Evalation of Flea Beetle Phenology and Damage to Carrot Production

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Project Title
Evaluation of flea beetle phenology and damage to carrot production

Status of Proposal
New

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Statement of Problem
For the past few years carrot growers in the lower San Joaquin and Antelope Valleys have been reporting an unknown injury to the taproot of carrots. Superficially the damage looks like cavity spot (*Pythium* sp.), a fungal disease that causes depressed lesions oriented across the taproot. However, upon closer inspection it became evident that damage was being caused by some type of feeding by an insect, coupled with secondary infections that enhanced the injury's appearance as cavity spot. This damage is now attributed to feeding by flea beetle larvae.

The principal concern with cavity spot and damage by flea beetle larvae is that they are easily confused with each other. This may trigger the use of fungicides for a problem caused by insects, or vice versa. The result is a lack of control, a waste of money, and continued economic damage to the crop. At this point we are still uncertain about the relative prevalence of flea beetle larva injury compared to cavity spot.

The adult potato flea beetle is a small (1.5 to 2.0 mm), oblong to oval-shaped shiny black beetle with reddish legs and antennae. The hind femora (thighs) are enlarged and help the beetle to jump when disturbed. Adults overwinter in leaf litter or soil in protected places such as field margins, tree rows, or less frequently, within cultivated fields. Adults emerge in spring when soil temperatures warm to approximately 15°C and begin feeding on winter annual weeds. It is anticipated that there are two broods in Kern County's climate, with the first brood feeding on a wide range of weeds and cultivated crops, especially when cotyledons and young leaves are present as the seedlings emerge. The second brood likely begins during the summer around the time that fall carrots are being planted.

Currently very little is known about the best approach to flea beetle management in carrots in California. In other states management of flea beetles in crops like potato, canola, and sugarbeet is achieved through sampling programs coupled with insecticide treatments as needed. Monitoring for adults can be done with yellow sticky cards clipped to short poles near the plant canopy or with sweep nets for larger plants, and can be done both within the field and near surrounding vegetation. In this project we propose to use similar monitoring techniques to help us understand flea beetle phenology in California as a first step towards developing management guidelines for carrot growers.

