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Kern County Vegetable Crops

June 2012

2012 Potato Seed Piece Trial

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Soft rot of potatoes has been an issue affecting all Kern County potato growers for some time now. However, field trials the past few years may have shed light on some ways to reduce the impact of this problem.

Soft rot is caused by the bacterium *Pectobacterium carotovorum* var. *carotovora or Dickeya chrysanthemi* (formally known as *Erwinia carotovora subsp. carotovora and E. chrysanthemi*). In-season infections are characterized by seed piece decay that extends into the lower stem and causes an early dying of the plants. Also, as the seed piece decays, the bacteria move through the stolons and the soil onto the new forming tubers. On these "daughter" tubers there will be a stem end decay and/or lenticel infections. Post-harvest loss can also occur as the harvested tubers are washed in the dump tank which pushes water along with the bacterium into the lenticels. An infection of the lenticels is often noticed a few days after packaging.

The disease is favored by high soil temperatures so late planted fields that are not harvested until late spring or early summer are most susceptible. The fall crop which is planted in August is of course very susceptible also.

This problem will never be fully controlled because of the high temperatures that the potato crop grows in here in Kern County. However the impact can be reduced by planting and harvesting early and avoid over watering. But other options may now be possible.

Two field trials were planted in early 2012 in grower's field to evaluate several different treatments to help manage this disease. The trial consisted of the following treatments:

1. Control-cut seed
2. Whole Seed Drop
3. Sterilized Cut Seed
4. Maxim MZ
5. Quadris in-furrow
6. Tenet
7. Accomplish
8. Soilgard
9. Rootshield
10. Serenade Soil
11. Actinovate
12. Potassium
13. Calcium
14. K-Phite

Each trial was planted with 27 seed pieces of Red La Soda variety in 20 ft plots and replicated four times. All the treatments were on cut seed except the whole seed drop. The tubers from treatment were harvested and graded into different size categories.

The standard practices most growers use today is planting cut seed treated with a fungicide seed treatment such as Maxim MZ. An in-furrow application of Quadris at planting is often done also. Whole seed drop is used when such seed is available and it often produces plants that are more vigorous and disease tolerant due to the lack of wounding like cut seed. Treatments 1 through 5 look at these individual practices.

Fungicides have not been effective in managing this disease because soft rot is caused by a bacterium and not fungal in nature. The success we have seen in the previous trials has been with the use of biologicals. Treatments 6 through 11 are all biologicals that are commercially readily available. Tenet is a biological material consisting of the fungi *Trichoderma asperellum* and *T. gamsii*. Accomplish is not sold as a biological control agent but rather as enhancing plant nutrient availability. It is composed of *Bacillus lichenformis, B. megaterium, and B. pumilus*. Soilgard is a biological composed of *Gliocladium virens*. Rootsheild is a strain of the fungus *T. harzianum.* Serenade Soil is the bacterium *B. subtilis* while Actinovate is the bacterium *Streptomyces lycicus*.

Treatments 12 through 14 are nutrients that may have an impact in reducing soft rot. Treatment 12 is potassium from the commercial product Agrigator K and K-Phite is another form of potassium. At the Teal site calcium was added at 100lbs/Ac in the form of soluble gypsum and at the Nord site as calcium lignosulfonate.

All the treatments were applied in-furrow at planting except Maxim MZ which was a seed treatment.

Statistical analysis showed no differences in yield among treatments at either site or combining the yield data from both sites (tables 1-3). However some treatments seemed to produce higher yields. The whole seed drop and Serenade Soil treatments produced higher yields than the control cut seed. Soilgard and Actinovate seemed to have a positive influence on yield also. Again this was not statistically significant.

Another trend that was noticed is that the treatments that produced the higher yields had less culls. As a note, all the culls were due to soft rot and not to cracked or misshapen tubers.

However, when the marketable yield is plotted versus the cull yield and correlations are analyzed then there are significant differences (figures 1-3). The treatments that produce higher yields also produce lower amount of culls due to soft rot.

