

**O9ON01**

**ONION - SYNGENTA Experiment  
ARDEC 2009**

Treatments	Schedule	Rate/Acre	CONTENTS PER BOTTLE (4 reps)
1. Control		NA	NA
2a. A16001 + Kinetic	Sprays 1,3,5,7	20 fl oz + 0.125 % v/v	8.1 ml + 1.6 ml
2b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt + 0.125 % v/v	9.8 ml + 1.6 ml
3a. A16001 + Actigard 50WG + Kinetic	Sprays 1,3,5,7	20 fl oz + 0.5 oz + 0.125 % v/v	8.1 ml + 0.2 g + 1.6 ml
3b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt + 0.125 % v/v	9.8 ml + 1.6 ml
4a. Quadris Top 2.71SC + Kinetic	Sprays 1,3,5,7	10 fl oz + 0.125 % v/v	4.1 ml + 1.6 ml
4b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt + 0.125 % v/v	9.8 ml + 1.6 ml
5a. Quadris Top 2.71SC + Kinetic	Sprays 1,3,5,7	14 fl oz + 0.125 % v/v	5.7 ml + 1.6 ml
5b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt + 0.125 % v/v	9.8 ml + 1.6 ml
6a. Inspire XT 4.17EC + Kinetic	Sprays 1,3,5,7	7 fl oz + 0.125 % v/v	2.8 ml+ 1.6 ml
6b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt + 0.125 % v/v	9.8 ml + 1.6 ml
7a. Inspire XT 4.17EC + Kinetic	Sprays 1,3,5,7	7.4 fl oz + 0.125 % v/v	3.0 ml + 1.6 ml
7b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt + 0.125 % v/v	9.8 ml + 1.6 ml
8a. A15909 + Kinetic	Sprays 1,3,5,7	10.5 fl oz + 0.125 % v/v	4.3 ml + 1.6 ml
8b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt + 0.125 % v/v	9.8 ml + 1.6 ml
9a. Omega 4SC + Kinetic	Sprays 1,3,5,7	1 pt + 0.125 % v/v	6.5 ml + 1.6 ml
9b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt + 0.125 % v/v	9.8 ml + 1.6 ml
10a. Switch 62.5WG + Kinetic	Sprays 1,3,5,7	14 oz + 0.125 % v/v	5.5 g + 1.6 ml
10b. Bravo Weather Stik + Kinetic	Sprays 2,4,6,8	1.5 pt+ 0.125 % v/v	9.8 ml + 1.6 ml

Treatments applied in 325.8 ml of water (1303 ml for 4 reps), equal to 25 GPA. Plot size is 5' x 30' = 150 ft<sup>2</sup> x 4 reps = 0.0138 A.

Transplanted onion cultivar 'Candy' - Planted: **04/29/09**      Harvested: **09/09/09**

Began Sprays at 2 weeks pre-bulbing. Began Inoculations after second spray and then every 14 days for 4 inoculations

Harvested 10' length of 1 bed per plot for weights of Total, Jumbo, and Medium onion components; a sample of 40 jumbo to medium bulbs was removed after harvest weights taken; and bagged for future storage rot evaluation of 10 bulbs each at 30, 60 and 90 days post harvest for Botrytis and Black Mold.

Chemical Sprays: 7/7, 7/14, 7/21, 7/28, 8/4, 8/11, 8/18, 8/25 Botrytis & Alternaria Inoculations (10 <sup>6-7</sup> conidia/ml): 7/16, 7/30, 8/13, 8/27 Xanthomonas Leaf Blight widespread in all plots on 08/26 as a result of frequent rain and light storm damage during July and August. <i>Iris yellow spot virus</i> incidence was trace at the end of the season, and did not influence foliar development or vigor. Onion leaf tip death (probable phytotoxicity from the Kinetic adjuvant) was observed on 08/26 in treatments 2 – 10.										
R4	6	9	2	3	8	5	10	1	4	7
	104	103	102	101	100	99	98	97	96	95
R3	10	8	6	1	7	3	4	2	5	9
	85	86	87	88	89	90	91	92	93	94
R2	4	7	5	2	10	1	9	3	8	6
	84	83	82	81	80	79	78	77	76	75
R1	1	2	3	4	5	6	7	8	9	10
	65	66	67	68	69	70	71	72	73	74

### Harvest Data (09/09/09)

Trt	Total (kg)	Colossal (kg)	Jumbo (kg)	Medium (kg)	Prepack (kg)
1	14.50	2.00	9.13	2.45	0.93
2	12.25	0.35	7.55	3.15	1.20
3	14.23	2.83	7.63	2.28	1.50
4	11.68	1.48	7.05	2.35	0.80
5	13.60	1.66	9.44	2.10	0.40
6	13.83	2.57	9.63	1.00	0.60
7	13.48	1.38	8.55	2.50	1.05
8	11.25	0.20	7.90	2.60	0.55
9	12.58	1.00	8.75	1.88	0.95
10	12.33	2.58	7.63	1.58	0.55
C.V.%	19.2	123.3	24.7	43.1	75.0
Prob	0.6018	0.4667	0.4640	0.2349	0.3429
LSD 0.05	n.s.	n.s.	n.s.	n.s.	n.s.

