U.S. Department of Agriculture
Forest Service
Division of Forest Insect Research

Review of Present Status, Progress and Future Plans for Forest Insect Research Conducted with Funds Allotted by the Department of Defense

By

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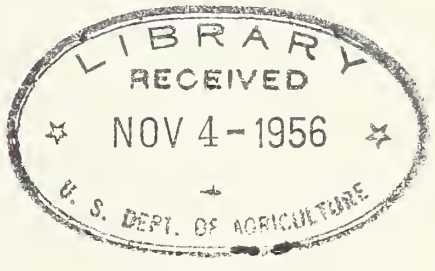

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INTRODUCTION

This summary describes briefly the various research projects conducted by the Division of Forest Insect Research since 1946. For each project, statements are given regarding the importance of the problems, the objectives of the research program, and accomplishments of particular significance. The magnitude of each project currently in progress and the needs for additional research are presented.

With the present level of allotment of funds, statements of needs for additional research, other than a continuation of work currently in progress, may seem unnecessary. A review of the number of long-term tests already underway indicates that continuation of present allotments will be required to finance periodic inspections and prepare reports on them. Therefore, unless funds can be increased, no new work is planned to answer the many unsolved problems. Many of the current tests are already several years old, and some of them probably will continue to give valuable results for several additional years. These tests become more conclusive as they grow older; therefore, it is hoped that they can be continued for several years in order to realize their full value.

Credit for preparation of the material used in this report should go to H. R. Johnston and L. W. Orr, Southern Forest Experiment Station.

II. PROTECTION OF MILITARY SUPPLIES, EQUIPMENT, AND PROPERTY FROM INSECT DAMAGE (.2)
A. PROTECTION OF WOOD AND CELLULOSE BUILDING MATERIALS (.21)

POWDER-POST BEETLES

Statement of the Problem

Lyctus powder-post beetles are a serious problem wherever hardwood products such as lumber, tool handles, tent stakes, gun stock blanks, etc., are stored and are also destructive to the pallets on which products are placed in storage. The annual losses in the United States and in foreign countries run into many hundreds of thousands of dollars annually.

The old house borer causes considerable damage to the pine woodwork of buildings in the United States and is a major pest in South Africa and in northern European countries. Judging from reports and inquiries, infestations of this beetle are increasing in the United States. The Anobiids (death watch beetles) are also serious pests of pine wood, and they can cause heavy losses.

Objectives

To develop control measures which will prevent the heavy losses caused by powder-post beetle damage to wood products.

Outstanding accomplishments

1. In laboratory tests, oil solutions of 5 percent DDT, 0.5 percent gamma BHC, 2 percent chlordane, or 5 percent toxaphene, applied as 3-minute dips to dry wood, have prevented attack by Lyctus after about 6 years. These formulations are now being recommended for preventing attack by Lyctus.

2. The oil solutions listed above are also effective in controlling active infestations of Lyctus beetles, when used as 3-minute dip treatments. Thorough brush or spray applications are effective on small dimension stock, such as tool handles or flooring.

3. Emulsions containing either 5 percent DDT or 0.5 percent gamma BHC applied as 10-second cold dips to green lumber were still present in sufficient quantities after 5 years to kill Lyctus adults within a few days. They are now being recommended for use on green lumber to prevent Lyctus attack in lumber storage yards.

4. Repeated fog application, using 10 percent DDT plus 2 percent lindane, during the period of beetle emergence was found effective in preventing attack by Lyctus in small-scale tests conducted in a large warehouse. Treatments of this type could be of great value

(Over)

where dipping of susceptible products presents an unusual problem. This treatment is effective only for loosely piled products.

5. An article giving recommendations for prevention and control of Lyctus appeared in the March 15, 1955 issue of the Southern Lumberman.

Current tests

1. In 1948 and 1949 thirty chemical formulations were applied to dry and green wood in laboratory tests. Ten samples of wood were treated with each formulation, making a total of 300 individual samples. All of these samples are still in test.

Needs for additional research

1. Continue all tests currently in progress to determine the duration of effectiveness of the various chemical formulations in preventing attack by Lyctus.

2. Apply on a practical scale under warehouse or building conditions the treatments found effective in laboratory tests. This phase of the problem needs emphasis, and practical tests should be established wherever possible.

3. Study the biology of old house borers and Anobiids.

SUBTERRANEAN TERMITES

Statement of the Problem

Subterranean termite caused-losses in the United States are estimated at $20,000,000 annually. They also cause serious losses abroad. Because these insects are responsible for such tremendous losses, the development of satisfactory control measures has been the major research project since 1946 at the Gulfport Laboratory and in the Canal Zone.

Treatments costing hundreds of thousands of dollars are made each year at various military installations to stop the ravages of termites. Not only are the buildings themselves damaged, but many materials stored in them are subject to attack. Termites pose a potential threat to millions of dollars worth of supplies and equipment in large storage depots. Severe losses of such stored materials have been reported. Heavy monetary losses have been reported at military installations as a result of termite penetration of underground electrical cable insulation, causing short circuits and failure of electric power.