These trials indicate that soft rot of potatoes can be reduced by the use of whole seed pieces, Serenade Soil, Soilgard and Actinovate. These treatments will increase yields slightly and reduce the amount of cull potatoes due to soft rot bacteria. We saw similar results in 2011 with these products.

Table 1. Yield for Nord Plot

	Nord Yield Data cwt						
	0-4 oz	**4-6 oz**	**6-10 oz**	**>11oz**	**Culls**	**Marketable**	**Total**
1. Control	44.0	240.4	140.9	49.3	60.1	555.8	615.7
2. Whole Seed	143.6	310.3	164.8	37.0	35.9	655.0	690.8
3. Sterilized Seed	187.3	217.1	126.8	35.1	73.9	566.0	639.5
4. Maxim MZ	168.3	252.7	108.3	28.2	72.9	557.0	629.9
5. Quadris in-furrow	139.1	239.8	145.6	75.8	43.7	599.7	643.4
6. Tenet	137.2	265.7	167.5	43.1	64.7	612.2	676.9
7. Accomplish	168.9	235.7	121.9	42.1	79.7	567.8	647.5
8. Soilgard	151.1	225.1	131.3	38.0	88.0	543.3	631.1
9. Rootshield	206.7	236.5	93.8	42.5	91.7	578.8	669.9
10. Serenade Soil	218.8	265.7	122.1	53.7	55.6	659.7	714.9
11. Actonovate	165.6	249.6	158.1	43.9	57.6	617.6	675.2
12. Potassium	142.8	215.7	139.5	16.5	62.1	514.3	576.4
13. Calcium	177.5	194.6	121.1	40.8	63.1	533.5	596.2
14. K-Phite	163.0	235.3	117.4	73.1	68.2	589.9	657.9
p=	NS	NS	NS	NS	NS	0.1113	NS
%CV	39.68	23.5	37.37	61.24	42.57	11.48	10.42
LSD p=0.05	NS	NS	NS	NS	NS	NS	NS

Table 2. Yield for Teal Plot

	Teal Yield Data cwt						
	0-4 oz	**4-6 oz**	**6-10 oz**	**>11oz**	**Culls**	**Marketable**	**Total**
1. Control	36.9	152.2	57.4	0.0	14.7	246.4	300.8
2. Whole Seed	46.9	216.4	89.1	0.0	7.9	352.3	360.2
3. Sterilized Seed	42.7	215.8	89.6	0.0	8.5	348.1	356.5
4. Maxim MZ	46.0	213.3	78.1	0.0	9.2	337.4	346.6
5. Quadris in-furrow	34.0	149.6	82.5	0.0	18.0	266.1	284.1
6. Tenet	39.1	186.9	85.4	0.0	7.6	311.4	318.9
7. Accomplish	38.9	185.4	83.7	0.0	17.1	308.0	325.1
8. Soilgard	37.5	179.6	86.2	0.0	9.6	303.3	372.8
9. Rootshield	34.8	173.1	80.9	0.0	8.7	288.8	297.5
10. Serenade Soil	40.8	203.3	77.6	0.0	11.2	321.7	332.9
11. Actonovate	33.8	185.7	92.9	0.0	12.1	312.4	324.5
12. Potassium	31.6	168.8	65.6	0.0	22.1	265.7	287.8
13. Calcium	26.8	123.4	76.1	0.0	11.8	226.2	293.0
14. K-Phite	32.8	168.3	95.8	0.0	12.9	296.9	309.7
p=	NS	NS	NS	NS	NS	NS	NS
%CV	29.72	29.87	38.17	-------	81.72	27.43	22.86
LSD p=0.05	NS	NS	NS	NS	NS	NS	NS

