AGRICULTURAL RESEARCH FOUNDATION
INTERIM REPORT
FUNDING CYCLE 2018 – 2020

TITLE: Effect of Colorado potato beetle control on natural enemies and alternative means of control

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COOPERATORS: Local growers and field men; Graduate student Pahoua Yang, BioTech III Daniel I. Thompson, 2018 Irrigated Agricultural Entomology Crew

EXECUTIVE SUMMARY: The Columbia Basin of Oregon and Washington contributes with over 26% of the USA potato production. Several pests, including the infamous Colorado potato beetle (CPB), affect the crop. CPB is one of the most important pest of potatoes worldwide. In the USA, CPB is present in all potato production regions; unfortunately, the primary control method is the use of insecticides. Year after year, both larvae and adults, feed on potato foliage through the growing season. In the Pacific Northwest, CPB may have up to 3 generations. They are exclusively a pest of Solanaceae such as potatoes, but CPB can also be found in other solanaceous weeds and crops. Close to 95-98% of growers in the region, are inclined to use insecticides (e.g. imidacloprid or thiamethoxam) at planting for CPB control. Control of CPB in the eastern half of the USA (e.g. Wisconsin, Virginia, and New York) is challenging since CPB has developed resistance to all major groups of insecticides. So far, in the western USA, CPB populations are effectively controlled with pesticides but in a recent isolated case study, there has been some reports that suggest the potential failure of chemical options. Commodity groups are not interested in funding pesticide resistance research; however, our program is currently investigating this occurrence, and collecting baseline information. Besides chemical options, several natural enemies have the potential of contributing to the control of CPB, however, limited information is available regarding the effect of pesticides on natural enemies in the region. Our research will contribute with the gap in knowledge related to the effect of pesticides not only on the pest, but most importantly on natural enemies.

OBJECTIVES:

1. Determine the effect of selected at-planting insecticides used to control CPB populations.
2. Determine the effect of selected at-planting insecticides on natural enemies.
3. Determine the role of parasitoids in controlling CPB populations.

PROCEDURES:

Research was conducted at the Hermiston Agricultural Research and Extension Center (HAREC) and at growers' fields in northeastern Oregon. Crops production at the HAREC followed standard local practices; records of practices in growers' s fields were also taken.

1. A randomized complete block with 4 repetitions per treatment was set at the HAREC. Each plot was 30 ft long X 4 rows wide. The following treatments were included:

Untreated control	imidacloprid – seed treatment	imidacloprid – in furrow
thiamethoxam – seed treatment	thiamethoxam – in furrow	

After plant emergence, each treatment plot was scouted weekly. CPB eggs, larvae, and adults were counted in each treatment plot; natural enemies such as Orius, Nabis, and spiders also were counted. Weekly data was tabulated.

2. Ten fields were visited weekly to evaluate the presence of CPB, CPB parasitoids, and generalist predators. An inverted leaf blower was used (Ryobi 150 mph) in at least 4 locations per field. GPS location of each field and sampling site within a field was collected to develop distribution maps. Samples were brought back to the laboratory for sorting and counting. Additionally, any CPB larvae or adults was carefully inspected for the presence of parasitoid(s).
3. CPB parasitized were brought to the HAREC and reared.

SIGNIFICANT ACCOMPLISHMENTS TO DATE:

The Graduate student is making progress towards the completion of her degree. During the 2018 growing season, she determined the effect of insecticides at planting on CPB and natural enemies populations. There seems to be no statistical differences among treatments regardless of the application (direct seeded or in-furrow). The residual effect of the insecticides is around 35 days after planting. Natural enemies are not observed in the field until early June, thus pesticides at planting have little or no effect on them since there is no synchronization between residual effect and arrival of natural enemies into the fields. Predators such as Orius, Geocoris, and Nabis spp. were abundant in potato fields. All predators combined (Figure 1) averaged 1.8-2.6 per plant per week. In 2018, the percentage of CPB that showed signs of parasitism was around 17%. That number represents a drop from previous years, where the average was around 40%. (Figure 2). The Tachnidae fly *Myiopharus doryphorae* (Figure 3) was the most predominant. The long-term goal is to be able to test the feasibility of classical biological control utilizing field-reared parasitoids.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:

Chemical companies (Corteva and Syngenta) donated the pesticides used on this trial. Graduate student was funded thru a NIFA grant.

FUTURE FUNDING POSSIBILITIES:

After a solid year of research, we will be able to apply for federal funds. We will use the results of this research to improve on our existing set of recommendations on how to best control CPB. Our results will provide information on how insecticides targeting CPB affect, or not, non-target beneficials. Long-term, this information will aid growers in pest management decisions and could be used as template for other cropping systems.

