EFFECT OF FUNGICIDE AND INSECTICIDE SEED TREATMENTS ON SUGARBEET STAND ESTABLISHMENT AND SUGAR YIELD IN MONTANA

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Fungicide seed treatments are used on all sugarbeet seed to control seed decays and pre and post-emergent damping off commonly caused by seedborne *Phoma betae*, and the soilborne fungi; *Rhizoctonia solani* AG 4 and AG 2-2 isp IIIB and IV, *Pythium ultimum*, *Fusarium* sp., and *Aphanomyces cochlioides.* Historically, metalaxyl (Apron) and thiram have been used as seed treatment fungicides. However today, new fungicide active ingredients such as fludioxanil (Maxim), azoxystrobin (Dynasty), hymexazole (Tachigaren), pyraclostrobin (Stamina), trifloxystrobin (Trilex), iproconazole (Vortex) have been registered. Activity of these fungicides and trade names are given in Table 1. These fungicides are typically used in combination to achieve control of the full spectrum of pathogens. In addition, the registration of the systemic neonicotinoid insecticides, clothianidan (Poncho, NipsIT Inside) and thiamethoxam (Crusier) and companion insecticides like betacyfluthrin (Beta) have been a dramatic advance in controlling insects affecting sugarbeet. In areas affected by Beet curey top virus these materials have provided control of the virus vector the bet leaf hopper and have dramatically reduced yield losses due to this virus. In addition to control of the beet leaf hopper, these insecticides also reportedly provide control of springtails, wireworm, cutworm, leaf miner, root aphid, black bean aphid, and flea beetles. Critical to using these new tools and other yet unlabeled fungicides is the determination of compatibility and efficacy when used in combination.

Table 1. Sugarbeet seed treatment fungicides, active ingredients, trade names and pathogens controlled.

Active ingredient	Trade name(s) and manufacturer	Pathogens controlled
metalaxyl	Apron XL (Syngenta), Allegiance (Bayer), Acquire (BASF)	Pythium species
Thiram	Thiram (Chemtura, Taminco)	Pythium, Rhizoctonia, Phoma
fludioxanil	Maxim (Syngenta)	Rhizoctonia, Fusarium
azoxystrobin	Dynasty (Syngenta)	Rhizoctonia, Aphanomyces
trifloxystrobin	Trilex (Bayer)	Rhizoctonia, Aphanomyces
pyraclostrobin	Stamina (BASF)	Rhizoctonia, Aphanomyces
hymexazole	Tachigaren (Sankyo Agro)	Pythium, Fusarium, Aphanomyces
iproconazole	Vortex (Bayer)	Rhizoctonia, Fusarium, Phoma??

Materials and Methods

Fungicides and insecticides at rates indicated in Tables 2, 3 and 4 were applied by ASTEC of Sheridan, WY when they made 4M pellets. Field trials were planted using a Milton planter to achieve a planted population of 47,520 seeds per acre in 24 inch rows. The cultivar Beta SB935 was used in insecticide/fungicide combination trials and Beta SB 934 was used in fungicide trials. Plots were planted on 5/5/09 at the Southern Agricultural Research Center at Huntley, MT and 5/6/09 at the Eastern Agricultural Research Center at Sidney, MT. Both sites were under irrigation, fertilized as recommended for a yield objective of 30 ton/A and weed control was done using glyphosate (Round UP Powermax with AMS). Plots were 3 rows 30ft in length and a randomized complete block design with ten replications was used. The plot stands were counted at Huntley on 6/22/09 and at harvest on 10/23/09 and at Sidney on 6/15/09 and at harvest on 9/24/09. Percentage curly top virus infection was determined on 8/26/09.The center row of each plot was harvested, weight recorded and samples were sent to the Western Sugar factory lab in Billings (Huntley) or the Sidney Sugars lab in Sidney (Sidney) for determination of tare, % sugar and sugar loss to molasses. Statistics used were ANOVA and Fischers Least Significant difference at P=0.05.