### Storage Rot Evaluation #1 (10/09/09)

Trt	% Bacteria	% Black Mold	% Botrytis Neck Rot	% Botrytis Shoulder Rot	% Botrytis Bottom Rot	% Total Botrytis Rot
1	40.38	9.62	7.69	38.46	1.92	48.08
2	18.07	5.26	10.61	58.43	0.00	69.04
3	34.01	0.00	18.51	55.33	0.00	73.84
4	41.88	9.43	10.26	53.94	0.00	66.12
5	42.65	7.98	4.52	45.93	0.00	50.45
6	57.38	7.52	0.00	49.64	0.00	49.64
7	35.45	6.35	10.42	54.71	0.00	65.13
8	25.43	1.79	3.85	63.40	0.00	67.25
9	57.63	9.78	1.92	46.69	0.00	48.62
10	46.89	0.00	21.81	40.07	3.13	65.01
C.V.%	83.7	135.1	139.9	36.5	368.8	39.2
Prob	0.7682	0.4523	0.4563	0.4964	0.5010	0.7187
LSD 0.05	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

### Storage Rot Evaluation #2 (11/09/09)

Trt	% Bacteria	% Black Mold	% Botrytis Neck Rot	% Botrytis Shoulder Rot	% Botrytis Bottom Rot	% Total Botrytis Rot
1	30.77	5.76	17.31	48.08	0.00	65.39
2	12.16	0.00	3.45	51.58	0.00	55.03
3	16.25	0.00	14.52	54.14	0.00	68.66
4	18.06	0.00	13.89	61.11	2.08	77.09
5	38.25	1.82	4.40	53.18	0.00	57.57
6	40.66	3.03	3.03	56.31	0.00	59.34
7	22.62	4.55	8.90	55.39	0.00	64.29
8	9.36	0.00	6.92	61.19	3.85	71.96
9	17.90	0.00	14.77	40.15	0.00	54.93
10	37.36	0.00	10.14	44.17	0.00	64.31
C.V.%	115.89	285.58	119.54	40.61	334.95	40.89
Prob	0.7382	0.4278	0.6259	0.9167	0.1233	0.9325
LSD 0.05	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

### Storage Rot Evaluation #3 (12/09/09)

Trt	% Bacteria	% Black Mold	% Botrytis Neck Rot	% Botrytis Shoulder Rot	% Botrytis Bottom Rot	% Total Botrytis Rot
1	1.92	2.08	9.53	25.69	1.79	37.00
2	1.79	0.00	1.79	14.29	0.00	16.07
3	12.09	0.00	1.79	22.84	0.00	24.62
4	3.13	0.00	16.03	30.10	3.13	49.55
5	3.48	3.484	4.87	18.71	5.15	28.73
6	16.67	0.00	13.21	26.68	3.03	42.93
7	8.17	1.923	4.17	25.83	0.00	30.00
8	3.71	0.00	1.79	24.82	2.78	29.38
9	6.25	0.00	15.63	25.42	0.00	41.04
10	12.53	0.00	10.10	25.21	0.00	35.32
C.V.%	155.85	295.56	131.28	80.02	215.05	71.81
Prob	0.5240	0.4042	0.3361	0.9780	0.3515	0.7260
LSD 0.05	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

### Total Storage Rot Evaluation

Trt	% Bacteria	% Black Mold	% Botrytis Neck Rot	% Botrytis Shoulder Rot	% Botrytis Bottom Rot	% Total Botrytis Rot
1	24.22	5.67	11.35	36.78	1.25	49.38
2	10.50	1.76	5.25	41.18	0.00	46.43
3	20.83	0.00	11.45	43.47	0.00	54.92
4	24.39	4.17	13.33	45.60	20.5	63.98
5	28.37	4.31	4.60	39.60	1.65	45.85
6	39.04	3.52	4.89	45.24	0.83	50.96
7	22.76	4.57	7.53	46.09	0.00	53.62
8	12.65	3.52	4.30	49.79	2.26	65.34
9	29.93	4.57	10.05	37.87	0.00	47.92
10	34.84	0.58	14.16	37.79	0.96	52.90
C.V.%	97.13	103.23	103.50	28.32	134.94	31.49
Prob	0.8451	0.0760	0.6743	0.7161	0.0714	0.8804
LSD 0.05	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

