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2003 Research Reports

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Funding Provided by the Colorado Agricultural Experiment Station

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Acknowledgements:
This report is dedicated to the two men pictured on the cover, Frank Schweissing (top photos) and Marvin Wallace (bottom photos). Frank served as both entomologist (1961-2004) and superintendent (1980-2004) of the AVRC. Frank retired in January of 2004 leaving an unparalleled legacy to the Research Center's facilities and programs. Marvin Wallace served as Farm Technician starting part-time in the summer of 1953 and becoming full-time in 1967. Marvin faithfully served the AVRC with a sense of humor and modesty until his sudden passing in May 2003. Words cannot describe the level of dedication shown to the Arkansas Valley and the AVRC by these two men.

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Rocky Ford, Colorado

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2003 Climatic Conditions
Arkansas Valley Research Center
Colorado State University
Rocky Ford, Colorado
Frank C. Schweissing, Superintendent

The annual precipitation of 9.23" was substantially better than last year but still below the long term average of 11.75". Most of the precipitation (5.83") came during the months of April, May and June. The Rocky Ford Ditch supplied an adequate amount of irrigation water to this Research Center. However, all other Ditches and Canals in the area and to the east of us had very inadequate supplies and crop production was severely limited. Fall harvest was carried out without interruption.

The frost free period of 156 days between May 11 and October 14 was 2 days shorter than average. Based on a nominal growing season of May 1 to September 30, there were 2954 corn growing degree days which is above normal (2857DD).

2003 Frost Dates		2003 Frost Free Period (days)	Average Frost Dates*		Average* Frost Free Period (days)
Last Spring Frost	First Fall Frost		Last Spring Frost	First Fall Frost	
May 11 - 31°F	Oct. 14 - 24°F	156	May 1	October 6	158

Month	Temperature(F°)			Precipitation		Snowfall	10 Year Precip.	
	High	Low	Avg.	2003 inches	Normal* inches	Total inches	Inches	
Jan.	74	10	36.6	T	0.26	1.0	1994	11.42
Feb	76	-7	32.0	0.50	0.29	6.0	1995	11.64
March	83	15	46.3	0.89	0.68	T	1996	13.38
April	90	24	57.3	2.31	1.32	0.5	1997	18.58
May	103	31	64.6	1.24	1.83		1998	14.62
June	100	42	70.0	2.28	1.40		1999	19.96
July	107	54	81.4	0.51	1.97		2000	9.60
Aug.	103	55	77.2	0.54	1.54		2001	11.99
Sept.	96	32	65.3	0.44	0.90		2002	3.52
Oct.	96	19	58.3	0.10	0.78	0.0	2003	9.23
Nov.	74	-3	39.3	0.20	0.46	2.0		
Dec.	72	2	52.7	0.22	0.32	4.2	Average	12.39
			Total	**9.23**	**11.75**	**12.7**		

*Average – 103 years

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FIELD CROPS

VEGETABLE CROPS

This research is partially supported by the
Arkansas Valley Onion Growers Association

Compiled by Michael Bartolo

NOTICE

This publication is a compilation of reports dealing with research carried out at the Arkansas Valley Research Center. Trade names have been used to simplify reporting, but mention of a product does not constitute a recommendation not an endorsement by Colorado State University or the Colorado Agricultural Experimental Station. In particular, pesticides mentioned in various reports may not be registered for public use. Pesticides are to be used only in accordance with the manufacturer's label.

2003 Alfalfa Variety Performance Trial Report

Location: Arkansas Valley Research Center
Rocky Ford, Colorado 81067

Stand Established: 2000

Investigator: Frank C. Schweissing, Superintendent

This is a report of the results of an irrigated alfalfa variety trial, planted September 1, 2000, after three years of production. There are 22 commercial and 2 public varieties included in this test.

The trial was set up as a randomized complete block, with four replications (1 plot = 75 sq. ft.). The trial was managed to reduce factors which limit production. The plot area was fertilized with 100 lbs. of P_2O_5 + 21 lbs. of N per acre prior to planting and 156 lbs. of P_2O_5 + 33 lbs. of N per acre on October 28, 2002. Sencor DF .75 lbs. + Gramoxone Extra .47 lbs. Ai/acre were applied on March 12, 2002 and March 13, 2003 to control winter annual weeds. Warrior T .025 lbs. + Lorsban .125 lbs. Ai/acre were applied on May 13, 2002 and May 14, 2003 alfalfa weevil control.

Harvest dates in 2003 were June 4, July 8, August 12 and October 14. Rainfall from April through September was 7.3 inches compared to a long term average of 9 inches. Growing degree days were above normal. The trial was irrigated prior to the first cutting and after each of the four cuttings. All four cuttings were harvested without significant rain damage. The average trial yield was 5.41 tons/acre compared to 7.26 tons in 2002 and 4.95 tons in 2001. Significant differences in yield were observed for all cuttings and total yield, however, variability was very high in the trial.

Yields are reported in oven-dry weights. If you want to determine yields with a particular percent moisture, divide dry yield by 1.00 minus the percent moisture you usually sell your hay. Example: (Yield/1.00-.10) = yield with 10% moisture or 5.41/.90 = 6.01 tons per acre.

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Table 1.-Forage yields of 24 alfalfa varieties in the irrigated trial at the Arkansas Valley Research Center, Rocky Ford, Colorado. 2001-2003.

Variety	Brand / Source	1st Cut 6/4	2nd Cut 7/8	3rd Cut 8/12	4th Cut 10/14	2003 Total	2002 Total	2001 Total	3 Yr. Total
		----------Tons dry matter/acre[1]----------							
Arapaho	Dairyland Research	2.61	1.33	1.15	0.80	5.89	8.28	5.52	19.69
Arrowhead	Dairyland Research	2.30	1.31	1.28	0.83	5.72	7.63	5.15	18.50
Ranger	USDA-Neb2.50	2.50	1.32	1.24	0.78	5.84	7.63	4.83	18.30
53V08	Pioneer Hi-Bred Int'l	2.69	1.37	1.14	0.79	5.99	7.29	5.02	18.30
Emperor	America's Alfalfa	2.21	1.33	1.16	0.90	5.60	7.42	5.09	18.11
ZG 9650A*	ABI Alfalfa, Inc.	2.43	1.26	1.14	0.82	5.65	7.36	5.07	18.08
ZX 9450A*	ABI Alfalfa, Inc.	2.36	1.20	1.11	0.60	5.27	7.49	5.20	17.96
Abilene + Z	America's Alfalfa	2.45	1.41	1.13	0.62	5.61	7.25	5.06	17.92
54Q53	Pioneer Hi-Bred Int'l	2.27	1.36	1.25	0.92	5.80	7.13	4.91	17.84
Lahontan	USDA-NV	2.24	1.34	1.23	0.60	5.41	7.54	4.87	17.82
Winter Crown	Dairyland Research	2.14	1.35	1.16	0.85	5.50	7.19	5.06	17.75
Dagger + EV	AgriPro	2.41	1.09	1.10	0.68	5.28	7.43	5.03	17.74
4200	Seed Solutions	2.23	1.49	1.11	0.95	5.78	7.05	4.79	17.62
FG 6M71*	Forage Genetics Int'l.	1.81	1.21	1.16	0.83	5.01	7.48	5.10	17.59
Target Plus	Producers Hybrids	2.07	1.22	1.11	0.72	5.12	7.23	5.17	17.52
Magnum V-Wet	Dairyland Research	1.91	1.18	1.19	0.77	5.05	7.40	4.90	17.35
Geneva	Novartis	2.18	1.26	1.25	0.68	5.37	7.15	4.78	17.30
FG 5M84*	Forage Genetics Int'l.	2.08	1.39	1.16	0.76	5.39	7.00	4.90	17.29
FG 3R139*	Forage Genetics Int'l.	2.41	1.32	1.16	0.77	5.66	6.84	4.67	17.17
ZX 9853*	ABI Alfalfa, Inc.	2.10	1.20	1.18	0.73	5.21	7.22	4.71	17.14
ZC 9941A	ABI Alfalfa, Inc.	1.98	1.20	1.12	0.80	5.10	7.08	4.77	16.95
Baralfa42IG	Barenburg USA	1.93	1.13	1.10	0.76	4.92	6.94	4.70	16.56
Samurai	America's Alfalfa	1.96	1.06	1.02	0.80	4.84	6.92	4.74	16.50
A30-06	ABI Alfalfa, Inc.	1.82	1.09	1.14	0.74	4.79	6.34	4.70	15.83
Column Mean		2.21	1.27	1.16	0.77	5.41	7.26	4.95	17.62
LSD (0.05)		0.49	0.27	0.30	0.26	1.07	0.76	0.33	1.75
CV (%)		15.80	15.11	18.29	24.07	13.98	7.39	4.71	7.02

[1]Yields calculated on oven-dry basis. *Indicates experimental entry
Planted: September 1, 2000

2003 Pinto Bean Trials
Arkansas Valley Research Center

This is the fourteenth year a variety trial has been carried out at this Center in recent times. The overall trial yield average was very good. The irrigation water supply was adequate but temperatures were very high during July. This years trial average was 3322 lbs./acre compared to 2407 lbs./acre in 2002, 3020 lbs./acre in 2001, 3664 lbs./acre in 2000, 2749 lbs./acre in 1999, 2134 lbs./acre in 1998, 2461 lbs./acre in 1997, 3419 lbs./acre in 1996, 1599 lbs./acre in 1995, 3129 lbs./acre in 1994, 3760 lbs./acre in 1993, 2541 lbs./acre in 1992, 2361 lbs./acre in 1991 and 2848 lbs./acre in 1990.

Precipitation for the year was 9.23 ", which is below normal but above last year..

Test Plot Information

Purpose - To evaluate the inherent genetic ability of selected pinto bean varieties to yield under irrigated conditions of the Arkansas Valley.

Data - 1. Yields
2. Test Weight
3. Seeds/ lb.

Plot - 32' X 10'(4 rows)

Design - Randomized complete blocks (3 replications)

Varieties - 18 entries

Fertilizer - 75 lbs. P_2O_5 + 16 lbs. N/acre as 11-52-0 - 11/7/01

Herbicide - Eptam 3 lbs. + Treflan .75 lbs. AI/Acre - incorporated 6/10/03

Insecticide - none Fungicide - none

Plant - June 12, 2003

Irrigate - 6/13, 7/1, 7/21, 8/4, 8/26.

Harvest - Cut - 9/25; Lift-9/29; Thresh - 9/29 - 4 rows, 32' long Self propelled plot combine.

Jerry J. Johnson
James P. Hain
Frank C. Schweissing

Average pinto bean performance over six Colorado locations in 2003.

	Location						
Variety*	Haxtun	Idalia	Montrose	Proctor	Rocky Ford	Yellow Jacket	Average
	----------Yield (lb/ac)----------						
Montrose	3662	2931	2640	2909	3853	1740	2956
99195	3108	2536	3709	2112	3862	2018	2891
Poncho	3070	2969	2450	2810	3987	1670	2826
CO12650	2892	2710	2934	1707	3712	1936	2648
99236	2710	2587	3181	2216	3120	2056	2645
99211	3155	2521	2872	2295	3464	1497	2634
00167	2324	2372	3477	2342	3153	2011	2613
00195	3117	2510	3248	1914	2808	1862	2576
CO96731	3163	2439	2995	1609	3176	1601	2497
CO96737	3239	2726	2711	1637	3139	1515	2494
CO83783	3118	2269	2756	1889	3173	1717	2487
CO83778	3233	2421	2733	1562	3185	1769	2484
Bill Z	3087	2323	2465	2083	3355	1466	2463
99204	2474	2029	3230	2343	2807	1594	2413
Buckskin	2873	2217	2327	2464	3038	1376	2382
99218	1946	2082	2732	1837	3239	1883	2287
Grand	2346	2317	2361	1854	3387	1436	2283
CO96753	2257	2152	2978	1179	3337	1613	2253
Average	**2876**	**2450**	**2878**	**2042**	**3322**	**1680**	**2542**

*Varieties ranked by the average yield over six locations in 2003.

Pinto Bean Variety Performance Trial at Rocky Ford[1] in 2003.

Variety	Yield	Moisture	Test Weight	Seed/lb
	lb/ac	%	lb/bu	No.
Poncho	3987	8.6	59.0	1112
99195	3862	10.8	59.1	1226
Montrose	3853	9.1	59.3	1161
CO12650	3712	12.6	59.8	1244
99211	3464	10.9	57.1	1137
Grand Mesa	3387	8.7	57.2	1326
Bill Z	3355	8.5	57.3	1249
CO96753	3337	17.1	54.9	1028
99218	3239	8.9	59.7	1159
CO83778	3185	10.3	58.0	1076
CO96731	3176	11.2	57.7	1068
CO83783	3173	11.5	57.6	1064
00167	3153	9.7	56.5	1215
CO96737	3139	10.8	57.4	1088
99236	3120	13.6	57.8	1165
Buckskin	3038	8.3	58.0	1168
00195	2808	10.8	57.4	1324
99204	2807	8.3	58.3	1224
Average	**3322**	**10.5**	**57.9**	**1169**
$LSD_{(0.30)}$	232			

[1]Trial conducted at the Arkansas Valley Research Center; seeded 6/12 and harvested 9/29.

Pinto Bean Varietal Descriptions

Bill Z A medium maturity (95 d) variety release by Colorado State University in 1985. It has a vine Type II growth habit with resistance to bean common mosaic virus and moderate tolerance to bacterial brown spot. It is a very productive variety with excellent seed quality, however it is susceptible to white mold, common bacterial blight and rust.

Buckskin A variety from released by Syngenta Seeds, Inc. (RNK101). It is a vine Type III growth habit with resistance to bean common mosaic virus but is susceptible to white mold, rust, and bacterial brown spot with early to medium maturity (92 d).

CO Experimental lines from Colorado State University.

Grand Mesa A medium maturity (96 d) from Colorado State University released in 2001. Grand Mesa combines resistance to rust, bean common mosaic virus and semi-upright Type II plant architecture and field tolerance to white mold, but is susceptible to common bacterial blight and bacterial brown spot. It has moderate yield potential and good seed quality.

Montrose A medium maturity (97 d) released from Colorado State University in 1999.It has resistance to rust and bean common mosaic virus. It has high yield potential and excellent seed quality. Because it has very prostrate Type III growth habit, it is highly susceptible to white mold.

Poncho A medium maturity (96 d) from Syngenta Seed, Inc. with resistance to bean common mosaic and has high yield potential and excellent seed quality. It has semi upright Type III growth habit. It is susceptible to rust and bacterial brown spot.

00167, 00195, 99195, 99204, 99211, 99218, 99236 Experimental lines from ProVita, Inc. (Relatively new bean seed company in Washington State).

2003 Corn Grain and Silage Variety Trial
Arkansas Valley Research Center

The average grain yield in this trial was 231 bushels per acre compared to 2002-184 bu., 2001-206 bu., 2000-233 bu., 1999-206 bu., 1998-200 bu., 1997-206 bu., 1996-219 bu., 1995-197 bu., 1994-230 bu., 1993-178 bu., 1991-209 bu. and 1990-183 bu. The average silage yield was 36 tons per acre compared to 2002-31T., 2001-34T., 2000-39T., 1999-33T., 1998-40T., 1997-32T., 1996-36T., 1995-35T., 1994-33T., 1993-27T., 1992-41T., 1991-37T., and 1990-31T. The average silking date for the grain trial was 2 days later and for the forage trial 3 days later than in 2002. Grain yields were adjusted to 15.5% moisture and 56 pound bushels while silage yields were adjusted to 70% moisture. This allows direct comparison between varieties, but actual harvest moistures and silking dates indicate maturity and should be considered when choosing a variety.

Test Plot Information

Purpose - To evaluate the inherent genetic ability of selected corn varieties to yield grain and silage under irrigated conditions in the Arkansas Valley.

