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SAVE CROPS BY CONTROLLING

FACT SHEET

U. S. DEPARTMENT OF AGRICULTURE
Office for Food and Feed Conservation
Information Supplied by
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Bureau of Entomology and Plant Quarantine

Grasshoppers

FOR 20 YEARS grasshoppers have been an annual 32-million-dollar menace to American agriculture.

Since 1927, principally in the western two-thirds of the Nation, they have destroyed food and feed crops worth more than 656 million dollars.

At their biggest feast on record, in 1936, they gobbled up 102 million dollars in crops.

In North Dakota alone, in 1933, they cost farmers 25¼ million dollars.

These are the losses in dollars.

In addition, grasshopper damage to range and pasture in some years amounts to unknown millions of dollars in lost feed and in forced sale of breeding stock and unfinished meat animals.

Nor are these all the losses.

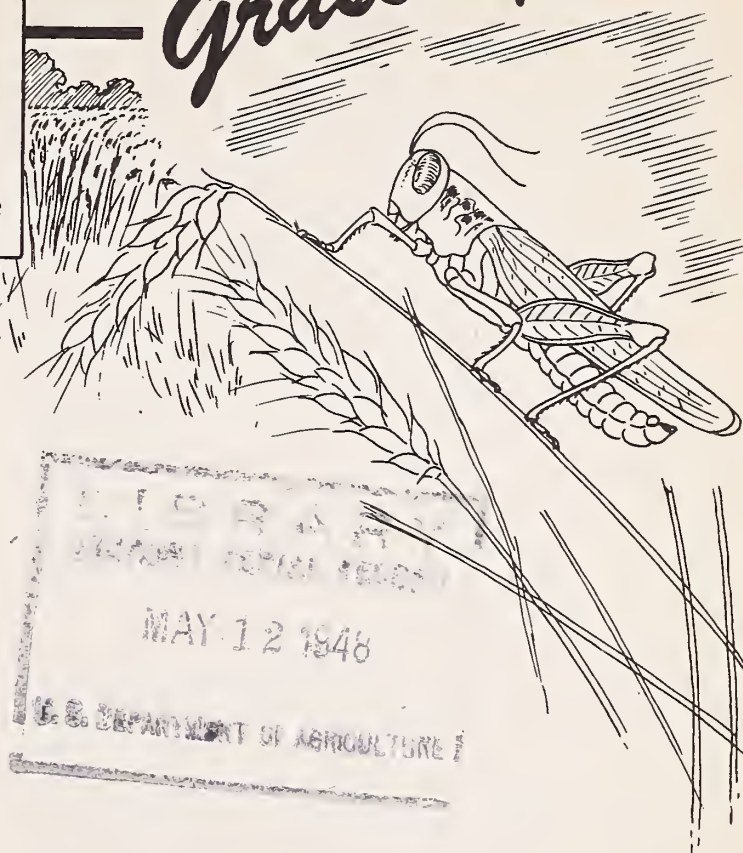
For on top of all this, grasshopper damage to crops, pastures, and ranges opens the way to soil erosion. The complete removal of vegetation, which frequently results from severe outbreaks, leaves the soil ready to wash and blow, and it may remain depleted for years.

How to Make \$25 for \$1

Records show that \$1 spent for control is worth an average of \$25 in crops saved. The critical world food and feed shortage makes it imperative to save this year's crops from grasshoppers. Here's how it can be done:

1. Kill hoppers before or soon after they hatch.
2. Attack survivors with bait, dust, and spray.
3. Kill remainder when they congregate for egg laying.
4. Organize community and county-wide control programs.

County agricultural agents, other farm specialists, and State and Federal grasshopper-control supervisors can



help farmers develop protective seeding and tillage practices, and organize control programs. Plans, specifications, and pictures of power bait mixers and spreaders may be obtained from the Division of Grasshopper Control, Bureau of Entomology and Plant Quarantine, 131 Speer Boulevard, Denver 3, Colo.

