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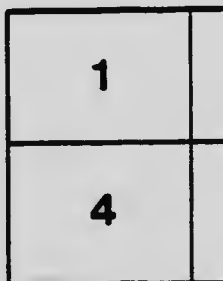
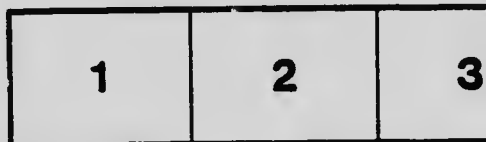
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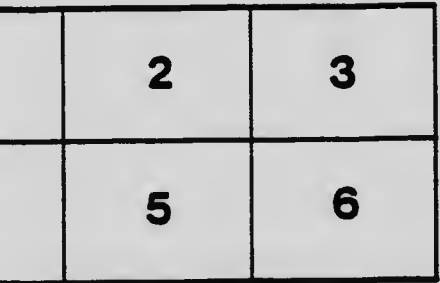
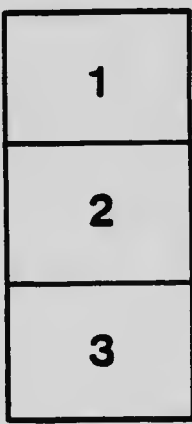
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MICROCOPY RESOLUTION TEST CHART

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CANADA.
DEPARTMENT OF AGRICULTURE.
 ENTOMOLOGICAL BRANCH.

C. GORDON HEWITT, DOMINION ENTOMOLOGIST.

Crop Protection Leaflet No. 6.

How to Control Locusts or Grasshoppers.*

Locusts, or "grasshoppers," as they are more generally spoken of, are true biting insects which feed actively throughout all their stages after hatching from the eggs. The latter enclosed in packets or pods, are deposited freely, chiefly in old neglected pasture lands, stubble fields, and along roadsides, etc., in spots where the soil is dry, not too hard, and largely free of vegetation. Egg-laying takes place in late summer and in autumn, the young locusts not hatching until about May of the following year.

In early life these insects have no wings, and their chief habits are eating and growing. As they develop they cast off their skins from time to time until after the fifth moult, when they attain fully developed wings. After becoming full grown, which is generally in the latter half of June and early July, their feeding habits are less active, and their attention is directed more towards mating and egg-laying.



Locust laying eggs. (Original).

The crops attacked by these insects are oats, barley, timothy, rye, wheat, buckwheat, corn, turnip, rape, clover, potato, cabbage, onion, bean, carrot, etc. In the province of British Columbia, in some years serious injury is effected to native grasses on range land.

REMEDIES.

Poisoned Baits.—In Eastern Canada large areas have been entirely freed from the ravages of destructive locusts by broadcasting over the infested fields the following mixture:—

Bran	20 pounds
Paris green or white arsenic	½ pound
Molasses	2 quarts
Oranges or lemons	3 fruits
Water	2 to 2½ gallons.

In preparing this bran mash, the bran and Paris green, or white arsenic, are mixed thoroughly in a wash tub while dry. The juice of the oranges or lemons is squeezed into the water, and to this is also added the pulp and peel after cutting into fine bits. The molasses should then be added, and when dissolved the mixture should be poured onto the dry man and poison, stirring

*By Arthur Gibson, Chief Assistant Entomologist, in charge of Field Crop Insect Investigations, and Norman Criddle, Field Officer for Manitoba.

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the whole constantly so as to dampen the bran thoroughly. A simple way of cutting up the peel, etc., is to run the same through a meat chopper.

If a large quantity of the bait is required the bran may be simply placed on a cement floor and the Paris green mixed in by means of an ordinary garden hoe, after which the fluids may be added and the whole kept constantly stirred by the hoe until all the bran is thoroughly dampened. Any vessel or floor used in mixing the formula should be thoroughly cleaned afterwards in order to prevent all possible danger of poisoning to live stock.

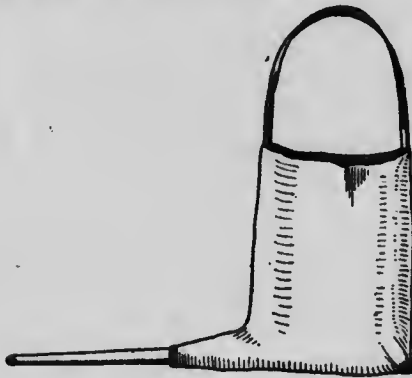
Another poisoned bait which has given excellent results under field conditions in the province of Ontario and Quebec is the following:—

Sawdust.....	20 pounds
Paris green.....	$\frac{1}{2}$ pound
Salt.....	$\frac{1}{2}$ pound
Water.....	3 gallons.