Data - 1. Grain yields
2. Forage yields
3. Growth factors

Plots - Grain - 32' X 10' (4rows) Harvest 2 rows
Silage - 32' X 5' (2 rows)

Design - Randomized complete blocks (3 replications)

Varieties - Grain-36 entries Silage-14 entries

Fertilizer - 52 lbs. P_2O_5 + 11 lbs. N/Acre - 10/28/02
100 lbs. N as urea - 3/17/03

Herbicide - Dual II Magnum 1.43 lbs. AI/Acre - 4/25/03
Clarity .50 lbs. AI/Acre - 5/28/03

Insecticide - Capture .08 lbs. AI/Acre - 8/1/03

Soil - Silty, clay loam, 1-1.5% o.m., pH ca. 7.8

Plant - May 5, 2003

Irrigate - 5/6, 6/19, 7/4, 7/14, 7/26, 8/8, 8/19 silage, 9/1 grain

Harvest - Silage - September 17, 2003 - Forage harvester
Grain - October 16, 2003 - Self-propelled two row plot combine

Jerry J. Johnson
James P. Hain
Frank C. Schweissing

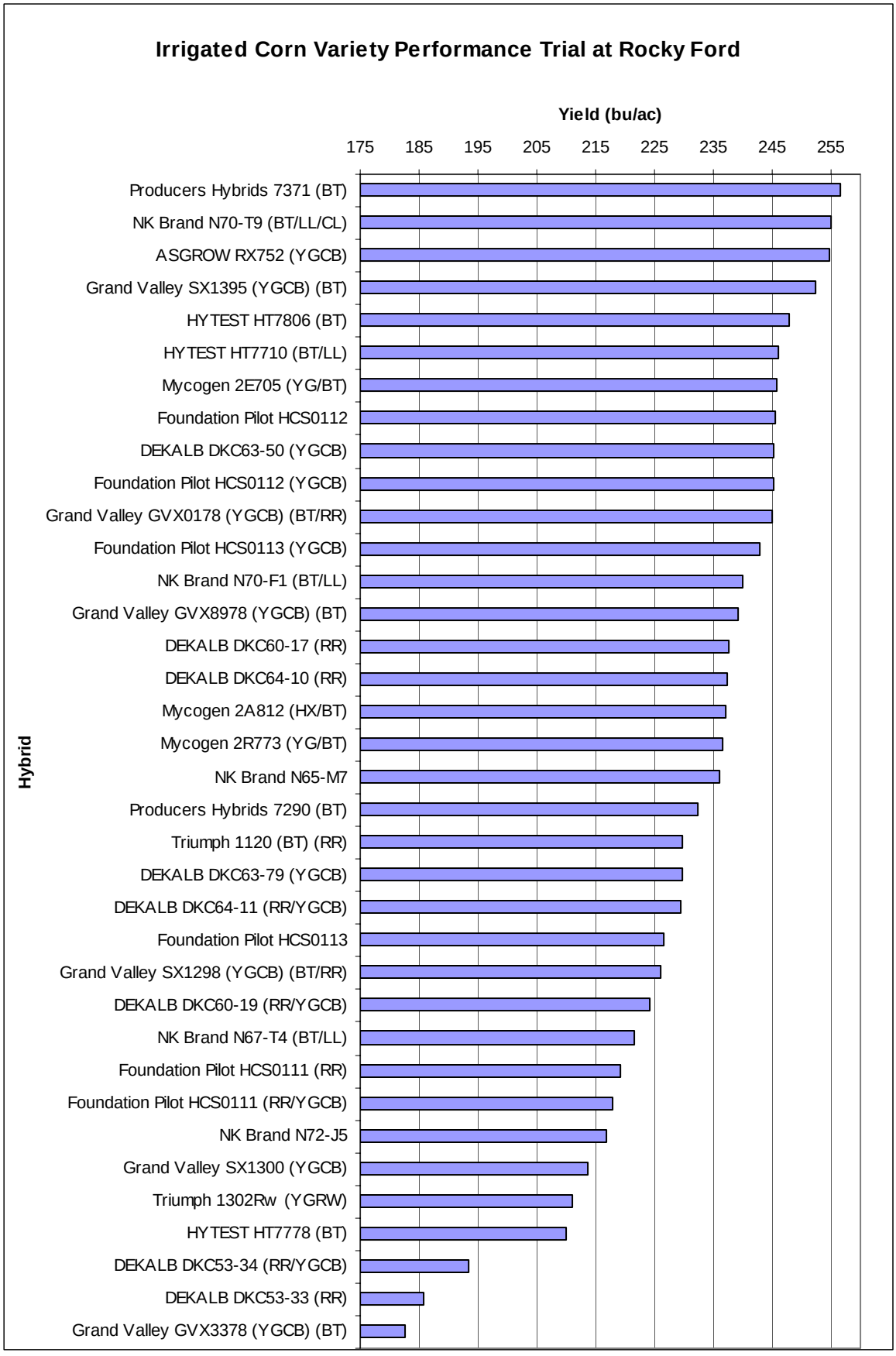
Irrigated corn variety performance trial at Rocky Ford[1] in 2003.

Hybrid	Yield	Grain Moisture	Test Weight	Plant Height	Density	Silking[2]
	Bu/ac	%	lb/bu	in	plants/ac	date
Producers Hybrids 7371 (BT)	257	16.1	57.7	78	30220	197
NK Brand N70-T9 (BT/LL/CL)	255	16.1	57.7	77	31445	197
ASGROW RX752 (YGCB)	255	15.7	58.5	76	30628	197
Grand Valley SX1395 (YGCB) (BT)	253	16.3	57.7	81	30220	196
HYTEST HT7806 (BT)	248	17.1	59.0	82	31309	198
HYTEST HT7710 (BT/LL)	246	16.0	57.7	79	31173	197
Mycogen 2E705 (YG/BT)	246	15.9	57.7	77	30628	197
Foundation Pilot HCS0112	245	16.0	58.2	78	31173	197
DEKALB DKC63-50 (YGCB)	245	15.3	58.2	79	31445	197
Foundation Pilot HCS0112 (YGCB)	245	16.1	57.7	79	31037	198
Grand Valley GVX0178 (YGCB) (BT/RR)	245	16.0	56.1	80	30492	198
Foundation Pilot HCS0113 (YGCB)	243	15.8	57.7	77	28722	197
NK Brand N70-F1 (BT/LL)	240	15.7	57.7	73	30764	198
Grand Valley GVX8978 (YGCB) (BT)	239	15.8	58.5	78	30492	198
DEKALB DKC60-17 (RR)	238	15.4	58.1	70	29948	196
DEKALB DKC64-10 (RR)	238	14.9	58.7	80	31445	197
Mycogen 2A812 (HX/BT)	237	16.7	57.2	87	32942	196
Mycogen 2R773 (YG/BT)	237	16.0	59.8	80	31853	197
NK Brand N65-M7	236	15.7	58.2	80	31445	196
Producers Hybrids 7290 (BT)	232	16.0	58.7	80	30084	196
Triumph 1120 (BT) (RR)	230	14.8	59.1	80	31989	196
DEKALB DKC63-79 (YGCB)	230	16.2	59.3	76	30356	198
DEKALB DKC64-11 (RR/YGCB)	230	15.5	59.3	83	32398	198
Foundation Pilot HCS0113	227	15.1	57.8	74	28450	197
Grand Valley SX1298 (YGCB) (BT/RR)	226	14.5	58.7	78	31037	198
DEKALB DKC60-19 (RR/YGCB)	224	15.6	58.8	72	31173	197
NK Brand N67-T4 (BT/LL)	222	15.7	58.5	77	30900	197
Foundation Pilot HCS0111 (RR)	219	15.8	61.2	81	31309	197
Foundation Pilot HCS0111 (RR/YGCB)	218	15.6	60.8	80	30220	197
NK Brand N72-J5	217	15.7	57.9	79	30084	198
Grand Valley SX1300 (YGCB)	214	15.2	59.7	77	29539	197
Triumph 1302Rw (YGRW)	211	15.2	58.1	73	31445	198
HYTEST HT7778 (BT)	210	15.4	58.3	79	31037	198
DEKALB DKC53-34 (RR/YGCB)	193	13.5	58.8	65	32534	195
DEKALB DKC53-33 (RR)	186	13.2	58.6	76	31309	195
Grand Valley GVX3378 (YGCB) (BT)	183	11.5	58.1	75	31853	196
Average	**231**	**15.4**	**58.4**	**78**	**30919**	**197**
$LSD_{(0.30)}$	13					

[1]Trial conducted at the Arkansas Valley Research Center; seeded 5/5 and harvested 10/16.
[2]Julian date.
*No significant ear drop or lodging.

2-Yr irrigated corn variety performance at Rocky Ford in 2002-03.

Hybrid	Yield	Grain Moistur	Test Weight
	lb/ac	%	lb/bu
HYTEST HT7806 (BT)	224	16.2	59.1
Producers Hybrids 7290 (BT)	221	14.6	56.8
DEKALB DKC60-19	211	14.7	59.1
NK Brand N72-J5	204	15.3	58.4
Triumph 1120 (BT) (RR)	199	13.4	58.6
NK Brand N67-T4 (BT/LL)	196	14.5	58.8
Average	**209**	**14.8**	**58.5**


Irrigated Corn Variety Performance Trial at Rocky Ford
Yield (bu/ac)
175
185
195
205
215
225
235
245
255
Hybrid
Producers Hybrids 7371 (BT)
NK Brand N70-T9 (BT/LL/CL)
ASGROW RX752 (YGCB)
Grand Valley SX1395 (YGCB) (BT)
HYTEST HT7806 (BT)
HYTEST HT7710 (BT/LL)
Mycogen 2E705 (YG/BT)
Foundation Pilot HCS0112
DEKALB DKC63-50 (YGCB)
Foundation Pilot HCS0112 (YGCB)
Grand Valley GVX0178 (YGCB) (BT/RR)
Foundation Pilot HCS0113 (YGCB)
NK Brand N70-F1 (BT/LL)
Grand Valley GVX8978 (YGCB) (BT)
DEKALB DKC60-17 (RR)
DEKALB DKC64-10 (RR)
Mycogen 2A812 (HX/BT)
Mycogen 2R773 (YG/BT)
NK Brand N65-M7
Producers Hybrids 7290 (BT)
Triumph 1120 (BT) (RR)
DEKALB DKC63-79 (YGCB)
DEKALB DKC64-11 (RR/YGCB)
Foundation Pilot HCS0113
Grand Valley SX1298 (YGCB) (BT/RR)
DEKALB DKC60-19 (RR/YGCB)
NK Brand N67-T4 (BT/LL)
Foundation Pilot HCS0111 (RR)
Foundation Pilot HCS0111 (RR/YGCB)
NK Brand N72-J5
Grand Valley SX1300 (YGCB)
Triumph 1302Rw (YGRW)
HYTEST HT7778 (BT)
DEKALB DKC53-34 (RR/YGCB)
DEKALB DKC53-33 (RR)
Grand Valley GVX3378 (YGCB) (BT)

Corn silage variety performance trial at Rocky Ford[1] in 2003.

Hybrid	Yield	Moisture	Density	Plant Height	Silking[2]
	t/ac	%	plants/ac	in	date
HYTEST HT7815 (RR)	40.8	60.1	30855	87	203
Grand Valley SX1610	39.2	56.7	27970	89	202
Grand Valley SX1602	38.0	55.0	31218	87	201
AgriPro 9646	37.9	57.1	30129	93	202
DEKALB DKC69-72 (RR)	37.4	55.9	32126	88	204
Grand Valley SX1606	36.2	56.5	30085	86	201
HYTEST HT7930 (BT)	35.6	56.2	30855	90	199
ASGROW RX897 (RR)	35.0	58.7	30946	89	202
HYTEST TNT-119	34.9	54.4	31309	86	198
NK Brand N83-N5	34.6	56.7	29913	86	202
FX419	33.3	53.7	30304	92	199
Mycogen 2888IMI	31.7	56.1	31309	89	202
Triumph 1866 (BT)	31.6	53.2	31763	85	201
Garst 8315 IT	31.2	59.8	30401	85	202
Average	**35.5**	**56.4**	**30656**	**88**	**201**
$LSD_{(0.30)}$	2.9				

[1]Trial conducted at the Arkansas Valley Research Center; seeded 5/5 and harvested 9/17.
[2]Julian date.

2-Yr average corn silage variety performance at Rocky Ford in 2002-03.

Hybrid	Yield	Moisture
	t/ac	%
HYTEST HT7815 (RR)	37.7	58.3
Grand Valley SX1610	35.7	57.4
ASGROW RX897 (RR)	35.4	55.6
Grand Valley SX1606	35.3	55.6
AgriPro 9646	34.7	54.6
Grand Valley SX1602	34.4	54.3
Mycogen 2888IMI	33.1	54.8
Garst 8315 IT	31.4	56.1
FX419	30.4	52.5
Average	**34.2**	**55.5**

Nitrogen Requirements of Irrigated Corn In Colorado Arkansas Valley

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SUMMARY

This study evaluated the effects of N fertilizer rate and N source (urea and Polyon®[3]) on corn yields for 4 years following 5 years of alfalfa and one year of watermelon production. Corn grain yields were not significantly increased by N fertilization the 1st year following watermelon, but increased with increasing residual soil NO_3-N levels the 2nd year without additional N fertilization, and increased by N fertilization in the 3rd and 4th years. Averaged over years, N source did not significantly affect corn yields. Averaged over years, corn grain yields were near maximum with an average application of 75 to 100 lb N/a per year. Silage yields increased with increasing N rate each year, except for the 2nd yr. Residual soil NO_3-N levels declined with each additional corn crop in the check (no N added) treatment. Soil residual NO_3-N levels were increased with increasing N rate the 1st year. Residual soil NO_3-N levels declined following the 2nd corn crop with no additional N fertilizer applied. Irrigation water was limited and became unavailable due to drought conditions the first week of August for the 3rd crop. Therefore, the 3rd corn crop suffered from severe drought stress and reduced yields. The 4-year average N fertilizer use efficiency was 82% at the lowest fertilizer N rate and 47% at the highest N rate. Nitrogen application to corn in Arkansas River Valley produced in rotation with vegetable crops and alfalfa may need to be reduced to prevent NO_3-N contamination of groundwater in this area. Based on this study, it appears that a minimal amount (75 to 100 lb N/a) of N fertilizer may be needed to maintain high grain and silage corn yields in the Valley in rotation with vegetable crops and alfalfa. Fertilizer N appears to be moving out of the root zone with downward movement of irrigation water. Residual soil NO_3-N levels declined with each additional corn crop in the check (no N added) treatment.

PROBLEM

High nitrate-N (NO_3-N) levels have been reported in groundwater in the Arkansas River Valley in Colorado, which is a major producer of melons, onions, and other vegetable crops grown in rotation with alfalfa, corn, sorghum, winter wheat, and soybeans. Relatively high rates of N fertilizer are used to optimize crop yields and quality, generally without regard to soil testing. Vegetable crops generally have shallow rooting depths and require frequent irrigation to maintain

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[3]Trade names and company names are included for the benefit of the reader and do not imply any endorsement or preferential treatment of the product by the authors or the USDA, Agricultural Research Service.

market quality. High residual soil NO_3-N levels, high N fertilization rates to shallow-rooted crops, shallow water tables, and excess water application to control soil salinity all contribute to a high NO_3-N leaching potential.

Application of controlled-release N fertilizers to crops in the Arkansas Valley could potentially increase nitrogen use efficiency (NUE) and reduce NO_3-N leaching potential. Nitrogen management research is needed to develop improved NUE and N management practices for furrow irrigated crops in this area. Improved N management practices for crops in the Arkansas River Valley should optimize crop yields while minimizing N fertilizer impacts on ground water quality.

Objectives of this research were to determine N fertilizer needs for optimizing furrow-irrigated corn yields in a high residual soil N environment in Arkansas River Valley, evaluate the effects of a slow-release N fertilizer on N fertilizer use efficiency by corn, and evaluate the influence of N fertilizer application rate on residual soil NO_3-N and potential for groundwater contamination.

Study Details. A N source and rate study was initiated under conventional till, furrow irrigated corn on a calcareous Rocky Ford silty clay loam soil at the Arkansas Valley Research Center (AVRC) in 2000. The plot area had previously been in alfalfa for 5 years, before being plowed up on 20 October 98. Two applications of 150 lb P_2O_5/a as 11-52-0 added 64 lb N/a during the five years of alfalfa production. Watermelon was produced on the plot area in 1999 with 21 lb N/a added with the P fertilizer (Halvorson et al., 2001). Six N rates (0, 50, 100, 150, 200, and 250 lb N/a or N1, N2, N3, N4, N5, N6, respectively) were established in 2000. Due to only a minimal response to N fertilization in 2000, no additional N was applied to the 2001 crop. In 2002, N rates of 0, 25, 50, 75, 100, and 125 lb N/a were applied to the original 2000 N treatments, respectively. In 2003, the N rates were increased slightly to 0, 30, 60, 90, 120, and 150 lb N/a, respectively. Two N sources, urea and Polyon® (a controlled-release urea fertilizer), were applied at each N rate. The N fertilizer was broadcast and incorporated with a harrow before corn planting. In the fall of 2000, 2001, and 2002, 11 lb N/a was applied with the P fertilizer (11-52-0) just prior to plowing, and no P was applied to the 2003 crop. A split-plot, randomized complete block design with 4 replications was used.