Table 3. Yield for plots Teal and Nord Combined

	Combined Yield cwt						
	0-4 oz	**4-6 oz**	**6-10 oz**	**>11oz**	**Culls**	**Marketable**	**Total**
1. Control	81.7	196.1	98.9	24.5	37.6	401.1	458.3
2. Whole Seed	95.6	263.1	126.6	18.8	22.1	504.1	525.3
3. Sterilized Seed	115.2	216.5	107.8	18.0	40.8	456.7	498.4
4. Maxim MZ	107.0	232.8	93.1	13.9	40.8	446.9	487.7
5. Quadris in-furrow	86.6	194.4	114.4	37.6	31.0	433.0	464.1
6. Tenet	88.2	226.3	126.6	21.2	35.9	461.6	497.5
7. Accomplish	103.8	210.8	102.9	21.2	48.2	437.9	486.1
8. Soilgard	94.0	202.6	108.7	18.8	49.0	423.2	501.6
9. Rootshield	120.9	205.1	87.4	21.2	49.8	433.8	483.7
10. Serenade Soil	129.9	234.5	99.7	27.0	33.5	491.0	523.7
11. Actonovate	99.7	217.3	125.8	22.1	35.1	464.9	500.0
12. Potassium	87.4	192.0	102.9	8.2	42.5	389.7	432.2
13. Calcium	102.1	159.3	98.9	20.4	37.6	379.9	444.4
14. K-Phite	98.0	201.8	107.0	36.8	40.8	443.6	483.7
p=	NS	NS	NS	NS	NS	0.0656	NS
%CV	45.79	26.21	38.43	85.44	53.34	17.02	14.56
LSD p=0.05	NS	NS	NS	NS	NS	NS	NS

Figure 1. Scatter diagram of marketable tubers versus cull tubers at Nord plot.

