THE GROWING PROBLEM OF POLLINATION IN BRITISH COLUMBIA FROM THE POINT OF VIEW OF EXTENSION ENTOMOLOGY

J. C. ARPAND[1] AND J. CORNER[2]

Extension work in the field of pollination, even with the large amount of research information available (Bohart [1960], Free [1960], Todd & McGregor [1960]), is difficult. The effects of adequate pollination are only realized when yields over a period of several years are considered. The results of a single field demonstration may be obscured by uncontrollable factors, such as weather, the general physiological condition of the plant, competing bloom, or the population level of wild pollinators. As a result, an important extension tool is often rendered ineffective. Furthermore, because of the complexity of the problem, many growers develop the attitude that with or without pollinators successful yields are largely a matter of chance. For example, the yields of legume seed in the Peace River district of Northern British Columbia fluctuate considerably from year to year. The yields of crops that are adequately pollinated tend to be higher than the district average. However, the fact that the variability is general suggests to many growers that the success or failure of the enterprise lies outside their control.

In some areas a reasonable wild or honey bee population exists and the growers obtain fair or good yields of self sterile crops without any special effort. Under these conditions it is difficult for the individual to accept his responsibility for preserving the pollinators. It is even more difficult for him to realize that an increase in the number of pollinators could result in increased yields, better quality and more even ripening.

The fruit- or seed-grower and the beekeeper often fail to understand each others' problems. The beekeeper in the Okanagan may feel that the orchardist is spraying dangerous insecticides unnecessarily and indiscriminately. The seed grower in the Peace River district may feel that the beekeeper is getting something for nothing and should pay for putting bees near the field. Bringing these two groups to a common point of understanding is a major part of the extension program in pollination.

A discussion of the program in British Columbia including what has been done, future plans and where research can help, is best considered under the main crops involved.

LEGUMES

Several methods have been used to give growers the facts on legume pollination. For the past three or four years considerable information has been included in the annual short courses in beekeeping in the Peace River district, and meetings for beekeepers and seed growers have been held. Several formal addresses have been presented to the British Columbia Seed Growers Association and to the British Columbia Honey Producers Association. An exhibit on pollination was prepared and exhibited at fall fairs. Two pamphlets, "Insects and Legume Seed Production" and "Clover Seed Growers, Why Gamble? Use Bees", have been written and distributed. A successful demonstration, described in this paper, of planned pollination of alsike clover has been conducted.

Alfalfa

In Canada the economic production of alfalfa seed depends on the population level of certain species of wild bees. Honey bees are able to obtain

[1] A/Provincial Entomologist, Vernon, B.C.
[2] Provincial Apiarist, Vernon, B.C.

nectar by going into the side of the flower and consequently they "trip" only a small percentage of the flowers visited. They obtain pollen from other sources. Extension efforts to conserve wild bee nesting sites have been almost helpless against the economic facts which demand that the grower clear and break more and more land so that cash crops can be planted. The result has been that alfalfa seed production in the Peace River district has followed the familiar trend described by Stephen (1955). As the acreage increases the yields drop, growers are forced to turn to other crops, and alfalfa becomes confined to the hinterlands.

Future extension programs will probably depend on one or more of the following developments:

A. Establishing areas for alfalfa seed production where the wild bee population can be conserved.

B. Developing practical methods of semi-domesticating wild bees.

C. Finding ways of forcing honey bees to pollinate alfalfa under our conditions.

In the meantime extension efforts will have only a very limited effect.

Alsike and Sweet Clover

Alsike and sweet clover are readily pollinated by honey bees and are good nectar sources. Consequently more extension progress has been made in the pollination of these crops than in the pollination of other legumes. An increasing number of seed growers in the Peace River District are realizing the value of honey bees on alsike or sweet clover and are urging beekeepers to put colonies near their fields. They are not yet, however, willing to pay for the bees either in cash or on a share crop basis. The beekeeper is therefore necessarily concerned only with honey production, consequently he tends to use insufficient colonies for good pollination. Furthermore, he brings the colonies in before the fields are in bloom and does not space them — factors which greatly influence their effectiveness. It is important that the alsike or sweet clover seed grower and the beekeeper fully appreciate each other's position.

As a part of the extension effort a demonstration of alsike pollination was conducted in the Peace River district of Northern British Columbia:

On July 18, 1960, at Mile 24 Alaska Highway, forty colonies of honey bees were set out in 65 acres of alsike isolated by about 3 miles from other legumes. This acreage consisted of three adjacent fields of 20, 30, and 15 acres respectively. The colonies were spaced evenly around the centre 30 acre field.

By early September the seed had ripened evenly on all three fields. An average of 450 lb. of clean seed per acre was harvested as compared to an estimated district average of 250 lb. per acre. The most impressive feature was the appearance and quality of the seed.

It is interesting to note that the honey yield was 160 lb. per colony. The district average was 150 lb.

