Evaluating Season-long Insecticide Programs to Improve Potato Insect IPM

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REPORTING PERIOD: 2014 Growing Season

ACCOMPLISHMENTS:

Our overall objective is to evaluate insecticide management techniques based on sampling and insect thresholds in season long management programs and subsequently use tools available from the WSU Potato Horticulture program and private potato processing collaborators to quantify yield and quality impacts on potatoes grown under these various integrated pest management programs.

Season one (2013) provided some interesting observations, but 2014 had low insect pressure. Even with such low insect pressure, there was evidence that using insecticides tended to increase marketable yield and returns to the producer. With the trends showing higher yields and returns with the use of insecticides, it seems appropriate to perform the experiment again with minor adjustments to see if statistically significant results can be obtained. For the coming season, if funding is procured, plot size will be increased, and treatment threshold will be adjusted to allow for further insect population development. We will also consider actions that will foment more significant insect pressure.

RESULTS:

Treatment/App. Date	4/15/2014	6/11/2014	6/18/2014	6/25/2014	7/2/2014	7/8/2014	7/16/2014	7/30/2014	8/6/2014	Total Product Cost/A	Process Adj. gross	Gross less insecticide cost
Untreated										$0.00	3505.92	$3,505.92
Risk Averse	Cruiser Maxx	Movento	Movento	Fulfill	AgriMek	Beleaf	Coragen + AgriMek	Transform	Coragen	$237.42	4128.425	$3,891.01
Inexpensive Choice					Warrior	Warrior	Warrior + Coragen	Admire Pro		$48.08	3710.922	$3,662.84
Most Effective Choice	Cruiser Maxx				AgriMek	Torac	Coragen + Beleaf	Transform	Coragen	$146.86	3855.381	$3,708.52
Treated Check	Cruiser Maxx						Coragen		Coragen	$81.21	3486.642	$3,405.43

Table 1. Treatment programs by date with trade name of insecticides applied. Costs included do not include costs of surfactants or application, just insecticide.

Table 1 documents the insecticide regime applied to each treatment throughout the season, the total product cost per acre of applying those insecticides, and the gross return to the grower. The Risk Averse foliar insecticide treatment program began much earlier than the others since we were trying to make applications prior to insect infestation in our plot area. All of the applications to the Risk Averse treatment in June and early July were targeted at potato psyllid, which never increased in population enough to be considered a threat. Later in the season, the Risk Averse treatments were aimed at controlling Colorado potato beetle and potato psyllid. The Inexpensive Choice and Most Effective Choice insecticide regimes did not have any foliar insecticides applied until the first week of July due to very low insect pressure. Both the Inexpensive Choice and Most Effective Choice treatments had some mid season aphid and leafhopper numbers that triggered insecticide applications to be made. All treatments received fewer insecticide applications in 2014 than in 2013 and as a result overall costs were reduced. Even with the low pest pressure, applications of insecticides increase the per acre gross profitability to the grower, though results were not statistically significant.

Data from 2013 resulted in the conclusion that yellow sticky cards did not provide any information in terms of insecticide efficacy, rather served as a good indicator to measure insect arrival to the potato plots. As such, yellow sticky cards were only placed in the center of untreated check plots to be used as another monitoring tool to determine when insecticide applications should be considered. Figure 1 shows the average number of insects per sticky trap for winged aphids, potato psyllid adults, leafhopper adults, Lygus adults, and big-eyed bug adults, all mobile insects that could be trapped with a yellow sticky cards. All insects sampled with yellow sticky cards were much less abundant in 2014 than in 2013. For example, when comparing the potato psyllid numbers in Figure 1 to Figure 2, there are five to forty fold differences depending on the time of season. This trend was the same for all the pest insects except for aphids and Lygus, which had relatively high populations early in the season for both and late in the season for Lygus.

Figures 3 and 4 illustrate the total numbers of potato psyllids per treatment for the entire season by trapping method for 2013 and 2014. These figures further illustrate the dramatic difference in potato psyllid pressure from 2013 to 2014. There was very few potato psyllids caught in the plots in 2014.