Corn (Pioneer 33A14 hybrid) was planted on April 27, 2000 at a seeding rate of about 28,400 seeds per acre. The 2001 corn (DeKalb 642RR hybrid) crop was planted on April 24 at a seeding rate of about 40,000 seeds per acre. Corn (Garst 8559 Bt/RR) was planted on April 23, 2002 and April 29, 2003 at a seeding rate of about 39,000 seeds/acre. Herbicides were applied for weed control, with the plots being essentially weed free during the study period. Soil NO_3-N levels in the 0-6 ft profile have been monitored since the spring of 1999, and were measured before fertilization and after harvest of each crop.

Due to severe drought conditions and lack of irrigation water in 2002, the last irrigation occurred on August 2nd, shortly after pollination was completed. Therefore, the 2002 crop suffered from water stress during grain fill which reduced yield potential. The N level in the irrigation water was monitored by AVRC throughout each growing season. The irrigation water contained an average of 2.5 ppm NO_3-N in 2000, 2.8 ppm NO_3-N in 2001, and 2.4 ppm NO_3-N in 2002. The N contribution from the irrigation water to the plot area would have amounted to about 6 lb N/a in 1999 while irrigating the watermelon, about 15 lb N/a in 2000, about 14 lb N/a in

2001, and about 14 lb N/a in 2002 while irrigating the corn crops. In 2003, N level in the water was not monitored, but was assumed to be similar to previous years. Assuming a 50% irrigation efficiency, about 7 to 8 lbs of N may have entered the soil each year.

RESULTS

In April 1999, the soil NO_3-N in the profile was concentrated in the 0-2 ft soil depth, with low levels of NO_3-N at deeper depths (Table 1). The total amount of NO_3-N in the 6-ft profile was 114 lb N/a. Following the watermelon crop, soil NO_3-N levels in November 1999 had decreased in the top 2 ft but increased in the deeper soil depths. The total amount of NO_3-N in the 6-ft profile was 157 lb N/a in November of 1999. In April 2000, soil NO_3-N levels in upper part of the soil profile had increased, with a total level of 181 lb N/a in the 6-ft profile. Thus soil NO_3-N levels just prior to N fertilization and corn planting was relatively high, despite the fact that little N fertilizer had been applied during the previous 6 years. The amount of N in the watermelon tops and unharvested melons in 1999, with a C/N ratio of about 12, potentially contributed up to 184 lb N/a to the 2000 corn crop (Halvorson et al., 2001). This might explain the unexpected high level of soil NO_3-N (181 lb N/a) at corn planting in 2000. In 2001, soil NO_3-N levels had declined following the second corn crop. At corn planting in 2002, soil NO_3-N levels had increased slightly compared with levels after harvest in 2001. Planting soil NO_3-N levels in 2003 were similar to those in 2002. The check plot (no N fertilizer applied) has had sufficient residual soil N to produce 718 bu of corn per acre in 4 years. The mineralization of available N from the soil organic matter in this soil appears to be quite high, as evidenced from the corn yields obtained from the check plots and removal of 377 lb N/a in the grain in 4 years.

Residual soil NO_3-N levels after corn harvest for each N rate in 2001 and 2003 are reported in Table 2. Residual soil NO_3-N levels were approaching more normal levels after

Table 1. Average soil NO_3-N levels in the non-fertilized check plots before and after the 1999, 2000, and 2001 crops, and before planting the 2002, and 2003 crops.

Soil Depth	1999 Watermelon		2000 Corn		2001 Corn		2002 Corn	2003 Corn
	Apr. 1	Nov. 8	Apr. 10	Oct. 25	Mar. 20	Nov. 5	Apr. 1	Apr. 1
feet	Soil NO_3-N, lb/a							
0-1	82	41	79	42	72	20	47	62
1-2	13	23	33	22	15	6	16	8
2-3	6	26	24	32	14	5	5	4
3-4	4	25	18	20	11	6	4	3
4-5	5	24	15	17	7	8	2	2
5-6	4	17	11	7	6	6	2	2
Total	114	157	181	140	125	52	76	82

Table 2. Soil NO_3-N levels with soil depth on 5 November 2001 and 7 October 2003 for each N rate treatment.

Soil Depth	2000 Fertilizer N Rate (lb N/a)						2003 Fertilizer N Rate (lb N/a)					
	0	50	100	150	200	250	0	30	60	90	120	150
	N1	N2	N3	N4	N5	N6	N1	N2	N3	N4	N5	N6
	5 November 2001						7 October 2003					
Ft	Soil NO_3-N, lb N/a											
0-1	20	22	20	18	21	45	9	8	11	21	20	19
1-2	6	7	8	7	13	20	3	2	4	14	6	21
2-3	5	6	9	10	20	40	3	1	3	3	5	25
3-4	6	6	5	14	16	14	3	2	3	3	4	28
4-5	8	6	5	14	20	16	2	1	3	6	3	16
5-6	6	9	7	12	17	14	2	1	4	4	5	8
Total	52	55	54	76	107	149	22	15	28	50	42	116

harvest of the 2001 corn crop which was not fertilized. Residual NO_3-N levels in the 6 ft soil profile on 7 October 2003 still increased with increasing rates of N fertilization.

Corn grain yields were increased significantly ($\alpha = 0.05$) by N fertilization each year, except in 2000 (Figure 1). The lower yields in 2001 than in 2000 were partially caused by insect damage to the corn ear during ear development. The low yields in 2002 were the result of water stress due to lack of irrigation water during grain fill. Drought stress in 2003, although not as severe as in 2002, resulted in a severe ear smut problem, which may have reduced yield potential.

Averaged over years, the Polyon® N source (207 bu/a) did not have a significant yield advantage over urea (205 bu/a). However, if a controlled-release fertilizer becomes available at a competitive cost with urea, its use may improve NFUE and reduce NO_3-N leaching potential in the Arkansas Valley in Colorado.

Grain yields averaged 254 bu/a in 2000, 198 bu/a in 2001, 177 bu/a in 2002, and 195 bu/a in 2003 when averaged over all N rates and N sources. The higher grain yields in 2000 compared to the other years may reflect the rotational benefits of corn following watermelon

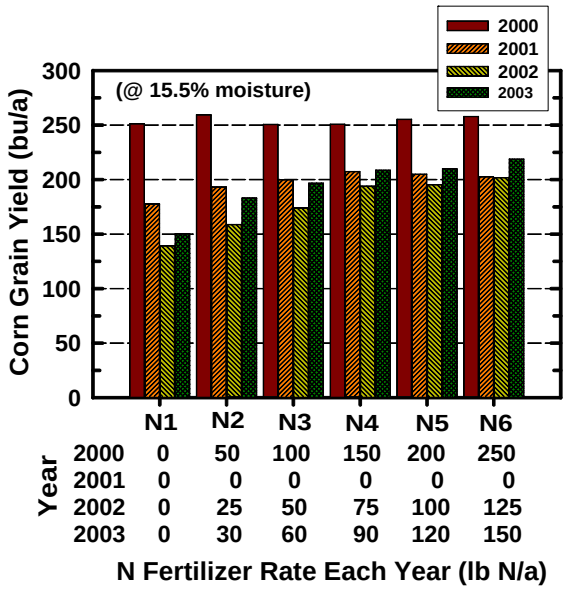

Figure 1 1. Corn grain yield each year as a function of N applied.

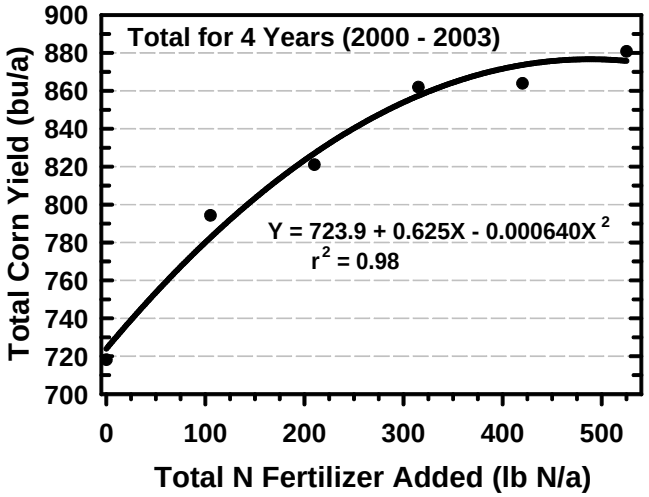

Figure 2 1. Four-year average corn yield as a function of average annual N rate.

rather than corn following corn. The average 4-yr grain yield increased with increasing N rate (Figure 2), with N rate expressed as a 4-yr average for the N1, N2, N3, N4, N5, and N6 treatments.

Corn silage yields (70% moisture) in 2000 increased significantly ($\alpha = 0.05$) with increasing N rate up to 150 lb N/a (Figure 3). Silage yields in 2001 did not increase significantly ($\alpha = 0.05$) with increasing residual soil NO_3-N levels. Silage yields in 2002 and 2003 increased significantly ($\alpha = 0.05$) with increasing N rate, but did not vary with N source.

Crop N fertilizer use efficiency (NFUE) based on total biomass N uptake in 2000 decreased with increasing N rate with NFUE of 41, 21, 15, 2, and 7% for the 50, 100, 150, 200, and 250 lb N/a treatments, respectively. The two year NFUE's based on total biomass N uptake for the combined 2000 and 2001 crops were 71, 39, 34, 25, and 25 % for these same respective N treatments. The four-year (2000-2003) NFUE was 82, 65, 56, 46, and 47 % for the N2, N3, N4, N5, and N6 fertilizer N treatments, respectively. Based on total N removal by grain in 4 years, the NFUE was 55, 36, 34, 31, and 30 % for the N2, N3, N4, N5, and N6 fertilizer N treatments respectively.

Based on the corn N uptake data, an average of 0.7 lb N/bu was removed in the corn grain in 2000, 0.68 lb N/bu in 2001, 0.63 lb N/bu in 2002, and 0.68 lb N/bu in 2003. Nitrogen removal in the grain increased with increasing N rate when averaged over 4 years. An average total N requirement of 1.09 lb N/bu was required to produce the 2000 corn crop, 1.19 lb N/bu in 2001, 0.87 lb N/bu in 2002, and 1.01 lb N/bu in 2003 with a 4 year average of 1.04 lb N/bu with N requirements increasing with yield level. There was no influence N source on the amount of N required to produce a bushel of corn. These total N requirement values from AVRC are in agreement with total N needs of irrigated corn of 1.1 to 1.2 lb N/bu reported in the literature and used by the fertilizer industry to estimate N fertilizer needs.

Although the irrigation water contributed some N to the cropping system, it does not appear to be a major contributor to the high levels of NO_3-N found in the soils at AVRC. Based on corn yields and N uptake of the check plots (no N fertilizer applied), soil N mineralization potential was very high in this soil.

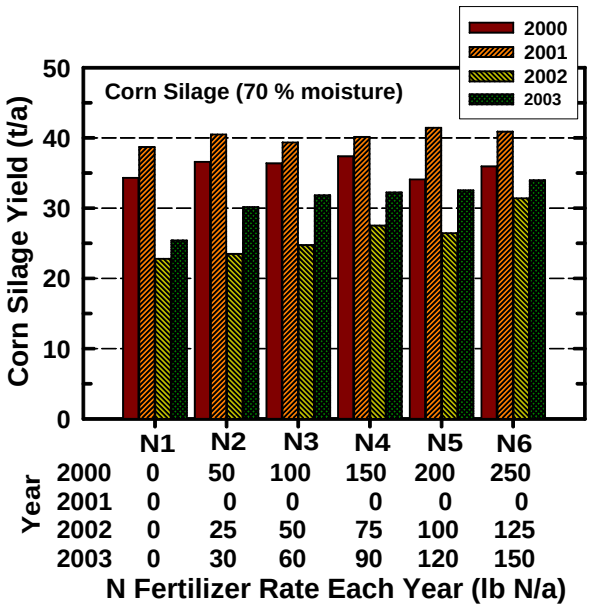

Figure 2. Corn silage yield each year as a function of N rate.

The plot (Figure 2) of average corn grain yield as a function of the average (annual) N fertilizer application rate for the 4 years shows a curvilinear increase in grain yield with increasing rate of N fertilizer application. Grain yields start to level off above an annual rate of 75 lb N/a and are near maximum at 100 lb N/a. This would indicate that N fertilizer rates applied to corn could potentially be reduced in the Arkansas Valley while maintaining high yield potential when rotating with vegetable crops and alfalfa, which would reduce NO_3-N leaching potential.

Based on the soil NO_3-N data in Table 2, the addition of N fertilizer increased the level of soil NO_3-N throughout the 6 ft profile. Assuming an effective rooting depth of 3 to 4 ft, some of the fertilizer N appears to have been leached beyond the corn root zone in this study. This observation is supported by an adjacent ^{15}N fertilizer study with onion and corn by Halvorson et al. (2002a), who found fertilizer N leached to a 6-ft depth the year of application to an onion crop and was still present after harvest of the following corn crop with no additional fertilizer N applied.

This N study will be continued on the same plots in 2004 with chile pepper as the crop. Nitrogen fertilizer will be applied at the same rates as used in 2003. Nitrogen fertilization effects on residual soil NO_3-N levels will continue to be monitored.

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The authors wish to thank Patti Norris, Brad Floyd, Catherine Cannon, Kevin Tanabe, and Marvin Wallace for their field assistance and analytical support in collecting the data reported herein.

Winter Wheat Variety Trial - 2002-2003
Arkansas Valley Research Center

Thirty cultivars, including twelve experimental lines, from the Colorado State University Wheat Breeding Project were entered in this years trial. The average yield of 105.3 bushels per acre is substantially higher than the last couple of years. The range in yield was 69.9 bu. to 121.8 bu. per acre. The rainfall during April, May and June was better than average and the irrigation supply was adequate.

Test Plot Information

Data - 1. Grain yields
2. Growth factors

Plots - 30' X 5' (4 rows), Harvest 5' X 24'

Design - Randomized complete block (3 replications)

Variety - 30 cultivars, including 12 experimental lines

Fertilizer - 75 lbs. P_2O_5 + 16 lbs. N - 11/7/01
102 lbs. N as urea in irrigation water - 5/7/03

Herbicide - Bronate 1 lb. AI/Acre - 3/13/03

Insecticide - 0
Plant - September 16, 2002 1,000,000 seeds/acre

Irrigate - 9/17/02, 10/12/02, 4/2/03, 5/7/03

Harvest - June 2, 2003 - small plot combine

Jerry J. Johnson
James P. Hain
Frank C. Schweissing

Please see **http://www.colostate.edu/Depts/SoilCrop/extension/CropVar/index.html** for more information including variety descriptions.

Colorado winter wheat Irrigated Variety Performance Trial summary for 2003.

