University of California
Agriculture and Natural Resources
Intermountain Research & Extension Center

RESEARCH REPORT
Number 135, 2011

Influence of Fungicides on Black Dot Suppression and Russet Norkotah Yield

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Introduction: In 2010, a trial was conducted at the Intermountain Research & Extension Center (IREC) to evaluate the influence of fungicides and fungicide application timing on Russet Norkotah yield in a field with a historic Black Dot disease problem. Fungicide application methods included seed treatment, in-furrow application at planting, and post-emergent application 46 days after planting. Some of the treatments and rates may not be labeled for use in potatoes. Please consult fungicide labels for use instructions.

General Trial Information:

Location:	IREC, Tulelake, CA
Soil Type:	Tulebasin mucky silty clay loam
Planting Date:	May 17
Vine Kill Date:	September 16: Roll vines and application of Reglone at labeled rate
Days to Vine Kill:	122 days
Harvest Date:	October 4
Irrigation:	Solid-set sprinklers
Plot Size:	2 rows by 25ft
In-Row Spacing:	10.0 inches
Row Spacing:	36 inch
Number of Reps:	6 replications
Weed Control:	Cultivation and Outlook (pre-emergence), Matrix and Sencor (post-emergence)
Fertilizer:	195-246-6-84
Insecticides:	Movento and Coragen (aerial application)

Treatment Application Information:

The treatment list is detailed in Table 1. All fungicide rates are listed in product per acre. Seed treatments were applied immediately after cutting according to label directions. In-furrow treatments at planting were applied after potato seed was dropped into the furrow and before furrow closure.

Post-emergent applications were applied 46 days after planting using a CO_2 backpack sprayer at 20 GPA. Treatment 11 evaluated the efficacy of a biological product (Superzyme) containing *Bacillus spp., Pseudomonas putida,* and *Trichoderma spp* for Black Dot suppression. Treatment 15 evaluated X-tra Power, a product containing a mixture of chelated micro-nutrients. Treatment 16 evaluated an experimental plant growth regulator. Spring Vapam treatments were applied on April 9, 2010 five weeks before planting. The Vapam was applied via spray and rototill incorporation. Average soil temperature was 44.1^0F and average air temperature was 40.3^0F seven days after application. Soil moisture and soil and air temperatures were within Vapam label directions.

Potato and Disease Data Collection Information:

Potato stand counts and early season potato vigor were visually estimated in the entire plot area on June 24th. On September 30th, ten stems were collected from each plot and the lower 8 inches of stem was evaluated for Black Dot sclerotia. The length of stem with Black Dot sclerotia and the density (percent coverage) of Black Dot sclerotia was estimated for each stem segment. The entire plot area in every plot was harvested for yield on October 4th. Potatoes from each plot were run across a gradeline to determine tuber yield, size distribution, quality, and internal discoloration.

Results:

Treatments 6 (CruiserMaxx + Dynasty + Quadris 46 days after planting DAP) and treatment 11 (CruiserMaxx + Superzyme) increased total potato yield compared to the untreated control (Table 2). Treatment 11 was the only treatment to increase U.S. No. 1 potato yield compared to the control (Table 2). Verticillium wilt likely influenced yield in this trial. Russet Norkotah is very susceptible to Verticillium wilt, and the entire plot area suffered severe early dying symptoms before variety maturity. Early dying symptom severity was the same across all treatments.

Several azoxystrobin treatments (treatments 6, 7, and 14) reduced the percent coverage of Black Dot sclerotia on the lower potato stems compared to the untreated control (Table 3). Treatments 6, 7, and 14 are similar in that they all had Quadris applied 46 DAP. Treatments that included spring Vapam fumigation (treatments 12 and 13) had the highest Black Dot sclerotia coverage in the trial (Table 3). This trend was surprising as treatment 13 (Vapam +Dynasty + Quadris applied 46 DAP) included Dynasty + Quadris 46 DAP which was one of the best treatments for decreasing Black Dot sclerotia. Treatments with Dynasty alone, Spring Vapam, Dynasty + Blocker, Bravo Weatherstik, and Superzyme had higher sclerotia coverage on lower stems compared the best azoxystrobin treatment.

