

**FARMERS' BULLETIN NO. 127.
IMPORTANT INSECTICIDES:
DIRECTIONS FOR THEIR
PREPARATION AND USE**

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Farmers' Bulletin No. 127. Important insecticides: directions for their preparation and use by C. L. Marlatt

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C. L. MARLATT

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IMPORTANT INSECTICIDES:

DIRECTIONS FOR THEIR PREPARATION AND USE.

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BY

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FIRST ASSISTANT ENTOMOLOGIST.



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U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF ENTOMOLOGY,
Washington, D. C., February 6, 1901.

SIR: I have the honor to transmit herewith copy for a Farmers' Bulletin on insecticides. This bulletin will supplant Farmers' Bulletin, No. 19, prepared in 1894, under my direction, by Mr. C. L. Marlatt, first assistant entomologist. The latter publication has gone through four slightly revised editions, but has now been thoroughly revised and in large part rewritten by Mr. Marlatt, and considerable new matter has been added. I therefore recommend that it be reissued under a new number, to take the place of the older publication. The constant call for information on insecticides warrants the prompt publication of this bulletin in a large edition.

Respectfully,

L. O. HOWARD,
Entomologist.

HON. JAMES WILSON,
Secretary of Agriculture.

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IMPORTANT INSECTICIDES: DIRECTIONS FOR THEIR PREPARATION AND USE.

INTRODUCTORY.

Without going minutely into the field of remedies and preventives for insect depredators, it is proposed to give in this bulletin brief directions concerning a few of the insecticide agents having the widest range and attended with the greatest usefulness, economy, and ease of application. These are not covered by patent, and in general it is true that the patented articles are inferior, and many of the better of them are in fact merely more or less close imitations of the standard substances and compounds hereinafter described. Only such brief references to food and other habits of the insects covered will be included as are necessary to illustrate the principles underlying the use of the several insecticide agents recommended.

RELATION OF FOOD HABITS TO REMEDIES.

For the intelligent and practical employment of insecticides it is necessary to comprehend the nature and method of injury commonly due to insects. Omitting for the present purpose the many special cases of injury which necessitate peculiar methods of treatment, the great mass of the harm to growing plants from the attacks of insects falls under two principal heads based on distinct principles of food economy of insects, viz, whether they are biting (mandibulate) or sucking (haustellate), each group involving a special system of treatment.

INJURY FROM BITING INSECTS.

The biting or gnawing insects are those which actually masticate and swallow some portion of the solid substance of the plant, as the wood, bark, leaves, flowers, or fruit. They include the majority of the injurious larvæ, many beetles, and the locusts. (See fig. 1.)

For these insects direct poisons, such as the arsenicals, which may be safely applied to the leaves or other parts of the plant attacked,



FIG. 1.—Illustrating the different classes of biting insects, all natural size (original).

and which will be swallowed by the insect with its food, furnish the surest and simplest remedy, and should always be employed, except where the parts treated are themselves to be shortly used for the food of other animals or of man.

INJURY FROM SUCKING INSECTS.

The sucking insects are those which injure plants by the gradual extraction of the juices, either from the bark, leaves, or fruit, and include the plant-bugs, plant-lice, scale insects, thrips, and plant-feeding mites. These insects possess, instead of biting jaws, sucking beaks or bristles, which are thrust down through the outer layers of the bark

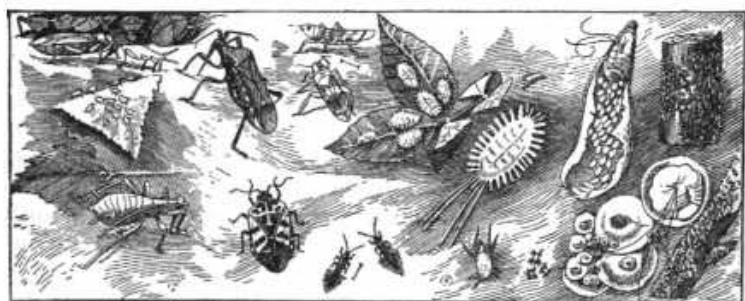


FIG. 2.—Illustrating the different classes of sucking insects, natural size and enlarged (original).

or leaves into the soft, succulent tissues beneath and used to extract the plant juices, with a resulting injury not so noticeable as in the first group, but not less serious. (See fig. 2.)

For this class of insects the application of poisons, which penetrate little, if at all, into the plant cells, is of trifling value, and it is neces-

sary to use substances which will act externally on the bodies of these insects, either as a caustic or to smother or stifle them by closing their breathing pores, or to fill the air about them with poisonous fumes. Of value also as repellants are various deterrent or obnoxious substances.

Wherever it is not desirable to use poisons for biting insects, some of the means just enumerated will often be available.

GROUPS SUBJECT TO SPECIAL TREATMENT.

The general grouping outlined above relates to the species which live and feed upon the exterior of plants for some portion or all of their lives, and includes the great majority of the injurious species. Certain insects, however, owing to peculiarities of habit, inaccessibility, or other causes, require special methods of treatment. Of these, two groups properly come within the scope of this bulletin: (1) Those working beneath the soil, or subterranean insects, such as the white grubs, root maggots, root-lice, etc., and (2) insects affecting stored products, as various grain and flour pests.

Three other groups, which include species requiring very diverse methods of treatment, and therefore not coming within the limits of this bulletin, are (1) the internal feeders, such as wood, bark, and stem borers, leaf-miners, gall insects, and species living within fruits; (2) household pests, and (3) animal parasites.

The classification of insects outlined above, based on mode of nourishment and indicating groups amenable to similar remedial treatment, simply stated, is as follows:

- I. External feeders:
 - (a) Biting insects.
 - (b) Sucking insects.
- II. Internal feeders.
- III. Subterranean insects.
- IV. Insects affecting stored products.
- V. Household pests.
- VI. Animal parasites.

INSECTICIDES FOR EXTERNAL BITING INSECTS (FOOD POISONS).

THE ARSENICALS: PARIS GREEN, SCHEELE'S GREEN, ARSENATE OF LEAD, AND LONDON PURPLE.

The arsenical compounds have supplanted, practically, all other substances for the insects falling under this heading.¹ The two arsenicals in most common use, and obtainable everywhere, are Paris green and London purple. The other two arsenicals mentioned, viz, Scheele's

¹ *Hellebore*.—The powdered roots of the white hellebore (*Veratrum viride*) are often recommended and used as an insecticide, particularly as a substitute for the arsenites. This substance is useful when a few plants only are to be sprayed, as in yards and