	Location						2003					
	Fort Collins		Ovid		Rocky Ford		Averages					
Variety[1]	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	**Yield**	% of Trial Average	Test Wt	Plant Ht	Lodging[2]	Grain Moisture[3]
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	Lb/bu	**bu/ac**	%	lb/bu	in	1-9	%
CO99W254	129.4	61.2	102.7	59.2	116.3	61.3	**116.2**	116	60.6	37	3	10.3
Jagalene	128.0	60.4	100.6	57.6	116.8	59.3	**115.1**	115	59.1	37	4	9.8
CO99141	109.9	58.8	108.3	56.3	108.9	60.1	**109.0**	109	58.4	37	5	9.3
Prairie Red	124.7	59.1	81.7	53.2	119.1	58.4	**108.5**	108	56.9	38	2	8.9
CO99W183	112.0	56.7	96.5	53.3	116.6	59.5	**108.4**	108	56.5	38	5	8.6
CO99W329	118.3	59.3	94.2	55.3	111.8	60.2	**108.1**	108	58.3	37	3	9.4
Wesley	113.1	57.6	91.7	58.2	116.6	60.0	**107.1**	107	58.6	35	1	10.2
Yuma	120.2	58.2	97.5	58.3	103.5	59.4	**107.1**	107	58.6	38	2	9.6
G980091-1	116.8	58.4	92.4	56.0	106.7	61.6	**105.3**	105	58.7	35	3	9.9
Cisco	119.9	60.6	88.3	57.9	101.0	58.4	**103.1**	103	59.0	38	3	9.7
CO970547-7	105.0	58.6	93.4	56.4	108.9	59.3	**102.5**	102	58.1	38	6	9.3
Antelope	107.1	58.0	90.8	56.8	106.5	61.5	**101.5**	101	58.7	39	4	10.2
CO980607	107.3	58.2	88.3	55.7	108.5	61.3	**101.4**	101	58.4	39	5	9.8
Ok101	115.2	58.9	79.8	53.1	107.7	59.4	**100.9**	101	57.1	39	3	9.1
CO980630	111.8	58.2	80.9	54.6	109.3	59.0	**100.7**	100	57.3	39	4	10.5
G980122	117.4	58.9	78.3	54.4	105.6	60.5	**100.4**	100	57.9	38	2	9.7
Dumas	126.4	60.7	78.5	53.2	96.1	61.3	**100.3**	100	58.4	37	2	9.5
Platte	121.5	61.5	53.2	47.5	121.8	60.6	**98.8**	99	56.5	37	2	9.1
CO99314	116.7	58.4	69.7	54.6	110.2	61.3	**98.8**	99	58.1	37	3	9.7
Kalvesta	116.8	59.3	74.7	52.9	101.3	60.7	**97.6**	97	57.6	39	2	9.4
2137	121.4	59.1	76.0	54.3	94.9	60.1	**97.4**	97	57.8	39	1	9.8
CO99W192	101.5	57.1	80.5	51.9	108.4	58.5	**96.8**	97	55.8	39	5	9.1
Ok102	113.8	58.9	73.9	54.0	101.0	60.4	**96.2**	96	57.8	38	1	9.2
Ankor	109.0	57.5	65.5	53.4	108.5	61.1	**94.3**	94	57.3	40	2	9.9
CO970547-2	109.2	57.4	72.9	53.7	97.1	60.7	**93.1**	93	57.3	40	5	9.5
CO99W188	99.6	56.9	87.8	56.4	86.0	60.6	**91.1**	91	58.0	40	7	9.8
CO99W277	89.8	58.9	79.6	59.2	103.1	61.2	**90.8**	91	59.8	39	7	10.2
Venango	116.1	59.3	82.1	58.2	69.9	62.2	**89.4**	89	59.9	38	2	10.6
Arrowsmith	86.4	54.1	81.9	55.6	98.6	61.5	**89.0**	89	57.1	43	4	10.7
Nuplains	92.7	60.0	51.6	52.8	98.6	60.8	**81.0**	81	57.9	37	2	9.5
Average	**112.6**	**58.7**	**83.1**	**55.1**	**105.3**	**60.3**	**100.3**	**100**	**58.0**	**38**	**3**	**9.7**
$LSD_{(0.30)}$	7.6		9.4		6.8							

[1]Varieties in table ranked by the average yield over three locations in 2003.
[2]Rating scale 1-9, with 1 = no lodging and 9 = completely lodged.
[3]Grain moisture was only taken at Ovid and Rocky Ford.

Winter wheat Irrigated Variety Performance Trial at Rocky Ford in 2003[1].

Variety	Yield	Grain Moisture	Test Weight	Plant Height	Lodging[2]
	bu/ac	%	lb/bu	in	1-9
Platte	121.8	10.2	60.6	37	3
Prairie Red	119.1	8.8	58.4	38	2
Jagalene	116.8	9.5	59.3	37	2
Wesley	116.6	10.0	60.0	36	1
CO99W183	116.6	9.0	59.5	37	5
CO99W254	116.3	10.4	61.3	38	3
CO99W329	111.8	9.7	60.2	36	3
CO99314	110.2	10.3	61.3	36	3
CO980630	109.3	9.9	59.0	38	4
CO970547-7	108.9	9.4	59.3	36	5
CO99141	108.9	9.6	60.1	37	4
CO980607	108.5	10.4	61.3	38	6
Ankor	108.5	10.6	61.1	40	2
CO99W192	108.4	9.0	58.5	37	3
Ok101	107.7	9.3	59.4	37	4
G980091-1	106.7	10.4	61.6	36	3
Antelope	106.5	10.5	61.5	38	5
G980122	105.6	10.2	60.5	38	2
Yuma	103.5	9.4	59.4	36	3
CO99W277	103.1	10.4	61.2	37	8
Kalvesta	101.3	10.2	60.7	37	3
Cisco	101.0	9.3	58.4	38	2
Ok102	101.0	9.8	60.4	33	1
Nuplains	98.6	10.5	60.8	38	2
Arrowsmith	98.6	11.3	61.5	41	5
CO970547-2	97.1	10.1	60.7	38	3
Dumas	96.1	10.4	61.3	37	2
2137	94.9	9.9	60.1	38	1
CO99W188	86.0	10.1	60.6	37	6
Venango	69.9	11.4	62.2	36	3
Average	**105.3**	**10.0**	**60.3**	**37**	**3**
$LSD_{(0.30)}$	6.8				

[1]Trial conducted at the Arkansas Valley Research Center; seeded 9/16/02 and harvested 7/02/03.
[2]Rating scale 1-9, with 1 = no lodging and 9 = completely lodged.

Notes: Plots looked very nice and uniform. No significant disease or insect problems. Significant lodging noted early June. Great trial.

Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 2003.

INVESTIGATOR: Frank C. Schweissing, Superintendent, Arkansas Valley Research Center, Rocky Ford, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions.

PLOT: Two rows with 30" spacing, 32' long. SEEDING DENSITY: 96,800 Seed/A. PLANTED: June 12. HARVESTED: September 17.

EMERGENCE DATE: ca. 10-14 days after planting. SOIL TEMP: 61^0 F.

IRRIGATION: Five furrow irrigations: June 14, July 1, July 26, August 8, August 25, total applied ca. 18 acre-in/A.

PEST CONTROL: Preemergence Herbicide: glyphosate 1 lb. AI/A. Postemergence Herbicide: dicamba .25 lbs. AI/A. Insecticide: none.

CULTURAL PRACTICES:
Previous crop: corn.
Field Preparation: chisel, disc, roll, level, furrow out, rodweed. Cultivation: 2X.

Summary: Growing Season Precipitation and Temperature/1
Arkansas Valley Research Center, Rocky Ford, Otero County.

Month	Rainfall	GDD/2	>90F	>100F	DAP/3
	in.		----------no. of days---		
June	2.28	374	12	2	18
July	0.51	829	29	22	49
August	0.54	770	28	6	80
September	0.44	256	4	0	97
Total	3.77	2229	73	30	97

/1 Growing season from June 12 (planting) to September 17 (harvest).
/2 GDD: Growing Degree Days for sorghum.
/3 DAP: Days After Planting.

SOIL: silty-clay loam, 1-1.5% O.M., pH-ca. 7.8. FERTILIZER: 52 lbs. P_2O_5 and 111 lbs. N/Acre.

COMMENTS: Irrigation water adequate, very hot July, stand-fair, weed control-fair, forage yields below average.

Table 1.-Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 2003[1]

Brand	Hybrid	Forage Type[2]	Days To 50% Bloom (No.)	Plant Density 7/1/03 Plants/A (1000 X)	Plant Ht. (Ins.)	Stage At Harvest3	Stem Sugar (%)	Dry Matter (%)	Forage Yield4 (T/A)	Yield % of Test Avg. (%)
SORGHUM PARTNERS	Sordan 79	SS	74	78.1	105	ED	2	26	24.54	119
SORGHUM PARTNERS	SS 405	FS	96	62.9	108	EM	7	21	24.12	117
SORGHUM PARTNERS	1990	FS	----	68.3	103	VEG	7	20	21.89	106
(Check)	NB 305F	FS	79	62.1	97	MM	15	25	21.70	105
SORGHUM PARTNERS	Sordan Headless	SS	----	70.2	102	VEG	8	20	21.69	105
SORGHUM PARTNERS	NK 300	FS	82	55.5	70	LM	12	24	21.04	102
CAL/WEST SEEDS	CW 1-63-1	SS	76	66.2	91	LM	11	26	20.69	100
CAL/WEST SEEDS	CW 1-63-4	SS	77	68.9	88	MM	11	27	20.65	100
CAL/WEST SEEDS	CW 1-61-4	SS	76	55.5	92	LM	12	26	20.55	100
CAL/WEST SEEDS	CW 1-61-1	SS	76	55.5	88	LM	11	26	20.30	100
CAL/WEST SEEDS	CW 1-61-10	SS	76	67.2	88	LM	11	26	18.92	92
SORGHUM PARTNERS	Trudan 8	SS	74	59.9	99	ED	8	31	18.83	91
CAL/WEST SEEDS	CW 1-61-9	SS	78	52.8	88	MM	11	26	17.94	87
DEKALB	DK 642	corn	67	34.0	72	MM	12	27	15.44	75
Average			78	61.2	92		10	25	20.59	
LSD (0.20)									1.81	
CV%									9.52	

1 - Planted June 12, 2003; Harvest September 17, 2003

2 - Forage Type: FS, Forage Sorghum; SS, Sorghum Sudan grass

3 - Seed Maturation: PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; MT, mature.

4 - Forage Yield adjusted to 70% moisture content based on oven-dried samples.

Soybean Variety Trial - 2003
Arkansas Valley Research Center

This is the fifth soybean trial at this Center in recent years. Trials were initiated in 1999 due to a renewed interest in oil crops. Precipitation for the year (9.23") was substantially better than last year, but still below normal. Irrigation water was adequate throughout the season. Trial yields averaged 62.0 bushels per acre for the trial compared to 75.9 bu. per acre in 2002, 68.8 bu. per acre in 2001, 66.0 bu. per acre in 2000 and 53.7 bu. per acre in 1999. Yields ranged from 57.0 to 66.0 bu. per acre.

Test Plot Information

Purpose - To evaluate the inherent genetic ability of selected soybean varieties to yield under irrigated conditions in the Arkansas Valley.

Data - 1. Yields
2. Growth factors

Plots - 32' X 10' (4 rows) Harvest-3 rows

Design - Randomized complete blocks (3 replications)

Variety - 6 entries

Fertilizer - 52 lbs. P_2O_5 + 11 lbs. N/acre as 11-52-0 - 10/28/02
Equivalent of 15 oz. of soybean innoculant/300 lbs. of seed

Herbicide - Dual II Magnum 1.43 lbs. + Gramoxone Extra .625 lbs. AI/Acre - 5/12/03
Basagran .75 lbs. + Blazer .25 lbs. + Poast .28 lbs. AI/Acre - 6/9/03

Insecticide - none

Soil - Silty, clay loam, 1-1.5 o.m., pH - ca. 7.8

Plant - May 13, 2003

Irrigate - 6/26, 7/8, 7/21, 8/4, 8/21

Harvest - September 29, 2003 Self-propelled plot combine

Jerry Johnson
Jim Hain
Frank Schweissing

Soybean variety performance trial at Rocky Ford[1] in 2003.

Variety	Yield	Moisture	Test Weight	Plant Height	Leaf Dropping[2]
	bu/ac	%	lb/bu	in	date
DG 37R39	66	7.1	55.7	33	259
DG 34P38	63	7.0	56.1	31	258
Triumph TR3752 (RR)	62	7.0	56.0	36	257
Garst 3824 RR/N	61	7.0	55.6	35	258
DG 3399 + RR	61	6.9	55.2	34	260
Garst 3135 (RR)	57	7.0	55.8	30	252
Average	**62**	**7.0**	**55.7**	**33**	**257**
$LSD_{(0.30)}$	4				

[1]Trial conducted at the Arkansas Valley Research Center; seeded 5/13 and harvested 9/29.
[2]Julian Date - 50% leaf drop.

2-Yr average soybean variety performance at Rocky Ford in 2002-03.

Variety	Yield	Moisture	Test Weight
	bu/ac	%	lb/bu
DG 3399 + RR	75	7.7	54.8
Triumph TR3752 (RR)	71	7.9	55.8
Garst 3135 (RR)	70	7.7	55.7
Average	**72**	**7.8**	**55.4**

Onion Variety Trial

Mike Bartolo
Frank Schweissing
Arkansas Valley Research Center
Colorado State University

PRODUCTION INFORMATION

Plots - *planted 20' long X 2 rows (3.3') wide. 16" X 24" - 2.5" spacing. Harvest 16' of row. Each plot was replicated four times in the trial.*

Planted *- March 7th , 2003*

Fertilizer *- 104 lbs. P_2O_5/A and 22 lbs N/A as 11-52-0 - preplant. ~ 100 lbs. N/A residual.*

Weed Control *- Prowl 3.3E (1.0 AI/A) + Roundup Ultra (0.75 lbs AI/A) on March 31st*
-Goal 2 (0.25 lbs. AI/A) on May 9th
-Goal 2 (0.25 lbs. AI/A) + Dual II (0.96 lbs AI/A) on June 25th (All ground applications)
-Hand weeded 2 times

Insect Control *- None Applied (low thrips populations were detected)*

Disease Control *- Mancocide (1.5 AI/A) on July 3rd .*

Irrigation *- 11 times (approximately 2" each irrigation)*

Harvest *- September 2nd*

Grade *- November 10th - 12th*

Comments

The 2003 season was one of the hottest ever recorded in the Rocky Ford area. There were 22 days in July that registered 100 ^oF or above. Three days registered 107 ^oF during that period. High temperatures during the bulbing period contributed to lower yields and smaller bulb sizes. Although there was not a shortage of irrigation water, the hot and dry conditions made it difficult to keep the crop from experiencing moisture stress. On a positive note, onions thrips populations were low throughout the season and as a result, the trial did not require any insecticide applications. Disease pressure was low until the end of the season and did not have an influence on bulb quality.

In general, the longer season Spanish varieties like X-202 (Tequilla), X-201 (Mesquite) and SR7009N and SR7008N performed well under the stressful conditions.

Please contact Mike Bartolo at the Arkansas Valley Research Center (719-254-6312) for additional information.