In addition, seed samples from each field treatment were planted at the MSU Plant Growth Center in Bozeman in MSU mix soil that was pasteurized and inoculated with 12 oospores/gm of soil of Pythium ultimum or

Aphanomyces cochioides, with Rhizoctonia solani AG 2-2 isp IV ground barley inoculums (sufficient to give 70-90% damping-off) or not inoculated. Stands for each treatment were determined 14 days after emergence.

Results.

Results for the Huntley and Sidney insecticide/fungicide trials are given in Table 2 and 3 respectively. Results for the Huntley and Sidney fungicide trial are given in Table 4. Results for the MSU greenhouse trials are given in Tables 5 and 6. No significant differences in stand or yield were found in field trials. Beet curly top virus pressure at Huntley was low and no conclusions regarding control of this virus could be determined. In field trials at both Huntley and Sidney root maggot damage was low to nonexistent. In greenhouse trials, several treatments provided improved pathogen control, particularly Aphanomyces. No phytotoxicity or germination reductions were seen for any treatment except Stamina at the 150 ml/kg rate. It appears that we will have several new seed treatment tools available in the near future.

Table 2. Results of the 2009 Huntley Sugarbeet Insecticide/Fungicide Seed Treatment Trial

Treatment: Planted 5/5-6/09 @ 47,520 seed/A 24" rows Harvest 10/23/09 Beta SB935- 4M pellet	**G ai/kg seed**	**Early Stand/A** 6/22/09	**Harvest Stand/A** 10/23/09	**% curly top infection 8/26/09**	**% Sugar**	**Extractable Sugar lbs/A**	**Tons/A**
1.Apron XL 3 LS Maxim 4 FS 2.5	0.075 0.025	38333	37026	6.3	15.6	11198.8	38.57
2.Untreated		37810	36329	6.7	15.8	10732.5	36.23
3 . Apron XL 3 LS Maxim 4 FS Cruiser 5 FS	0.075 0.025 0.050	39030	36329	3.8	15.7	11005.7	37.57
4. Apron XL Maxim 4 FS Dynasty 100 Cruiser 5 FS	0.075 0.025 0.025	40337	41034	3.5	15.7	10562.9	36.10
5. Apron XL Maxim 4 FS Cruiser 5 FS Force 20 CS A14321	0.075 0.025 0.025 60.0	37897	35458	4.1	15.9	9953.6	33.62
6. Apron XL Maxim 4 FS Dynasty 100 Cruiser 5 FS Force 20 CS A14321	0.075 0.025 0.050 60.0	38332	38159	3.9	15.6	10635.4	36.47
7. Ponch-Beta Thiram Allegience Vortex 5.0g/100k	0.075 0.025 0.025 60.0	37810	37810	3.2	15.7	11133.7	38.04
8. Ponch-Beta Thiram Allegiance Vortex Trilex	50 ml	37549	36852	3.1	15.8	10719.5	36.32
9. V-10240 NiPSIT	50 ml	35284	35545	3.1	15.7	9947.7	33.84
10. V-10240 V-10178 NIPSIT 60	150 ml	28924	28488	3.0	15.4	10457.4	36.36
11. V-10249 NIPSIT 60.0	50 ml 20g	34151	32409	3.3	15.9	11620.4	39.08
12. V-10230 27.7 NIPSIT 60.0	150 ml 20g	32757	31886	3.3	15.8	10996.5	37.28
13. V-10250 NIPSIT 60.0	50 ml 0.07	29011	29098	3.1	15.4	11239.5	39.19
14. V-10256 NIPSIT	150 0.07	37984	37549	3.4	15.9	10295.5	34.88
15. V-10234 NIPSIT		27181	27791	3.3	15.7	10794.4	36.86
16. Thiram Allegiance NIPSIT		39030	35981	3.2	15.9	11256.4	37.78
17. Poncho-Beta453 FS Thiram 42-S Allegiance FL		38943	38246	3.3	15.6	10819.6	37.03
Flsd 0.05		4792	4391	ns	0.52		3.3

Table 3. Results of the 2009 Sidney Sugarbeet Insecticide/Fungicide Seed Treatment Trial