Sawdust, if fairly well free of small pieces of wood, spreads easily, and in many districts where it is difficult to obtain bran, can be had for practically nothing, thus presenting a carrier for the poison which makes the cost of control, including the labour of spreading the mixture, very small. In 1915, the cost of the sawdust-Paris green-salt mixture was only 7 cents an acre, including price of materials and labour.

Twenty pounds of either of the above poisoned baits are sufficient to treat five acres of growing crop. It is not necessary that the mixture be applied to all of the land, but by scattering it thinly here and there throughout the fields, sufficient of the bait will be distributed to attract the locusts from considerable distances. The best results in destroying these insects will be obtained before they reach the winged state, namely, when they are in the hopping stage and in size from about one-quarter to one-half an inch in length.

Whichever poisoned bait is used it should be broadcasted in the infested areas early in the morning, about the time the insects are beginning to move about after their night's rest. In treating large areas it is of the utmost importance that farmers in the infested district co-operate and apply the mixture at the same time.



Canvas bag, with metal spout, used for spreading poisoned bait. (Redrawn after Parks)

During 1917, Mr. T. H. Parks* devised a spreader for distributing the poisoned bait. This is shown herewith. It consists of a canvas bag strapped over the shoulders of the operator to which is attached a feeding device consisting of a canvas sleeve and swinging tube made of tin or galvanized iron. "The dimensions of the metal tube are as follows: length, 28 inches; diameter at upper end, 2 $\frac{1}{2}$ inches; diameter at lower end, 1 $\frac{1}{4}$ inches. Over the opening at the lower end is soldered two short wires bent around in the shape of a U, and crossing each other at right angles at exactly the centre and about one inch below the opening of the tube. These wires are soldered to the edge of the tube and soldered together where they cross. Their purpose is to scatter the mixture evenly and thinly as it leaves the tube, being swung by the operator. The canvas sleeve is 12 inches long, 13 inches in circumference at the upper end, and 8 inches at lower end, which fits tightly over the upper end of the metal tube."

The Criddle Mixture.—In the province of Manitoba the mixture known as the Criddle mixture has been of great value in controlling outbreaks of injurious locusts; in fact, it is the only practical measure which has been adopted, in recent years, in that province. Its value in adjoining Prairie Provinces is also undoubted. Owing to the present high cost of bran and the difficulty

*Jour. Econ. Ent., Dec., 1917.

of securing sawdust in sufficient quantities on the Prairie Provinces, the cheapness of the Criddle mixture is an important factor. It is made by adding 1 pound of Paris green, or white arsenic, and 1 pound of salt to 15 gallons, by measure, of fresh horse droppings. Sufficient water should be added to the droppings to make a moist, but not sloppy, mash, and the Paris green and salt then added and thoroughly mixed by means of a fork or rake. The mixture may be scattered lightly from a low barrel, box, or tub, by means of a trowel or shingle, in the infested fields, chiefly where the insects are feeding.



Egg pods of locusts, showing various shapes; pod at right opened to show the closely packed eggs. (Original).

Ploughing.—Old pasture land or other areas known to attract locusts for the purpose of egg-laying should be ploughed to a depth of at least six inches after the eggs have been deposited. Egg-laying takes place in late summer and early autumn, and the ploughing therefore, should be done in late autumn or in spring before May of the following year, in order that as many eggs as possible will be buried deeply, thus preventing the young escaping to the surface. If the ploughing is done in spring, it is wise to follow this immediately by harrowing. Shallow ploughing, which would undoubtedly break up many of the egg pods, would not, however, be thorough enough, so is not to be recommended.

Damage to Binder Twine.—In the Prairie Provinces considerable injury, some years, has been caused by locusts, as well as crickets, eating binder twine when grain is standing in stooks. Some kinds of twine, as for instance that which is loosely twisted, has been more attractive to the insects. We have used several mixtures to protect the twine from locust injury, and the following has been found most useful:—

Bluestone.....	1 pound
Water.....	6 gallons.

The binder twine should be soaked in the solution for half an hour, and then dried before using. The mixture, of course, is not intended to destroy locusts; it simply deters them.

We shall be pleased to hear from any one concerning damage or trouble of any kind due to insect pests. No postage is required on such letters of inquiry when addressed:

*Dominion Entomologist,
Department of Agriculture,
Ottawa, Ont.*

Such inquiries should be accompanied, in all cases where it is possible, by specimens of the insects. The insects should be sent packed with their food plant in a strong wooden or tin box to prevent loss in transit. Packages up to 12 ounces in weight may be mailed free, and every package should bear or contain the sender's name and address, and be accompanied by a letter.

OTTAWA: Reprinted, June, 1919.