ONION VARIETY TRIAL

Arkansas Valley Research Center
Colorado State University, Rocky Ford, Colorado, 2003

Variety	Source	Maturity (% tops down) 8-19	Colossals ≥ 4" %	Jumbos 3"-4" %	Medium 2¼"-3" %	**C J M CWT/A**	Pre-Pack 1¾"-2¼" %	**Total Market. CWT/A**	Culls %	Total Weight CWT/A
X-202	Waldow	28	0.0	73.2	22.5	**461.4**	1.5	**468.8**	2.6	482.6
SR7009N	Sunseeds	30	0.0	55.6	38.0	**437.3**	5.1	**460.6**	1.1	465.9
SR7008N	Sunseeds	30	0.0	63.8	32.5	**434.5**	3.6	**451.2**	0.0	451.2
Mesquite	D. Palmer	18	0.0	71.8	24.4	**432.4**	2.2	**442.6**	1.3	448.8
Torero	Sunseeds	20	0.0	70.2	25.7	**430.6**	1.7	**437.7**	2.2	446.7
X-201	Waldow	23	0.0	67.2	26.3	**418.5**	2.8	**431.6**	3.5	447.9
Cannonball	Seminis	30	0.0	53.3	40.6	**414.0**	3.6	**430.4**	2.3	440.6
Colorado 6	Burrell	10	1.4	68.9	24.5	**408.7**	3.5	**423.8**	1.6	430.4
Harmony	Cookham	30	0.0	41.9	52.7	**408.7**	3.2	**423.0**	2.0	432.0
Ranchero	Sunseeds	28	0.0	57.7	36.7	**402.2**	3.6	**417.3**	1.9	426.3
Santa Fe	Seminis	30	0.0	64.8	29.9	**403.4**	3.1	**416.1**	2.0	423.8
SR7004ON	Sunseeds	43	0.0	36.0	60.2	**398.1**	3.7	**414.0**	0.0	414.0
Cometa (W)	Sunseeds	40	0.0	49.6	45.6	**392.0**	4.6	**410.8**	0.0	410.8
Colorado 6	Waldow	10	0.0	65.9	24.2	**387.9**	3.9	**404.6**	5.8	430.4
Sweet Perfection	Crookham	40	0.0	55.2	38.9	**384.6**	3.9	**401.0**	1.8	407.9
T-433	Takii	18	0.0	59.8	35.6	**383.4**	3.3	**399.7**	0.0	399.7
Granero	Sunseeds	63	0.0	37.1	58.0	**382.2**	3.9	**397.7**	0.8	401.8
DPSX 1171	D. Palmer	40	0.0	41.9	50.0	**367.9**	4.9	**387.5**	3.0	399.3
Pandero	Sunseeds	30	0.0	24.9	68.6	**364.6**	5.9	**387.1**	0.5	389.5

Variety	*Source*	*Maturity (% tops down) 9-12*	*Colossals ≥ 4" %*	*Jumbos 3"-4" %*	*Medium 2¼"-3" %*	***C J M CWT/A***	*Pre-Pack 1¾"-2¼" %*	***Total Market. CWT/A***	*Culls %*	*Total Weight CWT/A*
OLYS97-24	Crookham	20	0.0	42.7	47.2	**360.5**	5.9	**383.0**	4.0	397.7
Vaquero	Sunseeds	55	0.0	37.5	54.1	**348.3**	6.9	**374.4**	1.4	380.1
Tequilla	D. Palmer	25	0.0	70.3	25.4	**358.1**	2.4	**367.5**	1.8	375.2
Tioga	Seminis	43	0.0	31.6	62.1	**341.8**	6.2	**363.4**	0.0	363.4
Delgado	Bejo	23	0.0	27.2	65.8	**337.7**	5.7	**357.3**	1.0	361.0
DPSX 1172	D. Palmer	43	1.7	33.5	55.0	**320.1**	4.1	**334.8**	5.4	354.8
SR7003ON	Sunseeds	30	0.0	30.3	63.0	**311.5**	6.6	**333.6**	0.0	333.6
Tamara	Bejo	23	0.0	13.1	73.0	**289.1**	13.0	**331.1**	0.7	334.0
Daytona	Bejo	15	0.0	22.7	67.3	**297.7**	9.4	**329.9**	0.4	331.6
OLYX00-23	Crookham	78	0.0	18.7	63.9	**256.0**	17.2	**305.0**	0.0	305.0
SR9000ON	Sunseeds	28	0.0	18.2	68.7	**266.2**	12.3	**303.8**	0.6	305.8
Flare (R)	Seminis	40	0.0	25.9	62.9	**279.0**	7.3	**301.7**	3.8	313.6
Redwing (R)	Bejo	10	0.0	18.7	66.7	**274.0**	7.5	**298.5**	6.9	321.3
BGS 167	Bejo	18	0.0	38.5	55.3	**274.0**	6.0	**290.7**	0.0	290.7
Gladstone (W)	Bejo	38	0.0	25.8	57.1	**246.6**	14.0	**283.0**	2.9	293.2
Blanco Duro (W)	Burrell	45	0.0	15.7	66.1	**235.2**	16.9	**278.9**	1.1	282.5
Gunnison	Bejo	43	0.0	7.6	69.6	**202.5**	20.9	**254.4**	1.7	258.9
Genesis	Crookham	55	0.0	0.0	63.8	**136.3**	35.0	**207.4**	1.0	209.9
OLYH99-2900	Crookham	45	0.0	2.2	74.0	**157.6**	21.6	**197.2**	1.9	200.9
Flamenco	Sunseeds	33	0.0	2.2	67.2	**134.7**	28.1	**191.9**	2.2	196.8
Winston	Bejo	25	0.0	0.0	71.3	**136.8**	26.3	**187.0**	2.2	191.1
DPS 3015 (R)	D. Palmer	90	0.0	5.3	50.3	**80.0**	44.3	**146.6**	0.0	146.6
Red Eyes (R)	Waldow	88	0.0	0.0	56.2	**80.0**	39.2	**135.5**	4.4	141.7
lsd (0.05) =						**65.0**		**60.3**		

2003 Onion – Adjuvant Study October 10, 2003

Dr. Howard F. Schwartz and David H. Gent, Dept. of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, CO 80523-1177

Objective: The objective of this study was to evaluate the effectiveness of various commercially-accepted adjuvants in enhancing the activity of fixed-copper bactericides and EBDC fungicides for management of the onion bacterial disease complex.

Experimental Design: Direct seeded onion plots were established at the Irrigation Research Farm in Yuma with the yellow onion variety 'Vantage'. All treatments were applied in 25 gallons of water per acre with a CO_2 backpack at 32 psi pressure, using Teejet 8002 flat-fan nozzles (2 per bed of 2 onion lines). Plots were one 30" wide row by 30 feet in length. The experiment was a randomized complete block design with 4 replicates. Irrigation was by center pivot and all plots were watered two to three times per week.

The field was furrow irrigated and grown according to standard production practices.

Treatments:	Product/Acre (unless otherwise stated):
1. Untreated Control	
2. NuCop 50 DF + Maneb 75 DF	2.0 lb/A + 2.0 lb/A
3. NuCop 50 DF + Maneb 75 DF+Latron AG-98	2.0 lb/A + 2.0 lb/A + 0.5% (v/v)
4. NuCop 50 DF + Maneb 75 DF+Bond	2.0 lb/A + 2.0 lb/A + 0.25% (v/v)
5. NuCop 50 DF + Maneb 75 DF + Kinetic	2.0 lb/A + 2.0 lb/A + 0.5% (v/v)
6. NuCop 50 DF + Maneb 75 DF +AeroDynamic	2.0 lb/A + 2.0 lb/A + 2.0% (v/v)

Treatment Application Dates:
(1) 13 July
(2) 20 July
(3) 27 July
(4) 3 August
(5) 9 August
(6) 20 August
(7) 23 August
(8) 30 August
(9) 5 September

Plot Inoculations: 10^8/ml bacterial cell suspension of X*anthomonas axonopodis* pv. *allii* strain RO177
(1) 11 August
(2) 18 August

Disease Notes and Evaluations:

7/29/03 Trace Xanthomonas leaf blight observed in plots

8/21/03 First disease evaluation. 5-10% disease intensity in untreated plots

8/29/03 Second disease evaluation. Percent foliage infected or killed from bacterial disease complex and/or phytotoxicity

9/09/03 Third disease evaluation.

9/23/03 Selected plots harvested. Ten bulbs were randomly selected, weighed, and cut open to check for bulb rot.

Results:

Table 1. Yuma Onion Bacterial Complex: Disease and Yield Measurements[1]

Yield (10 bulb weight)

[1] Treatments followed by the same letter are not significantly different at $\alpha = 0.05$.

Treatment	8/21/03	8/29/03	9/9/03	rAUDPC	Yield (lbs/10 bubls)	Bulb rot (%)
1. *Untreated Control*	7.33a	40.50a	46.67ab	0.179a	2.33a	61.3a
2. NuCop 50 DF + Maneb 75DF	6.50a	30.00b	40.00ab	0.143a	3.00a	51.5a
3. NuCop 50 DF + Maneb 75DF + Latron AF-98	5.75a	34.00ab	48.75a	0.162a	.	.
4. NuCop 50 DF + Maneb 75DF + Bond	6.00a	40.50a	50.00a	0.179a	.	.
5. NuCop 50 DF + Maneb 75DF + Kinetic	8.00a	28.00b	33.75b	0.137a	3.00a	45.0a
6. NuCop 50 DF + Maneb 75DF + Aero Dyneamic	8.00a	36.00ab	45.50ab	0.167a	.	.
C.V.%:	*52.78*	*16.94*	*20.52*	*18.92*	*39.30*	*54.11*
Treatment F Value:	*0.55*	*2.05*	*1.37*	*1.07*	*0.77*	*1.12*
Treatment P Value:	*0.80*	*0.11*	*0.28*	*0.44*	*0.61*	*0.45*
LSD:	*5.51*	*8.90*	*13.49*	*0.046*	*2.57*	*2.57*

Discussion:

Phytotoxicity was observed with treatments amended with Kinetic or Areo Dyneamic after two weekly applications. Considerable tip death and leaf scalding was found in all replications of treatments including these adjuvants. No yield reduction was observed with Kinetic compared to the untreated or NuCop 50DF + Maneb 75DF alone. NuCop 50 DF + Maneb 75DF without or with Kinetic significantly reduced the severity of disease late in the season, but Bond treatments were not significantly different from the untreated. No treatment significantly reduced the relative area under the disease progress curve, improved yield, or reduced bulb rot compared to the untreated.

Under high disease pressure, the organosilicone surfactant Kinetic and the no adjuvant treatments provided the best suppression of Xanthomonas leaf blight. In previous years we have observed a significant yield reduction with Kinetic in the absence of disease. A benefit may only be observed from copper bactericides amended with Kinetic when disease pressure is high.

ACKNOWLEDGEMENTS: We gratefully acknowledge partial financial assistance from the CSU Agr. Experiment Station, Arkansas Valley Growers and Shippers Association, and Colorado Onion Association.

2003 Onion-Bacteriophage Efficacy Study **October 28, 2003**

Dr. Howard F. Schwartz, Jillian M. Lang and David H. Gent, Dept. Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, CO 80523-1177

Objective: The objective of this study was to determine efficacy of a bacteriophage for control of Xanthomonas leaf blight caused by *Xanthomonas axonopodis* pv. *allii* compared to the industry standard bactericide Mankocide and in conjunction with Actigard (a plant defense stimulating compound).

Experimental Design: Direct seeded onions were grown at the Irrigation Research Foundation in Yuma, Co and at the Arkansas Valley Research Center in Rocky Ford, CO. In Yuma, the susceptible yellow variety Vantage was used. Plots were 30" wide by 25' in length. All treatments were applied in 25 gallons of water per acre with a CO_2 backpack at 32 psi pressure, using Teejet 8002 flat-fan nozzles (2 per 15" boom). The experiment was set up in randomized complete block design with 4 replications. The field was irrigated by center pivot 2 to 3 times per week.

In Rocky Ford, another susceptible variety of yellow onion, "X202," was directly planted. Plots were 40" wide by 25' in length. All treatments were applied in 25 gallons per acre water at 32 psi with Teejet 8002 flat-fan nozzles (3 per bed of 2 onion lines). This experiment was also set up in randomized complete block design with 4 replications. The field was furrow irrigated once a week.

Experiment Protocol:

Treatments:	Product/Acre (unless otherwise stated):
Untreated Control	--
ManKocide + Latron AG-98	3 lb/A + 0.25% v/v
Xaa Bacteriophage + Casecrete + PGCF + Sucrose	10^8pfu/ml + 0.5% + 0.5% + 0.25%
Xaa Bacteriophage + Casecrete + PGCF + Sucrose (Sprays 1, 3, 5, 7, 9, 11)	10^8pfu/ml + 0.5% + 0.5% + 0.25%
ManKocide (Sprays 2, 4, 6, 8, 10, 12)	3 lb/A
Xaa Bacteriophage + Actigard (Sprays 1 and 2)	10^8 pfu/ml + 0.5% + 0.5% + 0.25% 0.75 oz/A

Treatment Application Dates:

Yuma	Rocky Ford
(1) 28 July	(1) 28 July
(2) 31 July	(2) 31 July
(3) 4 August	(3) 4 August
(4) 7 August	(4) 7 August
(5) 11 August	(5) 11 August
(6) 14 August	(6) 14 August
(7) 18 August	(7) 18 August
(8) 21 August	(8) 21 August
(9) 25 August	(9) 25 August
(10) 28 August	(10) 28 August
(11) 1 September	
(12) 4 September	

Plot Inoculations: 10^8cfu/ml *Xanthomonas axonopodis* pv.*allii* strain RO177

Yuma	Rocky Ford
(1) 11 August	(1) 12 August
(2) 18 August	(2) 19 August

Disease Notes and Evaluations:

8/21/03	Rocky Ford, first disease evaluation
8/29/03	Yuma, first disease evaluation.
8/30/03	Rocky Ford, second disease evaluation
9/4/03	Rocky Ford, 10' length harvested and sorted to market class
9/9/03	Yuma, second disease evaluation

Results: Disease severity ratings and relative area under the disease progress curve and yield data are presented for Yuma and Rocky Ford in Tables 1 and 2, respectively. At Yuma, all treatments significantly suppressed leaf blight except the bacteriophage + ManKocide in the second disease evaluation. In the first disease evaluation, treatments of the bacteriophage alone and with Actigard significantly reduced disease severity. The rAUDPC was significantly reduced by all treatments compared to the untreated, but weren't significantly different from each other.

At Rocky Ford, all treatments significantly reduced leaf blight compared to the untreated in both the first and second disease evaluations. Again, the rAUDPC was significantly reduced, but treatments were not significantly different from each other. Total yield was not affected by any treatment. The bacteriophage alone or with Actigard significantly decreased medium sized bulbs, while increasing jumbo onion yield.

Table 1. Xanthomonas leaf blight suppression at Yuma.

	Disease Severity		
Treatment	**8/29**	**9/9**	**rAUDPC**
1. Untreated control	30.0a	51.3a	0.26a
2. ManKocide + Latron AG-98	20.0ab	36.3b	0.18b
3. Bacteriophage	18.0b	38.8b	0.17b
4. Bacteriophage (Sprays 1,3,5,7,9,11) ManKocide (Sprays 2,4,6,8,10,12)	19.0ab	40.0ab	0.18b
5. Bacteriophage + Actigard (Sprays 1,2)	13.0b	32.5b	0.13b
CV%:	*35.73*	*19.18*	*26.11*
Treatment F:	*1.78*	*2.52*	*2.15*
Treatment P:	*0.18*	*0.08*	*0.12*
$LSD_{.05}$:	*11.01*	*11.75*	*0.073*

Table 2. Xanthomonas leaf blight suppression and yield at Rocky Ford.

	Disease Severity			Yield (cwt/A)		
Treatment	**8/21**	**8/30**	**rAUDPC**	**Medium**	**Jumbo**	**Total**
1. Untreated control	20.0a	43.8a	0.19a	92.3a	143.3b	246.7a
2. ManKocide + Latron AG-98	12.0b	34.0b	0.13b	79.8ab	180.6ab	276.8a
3. Bacteriophage	14.0b	36.0b	0.14b	45.2b	184.5ab	233.0a
4. Bacteriophage (Sprays 1,3,5,7,9,11) ManKocide (Sprays 2,4,6,8,10,12)	13.0b	34.0b	0.13b	60.2ab	200.9a	287.3a
5. Bacteriophage + Actigard (Sprays 1,2)	11.0b	29.5b	0.11b	45.8b	197.6a	251.9a
CV%:	*26.47*	*13.09*	*18.01*	*42.98*	*16.16*	*21.47*
Treatment F:	*2.11*	*2.98*	*2.91*	*4.33*	*1.75*	*0.74*
Treatment P:	*0.12*	*0.05*	*0.05*	*0.01*	*0.19*	*0.65*
$LSD_{.05}$:	*5.71*	*7.15*	*0.039*	*42.8*	*45.2*	*85.7*

Acknowledgements: We gratefully acknowledge the cooperation and assistance of Mike Bartolo and Frank Schweissing at Rocky Ford and IRF staff. Partial financial assistance from the Colorado State University Agricultural Experiment Station, Arkansas Valley Growers and Shippers Association and Colorado Onion Association is also acknowledged and appreciated.

2003 Onion – Bactericide Screening Study October 10, 2003

Dr. Howard F. Schwartz and David H. Gent, Dept. of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, CO 80523-1177

Objective: The objective of this study was to evaluate the effectiveness of various fungicides and bactericides in controlling the primary bacterial diseases in Colorado, including Xanthomonas Leaf Blight (*Xanthomonas campestris*), Sour Skin (*Burkholderia cepacia)*, Slippery Skin *(B. gladioli* pv. *alliicola*), Bacterial Soft Rot (*Erwinia carotovora* subsp. *carotovora*), and Pantoea blight/Soft Rot (*Pantoea anaatas*).

Experimental Design: Direct seeded onion plots were established at the Irrigation Research Foundation in Yuma with the yellow onion variety 'Vantage'. All treatments were applied in 25 gallons of water per acre with a CO_2 backpack at 32 psi pressure, using Teejet 8002 flat-fan nozzles (2 per bed of 2 onion lines). Plots were 1 rows 30" wide by 25 feet in length with an untreated spreader row separating each treatment. The experiment was a randomized complete block design with 4 replicates. The field was irrigated by center pivot 2 to 3 times weekly.