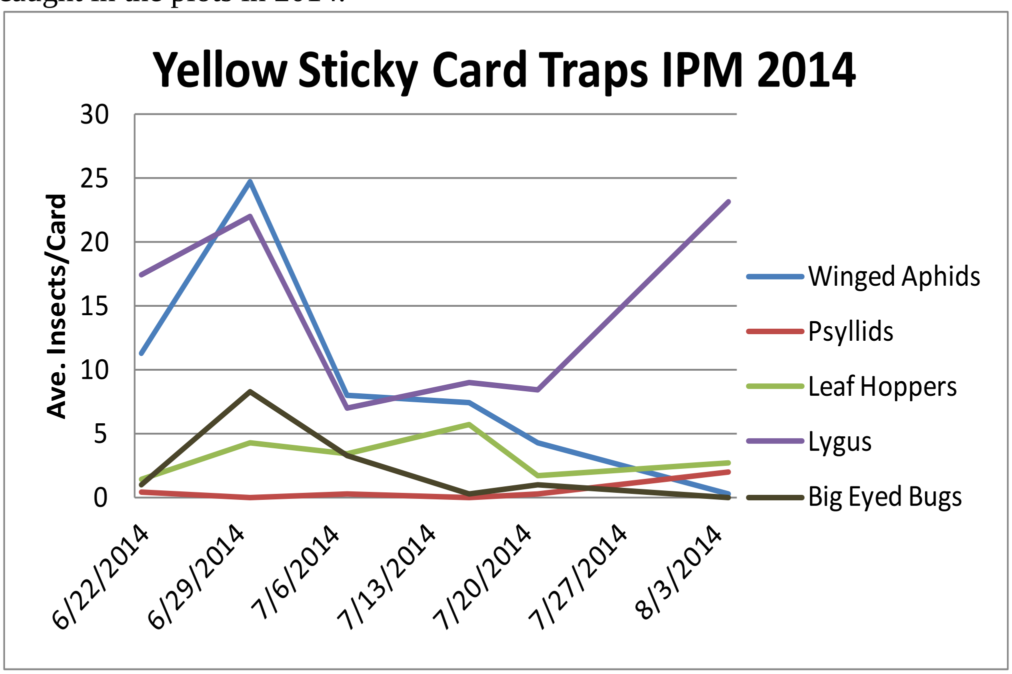

Figure 1. Average insects per yellow sticky trap per week.

