

UNIVERSITY OF ARIZONA
AGRICULTURAL EXPERIMENT STATION

TIMELY HINTS FOR FARMERS. No. 104

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GRASSHOPPERS

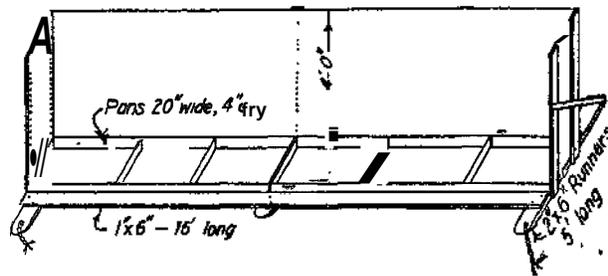
The control of grasshoppers is an important insect problem in Arizona. Nearly all crops are subject to attack and consequently the citrus fruit grower, the truck crop grower, the grain grower and the alfalfa grower are all interested in this problem. In this State alfalfa probably suffers a greater total loss from grasshopper attacks than any other single crop and reports of injury and requests for advice in the control of these insects in alfalfa fields are correspondingly more frequently received by the Experiment Station.

It is unnecessary to discuss here the different kinds of grasshoppers found in Arizona. It is sufficient to point out that with one exception the more injurious grasshoppers of Arizona have similar habits and are subject to control by the same general methods. The exception is the unusually large and clumsy black species marked with reddish lines, common in the southeastern part of the State and known as the Military grasshopper. This species will be discussed separately.

The female grasshoppers lay their eggs in clusters in the ground just below the surface during late summer and early fall. Cultivated ground is generally avoided, the insects seeming to know by instinct that neglected fields of grass and weeds, roadsides, ditch banks and alfalfa fields are the most suitably protected locations for depositing the eggs. The egg clusters consist of from 30 to 100 eggs each, covered in each case with a glue-like protective coating. The young grasshoppers are hatched from the eggs in late winter or early summer, depending upon climatic conditions, and are ready, as one writer has aptly expressed it, "to eat their way to maturity."

In the control of grasshoppers, all stages, egg, nymph and adult, should be given attention. The measures for the destruction of the eggs are generally spoken of as preventive, as contrasted with the measures for destroying the hoppers in the nymph and adult stages.

Hopperdozers: For the wholesale destruction of grasshoppers in alfalfa fields, the hopperdozer is the most successful and practicable means. This consists of a shallow elongated pan with a high back shield arranged for dragging across the fields for the collection of the hoppers. The pan is of galvanized sheet iron and divided into compartments each of which when in use contains water with coal oil on the surface. The shields and sides are preferably made of a smooth cloth such as oil cloth. The runners may be wagon tire iron or wood, or the hopperdozer may be provided with small wheels. The details may be worked out by any person of ordinary ingenuity and modified to suit the materials available for use in the construction. The accompanying plan for the construction of a hopperdozer was drawn by Mr. Rupert E. Lee Wilcox, Crop



Hopperdozer for farm use

Pest Inspector, Arizona Commission of Agriculture and Horticulture, Thatcher, Arizona. This design is for a large one to be drawn by two horses, one at each end. Smaller hopperdozers which can easily be drawn by two men or boys can be constructed more cheaply. One of the simplest is described as made of sheet iron, 8 feet long, 11 inches wide at the bottom and turned up a foot high at the back and an inch in front. A runner of wood or wheel tire iron at each end completes the hopperdozer. This type would probably cost about four dollars. The comparatively low back is a weak feature since too many of the hoppers would fly or hop entirely over it. The figures on the cost of

construction of the first mentioned type of hopperdozer, according to the accompanying plan, are supplied by Mr. Wixom, as follows.

0 2-3 yds. of oil cloth at 23c. per yd	\$ 1.65
Nails and tacks10
2 galvanized iron pans (22 gauge iron) 20in. wide, 9 $\frac{3}{4}$ in. long, 4in. deep, containing 2 cross partitions, \$4.50 each	9.00
2 pieces of lumber 1in.x6in.x16ft., containing 16 feet of lumber	
2 pieces of lumber 1in.x4in.x16ft., containing 102-3 feet of lumber,	
1 piece of lumber 1in.x4in.x10ft., containing 31-3 feet of lumber,	
Total of lumber, 30 feet, at 3c. per foot.90
Total	<u>\$11.65</u>

Hopperdozers are used to best advantage before the insects have reached the winged stage and immediately after the hay crop is cut and stacked. If it is desired to use one when the alfalfa is six inches high or more, the runner may be made higher or, preferably, wheels may be used to raise the pans higher from the ground.