This study was replicated at the Arkansas Valley Research Center in Rocky Ford with the yellow variety 'X202'. Plots at this site were 40" wide by 25 feet in length, separated by a single untreated spreader row. All treatments were applied in 25 gallons per acre water at 32 psi with 8002 flat-fan nozzles (3 per bed of 2 onion lines). The experiment was a randomized complete block design with 4 replicates. The field was furrow irrigated once weekly.

Both fields were grown according to standard production practices.

Rocky Ford and Yuma Protocol:

Treatments:	Product/Acre (unless otherwise stated):
1. Untreated Control	--
2. Dithane DF + Kocide 2000 Protech	3.36 lb/A + 1.5 lb/A
3. Cuprofix MZ DF	7.25 lb/A
4. NuCop 50 DF + Dithane DF + Latron	2 lb/A + 3.36lb/A + 0.5% (v/v)
5. NuCop 3L + Dithane DF + Latron	2.67 pt/A + 3.36lb/A + 0.5%(v/v)
6. FeCl*6H_20 + Kocide 2000	22.9 g/A + 2 lb/A
7. FeCl*6H_20	22.9 g/A
8. ManKocide	3 lbs/A
9. Apogee	8 oz/A

Treatment Application Dates:

Yuma	Rocky Ford
(1) 13 July	(1) 1 July
(2) 20 July	(2) 8 July
(3) 27 July	(3) 16 July
(4) 3 August	(4) 23 July
(5) 9 August	(5) 30 July
(6) 20 August	(6) 6 August
(7) 23 August	(7) 14 August
(8) 30 August	(8) 20 August
(9) 5 September	(9) 27 August

Plot Inoculations: 10^8cfu/ml *Xanthomonas axonopodis* pv. *allii* strain RO177

Yuma	Rocky Ford
(1) 11 August	(1) 5 August
(2) 18 August	(2) 12 August
	(3) 19 August

Disease Notes and Evaluations:

8/21/03	Rocky Ford, first disease evaluation. Percent foliage infected or killed from bacterial disease complex and/or phytotoxicity
8/22/03	Yuma, first disease evaluation.
8/29/03	Yuma, second disease evaluation
8/30/03	Rocky Ford, second disease evaluation
9/04/03	Rocky Ford, 10' length harvested and sorted to market class
9/09/03	Yuma, third disease evaluation
9/23/03	Yuma, 10 bulbs harvested, weighed, and bulb rot incidence checked

Results: Disease intensity ratings and relative area under the disease progress curve are presented for Yuma and Rocky Ford in Tables 1 and 2, respectively.

At Yuma, all treatments except Apogee and FeCl alone provided significant disease suppression at the second and third disease evaluations. NuCop 3L + Dithane DF + Latron AG-98 was not different from the untreated on the third disease evaluation. The rAUPDC was reduced by all treatments except Apogee and FeCl. NuCop 50 DF + Dithane DF + Latron AG-98 suppressed disease better than NuCop 3L + Dithane DF + Latron AG-98.

Foliar disease suppression was not related to yield in this study. No treatment reduced bulb rot.

At Rocky Ford, all treatments except Apogee or FeCl reduced disease compared to the untreated. No differences were noted among copper treatments. Yields were highly variable within the field and differences were not associated with efficacy of treatments.

Table 1. Yuma disease evaluations, relative area under the disease progress curve, yield, and bulb rot.

	Disease Intensity (%)				Yield (lbs/10 bulbs)	Bulb Rot (%)
Treatments	**8/22/03**	**8/29/03**	**9/9/03**	**rAUDPC**		
1. Untreated Control	3.75bc	38.00a	50.00a	0.16a	8.10b	27.5a
2. Dithane DF + Kocide 2000 Protech	2.00d	24.00b	33.33d	0.10bc	8.35ab	16.6a
3. Cuprofix MZ DF	2.58bcd	24.00b	35.50cd	0.11bc	9.00ab	23.3a
4. NuCop 50 DF + Dithane DF + Latron	2.75bcd	14.50c	33.33d	0.09c	6.27c	20.0a
5. NuCop 3L + Dithane DF + Latron	3.00bcd	21.25bc	45.00abc	0.12b	9.33a	16.7a
6. FeCl*6H20 + Kocide 2000	2.25cd	20.00bc	37.50cd	0.10bc	.	.
7. FeCl*6H20	6.50a	42.50a	48.75a	0.18a	.	.
8. ManKocide	2.33cd	24.00b	38.75bcd	0.11bc	8.33ab	36.7a
9. Apogee	6.50a	43.75a	47.50ab	0.17a	.	.
C.V.%:	*34.75*	*21.82*	*15.90*	*16.04*	*8.59*	*57.36*
Treatment F Value:	*5.09*	*8.98*	*4.60*	*9.48*	*5.80*	*1.61*
Treatment P Value:	*0.0004*	*<0.0001*	*0.0009*	*<0.0001*	*0.0017*	*0.1998*
$LSD_{.05}$:	*1.64*	*8.91*	*9.53*	*0.029*	*1.09*	*2.13*

Table 2. Rocky Ford disease evaluations, relative area under the disease progress curve, and yield.

Treatments	Disease Intensity (%)			Yield (CWT/A)		
	8/21/03	**8/30/03**	**rAUPDC**	**Medium**	**Jumbo**	**Total**
1. Untreated Control	19.00a	50.00a	0.165a	62.8ed	179.3cd	248.7c
2. Dithane DF + Kocide 2000 Protech	13.50ab	36.00cd	0.118bc	65.4ed	179.9cd	250.0c
3. Cuprofix MZ DF	13.00ab	32.00d	0.110bc	86.4bcd	203.2bc	295.8b
4. NuCop 50 DF + Dithane DF + Latron	13.00ab	34.00d	0.113bc	79.2cd	159.0d	246.0c
5. NuCop 3L + Dithane DF + Latron	16.00ab	38.00bcd	0.133abc	115.2abc	178.6cd	301.7b
6. FeCl*6H20 + Kocide 2000	15.00ab	36.00cd	0.126abc	18.3e	111.2e	133.5d
7. FeCl*6H20	16.00ab	45.00ab	0.143ab	145.3a	250.0a	402.4a
8. ManKocide	11.00b	32.00d	0.100c	142.0a	227.2ab	375.6a
9. Apogee	15.00ab	42.50abc	0.135abc	133.5ab	233.6ab	373.0a
C.V.%:	*33.71*	*14.39*	*23.34*	*35.69*	*15.14*	*10.59*
Treatment F Value:	*0.69*	*4.04*	*1.32*	*6.88*	*7.09*	*22.32*
Treatment P Value:	*0.73*	*0.0021*	*0.27*	*<0.0001*	*<0.0001*	*<0.0001*
$LSD_{.05}$:	*7.19*	*8.06*	*0.043*	*3.75*	*3.23*	*3.45*

ACKNOWLEDGEMENTS: We gratefully acknowledge the assistance of Kris Otto & Jill Lang, Mike Bartolo & Frank Schweissing at Rocky Ford, ARDEC and IRF staff. Partial financial assistance from the CSU Agr. Experiment Station, Arkansas Valley Growers and Shippers Association, Colorado Onion Association, Cerexagri, Griffin and MicroFlo Company is also acknowledged and appreciated.

2003 Onion – Fungicide Screening Study **December 18, 2003**

Dr. Howard F. Schwartz, David H. Gent and Kris Otto, Dept. of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, CO 80523-1177

Objective: The objective of this study was to evaluate the effectiveness of various fungicides in managing the primary foliar and storage fungal pathogens of onion in Colorado, including Downy Mildew (*Peronospora destructor*), Botrytis Blast/Neck Rot (*Botrytis alli*), Purple Blotch (*Alternaria porri*), Blue Mold (*Penicillium* species) and Black Mold (*Aspergillus niger*).

Experimental Design: Direct seeded onion plots were established at the Irrigation Research Foundation in Yuma with the yellow onion variety 'Vantage'. All treatments were applied in 25 gallons of water per acre with a CO_2 backpack at 32 psi pressure, using Teejet 8002 flat-fan nozzles (2 per bed of 2 onion lines). Plots were one row 30" wide by 25 feet in length with an untreated spreader row separating each treatment. The experiment was a randomized complete block design with 4 replicates.

Several treatments in this study were duplicated at the Arkansas Valley Research Center in Rocky Ford with the yellow variety 'X202'. Plots at this site were 40" wide by 25 feet in length, separated by a single untreated spreader row. All treatments were applied in 25 gallons per acre water at 32 psi with 8002 flat-fan nozzles (3 per bed of 2 onion lines). The experiment was a randomized complete block design with 4 replicates. Both fields were furrow irrigated and grown according to local recommendations.

Treatments:		Product/Acre (unless otherwise stated):
1. Control A		--
2. Bravo Ultrex 82.5 WG		2500 g a.i. / Ha
3. NuCop 50DF + Dithane DF + Latron		2 lb + 3.36 lb + 0.25%
4a. NuCop 50DF + Dithane DF + Latron Spray 1-4		2 lb + 3.36 lb + 0.25%
4b. NuCop 50DF + Dithane DF + Iprodione (generic) + Latron Spray 5 & 6		2 lb + 3.36 lb + 1.5 lb + 0.25%
5a. NuCop 50DF + Dithane DF + Actigard + Latron Spray 1 & 2		2 lb + 3.36 lb + 0.75 oz + 0.25%
5b. NuCop 50DF + Dithane DF + Latron Spray 3-6		2 lb + 3.36 lb + 0.25%
6a. NuCop 50DF + Dithane DF + Actigard + Latron Spray 1 & 2		2 lb + 3.36 lb + 0.75 oz + 0.25%
6b. NuCop 50DF + Dithane DF + Latron Spray 3 & 4		2 lb + 3.36 lb + 0.25%
6c. NuCop 50DF + Dithane DF + Iprodione (generic) + Latron Spray 5 & 6		2 lb + 3.36 lb + 1.5 lb + 0.25%
7a. Cabrio 500EG Spray 1,3 & 5		9 oz
7b. NuCop 50DF + Dithane DF + Latron Spray 2,4 & 6		2 lb + 3.36 lb + 0.25%
8a. Pristine 516 Spray 1,3 & 5		15 oz
8b. NuCop 50DF + Dithane DF + Latron Spray 2,4 & 6		2 lb + 3.36 lb + 0.25%
9a. Pristine 516 + Latron Spray 1,3 & 5		15 oz + 0.25%
9b. NuCop 50DF + Dithane DF + Latron Spray 2,4 & 6		2 lb + 3.36 lb + 0.25%
10. Scala 60SC		800 g a.i./Ha
11. Scala 60 SC + Bravo Ultrex 82.5 WG		800 g a.i./Ha + 1300 g a.i./Ha
12. Acrobat 50W + Maneb (IR-4)		0.2 lb a.i. + 2 lb
13. Acrobat MZ (IR-4)		2.25 lb
14. Control B		--

Application Dates:		Plot Inoculations: 10^8 conidia/ml suspension of *Botrytis alli* and *Alternaria porri*	
Rocky Ford	Yuma	Rocky Ford	ARDEC
(1) 7/15/03 (2) 7/21/03 (3) 7/29/03 (4) 8/05/03 (5) 8/12/03 (6) 8/21/03	(1) 7/28/03 (2) 8/04/03 (3) 8/11/03 (4) 8/18/03 (5) 8/24/03 (6) 8/29/03	(1) 7/29/03 (2) 8/5/03	(1) 8/04/03 (2) 8/11/03

Disease Notes and Evaluations:

8/21/03 First disease evaluation, 10 to 20% Xanthomonas leaf blight intensity in untreated plots

8/30/03 Second disease evaluation,30 to 50% Xanthomonas leaf blight intensity in untreated plots

9/04/03 Rocky Ford, plots harvested, 20 bulbs from each plot were collected and stored for later storage rot evaluation

9/22/03 Yuma, 10 bulbs from each plot were collected and stored for storage rot evaluation

12/18/03 Storage rot evaluation made by examining each split bulb (basal plate to neck) for evidence of infection by Botrytis or other storage rot pathogens

Results: Foliar fungal diseases (i.e., downy milder, purple blotch, or botrytis blast) were not present at either location in the field, but a moderate to severe epidemic of Xanthomonas leaf blight did occur at Rocky Ford. Differences were observed among treatments and disease intensity notes are present for Xanthomonas leaf blight in Table 1. Treatment efficacy generally fell into three groups: those not different from the untreated control (treatments 1,2, and 9-14), those not different from copper + EBDC (treatments 3,4,7 and 8), and treatments superior to copper + EBDC alone (treatments 5 and 6). These groups were generally present throughout the entire season. The best treatments for suppressing Xanthomonas leaf blight were copper + EBDC programs with Actigard.

Efficacy of disease suppression generally did not correspond with yield in this study, but treatment 4 did yield 96 cwt/A more than the untreated. Treatments 5 and 6 yielded 33 and 39 cwt/A more than the untreated, respectively.

Discussion: Treatments that did not include copper-based bactericides tank-mixed with EBDC fungicide did not provide any suppression of Xanthomonas leaf blight, a disease caused by a bacterium. Treatments that included a copper + EBDC every 14 days provided some disease suppression, but the best treatments were copper + EBDC treatments applied every 7 days with Actigard.

Storage rot, primarily by Botrytis neck rot, ranged only from 2.5 – 22.5% at Yuma; while there was only trace disease at Rocky Ford. The low pressure was apparently due to the hot dry conditions which persisted during the late part of the season when plants were inoculated in the field. The following treatments at Yuma had less disease than the untreated control 1, 2 & 5 (10%): 9 (2.5%); 7 & 8 (5.0%); 10, 11 & 14 (7.5%). The following had more disease: 12 – IR4 (12.5%); 3 & 13 – IR4 (17.5%); 4 & 6 (22.5%). Additional research is warranted to verify storage rot value of these fungicides.

ACKNOWLEDGEMENTS: We gratefully acknowledge the assistance of Mike Bartolo and Frank Schweissing at Rocky Ford and IRF staff. Partial financial assistance from the CSU Agr. Experiment Station, Arkansas Valley Growers and Shippers Association, Colorado Onion Association, IR-4 Program, MicroFlo, Bayer, and Syngenta Crop Protection and BASF is also acknowledged and appreciated.

Table 1. Xanthomonas leaf blight disease intensity, relative area under the disease progress curve, and yield of treatments at Rocky Ford.

	Disease Intensity (%)			Yield (cwt/A)		
Treatments	**8/21/03**	**8/30/03**	**rAUDPC**	**Medium**	**Jumbo**	**Total**
1.	16.00a	40.50a	0.137a	85.7bcde	144.6e	239.4eghi
2.	13.00ab	34.00ab	0.113a	122.4ab	148.5de	280.0efg
3.	7.00c	21.25cd	0.113a	55.0def	184.5bcde	248.6fghfi
4.	5.50cd	28.00bc	0.067b	113.5abc	207.4bcd	335.6cd
5.	2.50d	10.00e	0.027c	48.4ef	217.2b	272.1efg
6.	2.25d	18.00de	0.037c	88.3bcde	173.4bcde	278.0efg
7.	8.00c	22.00cd	0.071b	94.2bcd	211.3bc	316.0de
8.	7.00c	20.00cd	0.068b	73.3cdef	173.4bcde	264.9efghi
9.	12.00ab	34.00ab	0.108a	54.3def	155.0cde	216.5i
10.	14.00ab	40.50a	0.127a	96.2bcd	194.3bcde	298.3def
11.	12.00b	42.50a	0.119a	32.1f	187.8bcde	224.4hi
12.	14.00ab	42.50a	0.129a	122.4ab	292.4a	430.5a
13.	15.00ab	43.00a	0.135a	153.1a	232.9ab	403.6ab
14.	14.00ab	38.50a	0.119a	127.6ab	230.9b	371.6bc
%CV:	*27.44*	*21.64*	*20.96*	*35.24*	*21.68*	*12.39*
Treatment F Value:	*8.91*	*9.07*	*10.76*	*4.71*	*3.20*	*10.72*
Treatment P Value:	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*0.0015*	*<0.0001*
$LSD_{.05}$:	*3.98*	*9.61*	*0.03*	*45.6*	*61.0*	*52.9*

Treatments followed by the same letter are not significantly different ($LSD_{.05}$)

2003 Onion – Bactericide Spray Timing Study October 9, 2003

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Objective: The objective of this study was to evaluate spray timing and tank mixes of Kocide with varying rates of Maneb for Xanthomonas Leaf Blight (*Xanthomonas axonopodis* pv. *allii*) suppression.