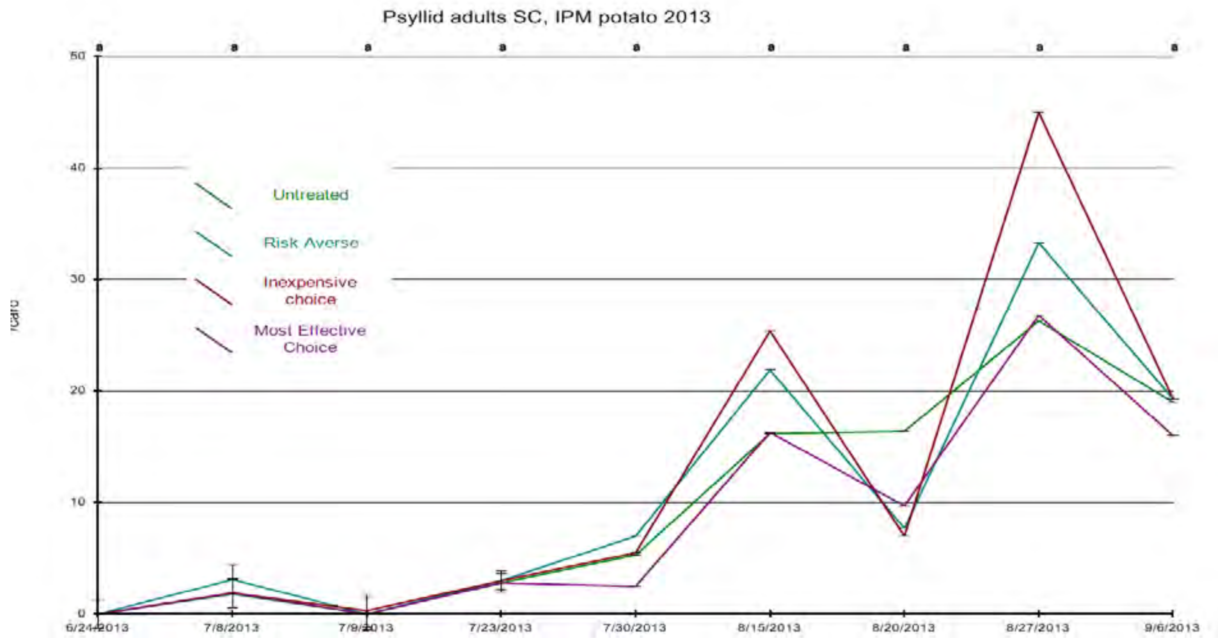

Figure 2. Potato psyllid adults by treatment, yellow sticky card samples 2013. Means with different letters are statistically significant from one another (p=.05 Student-Newman-Keuls test).

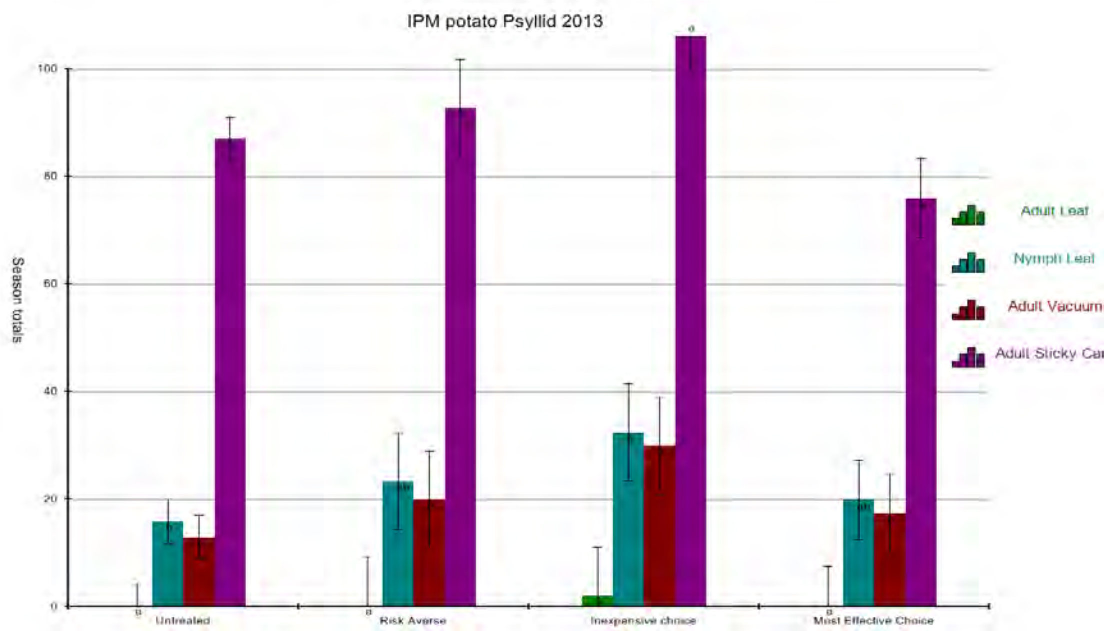

Figure 3. Potato psyllid total numbers by treatment and sampling method for adults and nymphs. Means with different letters are statistically significant from one another (p=.05 Student-Newman-Keuls test).

