

Sugar End Evaluation (1900 Series)

- Location:** Inkster, ND
- Plot design:** 4 rows X 30 feet X 4 reps; RCBD
All 4 rows were sprayed; foliar disease data was taken from the center 2 rows.
- Planting date:** May 27, 2009
- Row width:** 36 inches
- Seed spacing:** 14 inches
- Cultivar:** Russet Burbank
- 50% Emergence:** June 17
- Herbicide:** Prowl (2.0 pt/a) + Matrix (1.0 oz/a) + Sencor (0.5 lb/a); June 12
Sencor (0.5 lb/a) + Matrix (1.0 oz/a); June 20
- Fertilizer:** 57#N, 200#K, 20#S; Broadcast May 14
29#N, 100#P, 1#Zn; at planting
70#N; Sidedress June 10
20#N; Fertigation July 14
20#N; Fertigation July 19
20#N; Fertigation July 24
- Insecticide:** Belay (12.0 oz/a); in furrow at planting
Baythroid (1.0 oz/a) + Coragen (5.0 oz/a); August 18
- Objective:** Determine effect of foliar applications of QoI on sugar end development as a result of water stress.
- Fungicide application dates:** July 2, 8, 13, 22, 29, August 6, 10, 18, 25, September 2
- Fungicide application method:** Fungicide applications 1 and 4 were performed using a hand held CO₂ sprayer as indicated by the protocol. All other fungicides were applied using a converted ATV (55 psi; 61 gpa; 11005XR nozzles).
- Vinekill:** Reglone (2.0 pt/a) + Ad-Wet 90 Plus (1.0 pt/a/100gal); September 10 and 17
- Harvest:** October 5
- NDSU Fry evaluation:** October 30; 25 days after harvest
December 17; 73 days after harvest

January 21, 2010; 108 days after harvest
February 20, 2010; 138 days after harvest

Lamb Weston Fry evaluation: November 10; 36 days after harvest
December 3; 59 days after harvest
January 19, 2010; 106 days after harvest
February 25, 2010; 143 days after harvest

Sugar evaluation: November 4; 30 days after harvest
January 15; 102 days after harvest

NDSU Fry Protocol: Three tubers (170-227 g each) were cut into fries (1 cm², the full length of the tuber) using a manual cutter (Ductile, Bloomfield, Indiana, or Cabela's model AUFA International Corp). Nine central fries from each tuber were rinsed in cool water and fried in vegetable oil (Flavorite) at 375°F for 3.5 minutes. Fries were visually graded using the USDA Fry Color chart for fry color and sugar end (stem end fry color) color if different from the main body of the fry. The USDA scale defines a range of color from 000 to 4.0, with lower numbers indicating lighter color. A rating of 2.0 or lower is considered acceptable by the industry. In some analyses, the definition of sugar end in this study was more stringent than that used in the processing industry. Common industry practice is to grade any end of 3.0 or higher on the USDA scale, as a sugar end. In addition to analyzing the data using the industry standard, in the present study, a sugar end was defined as any stem end which varied by one or more scale unit darker from the main body of the fry. Mottling and vascular discoloration were also noted if present. In order to conduct statistical analysis of the data, a 000 was scored as 0.1, 00 as 0.3, and a 0 as 0.5. Average fry color, percent sugar ends, and average sugar end fry color were calculated.

Lamb Weston Fry Protocol: Two groups of ratings were performed by Lamb Weston on each date. For the first group, raw product was fried at 375°F for 3 min., for the second group, raw product was first blanched for 10 min. at 175°F and subsequently fried for 3 min. at 375°F. Sugar ends were rated as a #3 or greater color in at least the stem end 1/3 of the fry.

Treatment	Rate	Schedule	Notes	Foliar Disease (% Severity)							
				7/7	7/13	7/20	7/27	8/3	8/10	8/17	9/4
1908 Picoxystrobin + Induce Dithane Manzate Bravo Zn Gavel	16.0 fl oz / a + 0.25% v/v 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Picoxystrobin application at tuber initiation and early tuber bulking at 5 gpa using a handsprayer.	0.0	0.00	0.00	0.00	0.01	0.01	0.06	0.39
1909 Picoxystrobin + Induce Dithane Manzate Bravo Zn Gavel	16.0 fl oz / a + 0.25% v/v 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Picoxystrobin application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	0.0	0.00	0.00	0.01	0.02	0.03	0.04	1.30
1910 Quadris Dithane Manzate Bravo Zn Gavel	9.0 fl oz / a 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Quadris application at tuber initiation and early tuber bulking at 5 gpa using a handsprayer.	0.0	0.01	0.00	0.06	0.03	0.04	0.10	0.30
1911 Quadris Dithane Manzate Bravo Zn Gavel	9.0 fl oz / a 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Quadris application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	0.0	0.00	0.01	0.02	0.03	0.05	0.03	0.45
1912 Gem Dithane Manzate Bravo Zn Gavel	3.8 fl oz / a 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Gem application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	0.0	0.01	0.03	0.06	0.09	0.11	0.09	0.18
LSD _{P = 0.05}				.	NS	NS	0.05	NS	NS	NS	0.86

