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HOW TO MANAGE THE ALFALFA LEAF-CUTTING BEE (MEGACHILE ROTUNDATA FABR.) FOR ALFALFA POLLINATION

by George E. Bohart

It's too early to say how valuable the alfalfa leaf-cutting bee will become as an alfalfa pollinator in the Intermountain Region. We do know it has become the most important wild pollinator of alfalfa in the 7 or 8 years it has been here. About 30 years ago it was found in the vicinity of Washington, D.C. It had probably been inadvertently brought over from eastern Europe or western Asia. Since then, it has spread across the forests, plains, and mountains to the Pacific Coast.

We also know it "trips" alfalfa blossoms efficiently and doesn't waste much of its time (from the farmer's standpoint) visiting other crops. It likes sweetclover, Dutch clover, and some of the wild mints, but pays little or no attention to sunflower, gumweed, rabbitbrush, greasewood, and the host of other plants that compete for the attention of honey bees.

The grower's wife will be happy to know that, instead of cutting leaf pieces from shrubs and young trees the way other leaf-cutting bees do,

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this one operates on alfalfa leaves. Sometimes it cuts flower petals, but you needn't tell her about this.

Individual females live about two months, which is a long time “bee-wise.” What’s more, there is a partial second generation which extends the effective pollination period for another two or three weeks. The problem is not so much timing the bloom to fit the bees’ activity as it is to make sure the bees have plenty of bloom from early June till mid-September.

Another feature of these bees, both a blessing and a curse, is their short flight range. They like to forage within a few hundred feet of their nests. This means you will have to provide field shelters for them to nest in if you want uniform pollination across the field. Two blessings offset this problem: Your bees won’t be pollinating your neighbor’s alfalfa and they won’t be killed by his insecticide program.

**Utah favorable for the leaf-cutting bee**

The farming areas of Utah seem to be favorable for the alfalfa leaf-cutting bee for several reasons:

1) We have many acres of alfalfa, much of which is left for seed.
2) The old wooden outbuildings and dead and dying cottonwoods may be eyesores on the landscape, but they provide good nesting places.
3) No serious parasites or diseases have appeared, although minor ones take a light toll.
4) The bee likes bright sunshine and warm, but not excessively hot, temperatures.

The worst dangers to this bee in our area are probably:

1) Insecticides (it seems to be more susceptible than the honey bee)
2) Heat (the eggs and young larvae die when the cell temperature gets much above 100°F.
3) Birds (shelters may have to be protected with chicken wire)

Left, leaf nests (the left hand nest is typical)
Upper right, leaf nest cut away to show egg on pollen-honey mixture
Lower right, leaf nest cut away to show half grown larva on food
Alfalfa leaf-cutting bees nest in such places as nail holes, spaces between overlapping boards, beetle burrows, old wasp nests, and tubing in shop equipment. In the volcanic area around Flowell they nest in the pores of lava-block houses and have come to be called "cinder bees." It didn't take much inventive genius on anyone's part to try them out on holes drilled in timbers. The next step was to fit the holes with soda straws so the nests could be taken out and examined. This led to the idea of bundles of straws. Since this worked, what about rolls or bundles of corrugated cardboard? These didn't work too well, but when the cardboard was rolled up with straws, the bees liked it better.

How many bees

One of the first questions growers will ask is, "How many bees and how many shelters do I need?" One good pollen-collecting bee per 5 square yards should be enough for excellent pollination. This means about 1000 bees per acre during the principal blooming season. Assuming that nesting females spend about half their time working the alfalfa blossoms, about 2000 active nests are needed to provide this concentration.

Preliminary evidence indicates that these bees rarely fly more than a few hundred feet after they reach forage. On this basis, 10 shelters, each with about 10,000 nesting females, should provide excellent pollination on a square 50 acre field. With a field this size, 6 shelters around the edge of the field and 4 at about 600-foot intervals within it should ensure a fairly even distribution of foragers. Experience during the next few years may tell us whether this program should be scaled up or down.

How do we care for them?

Nesting sites must be provided, shelters built, and protective measures taken against insecticides. One of the first steps is to find out how many bees are already nesting in the area, and to obtain others, if necessary.

Providing nesting sites

Alfalfa leaf-cutting bees like to nest in tubular holes about 3/16 inch in diameter. The walls should be fairly smooth and should not admit light except at the entrance. We have found 4 x 4 timbers drilled with closely-spaced 3/16-inch by 3½-inch holes provide attractive nesting sites. We used a high speed wood bit to make clean holes.

Holes completely free of fiber can be made by grooving both sides of box wood lumber parallel with the grain, and then stacking the grooved boards so as to match the opposing grooves. The stacked boards can be fitted into a box to maintain their relative positions and seal off the back of the holes. It is relatively inexpensive to build a multiple groover on the principle of a bench saw, substituting a series of cutter heads fitted with 3-flute cutter-knife sets (3/16-inch flute) for the saw blade. This laboratory is developing such a unit and will
make the design available in the near future.

Milk straws (5/32-inch) and the smallest diameter milk shake straws (7/32-inch) are both attractive to the bees. The milk straws are actually more attractive but there is less mortality of eggs and larvae in the larger straws. The intermediate size straws (6/32-inch) are probably the best to use but they are difficult to obtain.