Treatment: Planted 5/6/09 @ 47,520 seed/A 24" rows Harvest 09/24/09 Beta SB934- 4M pellet-	G ai/kg seed	Stand Count /A June 15 LSD=3122	Stand Count/A Sept 12 LSD=3049	Tons/Acre LSD=4.12	Extractable Sugar lbs/A LSD=1412
1.Apron XL 3 LS Maxim 4 FS 2.5	0.075 0.025	40148	36518	37.5	12723.4
2.Untreated	0.025	34412	31654	35.6	11863.0
3 . Apron XL 3 LS Maxim 4 FS Cruiser 5 FS	0.075 0.025 0.050	41527	37534	37.8	12748.5
4. Apron XL Maxim 4 FS Dynasty 100 Cruiser 5 FS	0.075 0.025 0.025	41600	39059	38.9	13075.6
5. Apron XL Maxim 4 FS Cruiser 5 FS Force 20 CS A14321	0.075 0.025 0.025 60.0	42326	34558	39.2	12916.3
6. Apron XL Maxim 4 FS Dynasty 100 Cruiser 5 FS Force 20 CS A14321	0.075 0.025 0.050 60.0	41092	35647	37.9	12810.1
7. Ponch-Beta Thiram Allegience Vortex 5.0g/100k	0.075 0.025 0.025 60.0	43052	37462	36.8	12442.1
8. Ponch-Beta Thiram Allegiance Vortex Trilex	50 ml	42181	37607	37.0	12693.2
9. V-10240 NiPSIT	50 ml	40003	36373	34.6	11566.7
10. V-10240 V-10178 NIPSIT 60	150 ml	39277	34195	33.3	11329.0
11. V-10249 NIPSIT 60.0	50 ml 20g	36808	33614	34.9	11801.2
12. V-10230 27.7 NIPSIT 60.0	150 ml 20g	40438	35211	36.3	12416.9
13. V-10250 NIPSIT 60.0	50 ml 0.07	38551	33832	36.6	12398.8
14. V-10256 NIPSIT	150 0.07	42253	38042	38.5	12973.7
15. V-10234 NIPSIT		37970	34558	33.7	11403.4
16. Thiram Allegiance NIPSIT		43705	39277	40.3	13580.0
17. Poncho-Beta453 FS Thiram 42-S Allegiance FL		43560	37825	37.9	12794.9
Flsd 0.05		3122	3049	4.12	1412

Table 4. Results of 2009 Sugarbeet Fungicide Seed Treatment Trial at Huntley and Sidney, MT

Trt#	Treatment	Rate ai/kg	Early Stand/A		Harvest Stand/A		Extractable Sugar lbs/A	
			Huntley 6/22	Sidney 6/15	Huntley	Sidney	Huntley	Sidney
1	untreated	0.075 0.025	26048	30492	26310	28096	10564	11417
2	Apron Maxim	0.075 0.025	23784	27298	22390	26789	9302	11627
3	Apron Maxim A12050	0.075 0.025 0.025	27356	29040	27791	27007	9676	11103
4	Apron Maxim A16148	0.075 0.025 0.050	27530	28604	27007	26281	10074	11387
5	Apron Maxim A16148	0.075 0.025 0.025	27181	28532	27878	27225	9780	10970
6	Apron Maxim A16148 A12050	0.075 0.025 0.025 60.0	24394	28750	24394	26717	9309	11394
7	Apron Maxim A16148 Cruiser	0.075 0.025 0.050 60.0	29621	33832	28837	30202	10215	12346
8	Apron Maxim A16148 Cruiser	0.075 0.025 0.025 60.0	27356	37462	27007	32815	9740	12400
9	STP15201	50 ml	26223	35719	27443	31073	10357	12181
10	Stamina	50 ml	26659	35792	25875	32307	10355	12890
11	Stamina	150 ml	23958	33396	24655	28677	9697	11615
12	Stamina Tachigaren	50 ml 20g	28227	33396	26223	27152	10298	11888
13	Stamina Tachigaren	150 ml 20g	26920	30274	26223	27878	9669	11353
14	Stamina Aquire	50 ml 0.07	27966	27951	27530	27370	10957	11716
15	Stamina Aquire	150 0.07	28575	25991	29098	24757	10556	11632
Flsd 0.05			5467	5082	5162	4356		1386