Several of the new chemicals, such as DDT, BHC, chlordane, and dieldrin, have proved to be outstanding soil poisons, but the duration of their effectiveness has not been fully determined. The equipment necessary for the proper application of soil poisons underneath existing concrete slabs has never been fully investigated. The increased use of concrete slab construction and the frequency with which termites gain entrance through expansion joints has focused attention on the need for joint fillers through which termites cannot penetrate. Building insulation materials (wallboard) that will not be attacked by termites are needed. Many tropical woods have not been tested thoroughly to determine their natural resistance to termites.

Objectives

The purpose of these investigations is to develop chemical formulations for use as soil poisons which will give the longest possible period of protection against termites; to develop equipment and methods for properly applying soil poisons underneath concrete slabs; to develop expansion joint fillers which termites cannot penetrate; to develop electrical cable insulation which termites will not damage; to test the resistance to termites of various building insulation materials and develop chemicals to protect the susceptible materials; and to determine the relative natural resistance of tropical woods to termites.

Outstanding accomplishments

1. Soil poison formulations, which give longer periods of termite protection than poisons formerly recommended, have been developed. The Department of Defense is already using some of the new formulations. Also, the Federal Housing Administration and Veterans Administration are adopting these new formulations for use in treating the soil before constructing buildings. The Pest Control industry is also widely using these new formulations. All are based on results of these Army-sponsored tests.

2. In field tests simulating trench application, a concentration of 8 percent DDT in fuel oil has given 90 percent protection for 10 years; 0.8 percent gamma BHC is still 100 percent effective after 8 years; sodium arsenite, 10 percent in water, is still effective after 10 years. These formulations are being recommended for general use in preference to old formulations.

3. DDT, BHC, and sodium arsenite are still effective after 8 to 10 years when applied as soil poisons around the foundation of infested buildings.

4. Emulsions of chlordane, BHC, and dieldrin, and 10 percent sodium arsenite in water are highly effective after 4 to 6 years and are being recommended for use for treatment of soil prior to pouring concrete slabs.

5. An article has been prepared for early publication giving results of outstanding soil poisons.

6. Several expansion joint fillers have been tested in the laboratory. One material, MR-1950, has not been penetrated after about 3 years of continuous exposure to termites, and appears to be very promising. Termites penetrated a 3/4-inch layer of coal tar pitch in tests.

7. The termite resistance of several building insulation materials is being tested. Samples of cellulose material dipped in 5 percent pentachlorophenol, 2 percent copper naphthenate, and 10 percent sodium arsenite are still in fair-to-good condition after 6 years of exposure in field tests. These tests are being expanded under funds provided by the Navy.

8. Conduits made of used paper pulp impregnated with coal tar pitch and buried in the soil have resisted termite attack for 8 years in Mississippi and in the Canal Zone.

9. Alpeth cable insulation has not been damaged by termites after 5 years' exposure in the soil.

10. After two years of exposure in the Canal Zone, only one species of tropical wood, spiny cedar (Bombacopsis fendleri Hemsl.), has resisted attacks by termites. Decay is light in this species. Six species which showed light termite damage in all samples are: Panama mahogany (Swietenia macrophylla), Spanish cedar (Cedrela odorata), "Cedro granadino" (Cedrela tonduzii), Amarillo (Terminalia sp.), Sigua (Nectandra sp.), and Nuno (Hura crepitins). Decay was more serious than termite damage in these six woods. A wood with a local reputation for termite resistance, Maria (Calophyllum sp.), did not show up well in the tests. Light to heavy termite damage was found in 9 of 10 samples, and serious decay damage was present in all ten. Espave (Anacardium excelsum) is reported to be relatively resistant to termites if it can be kept dry. The test samples received very heavy damage from decay, and some termite damage developed during the second year of exposure. Cativo (Prioria copaifera) was the least resistant to termites.

Current tests

A total of 226 standard stake and 190 platform soil poison treatments, including different methods of application, chemical concentrations, and dosages have been established in Mississippi and the Canal Zone. One hundred thirty-eight of the tests are still in progress, some of which were established in 1946 and a number established as recently as 1953. In addition, approximately 250 buildings at Army installations have been treated experimentally with soil poisons; all of these

are still in progress. These building tests were established during the period 1944 to 1952; they are located at Fort Bragg, North Carolina; Camp Rucker, Alabama; and Memphis, Tennessee.

Over 50 tests of building insulation materials, including dip treatment of various products, were established in 1948 and 1949 in Mississippi. Over half of these tests are still in progress.

In 1950 several types of electrical cable insulation materials were established in tests in Mississippi. All of these are still in progress. Thirty-two new materials were added to this test recently under the Navy program. These new tests are located in Mississippi and the Canal Zone.

Since 1951 several different joint fillers have been tested in the laboratory at Gulfport, Mississippi. Only three products established in the original tests under Army funds are now in progress. At the present time, however, many new products are being added to this test under the Navy program.

The series of tropical woods that were exposed to termite attack in the Canal Zone in 1951 and in Mississippi in 1953 will be kept under observation until their relative resistance has been established.

Needs for additional research

1. Continue all soil poison tests to determine duration of effectiveness of the various chemical formulations. Many of the soil poison tests were established as recently as 1952 and 1953; therefore, continuation is essential in order to obtain any significant results.