Experimental Design: This study was conducted at the Arkansas Valley Research Center in Rocky Ford with the yellow variety 'X202'. Plots at this site were 40" wide by 60 feet in length, separated by a single untreated spreader row. All treatments were applied in 25 gallons per acre water at 32 psi with 8002 flat-fan nozzles (2 per bed of 2 onion lines). The experiment was a randomized split-block design with 4 replicates. The main plot received 1.5 lb/A Kocide 2000 and the subplots, each 15 feet in length, received 0.5, 1.0, or 2.0 lb/A Maneb 75 DF. Sprays programs were initiated on a weekly staggered schedule that began 4 weeks pre-bulbing to 2 weeks post-bulbing. The field was furrow irrigated and grown according to local recommendations.

Spray Protocol:

Table 1. Treatment application dates.

Treatments	**Treatment Application Dates**									
	6/15	**6/19**	**6/28**	**7/7**	**7/15**	**7/21**	**7/28**	**8/5**	**8/12**	**Total Sprays**
1. Untreated Control (Maneb only)*					x	x	x	x	x	5
2. 4 weeks pre-bulb	x	x	x	x	x	x	x	x	x	9
3. 3 weeks pre-bulb		x	x	x	x	x	x	x	x	8
4. 2 weeks pre-bulb			x	x	x	x	x	x	x	7
5. 1 week pre-bulb				x	x	x	x	x	x	6
6. Bulbing					x	x	x	x	x	5
7. 1 week post-bulb						x	x	x	x	4
8. 2 week post-bulb							x	x	x	3

*Treatments 2 to 8 included Kocide 2000 at 1.5 lb/A

Results: A naturally-occurring late season epidemic of Xanthomonas leaf blight allowed for a season final evaluation of disease severity. Yields were not expected to differ among treatments and were not estimated. The timing of sprays affected disease severity, but not the rate of Maneb 75 DF added to the tank-mix. All spray programs that incorporated Kocide 2000 reduced disease, but sprays applied two weeks pre-bulbing were significantly better than sprays initiated after bulb initiation. However, the two week pre-bulbing applications were no different than a spray beginning 3 or 4 weeks before bulbing.

This study confirms previous work that sprays initiated earlier in the season provide better disease suppression, but sprays applied more than 2 week before bulbing contribute little to Xanthomonas leaf blight control. There was less disease in plots treated with Kocide tank-mixed with any rate of Maneb. Maneb or other EBDC fungicide tank-mixes will also provide fungal disease suppression and improve Kocide efficacy if copper resistant strains of bacteria are present.

Table 2. Significance of spray timing, Maneb rate, their interaction.

Variable	**F Value**	***P*>F**	**Variable**	**F Value**	***P*>F**
Timing	8.68	<0.0001	Maneb Rate	0.59	0.62
Replication	7.38	0.0013	Timing x Rate	1.21	0.27

ACKNOWLEDGEMENTS: We gratefully acknowledge the assistance of Mike Bartolo and Frank Schweissing at Rocky Ford and financial support from the COA and CSU Agricultural Experiment Station.

Table 3. Spray timing effect on disease control

Treatment Spray Timing*	**Final Disease Intensity (%)**
1. Untreated Control (Maneb only)	10.42a
2. 4 weeks pre-bulb	2.46d
3. 3 weeks pre-bulb	4.75bcd
4. 2 weeks pre-bulb	2.52d
5. 1 week pre-bulb	5.11b
6. Bulbing	4.96b
7. 1 week post-bulb	4.83bc
8. 2 week post-bulb	5.04b
F Value:	*7.38*
P Value:	*0.0013*
$LSD_{.05}$:	*2.35*

Table 4. The Maneb effect on disease control.

Treatment (Maneb rate/application)	**Final Disease Intensity (%)**
1. 0 lb	5.58a
2. 0.5 lb	4.48a
3. 1.0 lb	5.04a
4. 2.0 lb	4.94a
%CV:	*57.51*
F Value:	*0.59*
P Value:	*0.62*
$LSD_{.05}$:	*1.66*

Table 5. Summary of spray program efficacy and costs.

Timing of Kocide 2000 Sprays	**Maneb Rate(lbs/A)**	**Final Disease Intensity (%)**	**Total Sprays**	**Pounds of Fungicide**	**Cost of Spray Program**	**Cost/acre/1% disease reduction**
1. Untreated	0	12.7	0	0	$0.00	..
2. 4 weeks pre-bulb	0	2.5	9	13.5	$16.25	$0.20
3. 3 weeks pre-bulb	0	5.3	8	12	$29.25	$0.50
4. 2 weeks pre-bulb	0	3.8	7	10.5	$26.00	$0.37
5. 1 week pre-bulb	0	5.2	6	9	$22.75	$0.39
6. Bulbing	0	5.5	5	7.5	$19.50	$0.34
7. 1 week post-bulb	0	2.7	4	6	$16.25	$0.21
8. 2 week post-bulb	0	7.0	3	4.5	$13.00	$0.29
1. Maneb only	0.5	8.3	5	2.5	$25.78	..
2. 4 weeks pre-bulb	0.5	2.0	9	18	$46.40	$0.55
3. 3 weeks pre-bulb	0.5	6.0	8	16	$41.24	$0.78
4. 2 weeks pre-bulb	0.5	1.6	7	14	$36.09	$0.41
5. 1 week pre-bulb	0.5	3.3	6	12	$30.93	$0.42
6. Bulbing	0.5	3.3	5	10	$25.78	$0.35
7. 1 week post-bulb	0.5	7.3	4	8	$20.62	$0.48
8. 2 week post-bulb	0.5	4.0	3	6	$15.47	$0.23
1. Maneb only	1.0	12.0	5	5	$35.30	..
2. 4 weeks pre-bulb	1.0	2.3	9	22.5	$63.54	$0.78
3. 3 weeks pre-bulb	1.0	2.3	8	20	$56.48	$0.69
4. 2 weeks pre-bulb	1.0	2.0	7	17.5	$49.42	$0.59
5. 1 week pre-bulb	1.0	8.7	6	15	$42.36	$1.34
6. Bulbing	1.0	3.3	5	12.5	$35.30	$0.48
7. 1 week post-bulb	1.0	4.7	4	10	$28.24	$0.45
8. 2 week post-bulb	1.0	5.0	3	7.5	$21.18	$0.35
1. Maneb only	2.0	8.7	5	10	$54.35	..
2. 4 weeks pre-bulb	2.0	3.0	9	27	$97.83	$1.28
3. 3 weeks pre-bulb	2.0	5.3	8	24	$86.96	$1.49
4. 2 weeks pre-bulb	2.0	2.7	7	21	$76.09	$0.97
5. 1 week pre-bulb	2.0	3.3	6	18	$65.22	$0.88
6. Bulbing	2.0	7.7	5	15	$54.35	$1.38
7. 1 week post-bulb	2.0	4.7	4	12	$43.48	$0.69
8. 2 week post-bulb	2.0	4.2	3	9	$32.61	$0.49
Treatment F:	*0.59*	*7.38*	…	…	…	…
Treatment P:	*0.63*	*0.0013*	…	…	…	…
$LSD_{.05}$:	*1.663*	*2.352*	…	…	…	…

Application Timing and Crop Safety of Outlook

Colorado State University – Weed Science

Project Code: ONIO013 **Location: Rocky Ford, CO** **Cooperator:** COA

Site Description

Crop: Onions	**Variety:**	**Planting Date:** 03/15/03
Weed Species Present:		**Irrigation Type:** Furrow
Plot Width: **6.7 feet**	Plot Length: **30 feet**	Replications: **4**

Soil Description

Texture	% OM	% Sand	% Silt	%Clay	pH	CEC
Silty Clay Loam	**2.2**				**7.5**	

Application Information

	A	B	C	D
Application Date	03/31/03	04/15/03	05/03/03	05/15/03
Time of Day	4:00 am	8:00 am	2:00 pm	2:00 pm
Application Method	Broadcast	Broadcast	Broadcast	Broadcast
Application Timing	PRE	Loop/Flag	1 Leaf	2 Leaf
Air Temp (F)	75	54	77	76
Soil Temp (F)	58	47	60	59
Relative Humidity (%)	11	67	42	34
Wind Velocity (mph/dir.)	3.0	5 E	4.0	3.4

Application Equipment

	Sprayer Type	Speed (mph)	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	GPA	PSI
A.	Backpack	3	Flat Fan	11002	20”	20”	6.7’	20	30
B.	Backpack	3	Flat Fan	11002	20”	20”	6.7’	20	30
C.	Backpack	3	Flat Fan	11002	20”	20”	6.7’	20	30
D.	Backpack	3	Flat Fan	11002	20”	20”	6.7’	20	30

Summary Comments

The purpose of this field trial and a similar study located near Brighton was to continue to evaluate the crop safety of Outlook. Outlook will have a label in the next year or two that will allow for a single application when onions have at least 2 true leaves. For several years PRE, loop, flag and 1 lf applications have been evaluated to determine if Outlook could be used safely earlier in the growing season. The time period between emergence and the 2 lf applications allow for the emergence of a large number of broadleaf weeds. Outlook application shortly after emergence would provide significant weed control during this critical period.

The second field site near Brighton provides some indication of the potential for crop injury even though there are very few significant differences in stand counts, onion injury or yield. The 2x rate applied at the loop/flag leaf stage showed a significant reduction in total yield compared to later applications. While the normal field rate appeared to be safe both locations this level of crop response suggests that under the right conditions significant injury could occur. It will take more field evaluations to convince BASF that early application of Outlook would be safe under Colorado conditions.

Colorado State University

Application Timing and Crop Safety to Outlook in Onions
-Rating Data-

Trial ID: ONIO013 Study Dir.: Dr. Scott Nissen
Location: Rocky Ford, CO Cooperator: COA

Trt No	Treatment Name	Rate	Rate Unit	Appl Code	ALLCE Stand # Plants 10' Row May-29-03 4 Leaf		ALLCE Injury % May-29-03 4 Leaf		KCHSC Control % May-29-03 10-18"		AMARE Control % May-29-03 2-12"		POROL Control % May-29-03 Rosets4-6"	
1	Untreated				39	c	4	cd	0	d	0	e	0	f
2	Handweeded				54	ab	3	d	100	a	98	a	93	a
3	Roundup Ultra	0.75	LB A/A	A	52	abc	6	a-d	93	abc	85	bcd	78	cde
	Prowl	0.99	LB A/A	A										
4	Roundup Ultra	0.75	LB A/A	A	54	ab	7	a-d	94	abc	94	ab	89	abc
	Outlook	0.656	LB A/A	A										
5	Roundup Ultra	0.75	LB A/A	A	52	ab	6	a-d	96	ab	94	ab	89	abc
	Outlook	1.31	LB A/A	A										
6	Roundup Ultra	0.75	LB A/A	A	53	ab	7	abc	96	a	89	abc	81	bcd
	Prowl	0.99	LB A/A	A										
	Outlook	0.656	LB A/A	B										
7	Roundup Ultra	0.75	LB A/A	A	56	a	4	cd	96	a	78	d	79	cde
	Prowl	0.99	LB A/A	A										
	Outlook	1.31	LB A/A	B										
8	Roundup Ultra	0.75	LB A/A	A	50	abc	7	abc	85	bc	79	cd	69	e
	Prowl	0.99	LB A/A	A										
	Outlook	0.656	LB A/A	C										
9	Roundup Ultra	0.75	LB A/A	A	42	bc	9	ab	84	c	88	a-d	78	cde
	Prowl	0.99	LB A/A	A										
	Outlook	1.31	LB A/A	C										
10	Roundup Ultra	0.75	LB A/A	A	51	abc	9	a	100	a	88	a-d	83	a-d
	Prowl	0.99	LB A/A	A										
	Outlook	0.656	LB A/A	D										
11	Roundup Ultra	0.75	LB A/A	A	48	abc	6	a-d	94	abc	88	a-d	76	de
	Prowl	0.99	LB A/A	A										
	Outlook	1.31	LB A/A	D										
12	Roundup Ultra	0.75	LB A/A	A	54	ab	5	bcd	93	abc	95	ab	91	ab
	Outlook	0.49	LB A/A	A										
	Outlook	0.49	LB A/A	D										
LSD (P=.05)						13.0		3.6		10.6		11.4		11.3
Standard Deviation						9.0		2.5		7.3		7.9		7.8
CV						17.96		42.09		8.51		9.69		10.39

Means followed by same letter do not significantly differ (P=.05, LSD)

Colorado State University

Application Timing and Crop Safety to Outlook in Onions
-Segregated Yield-

Trial ID: ONIO013 Study Dir.: Dr. Scott Nissen
Location: Rocky Ford, CO Cooperator: COA

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	ALLCE Cols & Jum Yield Wt Lbs/Acre Sep-02-03		ALLCE Medium Yield Wt Lbs/Acre Sep-02-03		ALLCE Prepak Yield Wt Lbs/Acre Sep-02-03		ALLCE Culls Yield Wt Lbs/Acre Sep-02-03	
1	Untreated				0	c	0	c	0	d	0	c
2	Handweeded				20336	ab	11261	ab	1114	ab	1196	abc
3	Roundup Ultra	0.75	LB A/A	A	20790	ab	11303	ab	1031	ab	949	abc
	Prowl	0.99	LB A/A	A								
4	Roundup Ultra	0.75	LB A/A	A	25328	ab	11550	ab	289	cd	1609	ab
	Outlook	0.656	LB A/A	A								
5	Roundup Ultra	0.75	LB A/A	A	19718	ab	9694	ab	949	ab	784	abc
	Outlook	1.31	LB A/A	A								
6	Roundup Ultra	0.75	LB A/A	A	23801	ab	9446	ab	619	bc	1485	ab
	Prowl	0.99	LB A/A	A								
	Outlook	0.656	LB A/A	B								
7	Roundup Ultra	0.75	LB A/A	A	16995	ab	13530	a	1031	ab	1155	abc
	Prowl	0.99	LB A/A	A								
	Outlook	1.31	LB A/A	B								
8	Roundup Ultra	0.75	LB A/A	A	12664	bc	10849	ab	1279	a	743	abc
	Prowl	0.99	LB A/A	A								
	Outlook	0.656	LB A/A	C								
9	Roundup Ultra	0.75	LB A/A	A	23224	ab	7631	b	990	ab	1073	abc
	Prowl	0.99	LB A/A	A								
	Outlook	1.31	LB A/A	C								
10	Roundup Ultra	0.75	LB A/A	A	27514	a	10560	ab	949	ab	371	bc
	Prowl	0.99	LB A/A	A								
	Outlook	0.656	LB A/A	D								
11	Roundup Ultra	0.75	LB A/A	A	21161	ab	9405	ab	866	abc	701	abc
	Prowl	0.99	LB A/A	A								
	Outlook	1.31	LB A/A	D								
12	Roundup Ultra	0.75	LB A/A	A	25740	a	11303	ab	990	ab	1815	a
	Outlook	0.49	LB A/A	A								
	Outlook	0.49	LB A/A	D								
LSD (P=.05)					12788.6		4454.8		598.2		1425.9	
Standard Deviation					8856.9		3085.2		414.3		987.5	
CV					44.79		31.77		49.19		99.75	

Means followed by same letter do not significantly differ (P=.05, LSD)

Colorado State University

Application Timing and Crop Safety to Outlook in Onions
-Total Yield-

Trial ID: ONIO013 Study Dir.: Dr. Scott Nissen
Location: Rocky Ford, CO Cooperator: COA

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	ALLCE Total Yield #Bulbs/Acre Sep-02-03		ALLCE Total Yield Wt. Lbs/Acre Sep-02-03	
1	Untreated				0	c	0	c
2	Handweeded				73838	ab	33908	ab
3	Roundup Ultra	0.75	LB A/A	A	68063	ab	34073	ab
	Prowl	0.99	LB A/A	A				
4	Roundup Ultra	0.75	LB A/A	A	71775	ab	38775	a
	Outlook	0.656	LB A/A	A				
5	Roundup Ultra	0.75	LB A/A	A	62700	b	31144	ab
	Outlook	1.31	LB A/A	A				
6	Roundup Ultra	0.75	LB A/A	A	72600	ab	35351	ab
	Prowl	0.99	LB A/A	A				
	Outlook	0.656	LB A/A	B				
7	Roundup Ultra	0.75	LB A/A	A	73838	ab	32711	ab
	Prowl	0.99	LB A/A	A				
	Outlook	1.31	LB A/A	B				
8	Roundup Ultra	0.75	LB A/A	A	63525	b	25534	b
	Prowl	0.99	LB A/A	A				
	Outlook	0.656	LB A/A	C				
9	Roundup Ultra	0.75	LB A/A	A	65175	ab	32918	ab
	Prowl	0.99	LB A/A	A				
	Outlook	1.31	LB A/A	C				
10	Roundup Ultra	0.75	LB A/A	A	72600	ab	39394	a
	Prowl	0.99	LB A/A	A				
	Outlook	0.656	LB A/A	D				
11	Roundup Ultra	0.75	LB A/A	A	65175	ab	32134	ab
	Prowl	0.99	LB A/A	A				
	Outlook	1.31	LB A/A	D				
12	Roundup Ultra	0.75	LB A/A	A	80025	a	39848	a
	Outlook	0.49	LB A/A	A				
	Outlook	0.49	LB A/A	D				
LSD (P=.05)					15077.6		11594.9	
Standard Deviation					10442.2		8030.2	
CV					16.29		25.64	

Means followed by same letter do not significantly differ (P=.05, LSD)

Seedless Watermelon Establishment

Mike Bartolo
Arkansas Valley Research Center
Colorado State University

Seedless watermelons are increasingly in demand by consumers throughout the country and represent a valuable new crop for Colorado growers. Like seeded melons, seedless watermelon grow exceptionally well in the Arkansas Valley. In contrast, seedless watermelons seeds are extremely expensive and difficult to germinate. Overall, seedless watermelon require special production practices to optimize yield and quality. Specifically, seedless watermelons are best grown with plastic mulch and drip irrigation. With the use of expensive production practices and seeds, getting a good stand is critical.