Attack Before They Hatch

The place for a farmer to start grasshopper control is on his own land, and the time to start is before the hoppers hatch. Plowing and harrowing are effective in destroying eggs or in burying them so deeply that most of the baby hoppers cannot climb to the surface. In areas where grasshoppers are a menace, only fall-plowed, spring-plowed, or summer-fallowed land should be seeded. Though the practice of "stubbling-in" crops may deter soil erosion, it also boosts the hopper birth rate. Where soil erosion is likely to be a serious factor, county agents, agronomists, soil conservationists, and entomologists should be consulted in developing a tillage and seeding program that will provide as much grasshopper control as is consistent with approved local farming methods.

When farmers practice grasshopper control on their own fields, their protected crops have more time to develop enough to survive attack, their control cost is reduced, and they can apply more of their control efforts on hoppers coming in from outside.

Use Bait, Spray, or Dust

Poison bait offers a simple, inexpensive, and reliable way to kill hoppers on range and idle lands, in grain fields, in field margins where vegetation is sparse, and in gardens. The recommended formula is:

Mill-run bran or mixed feed...	25 lb.
Sawdust (3 times bulk of mill-run bran).....	3½ bu.
Sodium fluosilicate.....	6 lb.
Water (only enough so bait will drip slightly when pressed firmly in hand).....	10-12 gal.

Mixing Bait.—Mix by hand on a tight floor, or in a wagon box or similar container. Spread sawdust evenly 6 to 8 inches deep. Distribute millfeed evenly over sawdust and scatter fluosilicate uniformly on top. Mix thoroughly with scoop shovel. Splash water over dry materials three times, turning mixture with shovel after each wetting.

WARNING.—Avoid breathing sodium fluosilicate dust. Where it is necessary to handle and mix large quantities, the use of a dust respirator approved by the United States Bureau of Mines is recommended. Wash hands thoroughly with soap and water after mixing and applying the bait. All vessels and clothing used should be thoroughly cleaned before storing or re-using them.

Spreading Bait.—Best time is when hoppers are on the ground during their first feeding of the day. In determining proper time, scatter a few handfuls of bait where hoppers are numerous and watch results. If they refuse the bait, wait until they become hungry. Spreading bait when conditions are not right usually results in small kills.

Scatter 20 pounds (wet basis) thinly but evenly on each acre of infested soil. Make several casts with each handful. Be sure it falls in flakes.

Don't expect immediate results. It takes a few hours before hoppers become ill, but they do little damage after eating a fatal dose. When poisoned, they seek shade and moisture and frequently die in large numbers under plants and clods and in soil cracks. In measuring results, study these spots carefully.

Bait is more effective when young hoppers have congregated on headlands and in field margins than it is after they have grown larger and have scattered. For effective and timely coverage of large acreages in a community or county-wide control program, the use of power mixers and spreaders is necessary.

Sprays and Dusts.—Many farmers are using new insecticides instead of the bran-sawdust-fluosilicate bait. Mixtures containing chlordane or benzene hexachloride

have been used as dusts and sprays. In Bureau of Entomology and Plant Quarantine tests, mixtures containing chlorinated camphene have been as effective as those containing chlordane. Generally good but more variable results have been obtained with benzene hexachloride. These materials give higher initial kills and are effective over a longer period when applied as sprays than when applied in equal doses as dusts.

When used as dusts or sprays on succulent growth along field margins, roadsides, canals, and railroads, or on crops like rank-growing alfalfa, young cotton, flax, and corn, these new insecticides produce a quicker control and they kill over a longer period than the standard sodium fluosilicate bait. Effectiveness, ranging from 1 to 3 weeks, is governed by conditions of weather and vegetation, season, age of hoppers and the formulation of the dust or spray.

In sprays and dusts used on range lands or idle lands, in fields of small grains, or in field margins with sparse vegetation, these new chemicals are not more effective than the bran-sawdust-fluosilicate bait.

For *spraying*, apply 1 pound of technical chlordane or 1½ pounds of technical chlorinated camphene per acre; for *dusting*, use 1½ pounds of technical chlordane or 2 pounds of chlorinated camphene per acre. Late in the season, after vegetation and hoppers have grown, a slight increase in dosage per acre of sprays and dusts may be required.

