone make a practical golfer. This is only the entering wedge. The practical method is to go back to the short swing. Take for example, the case of the large preponderance of beginners who slice. We get these people out on the driving tee and concentrate on the short swing while straightening them out. He (or she) gains necessary confidence upon seeing the ball going out straight, even though for short distances. Then we go on to the 'big swing'."

Next to be interrogated in getting the over-all picture of the Minnesota golf project is Dave MacMillan who since retirement as head basketball coach at the University has been instructing classes in physical education. With compietion of the driving range, Dave who is well versed in golf (and also a witty gent highly adept at meeting the public) was named active manager.

Boon to Week-end Golfer

Says Dave, starting right out in an enthusiastic vein, "What a boon for the week-end golfer who comprises a large segment of the total number of participants in this game! Now he can get out under the lights as many times a week as he wants. At the

The small clubhouse at the Univ. of Minnesota Driving Range has been designed to control all player traffic to and from the tees and original plans have been altered to provide parking space directly back of the tee line for spectators and guests who accompany players.

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