Honey Bees for Higher Yields of Alfalfa Seed in Utah

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UTAH STATE AGRICULTURAL COLLEGE
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Alfalfa must be cross-pollinated before it can set a profitable crop of seed. This cross pollination is brought about by insects tripping the blossoms. Some tripping is done by wind and rain or by such devices as drags and rollers, but the result is largely self-pollination, which leads to low yields of poor quality seed.

Honey bees and several species of wild bees are the only effective trippers of alfalfa in Utah. Unfortunately, there are only a few areas in the state with enough wild bees to do a good job of pollination, and no reliable method has yet been devised for increasing their numbers. Neither can assurance be given that existing populations will be maintained. Consequently, the honey bee, whose populations and distribution can be controlled, offers the seed growers of Utah the most dependable source of pollinating insects.

On alfalfa honey bees must be much more abundant than wild bees in order to provide the same amount of pollination. This is because most honey bees fly to alfalfa only for nectar and trip but few of the blossoms they visit. Those seeking pollen trip most of the blossoms they visit and are nearly as efficient as most wild bees. Consequently, the number of honey bees needed on a field depends largely upon the proportion that are visiting the flowers for pollen.

Recent experience has shown that, even when a field is visited only by honey bees collecting nectar, satisfactory pollination can result provided that enough
bees are present. In general, this means an average of 5 or more per square yard on the field during the period of heavy bloom. Unfortunately, bees in such concentrations are seldom able to store a surplus of honey. For this reason the bee-keeper will generally need some form of compensation from the seed grower to make it worth his while to "overstock" the field with bees.

In Utah pollen-collecting bees, which may be identified in the field by the loads of pollen on their legs, vary in number from none in some fields to more than 30 percent of the total population in others. It is probable that if 5 percent or more of the bees are pollen collectors, between 2 and 5 bees per square yard will do a good job of pollination. Experience has shown that for profitable honey production from alfalfa, populations of bees visiting the field should not exceed 2 or 3 per square yard. Populations on the field and the percentage of pollen collectors vary during the season, but a seed grower or beekeeper could make a rough estimate of the way the bees are performing by counting populations and percentages of pollen collectors at weekly intervals during the period of bloom. This estimate can be used as a basis for adjusting the number and distribution of hives during the season and for estimating needs for future years.

The number of hives per acre that will give a desired honey bee density on a field depends upon many factors. The most important are (1) the strength of the colonies, (2) the acreage of blossoming alfalfa, and (3) the relative attractiveness of the field to be pollinated. The best colonies to use for pollination are strong ones with plenty of food reserve. Since these factors can be both measured and controlled, any estimate of the number of hives needed should be based upon strong colonies. The amount of competing bloom can be roughly estimated but is usually only partially under control of the grower. In judging the number of hives to be used, one should consider all acreage of attractive bloom within 2 miles of the
colonies. Of course, other hives within range of any of this bloom will also affect the situation.

When an alfalfa field is being adequately pollinated, the wilted flowers and developing pods give it a characteristic brownish cast. On the other hand, a field which retains a "flower garden" bloom is not getting enough pollination and will benefit from an increased supply of bees.

In the long run the number of colonies used should be based upon (1) the experience of past years, (2) an appraisal of the numbers and activities of the pollinators, and (3) frequent checks on the condition of the bloom throughout the field. If evidence of deficiency in pollination is discovered, the number of bee colonies should be substantially increased without delay.

Since bees cannot be confined to a single field, it will obviously be advantageous to the seed growers to cooperate in obtaining an equitable distribution of the costs and benefits of pollination service. Organization by the seed growers will help them to set up standards for colonies and arrive at fair agreements with beekeepers. In addition, seed growers will benefit from organized control of dusting and spraying, especially any that is done in the bloom stage of the alfalfa.

Beekeepers likewise have much to gain from cooperating in order to bargain with growers and maintain high standards of pollination. The competition incentive will still be present in attaining efficient apiary management and in doing a better job for the grower to insure return contracts.

Finally, cooperation, both individual and organized, will work to the best interests of both seed growers and beekeepers. The seed grower's income will be more certain because pollination is not left to chance. The beekeeper will have better protection for his bees and a new source of income based upon his success in working with the seed grower.

Mutually satisfactory financial arrangements be-
tween seed growers and beekeepers will have to be developed according to local conditions. Seed prices, yield increases expected, numbers of bees used, general forage conditions for the bees, and difficulties of maintaining or moving apiary sites will all influence plans and details of agreements. Flat rates for colony rentals and various plans by which the beekeeper shares in the value of the seed crop both have obvious merit. Perhaps the best balance between responsibility, risk, and profit will result from an agreement combining these two principles.

Neither the seed grower nor the beekeeper should expect pollination to be the complete answer to high seed yields. Pollination can be regarded as an essential link in a chain of factors affecting the yields. Without pollination by bees satisfactory yields are impossible, but even with the best of pollination, other factors such as adverse weather, insect damage, and poor harvesting can break the chain and keep the seed from reaching the bag.

To conclude, we should like to emphasize the necessity both for applying insecticides to control harmful insects and for applying them in such a way as to prevent damage to either honey bees or wild bees. The use of insecticides for controlling insect pests on alfalfa is necessary in Utah to allow plants to maintain healthy growth and flower profusely. Both seed grower and beekeeper benefit.

Fig. 1. Two story colonies on margin of alfalfa seed field.
from fields of alfalfa in this condition. It is obvious that protection of pollinators will also be important to both parties in the long run.

Alfalfa seed fields should be treated in the early spring, when the plants are only 1 or 2 inches high, with 1½ to 2 pounds of chlordane per acre in an emulsion spray to kill adult alfalfa weevils and thus reduce egg laying, and in the bud stage with 20 pounds of 10-percent DDT per acre as a dust or 1½ pounds of DDT in an emulsion spray to control lygus bugs, weevil larvae, and other pests. If pollination is slow and lygus nymphs are abundant, a bloom-stage treatment to control the reinfestation may be necessary. Toxaphene is effective against lygus bugs but relatively harmless to bees when applied between 7 p.m. and 7 a.m. It should be used at 20 pounds of a 10-percent dust or as an emulsion spray at 1½ pounds of the toxicant per acre.

For further information concerning protection of alfalfa from injurious insects, refer to Utah Agricultural Experiment Station Circular 125, and Utah State Agricultural College Extension Bulletin 220 and 221.


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Fig. 2. Field and cage studies on the value of honey bees as cross pollinators of the alfalfa seed crop.