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# Alfalfa Seed Production and Pest Management

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# INTRODUCTION

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**High yields of alfalfa seeds depend heavily on management of two wild bee pollinators—the alkali bee and the alfalfa leafcutting bee. Integrated control of aphids, lygus bugs, and other insect pests uses selective insecticides that are safe for pollinators and beneficial predators and yet keep pest populations below damaging levels. These two factors—pollinator management and integrated pest control—make alfalfa seed production a complex undertaking. Other factors such as irrigation, seedbed preparation, harvesting, and weed control are also important.**

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**ALFALFA SEED PRODUCTION** is a highly specialized enterprise with the added complexity of pollinator propagation and management. If seed prices are high, returns to the grower can be sizable. However, growers must accept greater risks involving a considerable cash outlay for essential pollinators.

## POLLINATORS INCREASE PRODUCTION IN WEST

Prior to World War II, Kansas, Oklahoma, Nebraska, Montana, Utah, and South Dakota produced most of the alfalfa seed in the United States. Large acreages were harvested, but yields were usually below 100 pounds per acre. Managed pollination using the honey bee, *Apis mellifera*, enabled California to become a significant producer by 1947; but after reaching a peak with more than half the total seed production in 1957, California declined until about 1980 because of steadily decreasing acreage. Skyrocketing land values, new pests, and resistant pest problems contributed to the reduction during that time.

Research on another pollinator, the alkali bee, *Nomia melanderi*, helped Washington growers become the first producers to average over 400 pounds per acre in 1950. The following year, Washington became the second-ranking producer. As yields increased, so did alfalfa acreage; the number of acres approximately doubled each year from 1948 through 1951. Oregon and Idaho also began producing more alfalfa seed in the early 1950s. By 1961, the three Pacific Northwest states were producing over 25% of the total alfalfa seed crop and much more of the winter-hardy seed.

Nevada began producing a significant amount of seed in 1959. With introduction of the alfalfa leafcutting bee, *Megachile rotundata*, an excellent pollinator, Nevada became the fifth-ranking producer in 1968. The four states have continued to produce 35–50% of the total alfalfa seed crop since 1970.

## FACTORS IN SUCCESSFUL SEED PRODUCTION

Successful alfalfa seed production involves pro-

per insect control, adequate pollination, skillful use of irrigation water, acceptable varieties, and adjustment of cultural and management practices for local conditions. For many years, seed production increased and decreased in a haphazard fashion in different regions of the West. During the past 30 years, production has been stabilized by effective pollinator management. Problems with insecticide poisoning also led to integrated pest management programs.

A seed grower can work with the three main factors that limit production—insect control, pollination, and irrigation. An overriding factor, however, often is adverse weather. Continuous cool, windy weather not only reduces cross pollination but also reduces propagation of pollinating bees for the following season. Heavy rains in July can drastically reduce alkali bee populations. Heavy rains ahead of harvest in August and September can be even more devastating since they often reduce yields up to 50%. Drought causes alkali bees to leave dry nesting sites and also reduces the size and weight of seeds at harvest. Poor weather is involved in all cases of poor yield, whether it stimulates pest outbreaks, reduces pollination, or does direct damage to the plants.

Other factors of importance are seedbed preparation, weed and nematode control, and harvesting. Plant diseases, although not usually a critical concern, sometimes cause severe reduction in stands.

## DEVELOPMENT OF INTREGRATED PEST CONTROL

Thirty-five years ago many fieldmen and seed growers in the Northwest were convinced they needed parathion to kill lygus bugs, *Lygus hesperus and L. elisus*, and pea aphids, *Acyrthosiphon pisum*. In answer to bee poisoning problems caused by this use of parathion, 1953 research showed demeton (Systox) to be highly effective against aphids, while doing little damage to both alkali bees and honey bees. Demeton has continued to be the first choice pesticide because it is relatively safe to most aphid predators such as lady beetles and green lacewings. However, a truly integrated control program was delayed for another 14 years because other materials used to control lygus bugs, such as DDT and toxaphene, were destroying potential lygus bug predators.

Trichlorfon (Dylox) was first tested for lygus bug control in 1962. Although it was only partially effective against the pests, this material proved to be uniquely safe to the alfalfa leafcutting bee, which had quickly become a major pollinator in the Northwest. Such lygus bug predators as the western bigeyed bug, *Geocoris pallens*, and the western damsel bug, *Nabis alternata*, were not only initially tolerant to trichlorfon but have now gained at least a ten-fold increase in resistance with continued exposure. Acidification of alkaline spray water and use of relatively cool spray water have improved the performance of trichlorfon against lygus bugs during the last 20 years.

Basic ingredients for a successful integrated control program against the major pests had developed by 1970: pesticide-tolerant predators of the key insect pests, knowledge of damaging population levels of the insect pests, efficient and practical sampling procedures, and selective insecticides. Impetus for this development has always been safety to the essential pollinators: alkali bees, alfalfa leafcutting bees, and honey bees. From time to time, certain modifications have been required to control secondary pests such as the alfalfa weevil, *Hypera postica*, and the bertha armyworm, *Mamestra configurata*. During the past ten years, trichlorfon has sometimes adversely affected beneficial predators and pollinators in the field. Oxydemetonmethyl (Metasystox-R) is providing better integrated control in some cases. However, when the alfalfa is unusually lush, this material has repelled honey bees from the fields.

The Integrated Pest Management Project on alfalfa seed differs from other IPM programs in one important aspect: an effective pest control program must be coordinated with an effective pollinator program before the seed grower can be successful.

## IMPORTANCE OF POLLINATORS

Management of two species of wild bees for alfalfa pollination has been the main reason for success of the seed industry in the Northwest. Honey bees usually are not effective pollinators of alfalfa seed in northern areas and typically account for only 100-200 pounds of seed per acre. However, they are important as supplementary pollinators in Nevada, Utah, and Colorado and can lead to the production of 350-600 pounds per acre in isolated localities. Growers who utilize the alfalfa leafcutting bee and/or the alkali bee usually average between 500-600 pounds and have occasionally produced 2,000 pounds of clean seed per acre.

In recent years the seed industry has been threatened. Adverse weather, pesticide problems, bee parasites and predators, and poor management have caused serious population declines of essential pollinators. These problems are being overcome through education and effective pest and pollinator management. Honey production and honey bee management also benefit greatly from improved pest management on the seed crop, since honey bees, as well as wild pollinators, are highly susceptible to many insecticides. Effective bee management and pest control are essential elements of alfalfa seed production.