Red Clover

Red clover pollination presents several special problems. Although certain species of bumble bees are ideal pollinators, they are seldom present in large enough numbers except in newly settled areas. It has been pointed out elsewhere in this paper that attempts to conserve wild bee populations have generally proved futile. Honey bees are good pollinators of red clover if they are used in large enough numbers and if competing bloom is kept to a minimum (Bohart 1960). Unfortunately, beekeepers avoid putting colonies on red clover because it is an unreliable nectar source. The use of honey bees on red clover has to be consciously and specifically for pollination. Consequently, widespread acceptance of planned pollination on red clover will probably come only after it is an

accepted practice on sweet or alsike clover.

FRUIT TREES

There is a large amount of research information on tree fruit pollination (Free 1960). However, the fact that little of the research has been conducted in British Columbia is a serious handicap to the extension worker.

Where the need for increased pollination is obvious, as with plantings of Red Delicious apples, cherries, and pears, certain fundamentals can be applied. For example, it is well known that honey bee colonies should be brought in after and not before the beginning of bloom. Several other questions are, however, impossible to answer. What is the value of hand collected pollen? Are beehive inserts more effective than hand applicators? How should honey bee colonies be spaced in the orchard? What are the effects of prevailing winds in pollination? In many cases the information from different areas on these questions is not in agreement.

The importance of pollination is sometimes unclear. McIntosh apples, for example, generally have an overset of fruit. With this variety, however, would there be an improvement in quality and evenness of ripening if the king blossoms were set up quickly, even though thinning sprays were used subsequently?

There is also a lack of basic information on such questions as the foraging area of worker honey bees under various conditions. It is evident that only limited extension work is possible until an increased amount of research is conducted under local conditions and until more basic information becomes available.

THE PROBLEM OF INSECTICIDES

The widespread use of insecticides has no doubt been a factor in pollination in the Okanagan Valley fruit growing area. The chemical poisoning of honey bees except from the arsenicals has probably not been great, but in recent years some losses have occurred (Arrand & Corner, 1959). Partly because of a fear of insecticides, some beekeepers are moving their colonies to other areas. This along with the probability that wild pollinator populations have been reduced has increased the importance of planned pollination in this area.

During the past few years in British Columbia, beekeepers have been informed, by various methods, of the toxicities of new orchard chemicals and of possible ways of avoiding bee poisoning. Abstracts of pertinent papers have been mimeographed and distributed and the problem has been discussed fully at several beekeepers meetings. However, there has been little attempt made to bring the problem to the attention of fruit growers other than the warnings in the spray calendars.

Research can aid by giving more attention to the bee toxicity aspect of new chemicals that are being tested. The subject appears to be of increasing interest to researchers in other areas (Johansen [1960]; Anderson and Atkins [1959]).

BLUEBERRIES

Research information from other areas indicates that there is considerable variability in the self-fruitfulness of high bush blueberry varieties. However, the stigma of the flower on all varieties protrudes considerably beyond the anthers and regardless of the degree of self-fertility, bees are important in transferring pollen (Merrill, 1936). In addition, there is fairly general agreement that cross-pollination increases the size of berries and the earliness of ripening.

Once again extension is handicapped by a lack of information under local conditions and with local varieties. Many growers in the blueberry growing areas feel that their crops are not being adequately pollinated and are asking for information.

MISCELLANEOUS

In British Columbia the pollination of cranberries, greenhouse cucumbers, melons and holly has had little attention by research or extension workers.

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MUSINGS OF A RESEARCH OFFICER, AGRICULTURE (ENTOMOLOGY)

J. MARSHALL, Research Station, Summerland, B.C.

Entomological research in Canada grew from virtually nothing in 1918 to a well organized profession 40 years later. There were at first more positions to be filled than trained entomologists to fill them, and so men with some background in zoology, and even amateur insect collectors, were pressed into service. It was not by chance that a number of those entomological pioneers were born in England, or were sons of English parents. The English, generally speaking, have a more lively interest in insects and other aspects of nature study than Canadians. Since the beginnings of entomology in this country at least nine of our universities have instituted Departments of Entomology, or courses in Entomology. The colorful day of the amateur entomologist turned professional is over.

Since many of the early problems in entomology had to be solved quickly and with no nonsense, the pioneers of the science tended, on the whole, to emphasize the practical viewpoint; and they did well with it. Then, as the more straightforward problems were cleared up, attention had to be paid to less obvious issues. There arose a growing band of bright and shining young college graduates complete with Ph.D. degrees and a tendency to regard their predecessors as well intentioned but really somewhat ignorant chaps. One scintillating mind has summed it up in a word—"nozzle-heads", he calls the pioneer entomologists and those of his contemporaries who work in applied research.

Entomology in much of the western world has been going through a sort of scientific adolescence, a period when on the slightest pretext, the amateur statistician churns his experimental results in an electrical calculator until finally they butter into some sort of statistical odds. There is an urge to substitute statistical formulae for common sense. Even simple bits of research may emerge so gaudily bedecked in statistical finery that only a knowing few would ever guess their true stature. Perhaps the entomologists, and other biologists, have been moved to strive for profundity in the belief that if the layman can comprehend it can't