The Effect of Competing Pollen Sources on the Number of Honey Bees Collecting Alfalfa Pollen

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Pollen-collecting honey bees are about 10 times more efficient as alfalfa pollinators than are nectar collectors. The scarcity of pollen collectors on alfalfa in many areas has usually been attributed to the availability of more attractive sources of pollen in surrounding fields or in waste places. Actually, there are many approaches to the problem but this discussion will be limited to competing pollen sources.

The unattractiveness of alfalfa as a pollen source has usually been blamed on the bees' difficulties in obtaining it. The possible unattractiveness or lack of nutritional value of the pollen itself has been ignored, although pollens differ greatly in their suitability as bee foods. It has been demonstrated in Utah that pollens also differ in their attractiveness to bees when presented to them apart from the flowers.

The competition hypothesis has been tested in several ways. A number of investigators have confined bees in cages with alfalfa and thereby induced them to collect pollen. This represents the ultimate in elimination of competition. Linsley and MacSwain in California increased the percent and total number of pollen-collecting bees on an alfalfa field by cutting an adjacent field grown up to mustard, but they found it necessary to eliminate the mustard almost completely before any benefit was obtained. Similar trials in Utah failed. Here we were dealing with continuous strips of roadside sweetclover and gumweed, which we destroyed for a radius of one-half mile. The bees merely reoriented to the same strips outside the zone of control.

Statistical verification of the effect of competing pollen sources was obtained in Utah by analyzing daily samples of pollen taken from 10 colonies placed on an alfalfa field for 55 days. A highly significant negative correlation between grams of alfalfa pollen and grams of all other pollens was obtained. However, we failed to show such a correlation in two similar attempts in which we analyzed weekly samples.

It is apparent that the effect of competing pollen sources cannot be evaluated on the basis of abundance and proximity of the sources alone. Alfalfa, as a pollen source, is merely one in a series of plants of different degrees of attractiveness. Plants high on such a list are bound to be stronger competitors than those in about the same position as alfalfa. Those lowest on the list may not compete at all.

Many plants present pollen to bees only for limited periods during the day. This has often been considered grounds for judging them to be weak competitors. However, it has been shown that bees accustomed to visiting
such plants spend the rest of the day in the hive instead of collecting on other sources. It seems possible that some pollens, especially the wind-borne types, may be collected in quantity but still not satisfy nutritional requirements within the hive. Such a case was observed recently in Arizona, where a fair amount of incoming grass pollen did not seem to relieve pollen stress in the colonies or prevent a high concentration of pollen collectors from visiting a small field of alfalfa nearby.

As an alternative to eliminating competing pollen sources it would seem logical to saturate them by increasing the concentration of bees in the area. This method has been tried successfully with plants competing with red clover for visits of nectar collectors, but nothing clear-cut has been demonstrated in the case of alfalfa-pollen collectors.

A similar method with a different objective is to increase the population of bees in the field and hope that the pollen collector/nectar collector ratio will not be adversely affected. This method can be accomplished either by placing more colonies in the field or by reducing the acreage in bloom.

Other methods of overcoming competition include (1) inducing bees to seek alfalfa pollen by feeding it to them in syrup, (2) capitalizing on the tendency of inexperienced or disoriented bees to collect first from the nearest pollen source, (3) increasing the pollen stress in the colonies by removing pollen and/or increasing brood rearing, (4) breeding varieties of alfalfa more attractive to pollen collectors, (5) breeding varieties of bees that gather unusually large supplies of pollen, and (6) breeding varieties of bees more attracted by alfalfa as a pollen source. Some of these methods have shown promise but have not been developed to a stage where the grower has much chance of successfully applying them.

Still another method involves growing the plants in such a way as to make them attractive to pollen collectors. There is plenty of evidence that plant condition has a great influence on the percentage of pollen-collecting bees on alfalfa. Bees have been found to leave colonies placed in an unattractive field, fly across competing sources, and collect pollen from a distant field of alfalfa in a more attractive condition. Fields side by side or different portions of the same field sometimes have widely different percentages of pollen collectors. In general, it appears that plants with plenty of room and a somewhat dry condition are more attractive to pollen collectors than crowded or highly succulent plants. However, there is still much to be known concerning the plant conditions that are most attractive.

It has been observed that, in general, alfalfa-pollen collection is low in the East and North and becomes higher as one approaches the Southwest. This is probably due to a combination of climatic effect on flower "trippability," plant condition, and strength of competing pollen sources. It does indicate that elimination of competing pollen sources would have to be more nearly complete in the North and East than in the Southwest before benefit could be expected. It is even possible that in some areas the beneficial level would be beyond practical limits.
For any area it would probably be advisable to try a combination
approach involving (1) reduction or elimination of competing pollen
sources over as large an area as possible, (2) saturation of remaining
sources in order to force pollen collection on the alfalfa field, (3)
development of an attractive stand of alfalfa by giving the plants plenty
of room and carefully controlling the water supply, and (4) timing the
bloom for the period of highest temperatures and lowest humidities.