Chlordane and chlorinated camphene are available as emulsion concentrates, wettable powders, and dusts of varying strengths. Emulsions and wettable powders may be diluted with water for use with available spraying equipment, but regardless of form or dilution the quantity of technical material used per acre should follow the above recommendation.

These new insecticides, applied at the right time and place, are additionally effective if used on a community basis. They can be applied with ground dusters, sprayers, or airplanes, carefully adjusted for even distribution of the right amounts over the area being treated. Use of too much insecticide is wasteful and increases the danger of residues; use of too little wastes labor and materials and does not prevent crop losses.

Most satisfactory results will come when spray or dust is applied to colonies of young hoppers before they leave hatching grounds. This practice also makes a substantial savings by reducing the acreage to be treated.

To prevent hopper damage to corn, treat the cornfield margins and adjacent infested grainfields, or intervening weed patches, *when grains begin to mature*.

When a whole field of alfalfa is infested, it usually is most economical to cut the crop and then apply the control measure to protect the next growth. Do this by

spraying or dusting field margins, ditch banks, patches of weeds, and uncut strips of alfalfa. Hoppers congregate there after the first crop is removed. Irrigation of alfalfa fields frequently causes many more hoppers to hatch from eggs still present in the soil. These can be controlled by spraying or dusting the next crop when it is 6 to 10 inches high. By this practice, heavy deposits of insecticides on this second crop at harvest time may be avoided and material damage to the second growth may be prevented, unless there are new migrations of hoppers into the field from outside.

CAUTION.—Remember that chlordane, chlorinated camphene, and benzene hexachloride, like most other insecticides, are poisonous. Proper precautions should be taken in handling them and in feeding livestock on forage or pasture where any of them have been used. Wash hands thoroughly with soap and water after mixing and applying spray or dust. Thoroughly clean all vessels and clothing used before storing or re-using them.

Forage treated with these new chemicals should not be fed to dairy cattle. Treated vegetation should not be fed to animals being finished for slaughter. A related chlorinated compound is known to accumulate in fatty tissues of animals fed on treated forage and to be given off in the butterfat of their milk. It is, therefore, possible that chlordane or chlorinated camphene may behave similarly.

Forage treated with chlordane or chlorinated camphene, in doses heavier than those needed for grasshopper control, has been fed continuously to meat animals to the exclusion of other feed for several weeks without visibly impairing their health or development. However, this does not bar the possibility that animals fed for long periods on treated forage might accumulate sufficient quantities of these chemicals in their fatty tissues to make them unsafe for food.

Chlordane or chlorinated camphene should not be applied to fruits or leafy vegetables when foliage or fruit that is to be used as food is on the plant, unless the residue can and will be removed by washing or stripping.

Avoid applying these materials to legumes in bloom or when bees are active in the fields, because of the danger of killing the bees.

Kill Before Egg Laying

Effective control programs are aimed at reducing damage to next year's as well as this year's crops. Grasshoppers deposit eggs in soil *after they have developed wings*. One female may lay 200 eggs. Soil becomes unattractive for egg laying when grain stubble is worked after small grains have been harvested and when there is clean cultivation of summer-fallowed fields. Such practices encourage hoppers to congregate and lay eggs in weedy and grassy areas outside these fields. When this happens they should be killed in these places by baiting, dusting, or spraying, before they have had a chance to lay eggs.

The policy that always pays off is: *Kill concentrations of grasshoppers whenever and wherever they are found, even if they are not injuring crops. Kill them when they are young and before they lay eggs. It is much less expensive than after they have grown up and multiplied.*

Organize Community and County

When hoppers menace crops on only one farm, individual action generally is sufficient. When there are many of them, however, and they threaten crops on other farms, united community or county-wide action is necessary. *This can be obtained only through organization, effective leadership, and adequate financial support. A large-scale campaign lacking any one of these elements cannot be effective.* Thorough cleaning up of a community will reduce the necessity for intensive controls next year.

A well-organized campaign started early and pushed vigorously to completion before baby hoppers grow wings in most cases will prevent serious crop losses. If a "wait and see" policy is followed, complete success is extremely hard to attain.