2. Add to the soil poison tests chemicals which appear to possess outstanding properties as soil poisons.

3. Continue the current laboratory tests on expansion joint fillers.

4. Continue annual inspection of building insulation materials to determine their resistance to termites.

5. Continue the tests of various electrical cable insulation materials.

6. Continue tests of tropical woods to determine their resistance to termites.

7. Investigate various types of equipment and methods for applying soil poisons under concrete slabs. Emphasis should be placed on types of drills and nozzles and spacing of holes to adequately treat soil under slabs.

8. Investigate effects of soil poisons on shrubbery common to various sections of the United States.

9. Establish tests of expansion joint fillers under service conditions in buildings.

WOOD PRESERVATION

Statement of the Problem

The problem of replacement of wood damaged by both termites and decay at defense installations is a critical one. Instances of need for replacements can be found in such places as wooden steps, porches, sign posts, and in making general repairs. Temporary storage on soil of ammunition boxes, crating, etc., is also a problem. Hot dips and pressure treatments are, of course, the best methods of treating wood, but these require special equipment. It was felt that cold dips would give the desired protection of wood for many uses; therefore, this method of treatment was investigated. The cold dips have the advantage of being simple and economical, permitting treatments to be made at any defense installation, with a minimum amount of equipment. Studies of the value of combining insecticides, particularly the new hyrocarbons which have proved highly effective in soil poison tests, with the most effective fungicides were undertaken in coop ration with pathologists. In the Canal Zone, where conditions are severe and high chemical retention is necessary, hot dip treatments are being tested.

Objectives

To develop economical chemical formulations and simple methods of application to protect wood from attack by termites and decay. With these aims in view, the use of cold chemical solutions applied by instant dips and soaking is being tested intensively. Hot dip treatments are being tested to a lesser extent in the Canal Zone, where conditions are extremely severe.

Outstanding accomplishments

1. These studies have shown that, in general, instantaneous and 3-minute dips in cold solutions of standard wood preservatives do not give satisfactory protection to wood when it is placed in contact with the soil.

2. The Mississippi tests indicate that wood in contact with the soil can be given a high degree of protection for 3 years with a 1-hour cold soak in 2 percent copper naphthenate in kerosene; it appears to be slightly more effective than 5 percent pentachlorophenol, but it is also more expensive.

3. Combinations of pentachlorophenol with either BHC or DDT have given 4 years' protection against termites with 3-minute dip applications.

4. In recent tests, formulations of BHC, chlordane, and dieldrin combined with pentachlorophenol or copper naphthenate applied as 3-minute dips are very promising after one year.

5. Tests established in Mississippi in 1951 with 10 kinds of coal-tar creosotes of different chemical compositions indicate that some types are more effective than others. Three of the types were 80 to 90 percent effective against termites after 3 years when applied as 1-hour cold soaks; the other 7 types were less effective.

6. The use of wood treated by the cold soaking method has resulted in a very substantial reduction in the need for repairs and replacement of wooden steps, porches, and skirting, etc.

7. A summary giving results of all wood preservative tests to date has been prepared.

Current tests

During the period 1946 to 1953 a total of 173 different wood preservative treatments were established in soil-burial tests in Mississippi; 58 of these treatments are still in progress. In the Canal Zone, 123 treatments were established during the period 1946 to 1953; 43 of these treatments are still in progress. Ten 2" x 2" x 12" samples of wood were used in each treatment at each location; thus, there is a total of more than a thousand individual samples currently in test.

Needs for additional research

1. Continue all of the current tests in Mississippi and in the Canal Zone to determine the duration of effectiveness of the various treatments.

2. Develop more effective preservative treatments for use above ground in the Canal Zone to prevent attack by both subterranean and dry-wood termites.

DRY-WOOD TERMITES

Statement of the Problem

Dry-wood termites cause heavy losses in the southern half of Florida and in parts of California. In Hawaii and the Panama Canal Zone, surveys indicate that over 90 percent of the buildings are infested. Wooden furniture in these localities is often attacked and severely damaged.

Objectives

To develop effective insecticidal formulations and practical methods of applying them to prevent and control dry-wood termites.

Outstanding accomplishments

1. Trichlorobenzene fortified with either 2 percent chlordane, 0.5 percent gamma BHC, or 5 percent DDT, and applied either by brushing or as a 5-minute soak prevented attack for one year. These tests are still in progress in the Canal Zone.

2. Limited tests of oil solutions of chlorinated hydrocarbons applied by brushing and spraying showed highly promising results and they are being widely used in actual practice in the Canal Zone. These methods of control are proving far more effective than the use of arsenicals, which were formerly recommended.

Current tests

Only one series of small-scale laboratory tests is in progress at the present time. These are located in the Canal Zone.

Needs for additional research

1. Continue the annual inspection of the small-scale preventive tests which are in progress in the Canal Zone.

2. Develop inexpensive solvents that will penetrate wood.

3. Determine the value of vapor treatments and fumigants.

4. Develop practical methods for applying all types of treatments.

5. Determine the biology of various species of dry-wood termites.