Planted 5/5,6/09 @ 47,520 seed/A 24" rows
Sidney Harvest 09/24/09
Huntley Harvest 10/23/09
Beta SB934- 4M pellet-ASTEC treatments 7-17/Syngenta treatments 1-6

Table 5. Stand Establishment Results of 2009 Sugarbeet Fungicide Inoculated Greenhouse Trials

Trt#	Treatment	Rate ai/kg	Pasteurized soil % stand @14 days	Pythium ultimum % stand @ 14 days	Rhizoctonia solani AG2-2 % stand @14 days	Aphanomyces cochioides % stand @14 days
1	untreated		80	77	7	42
2	Apron Maxim	0.075 0.025	87	81	28	40
3	Apron Maxim A12050	0.075 0.025 0.025	82	80	17	31
4	Apron Maxim A16148	0.075 0.025 0.050	89	84	61	58
5	Apron Maxim A16148	0.075 0.025 0.025	89	93	30	52
6	Apron Maxim A16148 A12050	0.075 0.025 0.025 60.0	87	71	47	44
7	Apron Maxim A16148 Cruiser	0.075 0.025 0.050 60.0	82	83	65	65
8	Apron Maxim A16148 Cruiser	0.075 0.025 0.025 60.0	73	85	42	63
9	STP15201	50 ml	75	76	11	49
10	Stamina	50 ml	97	79	27	67
11	Stamina	150 ml	57	76	29	62
12	Stamina Tachigaren	50 ml 20g	86	79	35	70
13	Stamina Tachigaren	150 ml 20g	47	80	29	75
14	Stamina Aquire	50 ml 0.07	86	87	23	62
15	Stamina Aquire	150 0.07	84	90	23	63

Beta SB934- 4M pellet

Greenhouse 70-75F- MSU Mix soil

Pythium: 10 oospores/g soil, Rhizoctonia 1 gram ground barley inoculums/kg soil mix, Aphanomyces 10 oospores/g soil mix

Table 6. Stand Establishment Results of 2009 Sugarbeet Insecticide-Fungicide Inoculated Greenhouse Trials

		% stand establishment @ 14 days after emergence			
Treatment	**Rate g ai/kg seed**	**Pasteurized soil**	**Rhizoctonia solani**	**Pythium ultimum**	**Aphanomyces cochlioides**
1.Apron XL 3 LS Maxim 4 FS 2.5	0.075 0.025	94	32	94	48
2.Untreated		96	12	84	49
3 . Apron XL 3 LS Maxim 4 FS Cruiser 5 FS	0.075 0.025 0.6	95	54	84	53
4. Apron XL Maxim 4 FS Dynasty 100 Cruiser 5 FS	0.075 0.025 0.025 60.0	98	33	96	63
5. Apron XL Maxim 4 FS Cruiser 5 FS Force 20 CS A14321	0.075 0.025 60.0 0.08 0.02	97	43	65	39
6. Apron XL Maxim 4 FS Dynasty 100 Cruiser 5 FS Force 20 CS A14321	0.075 0.025 0.025 60.0 0.08 0.02	nd	nd	nd	nd
7. Ponch-Beta Thiram Allegience Vortex 5.0g/100k	60.0 2.09 0.05 0.05	98	34	93	38
8. Ponch-Beta Thiram Allegiance Vortex Trilex	0.6 2.09 0.05 0.05 0.1	97	55	93	55
9. V-10240 NiPSIT	0.28 60.0	97	19	96	86
10. V-10240 V-10178 NIPSIT 60	28 2.5 60	96	79	83	84
11. V-10249 NIPSIT 60.0	28.2 60	95	77	92	89
12. V-10230 27.7 NIPSIT 60.0	27.7 60	97	90	89	86
13. V-10250 NIPSIT 60.0	25.2 60	94	80	90	83
14. V-10256 NIPSIT	0.36 60	100	85	93	71
15. V-10234 NIPSIT	2.27 60	96	94	77	81
16. Thiram Allegiance NIPSIT	20.9 0.05 60	95	54	88	74
17. Poncho- Beta453 FS Thiram 42-S Allegiance FL	60 20.9 0.075	96	16	81	49