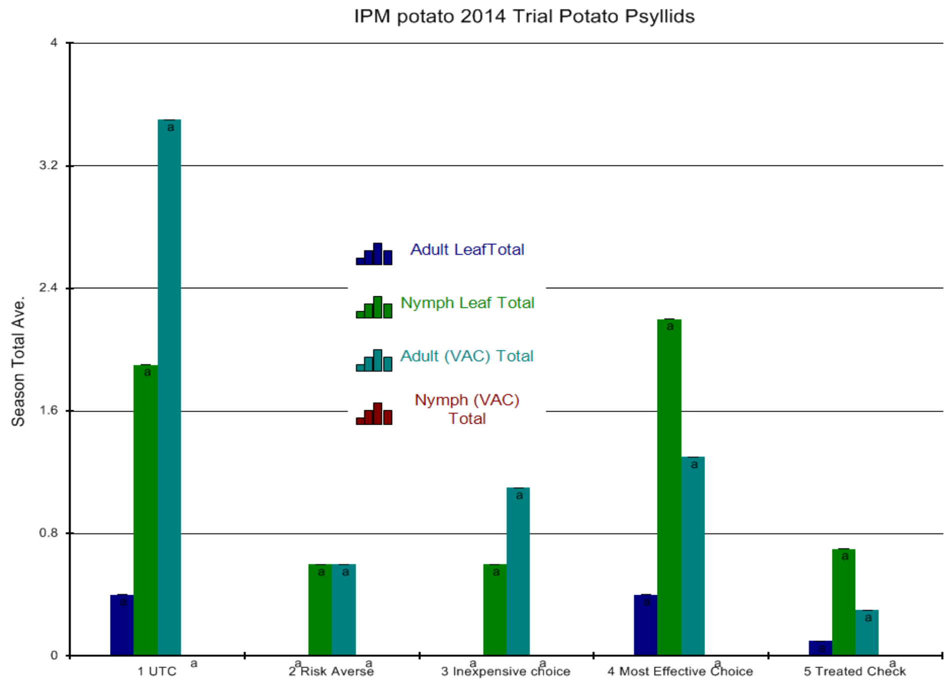

Figure 4. Potato psyllid total numbers by treatment and sampling method for adults and nymphs. Means with different letters are statistically significant from one another (p=.05 Student-Newman-Keuls test).

Figure 5 is a cumulative insect count for the sampling season by treatment for leaf samples. This figure also demonstrates how low the overall pest pressure at our site was. None of the season total insects evaluated by leaf sampling differ significantly from one another. Some targeted beneficial are not included on the graphic since none of them were collected, including spiders and minute pirate bugs. When the leaf sampling results are broken out by species by sampling week, no significant differences were detected either. The insect pressure at the site remained low throughout the season according to our results.