The straws can be sawed in half in their original box. The sawed ends of the straws should be glued or waxed to a piece of cardboard which is then fitted into the bottom of the container used. The straws can later be removed for study or redistribution by slicing them from the piece of cardboard. If the original straw boxes are used for containers, they should be tightly fitted into larger boxes to preserve their shape (as indicated in the next section). If strong containers such as juice cans are used, this is not necessary.

Corrugated cardboard of two types can be used for inexpensive, easy-to-assemble units. A type with large flutes and backing on only one side (known as bottle-wrap) can be rolled into compact rolls of any size desired. A roll of 6 inches in diameter has spaces for at least 600 nests. Another type (known as build-up corrugated paper) consists of sheets with backing on both sides of the flutes. Paper companies can glue together as many sheets as desired. The largest standard flute size should be used — approximately 3/16 inch across the middle of the triangle-shaped flutes. Whether you use "bottle-wrap" or "build-up," cut the cardboard so that the flutes are from 4 to 6 inches long. A piece of cardboard should be glued to the back of the unit.

Unfortunately the bees are sometimes reluctant to use corrugated cardboard. Attractiveness can be increased by rolling milk straws into the bottle-wrap unit or inserting them into the flutes of the build up material. If even only 5 percent of the available spaces are straw-filled, attractiveness will be increased.

Alfalfa leaf-cutting bees are gregarious and like to nest close to the hole from which they have emerged, even if this means using unattractive sites. Since drilled timbers make the most attractive nesting sites, we recommend using them as "bait" in each nesting station. By interspersing blocks containing completed nests with the empty units, you will get an even better "baiting" action. Then to get rapid, uniform use of the empty holes, you can insert straws filled with nests in a regular pattern throughout all of the empty nesting materials provided.
Building and installing shelters

Growers will want inexpensive, durable, and easy-to-handle shelters to distribute through the fields. Many designs will serve but they should meet the following basic requirements:

1) protection from high-angle rays of the sun
2. Easterly exposure to catch the sunlight.
3. Cross-ventilation.
4. Partial shelter from wind and rain.
5) large enough surface to attract and hold increasing populations
6) an elevation at least 2 feet from the ground
7) means for protection from birds and insecticides

Irrigator shed used for leaf-cutting bees

The illustrated shelter worked well for this laboratory last summer. The double box bolted on to steel posts was easy to install and dismantle. A masonite panel was used to cover the inner box for temporary protection from insecticides. The two by fours were filled with nests as were two of the boxes of straws. Chicken wire or strips of lath fastened across the face of the outer boxes protected the bees from birds. This year we plan to substitute grooved boards for at least one of the tiers of straw boxes in the shelters.

Alfalfa and sweetclover leaves cut by the alfalfa leaf-cutting bee

Obtaining bees

Where alfalfa leaf-cutting bees are already present, as they are in most farming areas of Utah, Idaho, and eastern Oregon, they will use the same kinds of nesting materials recommended above for use in shelters. Timbers drilled with holes and containers filled with straws can be hung under the eaves on the east side of wooden outbuildings. Another good place is on a wall or rafter inside an open doorway or window. In any case, it pays to look for nests or nesting bees before placing out the "trap nests." As soon as a "trapping" station shows good nesting activity, more nesting materials should be provided to exploit its potentialities fully. If the bees are scarce or absent in your area, your best bet would be to set out "trap lines" in areas where they are known to be abundant.
Moving the bees

So far, we don’t know how to move nesting bees satisfactorily. They can be moved as overwintering larvae at any time between October and May. Moving them between the first and second generations is also possible, but requires careful timing. If your “trap nests” are in place before the end of June, you should move them to your shelters as soon as they are full or nearly full, or, in any case, before emergence of the second generation. The same timing applies to moving them from shelter to shelter. In October, after adult activity is finished, the nests should be moved into an unheated building or cellar for protection from predators and the elements. By late April or early May they should be placed in the shelters where the bees can be expected to emerge in June.

Protection from insecticides

There is no point in working hard to get leaf-cutting bees and then killing them with insecticides. Preliminary studies indicate that these bees are more susceptible than honey bees to most of the commonly used materials. Even toxaphene, which is relatively safe for honey bees and alkali bees when used properly, appears to be hazardous to leaf-cutting bees. Because of their leaf-cutting habits they may even be harmed by pre-bloom applications of highly toxic, long lasting materials such as dieldrin.

For bloom stage treatments of alfalfa to control lygus bugs, dylox applied in the evening can be recommended at present. However, no residual protection from reinfecting bugs can be expected. Systox (demeton), an effective material against aphids, is also harmless when applied in the evening.

Suggested design for field shelter
During and after insecticide applications, the bees can be confined to their shelters with a panel. However, in hot weather the temperatures are likely to exceed the danger point so the bees should be released by the time the temperature in the shelter reaches 105 F. Better yet, the inner box of the shelters should be covered and moved to a cooler place where there is no danger of contaminating them with insecticide residues. The outer boxes should be covered with a tarp to protect them from residues which might be lethal to bees sunning themselves in the morning.

Other published information

The following technical papers give additional information on the life history and nesting habits of the alfalfa leaf-cutting bee:


Rate of increase

The reproductive potential of the alfalfa leaf-cutting bee is unusually high — up to 35 eggs for first-generation females. However, about 2 of every 3 eggs develop as males. Figuring on a moderate mortality of adults and larvae even under the best conditions, a five-fold increase from year to year is probably optimistic. Although a partial second generation occurs, second-generation bees don't provision as many cells as first. They are valuable in extending the working season but seem to have little effect in increasing the population.

Revised
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