

economic crop losses to farmers. The sting of this ant to man is vicious and a festered area usually results. The huge mounds this ant is capable of constructing in the heavy clay soils of West Florida are unsightly in lawns, and in pastures the mounds have been responsible for mechanical damage to cutter blades of combine machines. Mounds in sandy soil are not as large and in most cases the imported fire ant seems to prefer building its nest around the media retainer boards found in nurseries and at the base of plants. A mound in sandy soil is seldom conspicuous unless apparently constructed on or near a clay-balled plant. The clay apparently is needed to support the honeycombed arrangement of the nest.

The imported fire ant is about the same size as our native fire ant and can be distinguished from it with some degree of accuracy in the field. The major worker of the imported fire ant is needed for positive identification. The head of the major worker of the imported fire ant is never broader than the abdomen and is not as bilobed from the front. The head of a native fire ant major worker is much larger, more bilobed, and broader than the abdomen. The shape and arrangement of the teeth on the mandibles are good characters to use in distinguishing the imported from the native fire ant. The mandibles curve gradually from the base to the apex in the imported fire ant and the teeth are spaced at greater intervals on the inner face of the mandibles, while the mandibles of the native fire ant curve more abruptly on the outer face. The teeth are placed closer together on the inner face of the mandibles and do not overlap one another as much as those of the imported fire ant. In order to make a positive identification it is desirable to have a good representative sample

of specimens, a dozen or more including the larger workers.

Nurserymen who are dealing in balled nursery stock from Alabama, Mississippi, and the Pensacola area of Florida should guard against this pest infesting their nurseries. A safeguard would be to treat all fire ant colonies with one of the recommended materials. Chlordane, aldrin, and dieldrin, each in a 0.25-percent solution, have been found to be equally effective in controlling this ant.

For individual mounds in lawns, gardens, nurseries, and pastures, the State Plant Board recommends the use of two tablespoonfuls of 72% chlordane emulsifiable concentrate to three gallons of water, or the equivalent of other percentages of chlordane concentrate. Remove the top two inches of mound and apply the three gallons of prepared solution to each mound, using a garden sprinkler. For pastures with 25 or more mounds to the acre, use 5.2 pounds of 40% chlordane wettable powder, or one quart of 72% chlordane emulsifiable concentrate to 50-75 gallons of water and spray uniformly over an acre in the spring. Cattle should be removed from pastures before treatment, and they should be kept off for two weeks after treatment. Succulent plants may be treated with 5% chlordane dust at the rate of 30 to 40 pounds to the acre.

#### LITERATURE CITED

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## GRANULAR INSECTICIDES

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During the past two years (1952 and 1953) work has been in progress with granular insecticide formulations for the control of lawn and turf insects. Granular formulations must not be confused with dusts since the material

does not adhere to the foliage but falls through the ground cover to the soil. There is little drift during the application, hence a known amount may be applied to an area. The physical character of the product makes it one that can be handled easily without a mechanical applicator.

There is a great variety of effective organic insecticides on the market. Hesitancy to use many of these insecticides has been due in some cases to fear of the poisonous nature of

the material, but lack of equipment to apply these has been the big factor. Granular insecticides were meant to supplant spraying and dusting because they offer a simpler method of application.

Insecticides may be absorbed in or adsorbed upon a granulated clay or tobacco base. The fact that granular material may be applied to the soil and the base of the turf in the presence of foliage without waste and harmful residues remaining on the foliage presents a new approach to the problem of application from the standpoint of the homeowner, greenskeeper and park superintendent. The treatment of a turf is a three dimensional problem because depth as well as length and breadth are involved.

Several lawn pests were prevalent, but control studies during 1952 and 1953 were directed only against the sod webworm, *Pachyzancla phaeopteralis* (Guen.) and the chinch bug *Blissus leucopterus insularis* Barber.

#### DESCRIPTION OF BASE MATERIAL

Two base materials were used in some of the tests, granular tobacco by-products and a granular clay, but practically all of the tests were conducted with the granular clay. The mineral qualities and chemical analysis of the granular clay are identical to those of Attaclay.\* All granular clay material used was 30/60 mesh grade A regular granular clay. Regular granular has a sorptive capacity of 65 to 80 percent of its weight and still remains dry. Thirty to sixty mesh (Tyler Standard Sieve Size) appears to be the minimum particle size range which affords complete freedom from drift and the maximum distribution over a given area.

Three kinds of clay granules were used in some of the tests. For convenience, the clays were listed as low, A grade and AA or fast breaking. The regular grade is about midway between the low and fast in the amount of breakdown in the presence of moisture.

#### METHOD OF APPLICATION

The application of a granular insecticide is simple because it can be applied by hand. For spot treatment the only piece of equipment necessary when broadcasting the granulated material is a rubber glove. A lawn fer-

tilizer distributor may be used for treating large areas.

#### DISCUSSION AND RESULTS

Among the chlorinated and phosphatic insecticides on granular base tested in 1952 for the control of pests inhabiting turf were chlordane, heptachlor, aldrin, dieldrin, rhothane, lindane, benzene hexachloride, parathion and malathion. All work in 1953 was concentrated on chlordane and dieldrin.