### Syngenta Lab Experiment

Trt	Erwinia (log)	Burkholdaria (log)	Xanthomonas (log)	Botrytis (mm <sup>2</sup> )	Aspergillus (log)
1 – Bravo WS, 1.5 pt	4.4237 bc	4.3177	2.9304 d	2724.93 b	2.6080 c
2 – A16001, 20 fl oz	4.5211 ab	3.8797	3.5595 c	449.14 c	2.6080 c
3 – 15909, 10.5 fl oz	4.5307 ab	4.3468	3.9943 a	386.97 c	2.6080 c
4 – Quadris, 14 fl oz	4.4447 bc	4.3739	3.7713 b	91.69 d	2.6080 c
5 – Inspire, 7.4 fl oz	4.4766 ab	4.3804	3.7230 bc	38.47 d	2.6080 c
6 – Omega, 1 pt	4.3556 c	4.7620	2.6080 e	94.01 d	2.6080 c
7 – Switch, 14 oz	4.5674 a	4.3560	2.9845 d	38.47 d	2.6080 c
8 – Kocide, 1.5 lb	2.6080 d	4.1157	2.6080 e	5499.67 a	3.9594 b
9 - Control	4.5727 a	5.5797	3.9855 a	5499.83 a	4.0933 a
C.V.%	2.0738	16.3012	3.7962	4.3952	2.7745
Prob	<0.0001	0.0979	<0.0001	<0.0001	<0.0001
LSD 0.05	0.1143	n.s.	0.1639	93.257	0.1184

Minimum detection is 2.6080 for log numbers run on AutoPlater. Many of these were actually zero.

## Summary (Final):

There was some evidence of mild phytotoxicity on 08/26, probably due to multiple applications of Treatments 2 – 10 with Kinetic as an adjuvant. There were no visible symptoms of Botrytis disease (e.g., foliar blast) as a result of our field inoculations; blast symptoms are seldom observed, even with inoculation, in semi-arid areas like Colorado. There was trace incidence of Iris yellow spot virus in the plots at the end of the season, however, Xanthomonas Leaf Blight was widespread by late August as a result of the frequent rains and light storm damage that occurred during July and August.

There were no significant differences in any Yield component at harvest.

The Storage Rot protocol was modified at the 1<sup>st</sup> post-harvest date (10/09/09) due to the presence of badly deteriorating bulbs as a result of bacterial soft rots in many plot samples. Therefore, a minimum of 10 randomly selected firm bulbs or all rotting bulbs from the total sample of 30 bulbs collected per plot were evaluated for causes; e.g., bacterial diseases such as soft, rot, and /or slippery/sour skin, as well as fungal storage rots including Botrytis (neck rot, shoulder rot, basal plate rot) and/or Black Mold. Our plan is to continue this sampling process at Storage Rot Evaluations # 2 (early November) and # 3 (early December), at which time all data will be compiled to provide an overall evaluation of treatment effects upon Storage Rots, with an emphasis upon Botrytis and Black Mold incidence.

Based on Storage Rot Evaluation # 1, there were no significant differences between treatments or the control for the incidence of Bacterial Diseases, other than lower losses in Treatments 2 (18% incidence with A16001) and 8 (25% incidence with A15909) compared to the Control and other treatments with greater than 34% incidence. The Black Mold incidence was lowest in Treatments 3 (0% incidence with A16001), 8 (< 2% with A15909) and 10 (0% incidence with Switch). The Botrytis Neck Rot incidence was lowest in Treatments 5 (< 5% incidence with Quadris Top), 6 (0% incidence with Inspire) and 9 (< 2% incidence with Omega).

Storage Rot Evaluation # 2 showed that Bacterial incidence was 30% for the Control versus 12% for Treatment 2 and 9% for Treatment 8. Black mold incidence was zero with Treatments 2-4, and 8-10, compared to the Control with more than 5% incidence. Botrytis Neck Rot incidence was 17% in the Control, and less than 5% for Treatments 2, 5 and 6.

Storage Rot Evaluation # 2 again showed that Black mold incidence was zero with Treatments 2-4, 6, and 8-10, compared to the Control with 2% incidence. Botrytis Neck Rot incidence was nearly 10% in the Control, and less than 2% for Treatments 2, 3 and 8; total Botrytis Rot was at 16% for Treatment 2 versus 37% for the Control.

The TOTAL Storage Rot Evaluation (combined evaluations 1, 2 and 3) showed that: (a) Bacterial Rots - Treatments 2 and 8 were consistently but not significantly) lower than the untreated control; Black Mold – Treatments 2, 3 and 10 were significantly lower than the control at  $P < 0.10$ ; (c) Botrytis Neck Rot – Treatments 2, and 5-8 were lower, but not significantly, than the control; and there were no differences among treatments for other types of Botrytis diseases on the shoulder or basal plate areas of bulbs.

In addition, a laboratory test with amended growth media (PDA) inoculated with pathogenic fungi, revealed that there was good suppression ( $P < 0.001$ ) of Botrytis and Aspergillus (Black Mold) by A16001, A15909, Quadris, Inspire, Omega and Switch.

Therefore, products such as A16001 and A15909 showed promise against some of these storage rot problems of bulb onions, and may benefit from additional testing that looks at different spray schedules, intervals, rates, etc. that are economical and compatible with onion production systems in Colorado and other onion-producing states.

Thank you for the support of this project on behalf of the onion growers and industry in Colorado.

Howard F. Schwartz, Colorado State University 12/11/09