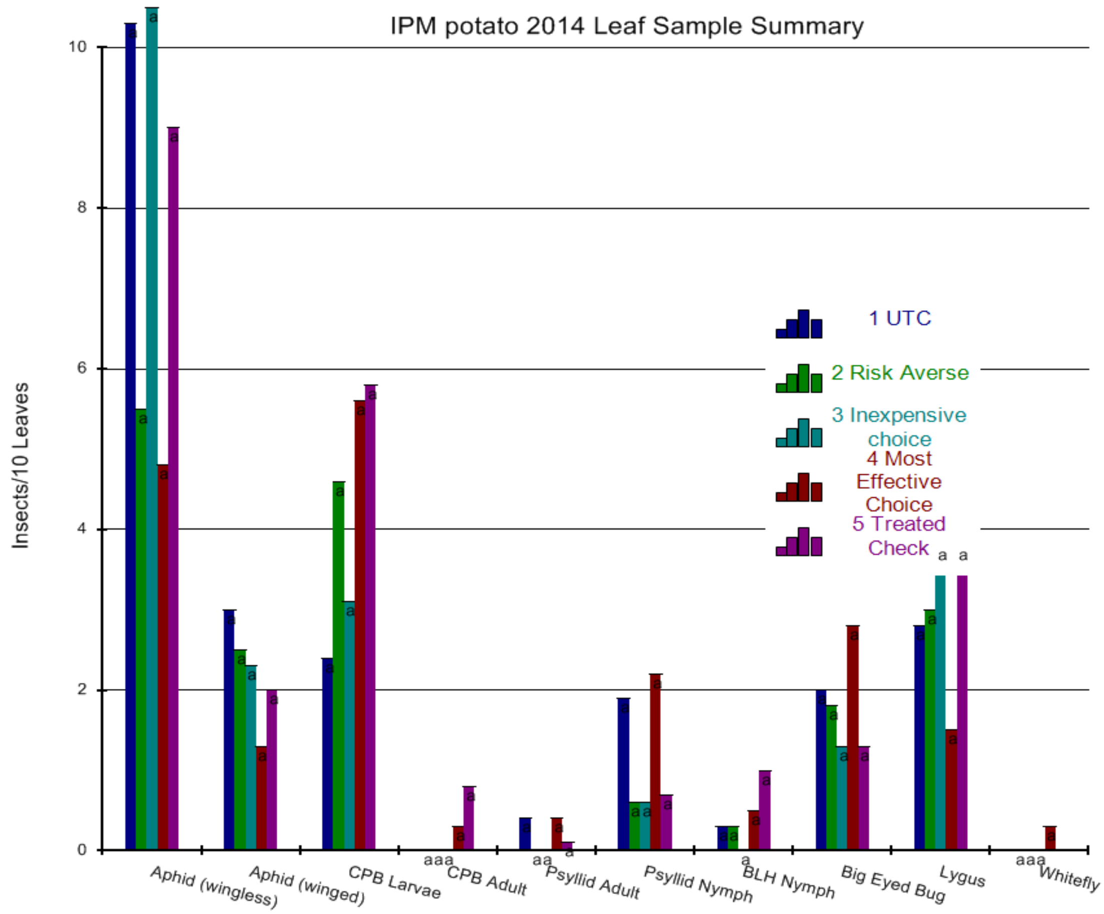

Figure 5. Cumulative insect numbers for the entire season by treatment by leaf sampling. Means with different letters are statistically significant from one another (p=.05 Student-Newman-Keuls test).

Figure 6 is a cumulative insect count for the sampling season by treatment for vacuum sampling potato plots. Once again, insect catches from this sampling method were extremely low, especially when comparing to previous seasons from the same site. Most insects evaluated did not differ in population when comparing treatments. The one exception to this was Lygus populations. Lygus are not considered a pest of potato, but were evaluated as part of the overall insect community. There were significantly fewer Lygus in the Most Effective Choice treatment than the other treatments in the trial. The reduction in Lygus numbers can likely be attributed to an application of Torac (tolfenpyrad) early in July in the Most Effective Choice treatment plots. The application was made to target a small spike in Colorado potato beetle and psyllid numbers early in July and was effective on the building population of Lygus. Warrior and Beleaf were applied in the other treated plots and did not seem to have the same impact on the Lygus.