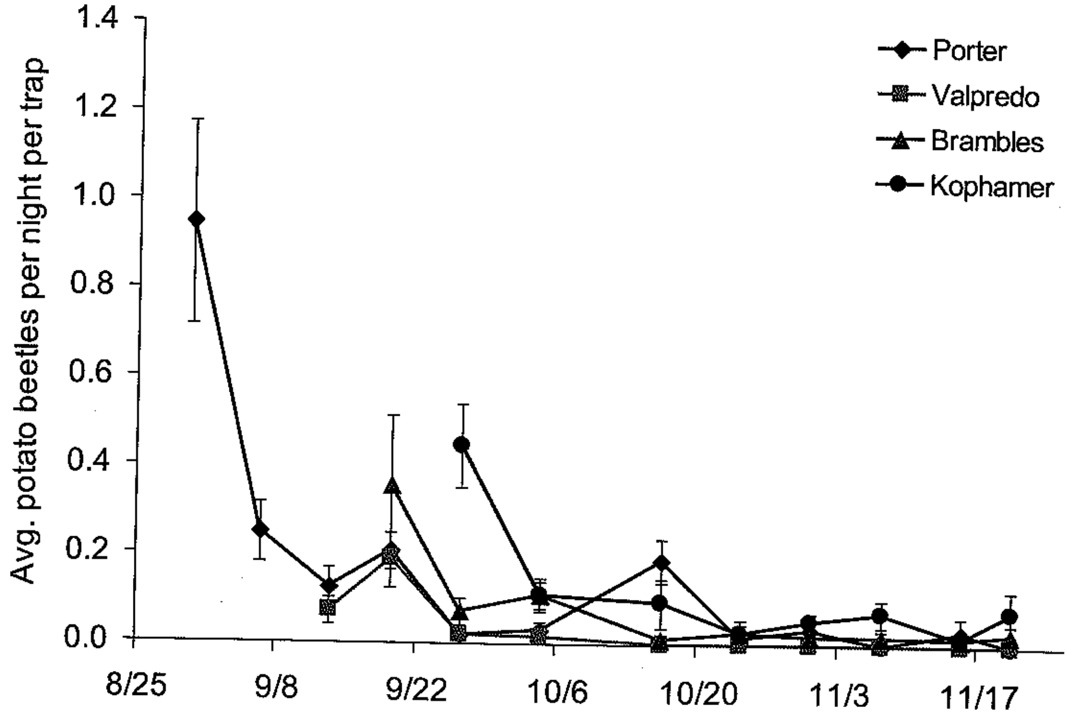

Fig. 2 Seasonal patterns in potato flea beetle captures in sticky traps.

Comparisons of potato flea beetle catches in traps placed at 3 ft compared to 5 ft are shown in Fig. 3 and 4. Throughout the season there were consistently more flea beetles caught in the traps that were closer to the plant canopy (Fig. 3) that resulted in significant differences in the overall number of beetles caught per trap (Fig. 4).

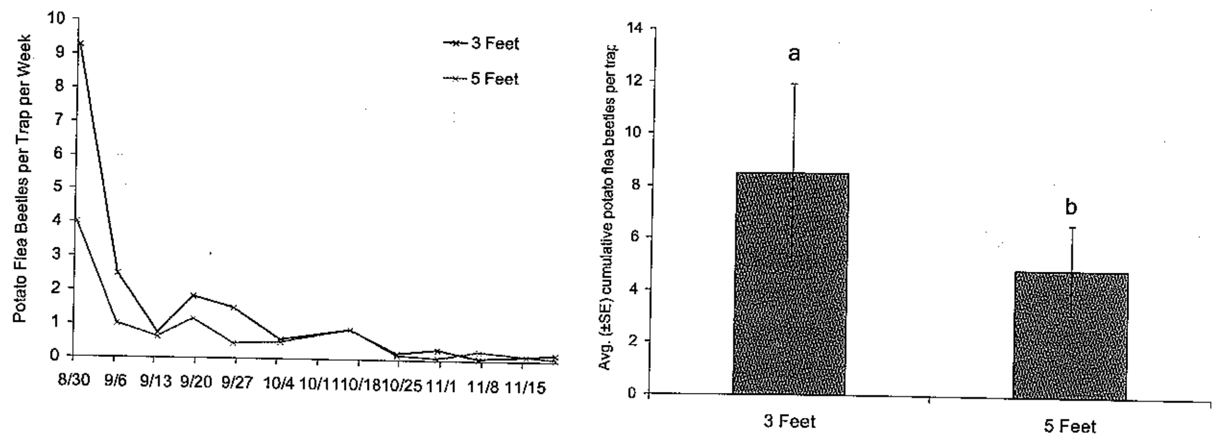

Fig. 3, 4. Comparisons of the weekly (left) and cumulative (right) catches of potato flea beetle in sticky traps placed at 3 and 5 foot heights above the ground.

Palestriped flea beetle trapping and phenology

Palestriped flea beetles were collected in sweep samples on nearly all evaluation dates (Fig. 5). In general populations were fairly consistent throughout the trapping period at the Porter, Valpredo and Kophamer locations, and appeared to start high and slowly taper off temporally at the Brambles location. Population density was highly variable among locations with relatively high populations at Brambles of 2 to 7 per 20 sweeps on the majority of the evaluation dates compared to densities at the Porter location where beetles were only found during the first two evaluation dates.