When factoring both yield and black dot sclerotia results, CruiserMaxx + Dynasty + Quadris 45 DAP produced higher yields while reducing black dot sclerotia on the stem. The reason treatment 7 (CruiserMaxx+ Dynasty+ Quadris in-furrow + Quadris 45 DAP) yield was the same as the untreated control is unknown. Treatment 16 reduced black dot sclerotia, but it caused unacceptable yield reduction.

Special thanks to the California Potato Research Advisory Board for funding support of this project.

Table 1: Treatment Timings for Blackdot Management Trial in Russet Norkotah Potatoes at IREC 2010.

	Pre	Seed treatment			In furrow application at planting						Post 46 days after planting	
Treatment	Vapam 37.5 gal/A (5 weeks before planting)	Cruiser Maxx .23 fl. Oz/100#	Dynasty .38 fl. Oz/100# seed	LEM 17 FS .5 fl. Oz/100# seed	Quadris .6 fl. Oz/1000 ft row	LEM 17 20 EC 1.6 fl. Oz/1000 ft. row	Blocker 7 pt/A	Superzyme 4 Qt/100 G	XtrPower 8 oz/A	STO-01 4 pt/A	Quadris 12 fl. Oz/A	Bravo 1.5 pt/A
1												
2		x										
3		x	x									
4		x	x		x							
5		x	x				x					
6		x	x								x	
7		x	x		x						x	
8		x	x		x							x
9		x		x								
10		x				x						
11		x						x				
12	x	x										
13	x	x	x								x	
14		x									x	
15		x							X			
16		x								X		

Table 2. Influence of Fungicide Treatments on Russet Norkotah Yield, Stand, and Vigor at IREC in 2010.

	Tuber Yield (cwt/A)										Early Plant
	U.S No. 1's (cwt)									% Stand	Vigor Rating
Treatment	Total 1's	12-16oz	8-12oz	4-8oz	<4oz	>16oz	Culls + 2's	Total	% 1's	6/24/2010	6/24/2010*
1	209	6	52	151	72	0	7	288	72	93	3.0
2	210	14	54	142	62	2	11	285	74	89	3.0
3	222	13	61	148	63	2	12	298	74	93	2.9
4	210	9	55	147	66	3	10	288	73	89	3.2
5	207	11	54	142	63	2	13	283	73	92	2.6
6	224	14	58	153	64	1	14	303	74	90	2.8
7	218	12	55	151	58	1	10	288	76	91	2.7
8	219	11	56	151	67	0	10	296	74	93	2.8
9	214	12	57	144	63	4	13	293	73	93	2.8
10	219	8	68	142	67	4	10	300	73	96	3.1
11	232	13	62	158	73	2	4	312	74	92	2.9
12	224	13	63	148	64	2	9	299	75	94	3.0
13	214	8	53	153	70	0	11	295	73	93	2.7
14	219	9	52	158	71	1	8	300	73	96	3.4
15	218	6	70	142	67	1	14	301	72	93	3.0
16	162	6	41	115	73	1	22	257	63	93	3.2
Mean	214	10	57	147	66	1	11	293	73	93	2.9
LSD {0.05}	16	5	9	12	7	NS	4	15	3	NS	0.4

