

Updated Recommendations for Growers with *Osmia cornifrons*, 2006

Nikki Rothwell, District Fruit IPM Educator

Number of bees/acre: Based on work from Batra (1997), we are recommending approximately 250 female *O. cornifrons* for a 1-acre block of cherries and apples. If each 6-inch straw contains 8 bees, 4-5 of those are males and the remainder of the bees is female. Currently, we have no good way of detecting how many bees are actually in the straws, but if there is mud filled out to the end, we can take a stab at 6-8 bees/tube. Therefore, depending on how many bees/straw, we can suppose that there needs to be approximately 70 full straws per bucket per acre to meet the recommended rate.

Placement of bees in 1-acre blocks: *O. cornifrons* nesting buckets should be hung in a visible location as observational data suggests these bees use visual cues to locate their nesting sites. At the Research Station, we are placing the buckets into apple boxes tipped on their sides, such that the buckets can be hung from the side slats of the wooden apple box. Last year, we wired buckets to the tops of the tipped up apple box with standard wire at the most horizontal angle possible. *O. cornifrons* in the wild use old beetle holes in trees for nesting, and those holes are horizontal and conducive for bee entrance. We want to mimic that system as much as possible, so buckets placed horizontally will work better than buckets placed at an angle. However, make sure the bucket tilts slightly downward to prevent rain from collecting in the bucket. Also, make sure to tie the buckets tight so they do not 'swing' in the wind.

We recommend placing one bucket in the middle row if you do not have many bees. If you have enough bees, I would recommend splitting the 70 tubes into two buckets, 35 tubes per bucket, and placing those buckets 1/3 of the distance into the orchards from both ends, either north or south or east or west. These bees do not forage as far as honeybees in terms of distance, approximately 200 m, so placing the 250 females (70 straws) in the middle of the 1-acre block may be beneficial. Splitting those straws into two buckets to try to spread the bees out through the orchard may be even more advantageous.

Timing of placement into orchard: Based on 2005 data and more recent literature, we recommend placing *O. cornifrons* into the orchards 1 ½ -2 weeks prior to bloom. Last year, we recommended putting them into the orchard 3-4 days before bloom, but I think we were much too late for optimal foraging activity (aka. pollination). The literature also suggests that they need a food source or they will 'take off'. We did not see this behavior last year as their 'homing' action was much stronger than their desire for food. The major behavior we all noticed last year was their need to mate before major foraging activity began. Males chew through the mud first, as they are laid toward the opening of the tubes. The males feed a bit, but they are more concerned with the females as they emerge.

Although the following information will vary based on temperature, males usually emerge within three days of placement into the orchard (as long as temperature is above

55 F), and females will emerge by day 6. They will need a few days to mate and feed. The major pollination thrust will come from females that are mated and ready to lay eggs. She must collect pollen and nectar for her offspring, and she will forage excessively for her offspring, so the majority of pollinating potential comes from these females that are ready to lay eggs. In order for females to reach this stage, they must emerge, find a mate, mate, feed, and then she will begin the intensive foraging. This timing is not well known for Michigan orchards, but our current recommendations based on last year's results is to place the buckets into the orchard 1 ½ -2 weeks before bloom. Again this timing will be dependent on temperature as they emerge based on temperature—the warmer the day, the faster they will emerge and vice versa. Additionally, these bees do not live long, approximately 35 days, so we want to time emergence as closely as to our cherry bloom in order for these bees to use cherry pollen for food rather than other pollen from other blooming plants.

The need for mud: *O. cornifrons* females use mud to separate the cells of their nest (tube). Therefore, somewhere near the hive, a mud source is needed, especially in a dry year. The recommended mud source is a 1-1.5 ft deep trench, approximately 20 yards from the nesting sites; this trench provides bees with a low angle to approach the nest. The soil in the trench should be kept moist, but there should be no standing water. The bees are capable of locating their own source of mud, but in the event of a droughty season, a mud trench is a good idea.

No sleep for O. cornifrons: These bees do not go back into the 'hive' at night like traditional honeybees, and this behavior can pose a problem if insecticides sprays are needed. However, these bees are more active in the day than at night, so if insecticides cannot be avoided, spraying in the evening is preferred to the daytime.

Propagation/new nesting: The only thing needed to propagate more *O. cornifrons* is a 6-8 inch depth hole, with a 5/16 inch diameter. There are many methods of creating these 'nesting sites': drilling holes into wooden blocks of wood, pvc pipes, cardboard tubes, and potentially many more. However, the key point to remember is that these bees will need enough empty holes to increase the size of the colony, and each female is capable of producing 2-4 nests each year. Therefore, if we put out 250 females/acre, a minimum of 750 empty nesting tubes are needed.

Another observation from 2005 is that the emerging bees prefer to reestablish the tubes from which they emerged. They will not start creating nests in an empty bucket of tubes unless the 'used' bucket is completely full. Therefore, we are recommended setting up your buckets with the minimum number of occupied tubes (~70 tubes with 250 females) and the remainder of the tubes should be empty. We have used old square 'cherry' buckets with wide screens to hold the tubes in the bucket, but any bucket would probably due.

2006 Recommendations and Protocol

Because we have been fortunate to obtain *O. cornifrons*, we have the great opportunity to gather some important pollination information on Michigan fruit crops. In order to gain the most valuable information, a standardization of how we go about using these bees is of utmost importance. Therefore, the following protocol should be used for data collection:

1. The recommended rate of bees/acre is 250 nesting females; all participating growers must put out this recommendation to eliminate variability. For each one acre block, one bucket of bees (or a split application of bees—two buckets with 125 females in each) should be hung from an apple box. The box should be placed in the center of the orchard block. For propagation purposes, a minimum of 500-750 empty nesting sites are needed to increase the population. No honey bees should be placed into blocks with *O. cornifrons*.
2. An adjacent one-acre block of the same fruit without an *O. cornifrons* nesting bucket should be selected as a control. The location of the control block should be similar to the experimental block in terms of soil type, growing site, past yields, and age of trees. The control block should contain the recommended rate of honeybees, 1-2 healthy hives/acre, depending on the crop. The control block should be far enough away from the experimental (*O. cornifrons*) block in order to keep far-foraging honeybees from entering the experimental blocks. Honeybees usually forage within 2 miles of the hive, but 75% forage within a half mile. Optimally, the control and experiment blocks should be placed at least ½ mile apart.
3. Percent fruit set should be determined from both the control and *O. cornifrons* blocks. Select thirty branches in the *O. cornifrons* block and 30 branches in the control block; to calculate numbers of flowers on each branch, measure 1 m from the terminal end and count the number of flowers. Flowers will be counted for each branch and then flagged for return fruit counts. On July 1 for cherries, numbers of fruit will be counted on flagged branches. For apples, fruit should be counted after thinning. Notes should be taken on how much thinner was needed for each the control and experimental blocks. Flower and fruit numbers will be compared to provide percent fruit set information. When the fruit is harvested, growers should record the yields for both the experimental and control blocks.

We are here to help you in any way we are able, and we are also available to answer any of your questions about this project, so please don't hesitate to call (946-1510). Thanks again for your support!