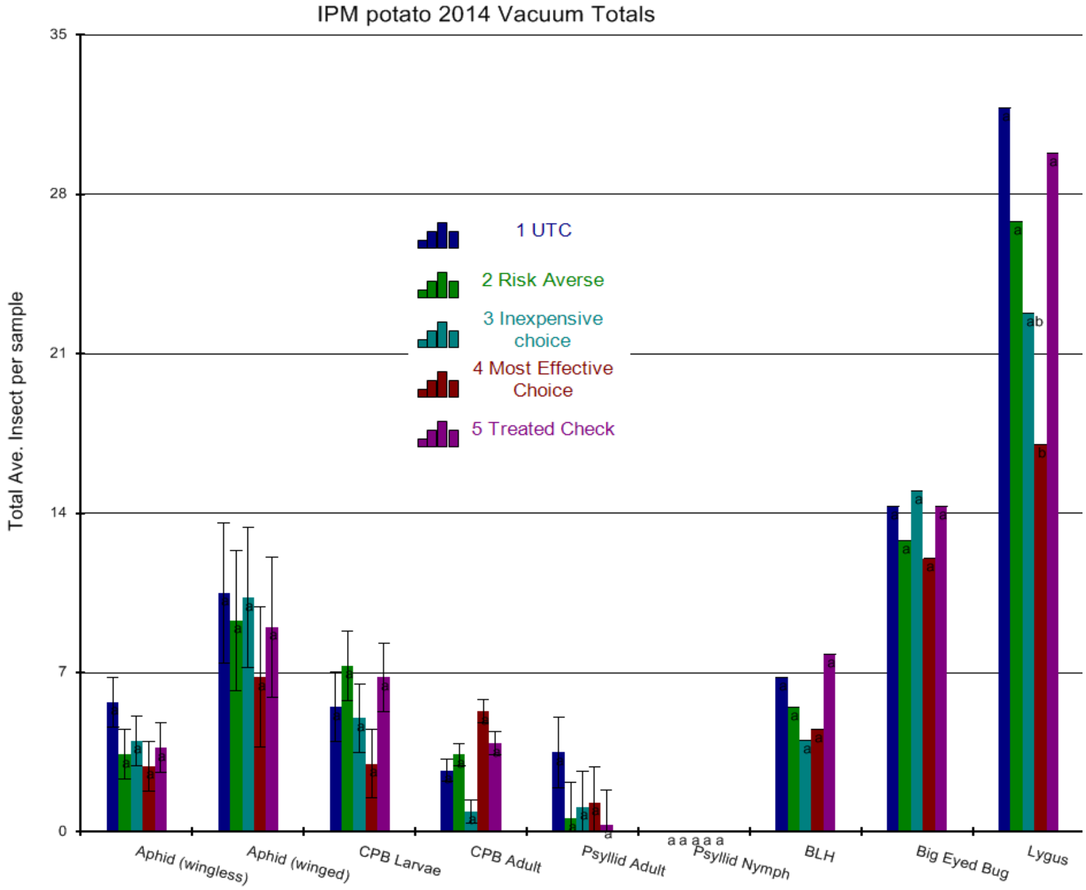

Figure 6. Cumulative insect numbers for the entire season by treatment for Vacuum Sampling. Means with different letters are statistically significant from one another (p=.05 Student-Newman-Keuls test).

One of the main goals of this project was to determine how insect management impacts yield and quality. Figure 7 shows total yield in tons per acre and percent of US No. 1 tubers while Figure 8 illustrates gross returns per acre. There were no statistically significant differences, but the numeric trends favor using the Risk Averse program over the others. High variability among plots caused the results to not vary statistically, but the trend in my opinion warrants further investigation. It is interesting that, under such low insect pressure, profitability would vary.
A subset of tubers from each plot was collected and cut with a commercial fry cutter following grading and sizing. All tubers that were cut did not display zebra chip symptoms. Potato psyllids that were collected in each plot are currently being tested for zebra chip at the USDA Wapato Laboratory.