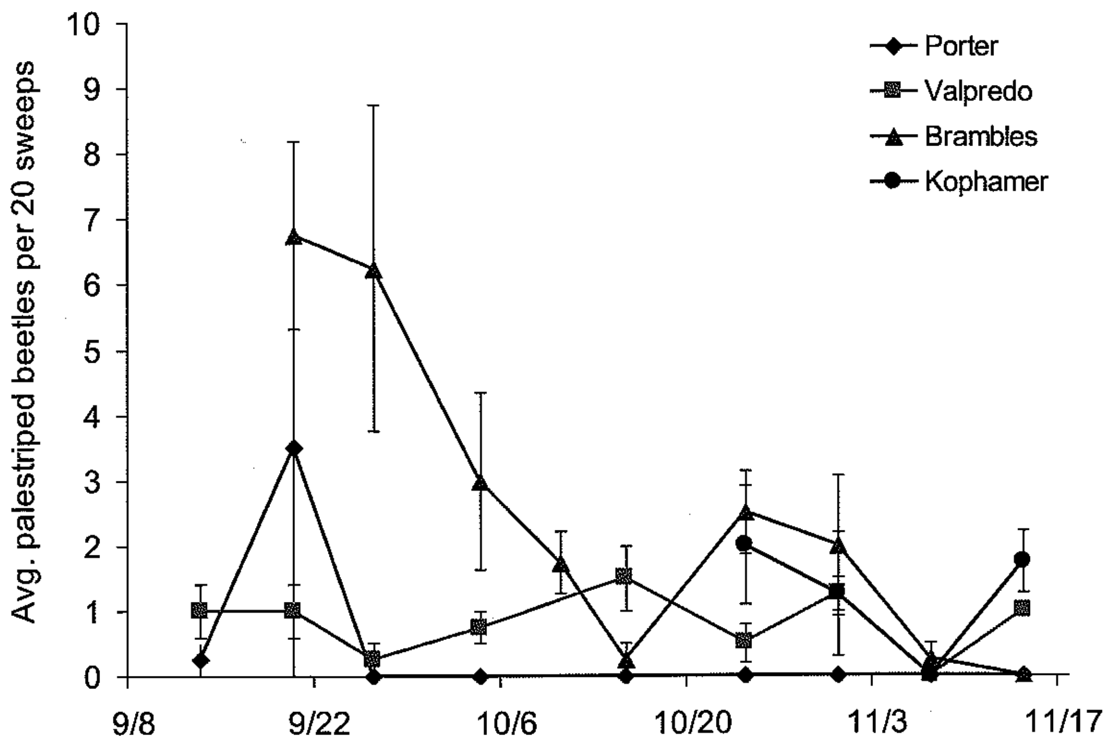

Fig. 5. Seasonal patterns in palestriped flea beetle captures in sweep net samples

Correlating beetle density to damage

The relationships between beetle density in traps and sweeps compared to flea beetle damage at harvest are shown in Figures 6 and 7. There was a very poor correlation between the cumulative number of beetles (both species) in sticky traps and the percentage of carrots damaged at harvest (Fig. 6, $R^2 = 0.02$). There was a slightly better relationship between the cumulative number of beetles (both species) caught in sweep samples compared to damage at harvest (Fig. 7, $R^2 = 0.15$).

However, the greatest correlations came from combining the two types of sampling for the two different species of beetles. Figure 8 shows a correlation between the cumulative number of potato flea beetles caught in sticky traps plus the cumulative number of palestriped beetles collected in sweep samples compared to damage at harvest ($R^2 = 0.36$). This correlation was developed even further by averaging all data within each location to result in just four datapoints (one for each location) that resulted in a correlation with an R^2 value that indicates a strong relationship between pest density and damage (Fig. 9, $R^2 = 0.84$).

evaluations we did were only completed in hindsight. The establishment of this relationship is an important first step in being able to develop a method in the future whereby pest density early in the season can be monitored in a way that will allow growers to determine if they need to treat for flea beetles or if they are at little risk of damage and can refrain from early-season insecticide use.

Objective 3. Provide educational resources to carrot growers on how to distinguish cavity spot damage from flea beetle injury.

A newsletter was sent out of the UCCE Kern office to growers and consultants on this issue of flea beetle injury on carrots in 2012. The newsletter is also posted on the UCCE Farm and Home website at: **http://cekern.ucanr.edu/news_80/Kern_Vegetable_Crops_Newsletter/?newsitem=45109**. This issue was presented to the carrot industry at the 2013 Carrot Symposium and at the 2013 Kern County Chapter CAPCA meeting. A presentation was also made at the 2013 UC Vegetable Research and Information meeting in 2013. Our findings will be written and presented at future meetings and outlets as opportunities arise.