1. Untreated- Raw Seed
2. Cruiser Maxx Seed Treatment (All CruiserMaxx trts were applied at 0.23 fl. oz/ 100 lbs of seed)
3. Cruiser Maxx + Dynasty Seed Treatment (All Dynasty trts were applied at 0.38 fl. oz/100 lbs of seed)
4. Cruiser Maxx + Dynasty Seed Treatment & Quadris 0.6 fl. oz/ 1000ft seed row in-furrow at planting
5. Cruiser Maxx + Dynasty Seed Treatment + Blocker (7 pint/A in-furrow at planting)
6. Cruiser Maxx + Dynasty Seed Treatment & Quadris 12 fl. oz/A at 46 days after planting (DAP)
7. Cruiser Maxx + Dynasty Seed Treatment & Quadris in-furrow at planting + Quadris 46 days after planting
8. Cruiser Maxx + Dynasty Seed Treatment & Quadris in-furrow at planting + Bravo Weatherstik (1.5 pt/A) 46 DAP
9. Cruiser Maxx + LEM 17 FS at 0.5 fl. oz/100 lbs of seed Seed Treatment
10. Cruiser Maxx Seed Treatment & LEM17 20 EC at 1.6 fl. oz/1000 ft of row in-furrow at planting
11. Cruiser Maxx Seed Treatment + Superzyme at 4 qt per100 gallons H20 in-furrow at plantings
12. Vapam 37.5 gal/A & Cruiser Maxx Seed Treatment (applied April 9th, 5 weeks before planting)
13. Vapam 37.5 gal/A (applied 5 wks before planting) & Cruiser Maxx + Dynasty Seed Treatment & Quadris 12 fl. oz/A at 46 DAP
14. Cruiser Maxx Seed Treatment & Quadris 12 fl. oz/A at 46 days after planting
15. Cruiser Maxx + XtraPower 8 oz/A in-furrow
16. Cruiser Maxx + STO-01 4 pt/A

* Early Season Plant Vigor Rating: 1 = Worst to 5 = Best

Table 3. Influence of Fungicide Treatments on Black Dot Sclerotia Stem Coverage.

Treatment	% Of Lower Stem with Black Dot Sclerotia	% Cover/Density of Black Dot Sclerotia on Lower Stem
1	51	37
2	47	35
3	48	40
4	52	31
5	51	35
6	55	28
7	48	30
8	52	41
9	46	32
10	52	33
11	52	36
12	57	45
13	53	42
14	51	30
15	54	34
16	37	24
Mean	50	35
LSD {0.05}	7	7

1. Untreated- Raw Seed
2. Cruiser Maxx Seed Treatment (All CruiserMaxx trts were applied at 0.23 fl. oz/ 100 lbs of seed)
3. Cruiser Maxx + Dynasty Seed Treatment (All Dynasty trts were applied at 0.38 fl. oz/100 lbs of seed)
4. Cruiser Maxx + Dynasty Seed Treatment & Quadris 0.6 fl. oz/ 1000ft seed row in-furrow at planting
5. Cruiser Maxx + Dynasty Seed Treatment + Blocker (7 pint/A in-furrow at planting)
6. Cruiser Maxx + Dynasty Seed Treatment & Quadris 12 fl. oz/A at 46 days after planting (DAP)
7. Cruiser Maxx + Dynasty Seed Treatment & Quadris in-furrow at planting + Quadris 46 days after planting
8. Cruiser Maxx + Dynasty Seed Treatment & Quadris in-furrow at planting + Bravo Weatherstik (1.5 pt/A) 46 DAP
9. Cruiser Maxx + LEM 17 FS at 0.5 fl. oz/100 lbs of seed Seed Treatment
10. Cruiser Maxx Seed Treatment & LEM17 20 EC at 1.6 fl. oz/1000 ft of row in-furrow at planting
11. Cruiser Maxx Seed Treatment + Superzyme at 4 qt per100 gallons H20 in-furrow at plantings
12. Vapam 37.5 gal/A & Cruiser Maxx Seed Treatment (applied April 9th, 5 weeks before planting)
13. Vapam 37.5 gal/A (applied 5 wks before planting) & Cruiser Maxx + Dynasty Seed Treatment & Quadris 12 fl. oz/A at 46 DAP
14. Cruiser Maxx Seed Treatment & Quadris 12 fl. oz/A at 46 days after planting
15. Cruiser Maxx + XtraPower 8 oz/A in-furrow
16. Cruiser Maxx + STO-01 4 pt/A