

2003

CPAC Research Proposal

Title: *Assessment of Cultivar Susceptibility to Potato Psyllid*

Primary Investigator:

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Nature, scope and objectives of the proposed research:

The potato/tomato psyllid, *Bactericerca* (= *Paratrioza*) *cockerelli*, is often the key insect pest of potatoes grown in the High Plains/Rocky Mountain region of the US. It is also important in many production areas of Mexico and Texas. It produces injury to potato (and tomato) through a uniquely potent phytotoxin that occurs in saliva injected by the potato psyllid into plants during feeding. The research on this insect and the damage it produces to potato has been summarized numerous times by the primary investigator, notably in Colorado State University Agricultural Experiment Station Bulletin TB93-5: **An Annotated Bibliography of the Potato/Tomato Psyllid, *Paratrioza cockerelli* (Sulc).**

Despite its importance relatively little work has been done regarding this potato pests and several fundamental questions remain to be answered. This paucity of new information has been particularly striking during the past forty years. Among the questions most commonly raised in discussion with potato producers include:

What treatments can be used to control potato psyllid?

How can one detect a potentially damaging psyllid infestation?

How damaging is potato psyllid at different times in the crop cycle?

To what effect can effects of psyllid yellows be reversed once they have begun to appear in a crop?

How resistant are different potato cultivars to potato psyllid?

In addition a key question of interest to other entomologists and potato researchers is "What is the nature of the potato psyllid toxin?"

Some of these questions have been worked upon by the primary investigator over the past 15 years and partially resolved. Research is planned for 2003 to address most, with funding from the Colorado Potato Administration, Area III being sought to support the research involved in several of the first questions. Funding from the San Luis Valley Research Center Committee is being sought to support specifically the project related to resistance of potato cultivars to potato psyllid.

Preliminary trials to establish methodologies for this research were conducted in 2001 and 2002. This involved 5 cultivars in the first year, eleven in the second. Large differences from the effects of psyllid management were observed among the tested cultivars. Yield increases from psyllid control ranged from 10% (Yukon Gold) to 70% (Russett Nugget) and 14.5% (Russet Norkotah) to 137.4% (Russet Nugget) in the two years, respectively. Little difference in the number of psyllids occurred on the various cultivars and the nature of resistance appears

to be largely do to relative insensitivity to effects of potato psyllid salivary toxin.

Methods, procedures and facilities:

A minimum of 15 cultivars will be included but as many cultivars will be tested as can be acquired, to exceed and expand upon preliminary trials. These will be planted in split plots and replicated a minimum of five times.

One half of each plot will be given a full-season potato psyllid management so that they will be maintained essentially psyllid-free. This will be done with a combination of a planting time treatment of a neonicotinoid (Admire, Platinum) followed by foliar treatments if psyllids are detected. The second half of the plot will be of the same cultivar managed similarly in all respects except for insect control. Should the plots receive infestation by another pest insect (e.g., flea beetles, Colorado potato beetle) they will be treated with a selective pesticide application capable of control of that insect but which does not control potato psyllid (e.g., carbaryl, spinosad, *Bacillus thuringiensis tenebrionis*).

Plots will be monitored for psyllid at several points during the season. This will be done 1) to determine that psyllids are not present on the psyllid-free plots; and 2) to determine populations of psyllids on the various cultivars. The latter information will be used to establish the relative preference of the cultivars to potato psyllid.

Plots will be harvested and the comparison made between those maintained psyllid-free and those infested by psyllid. These data will largely establish the relative resistance of the cultivars to psyllid infestation.

Subsamples of these potatoes will be stored for evaluation as to specific gravity and processing quality in conjunction with similar evaluations done by David Holm.

Subsamples from psyllid-free and psyllid-infested plots will be maintained and replanted in 2004 to determine carryover effects to seed from previous psyllid infestation.

These trials will be conducted at the Horticulture Field Research Center north of Ft. Collins. This site has several advantages including, most importantly, a history of quite regular infestation by this insect. Additionally plot maintenance, notably the periodic counts of insect numbers and harvest, can be done at this site at the lowest cost.

Relationship of the proposed research to overall problem:

This research will establish the relative tolerance of different potato cultivars to potato psyllid. This information is fundamental to determining economic thresholds for this insect. For example, cultivars that have high sensitivity to psyllid (e.g., Russet Nugget) will need to be managed much more intensively for this insect than a cultivar of low sensitivity. It is hoped that this information will become routinely incorporated into cultivar evaluations as is resistance to other potato pests (e.g., late blight, scab, certain viruses).

In time this work may also be used as a component of potato breeding. Determining cultivars

with low sensitivity to psyllid toxin can become the basis for dedicated breeding for this specific trait.

Potential for leveraging research results to obtain outside funding:

This line of research, with emphasis on cultivar improvement, appears to parallel well research of the type that is funded by the CSREES Special Research Grants Program, Potato Research. The demonstration of support by CPAC, combined with the past support of the Colorado Potato Administration Board, Area III will further strengthen this proposal. A proposal to this CSREES project will be made during the next funding cycle.

Timeline of proposed research and expected short term (1 year) and longer term (3-5 years) outcomes. Identify milestones and major expected accomplishments:

During 2003 a substantial number (15+) of cultivars will be evaluated for relative susceptibility to potato psyllid. For this type of data to be significant two years in such evaluations is considered a minimum. Ultimately it is hoped that all cultivars grown in Colorado, and all cultivars in development, will be included in such testing.

CPAC funding will probably again be sought in 2004. It is hoped that a CSREES grant will allow for pursuit of this research after that point.

Detail annual budget

Personnel

Support of Matt Camper, Graduate student 1/10th stipend and support	\$1,400
Hourly help	1,000

Materials and Supplies

Seed, fertilizer, pesticides	200
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Travel

Local travel, personal vehicle	150
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Equipment, Services

Plot maintenance, land rental, storage	750
Replanting 2004	500

Total Research Request	\$4,000
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