II.1 Introduction to Chemical Control

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NOTE: Acephate is no longer approved by EPA for rangeland grasshopper control.

Since the beginning of recorded history, outbreaks of grasshoppers have plagued humanity, coming in direct competition with people for life-sustaining food. Humans were initially helpless against grasshopper outbreaks. Natural control through grasshopper predators, parasites, diseases, and unfavorable weather conditions offered the only relief that could be expected.

Colonial America recorded grasshopper outbreaks in the mid-1700's. From 1718 to 1767, the founders of California missions faced near famine from grasshopper plagues (Schlebecker 1953). During 1874 to 1877, the outbreak of the Rocky Mountain locust (grasshopper) became widespread and severe. The U.S. Congress established the U.S. Entomological Commission to deal with grasshopper problems (Parker 1952). The first effective chemical control of U.S. grasshopper populations took place in 1885 with the use of bran and arsenic-based bait.

From then until the middle 1900's, poison baits that grasshoppers would eat were the most commonly used type of chemical control for combating these pests. Baits laced with arsenic were popular until 1943, when sodium fluosilicate became the active ingredient of choice.

Through increased research, baits were improved, and by 1950 the chlorinated hydrocarbons chlordane, toxaphene, and aldrin replaced sodium fluosilicate. Aerially applied sprays containing the newer chemicals saw use in the late 1940's and were so effective that bait treatments essentially disappeared in the 1950's (Parker 1952). Improved baits are now enjoying a renewed interest, primarily because of environmental concerns and improved application technology. By the mid to late 1960's, malathion spray applied at ultralow volume became the most common chemical for controlling grasshoppers on rangeland. In the early 1970's, the Sevin 4-Oil® formulation of carbaryl became available. By the early 1980's, acephate was added to the group of chemicals recommended for controlling grasshoppers.

There are several other chemicals highly toxic to grasshoppers, but they are not registered for use on rangeland, where treatments occasionally contact domestic livestock and wildlife. For grasshopper control programs that the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) oversees, only chemicals with minor impact on the environment and nontarget organisms are used. These chemicals give acceptable performance on grasshoppers. Currently, malathion, carbaryl, and acephate remain the three recommended chemicals for use in large-scale, aerially applied control programs against grasshopper outbreaks.

Because grasshopper outbreaks often are so extensive that individual land managers and owners alone cannot control them, Congress charged USDA in 1934 to help protect rangeland and cropland from the destructive populations of grasshoppers (U.S. Department of Agriculture 1979). In the 1980's, for example, the Federal Government sprayed millions of acres of public and private western rangeland for grasshopper control. Control programs on a smaller scale take place almost every year in some States. Congress authorized USDA involvement in large-scale, coordinated efforts against damaging outbreaks of grasshoppers by the Incipient and Emergency Control of Pests Act, 1927; the Organic Act of the Department of Agriculture, 1944; the Cooperation with State Agencies in the Administration and Enforcement of Certain Federal Laws Act, 1962; and the Food Security Act, 1985.

Currently, two major programs administrated by USDA exist for managing grasshoppers on or near rangeland areas. They are the Rangeland Grasshopper Cooperative Management Program and the Cropland Protection Program. USDA is also involved when grasshoppers reach certain levels on Conservation Reserve Program lands.

The work to develop alternatives to chemicals for suppression and control of grasshopper outbreaks is ongoing. However, advances are slow, and currently the proven options are few at best. The small number of effective tools and strategies for managing grasshoppers dictates continued reliance on chemical control as a major option within grasshopper management. When outbreaks reach crisis proportions, chemical control of some form may be the only remaining option.

A primary goal of integrated grasshopper management is to prevent the buildup of populations to damaging levels. However, some periodic outbreaks will inevitably occur, and some will require immediate intervention in the form of fast-acting chemical control. The traditional use of chemicals has been to control grasshoppers to the greatest possible extent. However, recent improvements in equipment and application methods and the development of a system for analyzing the economics of alternate strategies are expanding the role of chemicals. These developments may lead to strategies with objectives other than maximum control and ultimately will allow the use of a lower dosage of chemicals previously believed to produce unacceptable results.

The following section will explore some major techniques and issues related to current chemical control tools and tactics and will also discuss and propose some future tactics. The chapters in this Chemical Control section of the Grasshopper Integrated Pest Management User Handbook serve as a state-of-the-art source of information about the role chemical control has in integrated rangeland grasshopper management technology.

Suggested References

Parker, J. R. 1952. Grasshoppers. In: Insects: the Yearbook of Agriculture, 1952. Washington, DC: U.S. Department of Agriculture: 595–604.

Schlebecker, J. T. 1953. Grasshoppers in American agricultural history. Agricultural History 27: 85–93.

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