The granular materials were applied during the hottest part of the day, 11 a.m. to 2 p.m., to see what effect the hot sunlight might have upon them. The hot sun produced some unexpectedly good controls, so all applications have since been made during the hottest part of the day.

In 1952, afternoon showers put the final climax to an extensive test. Not until some dry weather prevailed for a couple of weeks, was it noted that watering in the evening or the following morning greatly improved the control from chlordane and dieldrin. It is now recommended that the home owner sprinkle in the evening or the next morning following an insecticide treatment. It soon became apparent that a heavy application of insecticide was necessary to penetrate the thick turf and give a kill. One pound of granular insecticide to 100 square feet of lawn was the amount used throughout the season. On a flat surface this amounts to approximately 100 particles per square inch.

The formulator is looking for a cheaper method of preparing his product. It is evident that it is cheaper to prepare a product from a solution than from an emulsion. However in the case of certain chlorinated materials differences in kill between solutions and emulsions were noted. Complete reversal of results with two materials led to the testing of a number of materials, to see if products made from an emulsion were more effective than those made from a solution. The results are given in Table I. These tests have been repeated many times and best results from chlordane 5% granular were with that made up from an emulsion. Conversely, dieldrin has given better results when made from a solution.

The results of the three kinds of clay, low, medium and fast breaking in the presence of moisture, given in Tables II and III show that the fast and low breaking clays were inferior to the regular grade of clay. In Table IV, the

\* Product of Attapulug Minerals and Chemical Corp., Philadelphia, Pa.

results from the use of different strengths of dieldrin on regular clay show that 1.5% granular was as effective as 5.0%.

#### RECOMMENDATIONS

Apply by hand those insecticides that have been accepted for home use in a granular form at the rate of 1 pound per 100 square feet of lawn. Apply during the hottest time of the day. Follow that evening or the next morning with sprinkling. Repeat in 7-10 days with an over-all or a spot treatment. Always wear a rubber glove if applying by hand so that the skin is not exposed to the insecticide.

Five percent chlordane granules made from emulsion and 1.5 percent (not less) dieldrin granules made from solution are recommended at this time.

#### SAFETY

This method of application and the formulations used are perhaps the safest available to the homeowner at the present time. There should be very little fine material or dust in this formulation so the danger of inhalation of dust is reduced to a minimum. The material is heavy and penetrates the turf so that the residue problem is of minor importance.

TABLE I

A comparison of granular clay insecticides made from an emulsion and from a solution, for the control of chinch bug—Bradenton, Florida, September 1952.

Insecticide	Strength %	Source of Material	Results 12 days After Treat.	Condition of Lawn
Chlordane	5	Emulsion	No live chinch bugs	Lawn was recovering
Chlordane	5	Solution	Poor control	Lawn looked worse
Dieldrin	5	Emulsion	Many live chinch bugs	Lawn looked bad
Dieldrin	5	Solution	No live chinch bugs	Lawn looked good
Check			Live chinch bugs	Lawn was dying

This experiment was conducted on a thick, heavily turfed St. Augustine lawn. Counting of insects was difficult, so condition of lawn three weeks after application was the criterion used in determining effec-

tiveness. This test was repeated six times in 1952, partly on sparsely turfed lawns with the same results.

Repeated tests in 1953 bear out the above results.

TABLE II

A comparison of the relative merits of high (AA), low, and medium (Regular) 30/60 mesh breaking clays as a base for 5% granular chlordane for chinch bug control. Bradenton, Florida, 1953.

Treatment	Reading Dates			
	7/21	7/23	7/27	8/3
1 5% granular chlordane, low	18*	20	15	23
2 5% granular chlordane, AA	12	15	15	18
3 5% granular chlordane, Regular	30	26	2	0
4 Check	21	23	29	33

\* The figures, an average of 3 replications represent no. of chinch bugs per 50 sq. inch area at end of 3 minutes using the float method.\*

\* Float method consists of inserting top of old brass cylindrical sprayer into the turf and then filling with water. Insects float to surface and are counted. The granules were made from an emulsion.

TABLE III

A comparison of regular versus fast breaking clays as a base for 5% granular dieldrin used in chinch bug control. Bradenton, Florida, 1953.

Treatment	Reading Dates			
	7/21	7/23	7/27	8/3
1 5.08% dieldrin, AA	16*	18	25	23
2 5.0% dieldrin, regular	24	20	14	3
3 Check	20	21	23	25

\* The figures, an average of 3 replications represent no. of chinch bugs per 50 sq. inch area at end of 3 minutes using the float method. The granules were made from a solution.

TABLE IV

A comparison of different strengths of granular dieldrin as a control for chinch bugs. Bradenton, Florida and Sarasota, Florida, 1953.

Treatment	Reading Dates			
	7/21	7/23	7/27	8/3
1 0.5% dieldrin, regular	22*	21	24	20
2 1.5% dieldrin, regular	15	17	19	2
3 5.0% dieldrin, regular	24	20	14	3
4 Check	20	21	23	25

\* The figures, an average of 3 replications represent no. of chinch bugs per 50 sq. inch area at end of 3 minutes using the float method. The granules were made from a solution.