Sugar End Evaluation - Tappen Series 1900 Sugar Evaluation

Treatment	Rate	Schedule	Notes	11/4/2009		1/15/2010	
				% Glucose	% Sucrose	% Glucose	% Sucrose
1901 Dithane	2.0 lb / a	1,3,5	60 gpa using a converted ATV.	9.5	14.7	15.1	17.7
Manzate	2.0 lb / a	7					
Bravo Zn	2.13 pt / a	2,4,6,8					
Gavel	2.0 lb / a	9,10					
1902 Headline	9.0 fl oz / a	1,4	Headline application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	8.9	18.6	20.6	19.9
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1903 Headline	9.0 fl oz / a	1,4	Headline application at tuber initiation and early tuber bulking at 60 gpa using a handsprayer.	9.5	18.1	16.1	18.8
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1904 Headline	9.0 fl oz / a	1,4	Headline application at tuber initiation and early tuber bulking at 5 gpa using a handsprayer.	7.8	18.9	10.4	15.1
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1905 Headline	6.0 fl oz / a	1,4	Headline application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	16.3	18.8	20.4	22.6
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1906 Evito	3.8 fl oz / a	1,4	Evito application at tuber initiation and early tuber bulking at 5 gpa using a handsprayer.	9.4	14.2	12.4	18.3
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					

Treatment	Rate	Schedule	Notes	11/4/2009		1/15/2010	
				% Glucose	% Sucrose	% Glucose	% Sucrose
1907 Evito Dithane Manzate Bravo Zn Gavel	3.8 fl oz / a 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Evito application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	8.5	18.4	16.3	18.8
1908 Picoxystrobin + Induce Dithane Manzate Bravo Zn Gavel	16.0 fl oz / a + 0.25% v/v 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Picoxystrobin application at tuber initiation and early tuber bulking at 5 gpa using a handsprayer.	9.8	16.9	13.6	19.0
1909 Picoxystrobin + Induce Dithane Manzate Bravo Zn Gavel	16.0 fl oz / a + 0.25% v/v 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Picoxystrobin application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	9.4	14.5	14.8	19.1
1912 Gem Dithane Manzate Bravo Zn Gavel	3.8 fl oz / a 2.0 lb / a 2.0 lb / a 2.13 pt / a 2.0 lb / a	1,4 2 6,8 3,5,7 9,10	Gem application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	7.5	13.8	15.3	20.1
LSD _{P=0.05}				NS	0.04	NS	NS

Sugar End Evaluation - Inkster Series 1900 NDSU Fry Analysis

Treatment	Rate	Schedule	Notes	% Sugar Ends			
				10/30/09	12/17/09	1/21/10	2/20/10
1901 Dithane	2.0 lb / a	1,3,5	60 gpa using a converted ATV.	66.7	83.3	66.7	91.7
Manzate	2.0 lb / a	7					
Bravo Zn	2.13 pt / a	2,4,6,8					
Gavel	2.0 lb / a	9,10					
1902 Headline	9.0 fl oz / a	1,4	Headline application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	16.7	50.0	0.0	100.0
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1903 Headline	9.0 fl oz / a	1,4	Headline application at tuber initiation and early tuber bulking at 60 gpa using a handsprayer.	0.0	66.7	0.0	66.7
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1904 Headline	9.0 fl oz / a	1,4	Headline application at tuber initiation and early tuber bulking at 5 gpa using a handsprayer.	16.7	16.7	0.0	41.7
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1905 Headline	6.0 fl oz / a	1,4	Headline application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	33.3	0.0	0.0	50.0
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1906 Evito	3.8 fl oz / a	1,4	Evito application at tuber initiation and early tuber bulking at 5 gpa using a handsprayer.	75.0	0.0	16.7	91.7
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					

Treatment	Rate	Schedule	Notes	% Sugar Ends			
				10/30/09	12/17/09	1/21/10	2/20/10
1907 Evito	3.8 fl oz / a	1,4	Evito application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	8.3	0.0	0.0	25.0
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1908 Picoxystrobin +	16.0 fl oz / a +	1,4	Picoxystrobin application at tuber initiation and early tuber bulking at 5 gpa using a handsprayer.	16.7	0.0	58.3	50.0
Induce	0.25% v/v						
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1909 Picoxystrobin +	16.0 fl oz / a +	1,4	Picoxystrobin application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	0.0	8.3	50.0	66.7
Induce	0.25% v/v						
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
1912 Gem	3.8 fl oz / a	1,4	Gem application at tuber initiation and early tuber bulking at 60 gpa using a converted ATV.	25.0	0.0	50.0	33.3
Dithane	2.0 lb / a	2					
Manzate	2.0 lb / a	6,8					
Bravo Zn	2.13 pt / a	3,5,7					
Gavel	2.0 lb / a	9,10					
LSD _{P=0.05}				47.0	30.9	47.3	NS

Percent sugar ends based on fry color great than or equal to 3 in 1/3 of the stem end of the fry or less, as per French fry industry protocol.