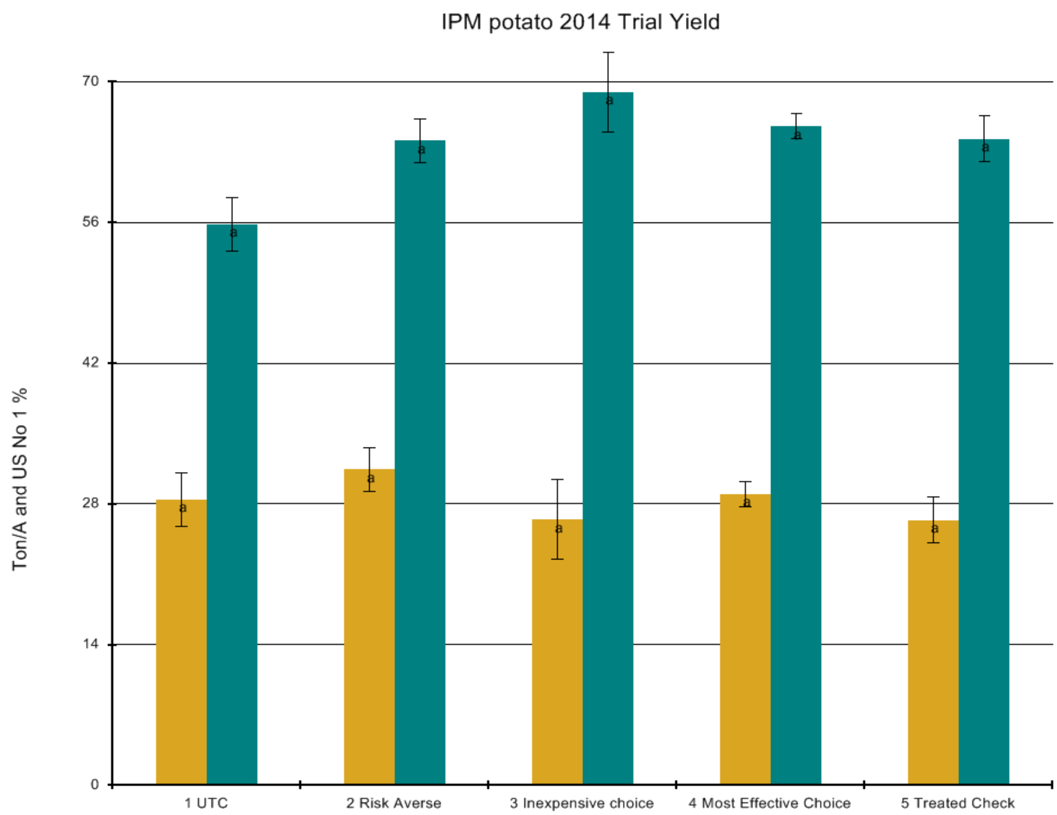

Figure 7. Total yield by treatment in tons/acre and % US No. 1 Grade. Means with different letters are statistically significant from one another (p=.05 Student-Newman-Keuls test).

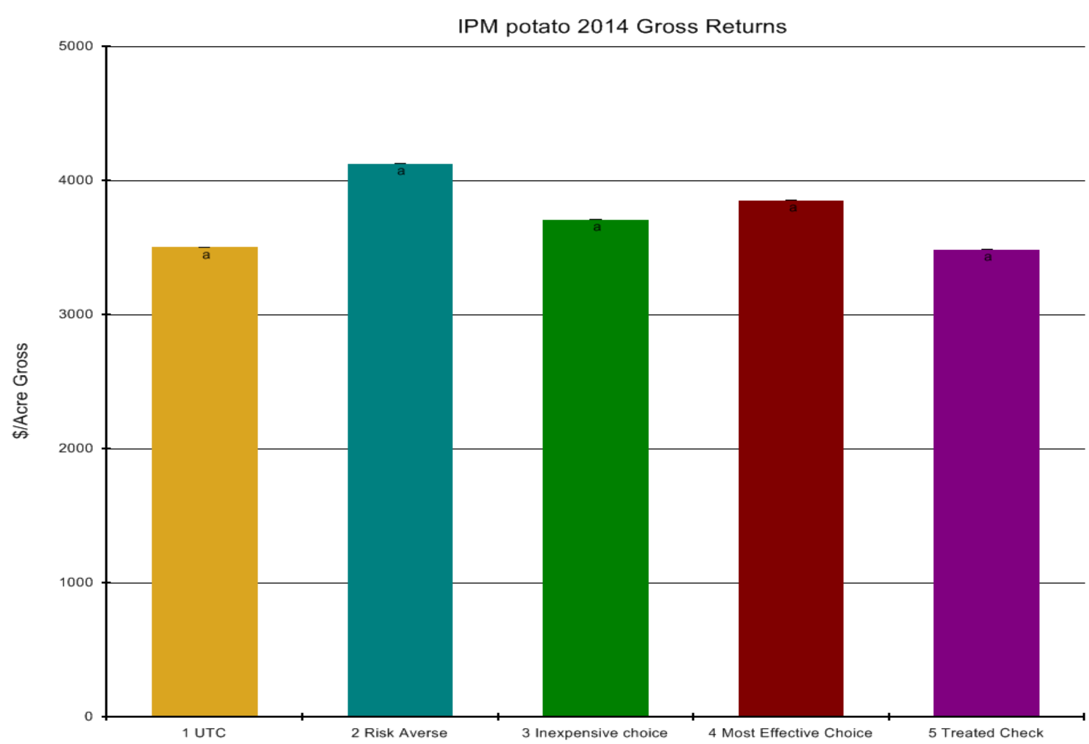

Figure 8. Gross Return in Dollars per Acre. Means with different letters are statistically significant from one another (p=.05 Student-Newman-Keuls test).