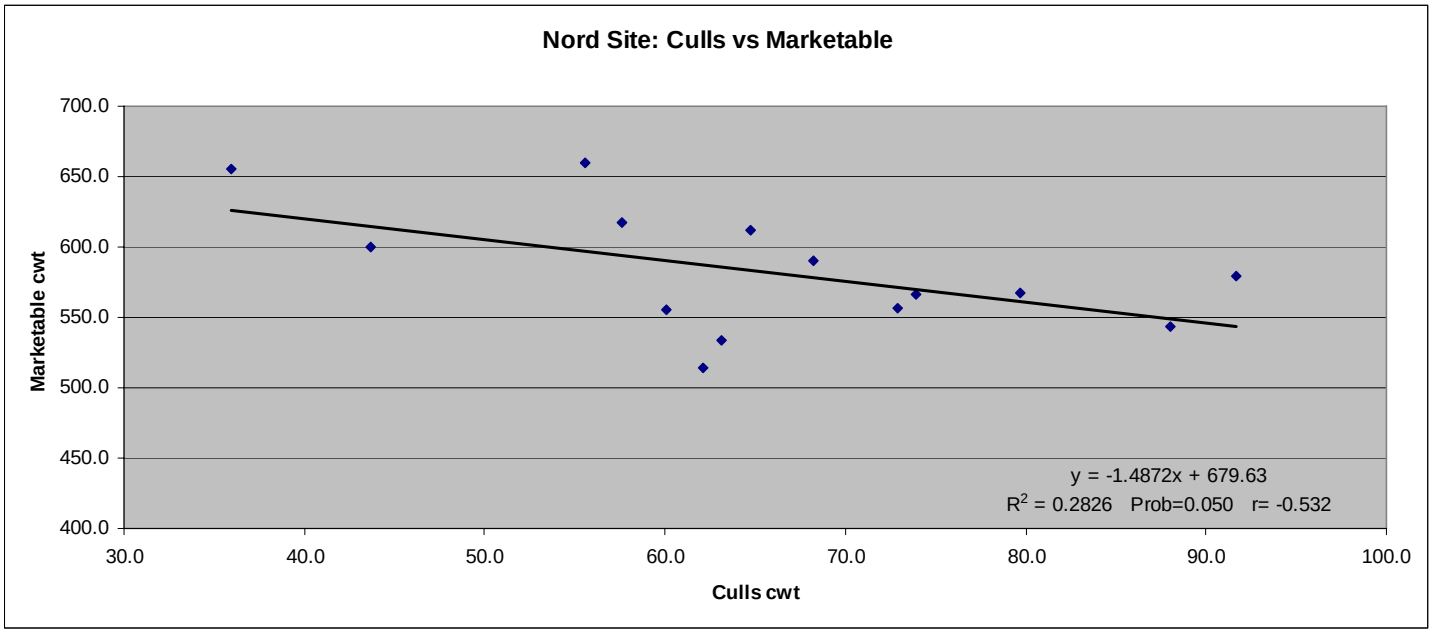

Figure 2. Scatter diagram of marketable tubers versus cull tubers at Teal plot.

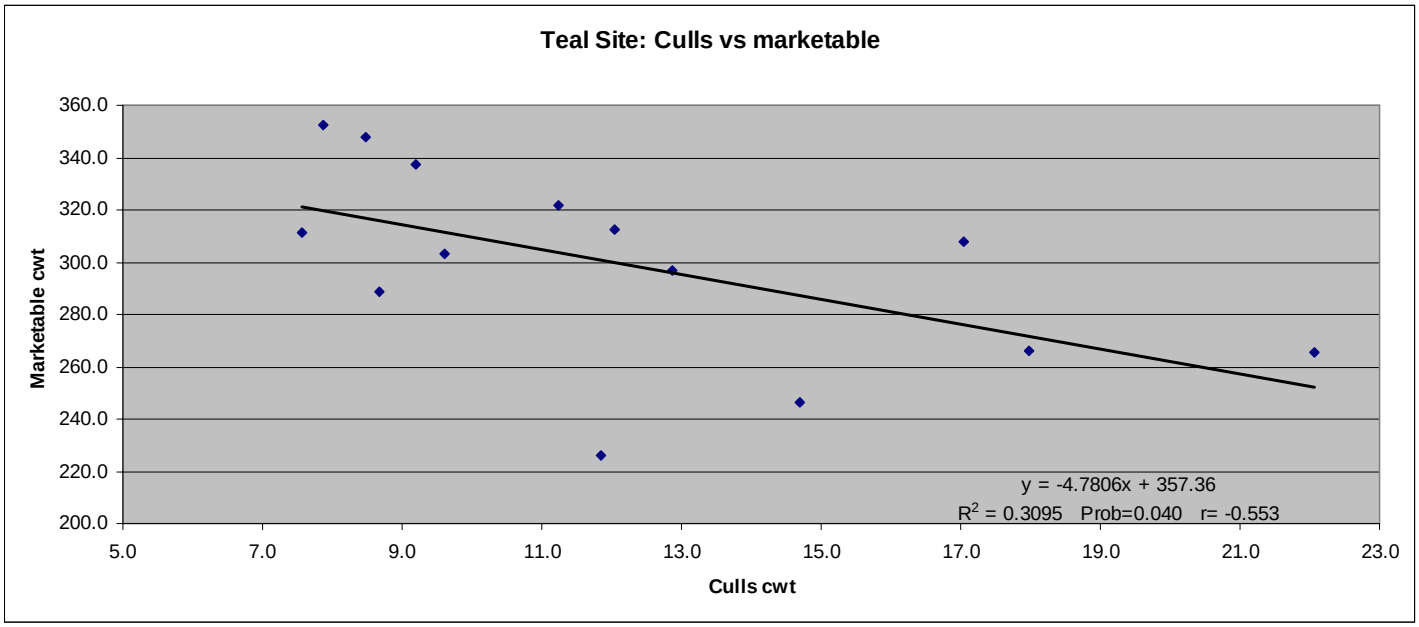

Figure 3. Scatter diagram of marketable tubers versus cull tubers at Nord and Teal plots combined.