Poison: Two kinds of poisoned baits are extensively used in the control of grasshoppers. These are known as "Poisoned Bran Mash" and "Criddle Mixture". Poisoned bran mash is made with the following materials;

Paris green	1 lb.
Wheat bran	20 lbs
Molasses	2 qts.
Lemons (chopped fine)	3
Water	3 $\frac{1}{2}$ gals

The dry bran and the Paris green should be thoroughly mixed. The lemons, the molasses, and the water should be mixed together and added to the bran and Paris green, making a stiff mash. The lemons are not essential, but it has been determined by experiments recently conducted in Kansas that they add fully 25 percent to the effectiveness of the bait. Twenty pounds of bran makes sufficient poisoned mash for four or five acres. It should be scattered broadcast in the early morning, preferably before sunrise. It is said that this method of broadcasting the bait makes it impossible for birds, poultry, or live stock to secure a fatally injurious amount of the poison. Criddle mixture is prepared from the following materials:

Fresh horse manure	½ bl.l.
Paris green	1 lb.
Salt	1 lb

Water to make a soft but not sloppy mixture.

The Paris green and the salt should be added to about two gallons of water, which is poured over the horse manure while the latter is being stirred. More water is added to make a soft mass, stirring the mixture thoroughly. Criddle mixture is ordinarily recommended for distribution in heaps of about a shovelful each at intervals of about a rod. Moistening these heaps by means of a sprinkling can, each day, will help to keep the bait attractive to the grasshoppers, and for the same object it is recommended that a shingle or piece of board be placed on top of each heap.

Preventive measures: Ordinarily, if enough chickens and turkeys are available, it is advisable to keep them in the infested fields and gardens in preference to using poisoned baits. A series of chicken broods allowed to run in vegetable gardens until about six weeks of age in each case will dispose of grasshopper and nearly all insect problems more satisfactorily than poisons. In some cases in small gardens cheap mosquito netting can be used as a cover to protect vegetables from grasshoppers. The writer has also successfully and economically used this material for the protection of the foliage of young citrus trees.

The destruction of grasshopper eggs is generally considered a very important control measure for grasshoppers, although useful only for the protection of future crops. The practicability of destroying the eggs varies greatly in different localities, and in a single locality varies according to the nature of the surroundings. Every farmer who is bothered by grasshoppers should observe during late summer and the fall where the adult hoppers are depositing their eggs. Whenever practicable, alfalfa fields should be disked during the fall and winter to break up the egg clusters; other fields should be plowed to bury the egg clusters so deeply that the nymphs cannot reach the surface, and the surface of the soil to a depth of about two inches should be broken up along ditch banks and the field borders wherever it is observed that large numbers of eggs have been laid.

The Military grasshopper, which has been mentioned as requiring different methods of control from the ordinary injurious species, is notorious in the Sulphur Spring Valley, especially as a pest of beans. This insect breeds in the desert surrounding cultivated fields and is usually first found feeding on mesquites leaves. The destruction of

the **eggs** during the fall and winter as recommended for other **grass-hoppers** is probably impracticable except in rare cases. The writer is informed that chickens and turkeys will not attack the Military grasshopper. As far as known no tests have been made to determine the effectiveness of the poisoned bran mash and the Crid-dle mixture against them although these poisoned baits have been tentatively recommended to correspondents. The habit of these insects in crawling up tree trunks, fence posts and poles at night makes it possible to take advantage of their peculiarities by driving stakes at intervals of a few feet along rows of crops which are attacked, and destroying the insects by hand in the early morning before they have started to feed. A deep trench plowed completely around a field or along the side threatened with invasion, offering a barrier of 4 or 5 inches of vertical earth-cut for the clumsy insects will impede and perhaps **effectively** check their progress. If large numbers collect in the trench they may be killed by spraying with kerosene or coal oil emulsion, or by dragging a log through the trench to crush them; probably **also** by digging post holes along the trench at intervals so that the **in-sects** may trap themselves by falling in.

A. W. MORRILL.