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# Identification and Estimation of the Cross-Pollinating Population of Blue Orchard and Honey Bees in an Almond Orchard

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## Interpretive Summary:

Blue orchard bees (BOB) introduced into almond orchards were captured as they returned to their nests. The pollen on the bodies of the bees was examined using scanning electron microscopy. The percentage of BOB with multiple cultivars of pollen on their bodies was determined. Of the bees examined, 75% had more than one cultivar of almond pollen on their bodies. However, 75% had less than 10 pollen grains on their entire bodies. Many of the bees were infested with mites. Low pollen counts seem to be correlated with high mite loads. It is therefore possible that the low number of pollen grains on some bees may be due in part to their mite loads. Micrographs of the mites were made. The mites are most likely hypopi of the genus *Chaetodactylus* based on the lack of obvious head and the number of legs. BOB have the potential to cross-pollinate almond blossoms because most carry multiple cultivars of almond pollen on their bodies. However, the low number of pollen grains on many bees might reduce the chances that pollen will be transferred to the stigma of a blossom during a foraging visit.

## **Objectives:**

Determine the proportion of blue orchard bees with multiple cultivars of almond pollen on their bodies.

## **Materials and Methods:**

Pollen Samples - Pollen samples were prepared for the scanning electron microscope (SEM) by removing stamens from at least 5 different flowers of a single cultivar type and attaching them to stubs with double stick tape tabs. Samples and the stubs were then coated with gold palladium using a sputter coater before examination with a Hitachi 3400 SEM. The majority of the pollen grains on each stamen were examined and several representative pollen grains were micrographed. Pollen was dried for 1 week prior to examination.

Osmia Samples - A pilot sample was prepared using a single BOB by placing a double-stick tape tab onto an SEM stub and rubbing the abdomen of the bee along the tape to transfer pollen from the bee to the stub. Upon examination of the sample, it was obvious that little pollen was present on the stub compared to the load on the bee. Subsequent samples were prepared by affixing whole *Osmia* to the stubs so that the pollen collecting region of the abdomen was fully exposed. All samples were then coated in gold palladium using a sputter coater and examined with the Hitachi 3400 SEM. All pollen grains on the bees were examined (or the majority of pollen grains on bees holding a great deal of pollen) and representative pollen grains of multiple types were micrographed for later analysis and comparison. The pollen grains were examined for morphological differences and the number of pollen types on the bees was counted.

## **Results and Discussion:**

Of the 8 BOB examined thus far, all but 2 had multiple cultivars of almond pollen on their bodies (Table 1). However, there were many BOB that had very little pollen on their bodies. Very thorough searches of each bee were conducted to ensure that all available grains of pollen were examined and micrographed.

Many of the bees were infested with mites. Low pollen counts seemed to correlate to high mite loads. It is therefore possible that the low number of pollen grains on some bees may be due in part to their mite loads. Micrographs of the mites were made for documentation purposes. They are most likely hypopi of the genus *Chaetodactylus* based on the lack of obvious head and the number of legs.

This study represents a preliminary investigation on the potential of BOB to contribute significantly to nut set in commercial almond orchards. A limited number of BOB samples (18) were provided to us, and thus far we have examined about half of them (some bees were damaged and could not be examined). Our data indicate BOB have the potential to cross-pollinate almond blossoms because they frequently carry multiple cultivars of almond pollen on their bodies. However, the low number of grains we

detected on many of the BOB reduces the chances that the compatible pollen will be transferred to the stigma of a blossom. Whether the low pollen number was due to the mites we found on the BOB or because they visited few almond blossoms requires further study.

**Table 1.** Number of almond cultivar types on the bodies of *Osmia* returning to their nests in almond orchards.

<b>Bee Number</b>	<b>Number of Pollen (Cultivar) Types</b>	<b>Notes</b>
Para 2	4	Contains a lot of pollen (>100 grains)
1-7-B	2-3	Little pollen (<10 grains)
1-8-B	3	Little pollen (<10 grains)
2-1-B	1	Very little pollen – 2 grains
2-2-B	2-3	Little pollen (<10 grains), many mites
2-3-B	2-3	Little pollen (<10 grains)
3-1-B	0	No pollen visible, many mites
3-4-B	3-4	Some pollen (>10, <30), few mites

**Recent Publications:**

None