This study was conducted to evaluate different stand establishment methods for seedless watermelon. A single seedless watermelon variety was either direct-seeded or transplanted into clear, green, or black plastic mulch. Yield and percent stand were evaluated under the different production conditions.

Methods

This trial was conducted at the Arkansas Valley Research Center, on a Rocky Ford silty clay loam. Beds, 60 inches between centers, were shaped in early April and drip lines were placed 1-2 inches from the center of the bed at a depth of 2-3 inches. Portions of the beds were then covered with either black embossed, green IRT-76, or clear embossed plastic mulch (Mechanical Transplanter).

The watermelon variety, "Premiere" (Colorado Seeds) were sown in the greenhouse in 72-cell flats on April 14th . At the 2-3 true leaf stage, the melons were transplanted in the field on May 16th . Direct-seeding into the mulch occurred on May 1st. Two seeds were placed in each hole at a depth of ~ 1 in. Both seeds and transplants were placed in single rows down the center of the bed at an in-row spacings of 3 feet. Each plot was one bed wide (5 feet) and 24 feet long and was replicated four times in a split plot design.

Transplanted "Stars and Stripes" (Seminis Seeds), an elongated Allsweet type, was used as the pollinator. The pollinator was randomly distributed throughout the plot area at a ratio of 1:2.

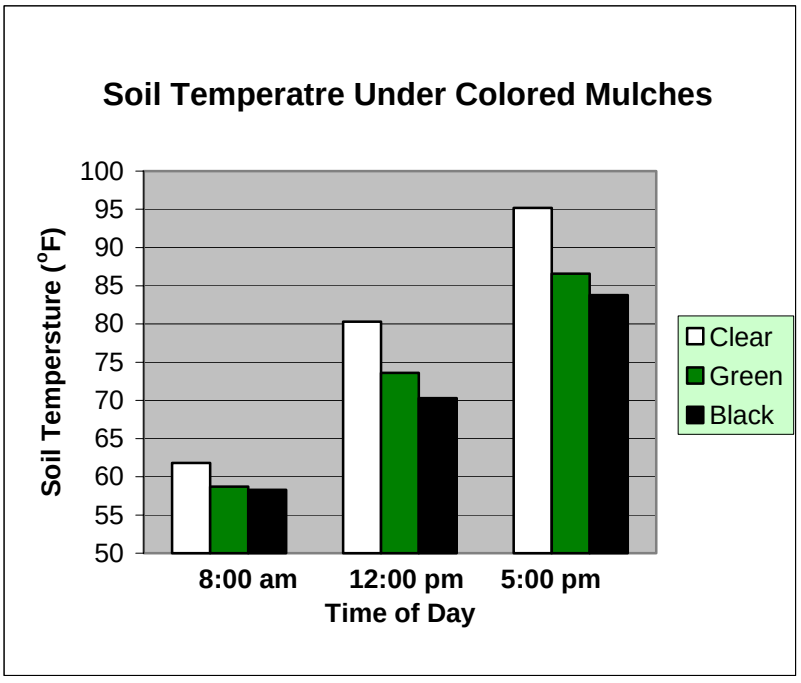
On May 29th , a stand count was taken to determine the percent viable plants in a plot. Transplants contained a single plant per hole (hill). Seeded melons contained up to two plants per hole. Those holes with two plants were not thinned.

The melons were irrigated by the drip lines as needed using canal (Rocky Ford Ditch) water. " Prefar" and "Alanap" were applied under the clear mulch for weed control. Later, weeds were removed by hand in the area between the mulched beds. " Sevin" was applied at the seedling stage to control cucumber beetles.

Each plot was harvested over a 5-7 day period. The maturity date represents the mid-point of the harvest period. Only fully ripe melons were selected. Each marketable melon was individually weighed. Watermelons were considered marketable if they weighed over 8 lbs and were free of any physical defects.

Marketable yield, average fruit weight, and percent stand of seedless watermelon seeded or transplanted into colored plastic mulches.

Establishment Method	*Mulch Color*	*% Stand*	*Maturity Date*	*Total Average Fruit Weight (lbs)*	*Total Marketable Yield (lbs/acre)*
Seed	*Black*	*50*	*8-1*	*12.5*	*34,321*
Transplant	*Black*	*100*	*7-29*	*13.5*	*51,201*
Seed	*Green*	*57*	*8-1*	*13.0*	*44,512*
Transplant	*Green*	*100*	*7-29*	*13.0*	*58,796*
Seed	*Clear*	*59*	*8-1*	*14.1*	*52,252*
Transplant	*Clear*	*100*	*7-29*	*12.9*	*55,076*
lsd (.05				*1.9*	*16,431*



Melon Foliar Fertilizer Trials

Mike Bartolo
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Colorado State University
Rocky Ford, Colorado

This study was conducted to evaluate the effect of different foliar-applied fertilizers on watermelon and cantaloupe yield and quality. In the watermelon trial, the effect of foliar fertilizers on marketable yield, fruit size, and soluble solids content were evaluated. In the cantaloupe trial, the effect on soluble solids content was examined.

In both trials, there was not a significant change in soluble solids due to any of the foliar applications. However, in the watermelon trial, there was a significant increase in yield due to the application of Crop Booster for Cotton*. Notably, none of the products caused any physical damage to the foliage.*

Methods

Watermelon Trial: This trial was conducted at the Arkansas Valley Research Center, on a Rocky Ford silty clay loam. Beds, 60 inches between centers, were shaped and drip lines were placed 8 below the surface down the center of the bed. .

The watermelon variety, "Crimson Sweet" (Burrell Seeds) was sown June 17th down the center of each bed. Plants were thinned to an in-row spacing of 3 ft. at the 2-3 true leaf stage. The melons were irrigated as needed during the course of the season with a total application of 9 acre-inches/ acre of water. All other cultural methods were standard for the area.

When the melons vines had covered the production bed, the foliar treatments were initiated. On August 5th the first applications were made. Two products from Agriliance, LLC were applied, AGM 03004 *and Crop Booster for Cotton, (see table 3 for analysis). Both products were applied at the rate of 1 quart per acre in 30 gal per acre water. Additional applications were made on August 15th and August 26th . The plots were arranged in a randomized complete block design with four replications. The watermelons were harvested on September 15th. All marketable melons were weighed and counted. Three melons from each plot were also analyzed for soluble solids content.*

Cantaloupe Trial: This trial was conducted in a commercial cantaloupe field grown by Hirakata Farms in Rocky Ford, Colorado. The cantaloupe variety "Valley Gold" (Harris Moran Seeds) was grown with plastic mulch and drip irrigation. Three

applications of AGM 03004 were made on August 5th , 18th , and 27th . Two test strip areas were sprayed. Each strip plot was 4 beds wide (24 ft) and 150 ft long. On September 9th and 17th, six melons were randomly harvested from the test and control areas and analyzed for soluble solids content.

Table 1: Marketable yield, average fruit weight, and percent soluble solids of untreated watermelon (var. Crimson Sweet) and watermelon that received applications of foliar fertilizer.

Foliar Treatment	*Percent Soluble Solids*	*Total Average Fruit Weight (lbs)*	*Total Marketable Yield (lbs/acre)*
Control	*11.84*	*17.4*	*44,218 b*
AGM 03004	*11.65*	*15.8*	*42,570 b*
Crop Booster for Cotton	*11.75*	*17.4*	*56,570 a*
lsd (.05)	*Ns*	*Ns*	*9,638*

Table 2: Solubles solids content (at two harvest dates) of untreated cantaloupe (var. Valley Gold) and cantaloupe that received foliar applications of AGM 03004 (Agriliance LLC).

Foliar Treatment	*Percent Soluble Solids September 9th*	*Percent Soluble Solids September 17th*
Control	*8.90*	*8.28*
AGM 03004	*8.98*	*8.76*
lsd (.05)	*Ns*	*Ns*

Table 3: Nutrient Analysis of Foliar Fertilizers

Product	***% N***	***% Ca***	***% B***	***% Mn***	***% Z***
AGM 03004	*9*	*11*	*-*	*-*	*-*
Crop Booster for Cotton	*-*	*2*	*2*	*1*	*3*

Special thanks to Mr. Joe Bush and Agriliance, LLC. for generously supporting this project.

Pepper Stand Reduction Trial

Mike Bartolo
Arkansas Valley Research Center
Colorado State University

Peppers are often subject to environmental conditions that can reduce plant stands at all stages of development. Early season soil crusting, wind storms, pests, and diseases may all reduce pepper populations. It is not clear how the yield and market quality of peppers are impacted by changes in plant population and the timing of those changes.

This study was conducted to determine the yield and quality of a long green chile pepper subjected to different levels of stand reduction at different stages of plant development.

In 2003, the growing season was extremely hot. There were 22 days in July that exceeded 100 ^{o}F. Fortunately, the irrigation water supply was ample. Despite these stressful environmental conditions, pepper yields were good and there were significant differences between treatments.

In general, stand reduction at a later stage of plant development was more detrimental to yield than stand reduction at an early stage. Stands reduced up to 50% early in development had yields comparable to the control. On the other hand, a 75% stand reduction severely reduced yields regardless of when the reduction occurred.

In terms of pepper pod quality, there was not a large difference between treatments for pod length and pod weight. Pod width was slightly greater in the 50% and 75% "Early" stand reduction treatments than in the other treatments.

Methods

The long green chile variety "NuMex Joe E. Parker" (Burrell Seeds) was used in this study. Peppers were direct-seeded into 30 inch rows on April 23rd with a Stanhay vacuum planter. Seeds were placed every 1.2 inches to ensure an adequate stand. Irrigation was by gravity-flow furrows and other production practices were standard for the area.

All treatments were thinned to a uniform in-row spacing of 6 inches on June 30th . Each plot was 4 rows wide (10 ft) and 13 ft long and was replicated four times in the trial. On July 9th, the "Early" stand treatments were thinned to remove either 25% , 50%, or 75% of the peppers. The same process occurred for the "Late" treatments on August 13th . Standard production practices continued for the remainder of the season. Harvest was initiated on

September 17th and was completed on September 23rd . All marketable pods were picked and weighed. The weight of a 25 pod sub-sample was recorded to determine average pod weight. In addition, the length and width of five randomly selected pods from each plot were recorded.

This project was generously supported by the National Crop Insurance Services.

Pepper development at the times of stand reduction

Stage of Development	Date	Plant Height (in)	Developing Pods	Leaf number or leaf area
EARLY	July 9	8-10	0	19-25 leaves per plant
LATE	August 13	20-25	6-8	2100-2500 cm^2

Marketable yield and pod quality of chile peppers (var. NuMex Joe E. Parker) subjected to different levels of stand reduction at two stages of development.

Treatment	Average Pod Width (cm)	Average Pod Length (cm)	Average Pod Weight (oz)	Marketable Yield (lbs/acre)
Control - Early	4.48	19.05	2.94	31,112
25% Reduction - Early	4.65	19.70	2.94	27,861
50% Reduction - Early	4.71	19.90	3.07	29,168
75% Reduction - Early	4.75	19.95	2.97	19,183
Control - Late	4.70	19.15	2.91	31,715
25% Reduction - Late	4.64	19.00	2.92	22,048
50% Reduction - Late	4.59	19.50	2.88	17,625
75% Reduction - Late	4.49	19.60	2.88	9.566
lsd (0.05)	0.21	ns	ns	3,744

Pepper Soil Crusting Trial

Mike Bartolo
Arkansas Valley Research Center
Colorado State University

Peppers are often subject to environmental conditions that can reduce plant stands at all stages of development. Early season soil crusting can have one of the greatest impacts on pepper stand populations and ultimately yield.

This study was conducted to determine how different soil-applied products affect pepper emergence in a silty clay loam soil.

In 2003, the growing season was extremely hot. There were 22 days in July that exceeded 100 ^{o}F. Fortunately, the irrigation water supply was ample. Despite these stressful environmental conditions, pepper yields were good.

Overall, there was not a significant difference in stands due to any of the treatments/applications. Subsequently, since plots were all thinned to a uniform stand, there was not a significant difference in marketable yield as well.

Methods

The long green chile variety "NuMex Joe E. Parker" (Burrell Seeds) was used in this study. Peppers were direct-seeded into 30 inch rows on April 23rd with a Stanhay precision vacuum planter.

Seeds were placed every 1.22 inches. On April 24th, prior to the first irrigation, the treatments were applied. The treatments were:

1. *Untreated Control*
2. *RSA EXP 342 (Agriliance LLC) at a rate of 5 gal/acre product sprayed in a 15 inch band above the seed row in 175 gal/a water.*
3. *RSA EXP 342 (Agriliance LLC) at a rate of 10 gal/acre product sprayed in a 15 inch band above the seed row in 350 gal/a water.*
4. *AG1008 (Agriliance LLC) at a rate of 2.5 gal/acre sprayed in a 15 inch band above the seed row.*

Due to the high viscosity of RSA EXP 342, it had to be applied with a high volume of water. Even then, the product was very difficult to apply through conventional spray equipment.

After the treatments were applied, there were visible changes in the soil structure. Generally the treated soil looked and felt more friable.

On May 2nd, prior to emergence, a hard driving rain with high winds occurred.

This rain event caused typical crusting. For example, peppers growing in an area adjacent to these plots need to be treated mechanically (western roller) in order to break through the crust.

For the remained of the season, normal production practices occurred. Irrigation was by gravity-flow furrows and other production practices were standard for the area.

On June 9, stand counts were taken in each row of each plot. Each plot was 4 rows wide (10 ft) and 25 ft long and was replicated four times in the trial. All treatments were thinned to a uniform in-row spacing of 6 inches on June 30th. Harvest was initiated on September 17th and was completed on September 23rd . All marketable pods were picked and weighed. The weight of a 25 pod sub-sample was recorded to determine average pod weight.

Special thanks to Mr. Joe Bush and Agriliance LLC for generously supporting this project.

Stand count, pod weight, and marketable yield of chile peppers (var. NuMex Joe E. Parker) grown in soil treated with different anti-crusting agents.

Treatment	Stand Count at Emergence (plants/acre)	Average Pod Weight (oz)	Marketable Yield (lbs/acre)
1. Untreated Control	48,460 a	2.80 a	38,036 a
2. *RSA EXP 342* - 5 gal	44,512 a	2.62 a	37,426 a
3. *RSA EXP 342* - 10 gal	49,277 a	2.68 a	39,970 a
4. AG1008	46,690 a	2.64 a	37,775 a
lsd (0.05)	6,151	0.24	7,330

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