

INSECT PESTS

WM. CLUNIE HARVEY
AND
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SECOND EDITION

INSECT PESTS

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PREFACE TO SECOND EDITION

It is now seven years since *Insect Pests* was first published, and much has happened during that time to warrant the preparation of a new edition.

The War which has recently terminated has added tremendously to our knowledge of insecticides and the practical uses to which they can be put, while in all fields of entomology and the allied sciences, great strides have been made.

An attempt has been made in this edition to incorporate the latest information available, and to bring the book right up to date. Amendments have been made to each section while two entirely new chapters (on "Mosquitoes and Moths" and "D.D.T.") have been added. It is now hoped that this new edition of *Insect Pests* will prove as popular as its predecessor, and that it may meet a need which has never been so clamant as it is to-day.

The thanks of the authors are due to the War Office and the Ministry of Production, for permission to use materials supplied by them, in this volume.

W. C. H.
H. H.

December, 1946.

PREFACE

DURING recent years the study of insect pests has received an increasing degree of attention, an attention which is in every way justified when the effects produced by this type of nuisance is taken into consideration. Now, with the onset of hostilities and the altered, indeed revolutionized conditions associated therewith, the problem has assumed even greater magnitude. What was formerly and far too often considered little more than a nuisance, has now been finally recognized as a definite menace. The evacuation problem, the herding together of Military, Naval and Air Force personnel in emergency quarters, the mobilization of Civil Defence Units, even the necessary alterations in the sanitary staffs of local authorities—all these factors have played and are still playing an important part in bringing the insect pest into the foreground of our national conscience.

For this reason the authors hope that the present volume will prove of some definite and practical use to those authorities and individuals who have the responsibility of insect pest control placed in their charge.

An attempt has been made to cover the necessarily extensive field as adequately as possible, but in a volume such as this it will be evident that some aspects of the problem have had to receive less extensive treatment than others which appeared to possess more urgent and important claims. In a practical handbook such as this, summarised treatment is probably an advantage,

and it will also be appreciated that in no other way could the material at the authors' disposal have been compressed into adequate space. The authors trust that the essentials have been given requisite attention, and that no fundamental aspect of the problem has been omitted.

The authors wish to tender their most grateful thanks to L. Peverett, Esq., and his associates for numerous courtesies and expert assistance at various stages in the preparation of this volume ; and to Dr. Fenton, Royal Borough of Kensington, and Dr. Dart, of the Metropolitan Borough of Hackney, for permission to reproduce various forms and office records. They are also indebted to Dr. Vynne Barland, Metropolitan Borough of Bethnal Green, for permission to reproduce propaganda leaflets. Acknowledgment is also made to H.M. Stationery Office for permission to include extracts from certain Acts of Parliament, Statutory Rules and Orders. They are prevented, through circumstances over which they have no control, from acknowledging their indebtedness to an eminent authority on insect pests, but they would nevertheless like it to be known that their gratitude is none the less sincere.

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PART I
INSECT PESTS

ADDENDA

The name "Gammexane" referred to on pp. 4, 38, 85, 89, 101, 104, 124, 173, 177, 182, 206, 303 and 316, is a registered Trade Mark of Imperial Chemical Industries Limited.

INSECT PESTS

CHAPTER I

GENERAL OUTLINES OF INSECT CONTROL

Introductory. The elimination of vermin is no longer governed by haphazard, rule-of-thumb regulations, but is a skilled procedure requiring the employment of scientific methods and of persons possessing considerable technical knowledge. It is only within the last decade that the methods originally in use have been abandoned, following the pooling of ideas from different authorities. As might be imagined, this has resulted in benefit to the community. As part of the work of a Public Health Department, insect control and the disinfestation of premises and furniture is now receiving that attention which its importance has rendered long overdue. The degree of ill-health and suffering resulting from verminous conditions, particularly in the home, cannot readily be estimated, but it is quite sufficient to have caused the more enlightened authorities to make strenuous efforts to rid their districts of vermin of all kinds.

The invasion of property by a variety of insect pests has created a problem which is engaging the attention of public health, medical and commercial authorities throughout this country, as well as abroad. The bed-bug, the flea, the mosquito and the louse are the more

familiar enemies of mankind, and medical literature abounds in details of the toll of suffering and disease caused by these pests. To counteract the activities of such insects, a knowledge of their habits and mode of life is essential. For this, we have to thank the scientific entomologist, whose work in field and laboratory has considerably simplified the task of destruction. A lack of such knowledge on the part of operators leads to misdirected effort and to the wastage of valuable material.

While the knowledge of the habits of insects provided by the entomologist is of considerable importance, it would be of little value without the co-operation of the chemist, who provides the lethal weapons necessary for destruction. Chemists are constantly experimenting with a view to producing new and more effective remedies, the latest of which are Dichloro-diphenyl-trichlorethane, more commonly termed D.D.T., and Gammexane. While many extravagant claims are made for a large proportion of these remedies, it is essential that they should be maintained in proper perspective until the validity of such claims can be fully substantiated.