Figure 1. Seasonal average number of predators in potatoes, Hermiston 2018

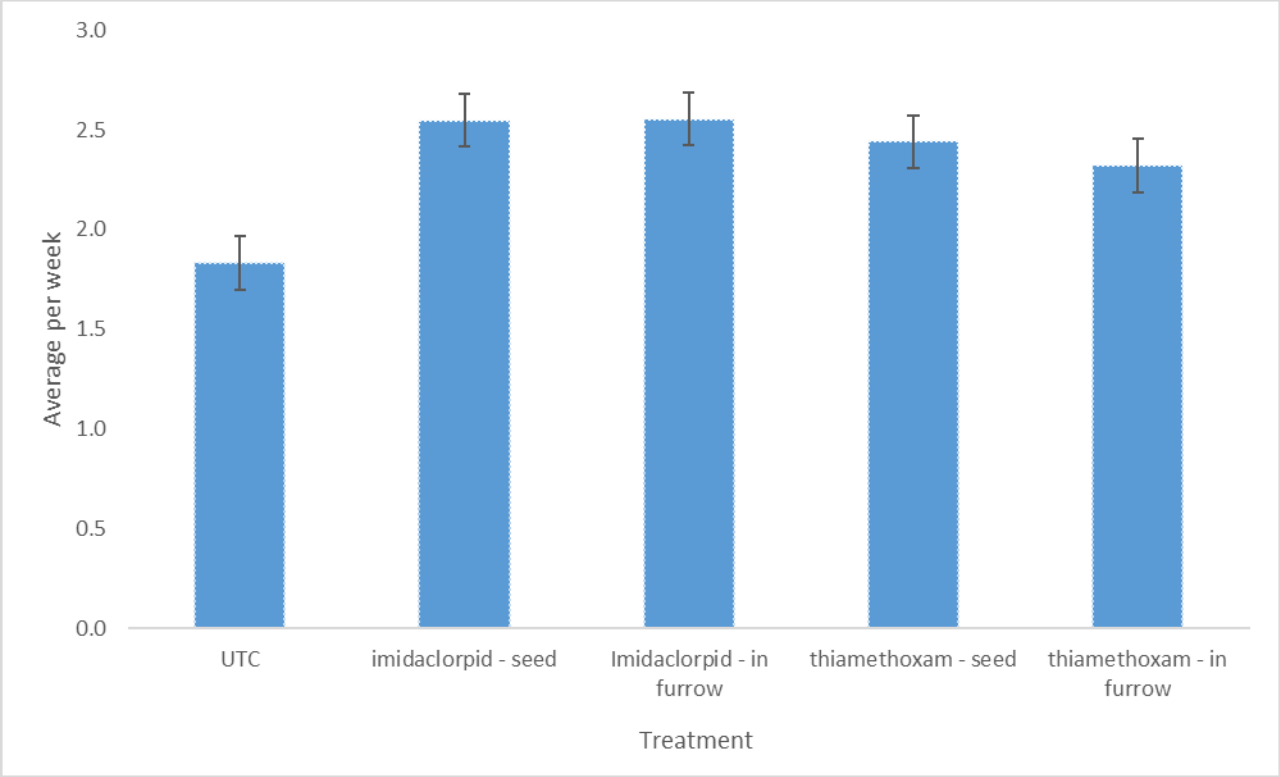

Figure 2. Colorado potato beetle percentage parasitism, 2017-2018.

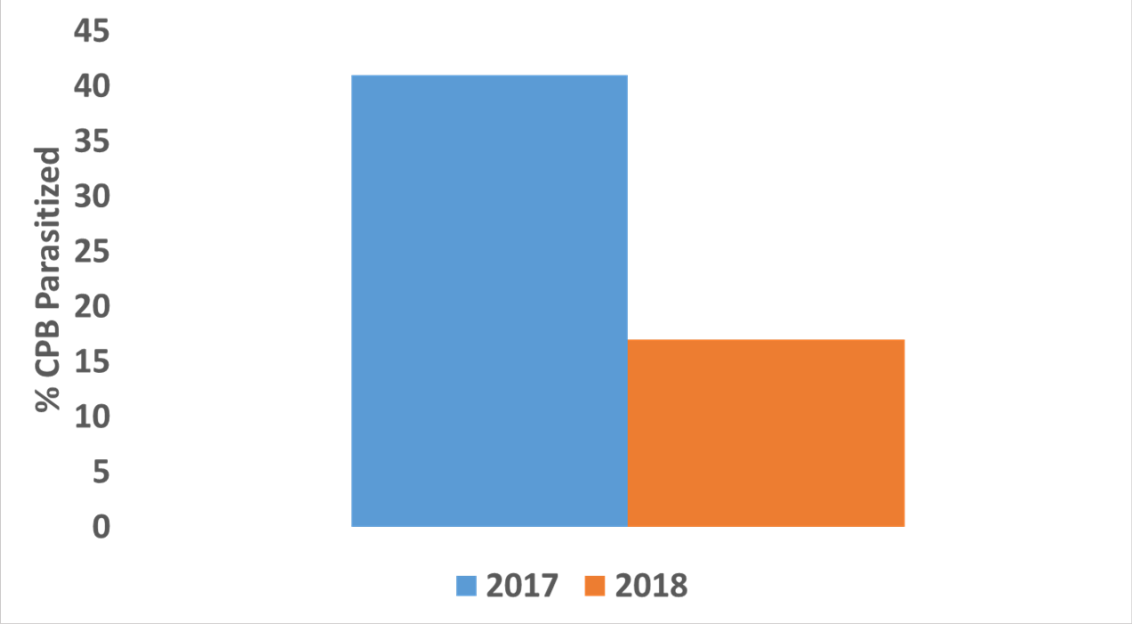

Figure 3. Tachnidae fly *Myiopharus doryphorae* (top); larva with two eggs of M. doryphorae. Photo credit OSU IAEP (Rondon's lab).