Ironically enough, man himself has been largely responsible for producing conditions which enable insect pests to multiply and so become a definite nuisance. By the crowding of both the human and domestic animal population, and by the storage of all kinds of products which serve as their food, man has provided insect pests with an easily available and almost unlimited food supply, together with ample shelter in reasonably undisturbed conditions. Thus, the two essentials for a rapid increase are to hand.

While there is an abundance, indeed a superabundance

of suitable chemicals available for the destruction of verminous insects, a dearth of skilled operators still exists, due probably to the lack of thought given to the work. The foundation of successful vermin destruction is an accurate knowledge of the habits, life history and environment of the insect in question, and it is only when this problem has been properly tackled and thoroughly understood, that the chemical and mechanical means of combating the pests can be utilised.

For these reasons, it is essential that persons in charge of disinfestation work should possess a sound knowledge of the following subjects :

- (1) Elementary entomology.
- (2) Materials used and the reasons therefor.
- (3) The need for the application of certain materials in certain specified ways.

Until recently, and, indeed, even at the present time, the work of disinfestation has been carried out by inexperienced operators, using ineffective methods and supervised by individuals with the barest knowledge of the principles of disinfestation. This is particularly unfortunate, since the ability of the operator is of the very greatest importance. In addition to skilled workmen, satisfactory materials are also essential. Thus, the ultimate goal of pest extermination is the elimination of untrained men and the weeding out of poor materials, far too many of which are still in use. It cannot be too often emphasised that there are no short cuts to vermin extermination; neither are there any stereotyped methods of treatment, each case of infestation requiring attention on its own merits.

Methods of Control. Three fundamental principles form the basis of all successful control, irrespective of the actual method or process. These are :—

- (1) Correct time of application.
- (2) Thoroughness in carrying out the work.
- (3) Suitable means of applying materials.

The correct time of application is of greater importance than is often supposed, and should be carefully borne in mind when planning a course of treatment, as, in the life cycle of most insects, short periods occur when the insects are exceptionally vulnerable and are thus easily attacked and destroyed. Such periods can only be determined from a knowledge of the insects' life history. Thoroughness implies considerably more than merely using sufficient material and applying the correct process. Care is required in treating the most likely haunts in an efficient manner. Lack of such thoroughness is often the cause of failure, as suitable products, if applied in a haphazard way, will not yield satisfactory results.

It should also be realised that two separate aspects of the problem must be faced. These are :

- (1) Prevention of the transference of vermin from infested property to new houses.
- (2) Routine treatment of existing verminous property.

Experience has shown that infestation of new property can be avoided if the requisite steps are taken. Particular attention to this aspect of the problem is essential if infestation is to be avoided when persons leave old houses for new property. The ordinary routine treatment of infested houses does not call for any unusual methods.

The control of insect pests should be carried out in three progressive stages, as follows :—

- (1) *Diagnosis of the Cause of Infestation.* Thorough knowledge of the insect and its habitat is necessary, particularly as regards the difference between harmless and noxious species.
- (2) *The Remedy Required.* The methods to be employed in extermination and the chemicals required depend upon the insect in question and the prevailing conditions.
- (3) *Application of the Remedy.* This is, in many cases, more important than diagnosis and prescription, since some insecticides, if properly applied, will exterminate all the household pests likely to be encountered.

From a control point of view, insects can be divided into two classes :—

- (a) Those which bite. These feed by biting or chewing portions of their food. Examples of this type are cockroaches and crickets.
- (b) Those which suck. These, such as bugs, fleas and mosquitoes, puncture their food supply, sucking up juices through their probosces.

Those insects which bite can be dealt with by means of poisoned baits, as can some of the sucking type. In the latter case, however, insecticides or fumigants are generally necessary and are definitely more effective. It should be remembered that all control methods are palliative, and that the cause of infestation must be traced and eradicated. Cleanliness, the removal of waste food and rubbish, sunlight, fresh air, sound construction

of buildings, together with soap and water will assist considerably in keeping persons and premises free from insect pests. In addition, delay in dealing with insects may lead to serious infestation, as the rate of increase under favourable conditions is prodigious.

Characteristics of Insects. Insects are included in the phylum *Arthropoda*. This group includes crabs, lobsters and centipedes in addition to insects proper, the group being the largest of the animal phyla. Insects are bilaterally symmetrical, the body being divided into rings or segments, of which a varying number bear jointed appendages. All *Arthropoda* possess a hard, horny exterior. This is less marked in some cases than in others, and is produced by the substance known as *chitin*. Chitin is insoluble in acids but not in alkalies. During growth, the external skeleton is moulded in its entirety.

Included in the phylum *Arthropoda* is the class *Hexopoda*. This class contains an enormous number of varieties of insects, which are to be found in all parts of the world. They are small animals possessing bodies made up of transverse segments, grouped in three distinct regions, as follows :—

- (1) *Head*. Possessing six divisions.
- (2) *Thorax*. Possessing three divisions.
- (3) *Abdomen*. Consisting of a variable number of divisions, with a maximum of eleven.

Segmentation is distinctly seen in the abdomen and thorax. In the head, the segments have become fused, forming a highly chitinated box. The thorax bears the legs, which never number more than three pairs, and in addition the wings. These latter appendages may