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

Barry J. Jacobsen[1], Ken Kephart[2]and Joyce Eckhoff[3]

1. Department of Plant Sciences and Plant Pathology, Montana State University, Bozeman, MT. 59717-3150, 2. Montana Agricultural Experiment Station, Southern Agricultural Research Center, Huntley, MT., 3. Montana Agricultural Experiment Station, Eastern Agricultural Research Center, Sidney, MT

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 curly top virus these materials have provided control of the virus vector the beet 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 where they made 4M pellets. Field trials were planted using a Milton planter to achieve a planted population of 43,560 seeds per acre in 24 inch rows. The cultivar Beta BTS36RR60was used in insecticide/fungicide combination trials and in fungicide trials. Plots were planted on 5/4/09 at the Southern Agricultural Research Center at Huntley, MT and 5/5/09 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 6/18/10 (45 days post plant) and at harvested on 10/4/10 and at Sidney on 6/14/10 and at harvest on 10/7-8/10. Percentage curly top virus infection was determined on 8/26/09 at Huntley and infects were <2% in untreated plots. 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 or with Fusarium oxysporum betae (~ 1 x10 ^{4}Cfu/10g of soil) or with Rhizoctonia solani AG 2-2 isp IV ground barley inoculum or

not inoculated. Stands for each treatment were determined 14 days after emergence. The greenhouse was maintained at 70-75 ^{0}F and flats were bottom watered.

Results.

Results for the Huntley and Sidney insecticide/fungicide trials are given in Table 2 and 3 respectively. Results for the MSU greenhouse trials are given in Table 4. 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 including; NipSit alone, Poncho-Beta+ 0.75 ml Stamina, Poncho-Beta+ Apron+Thiram + Yara Teprosyn ZN/P, reduced germination in pasteurized soil. In Pythium inoculated soils no reduced germination was seen and most treatments resulted in increased stand establishment. In Rhizoctonia infested soils stands were increased by most treatments with treatments including Dynasty having the best stand establishment. Stamina at the 0.75 mlr rate gave better several control than the 0.5 ml rate but was not equal to treatments that included Dynasty. Nearly all treatments improved Aphanomyces control with all three neonicotinoid insecticides showing control in the absence of additional fungicides as was also seen in 2009 trials. Again the 0.75 ml rate of Stamina gave better control of Aphanomyces than the 0.5 ml rate. No treatments provided significant Fusarium control except the NipSit+ Thiram + Allegience treatment. It appears that the addition of Dynasty will provide a new improved tool for Rhizoctonia control and that the neonicotinoid insecticides and Stamina are new tools for Aphanomyces control.

Table 2. Results of the 2010 Huntley Sugarbeet Insecticide/Fungicide Seed Treatment Trials

Treatment	Rate/seed unit (100,000 seed=1kg)	stand @45 days post plant 43,560 seeds planted/A	Final Stand Plants/A	Ton/A	Recoverable sucrose lb/A
untreated		35371	32147	28.2	7755
NipSit	60gm. ai	33715	32322	29.1	7849
Poncho-Beta	60-8 gm. ai	31015	31973	29.8	8108
Cruiser	60gm. ai	32496	30927	29.2	8183
NipSit Thiram Allegiance-FL	60 gm ai 4.8 gm ai O.15 gm ai	33367	31537	29.0	8022
Poncho- Beta Tachigaren Dynasty MSU 341-16-5 (Bp)	60-8 gm ai 20 gm product 2.5 ml product 10 gm	30231	29359	27.4	7672
Poncho-Beta Stamina	60gm. Ai 0.5 ml	34064	28488	27.4	7759
Poncho-Beta Stamina	60gm. Ai 0.75 ml	30579	28575	27.8	7632
Poncho-Beta Stamina Tachigaren	60-8 gm. Ai 0.75 ml 20 gm product	38768	33715	28.7	7930
Poncho-Beta Stamina Tachigaren	60gm. Ai 0.5 ml 20 gm	30666	32322	27.8	7748
Poncho-Beta Stamina Acquire	60-8 gm. Ai 0.5 ml 20.7 ml product	33367	29185	25.8	7319
Poncho-Beta Stamina Acquire	60-8 gm. Ai 0.75 ml 20.7 ml product	32757	31363	27.9	7730
Cruiser Maxim Apron XL Dynasty	60 gm ai 0.1 ml product 0.42 ml 2.5 ml product	33018	31712	29.7	8386
Poncho-Beta Apron XL Thiram Yara Teprosyn ZN/P	60-8 gm ai 0.42 ml 4.8 gm ai	31102	31363	30.2	8505
Poncho-Beta Apron XL Thiram Yara Teprosyn MN	60-8 gm ai 0.42 ml 4.8 gm ai	32409	33367	30.8	8489
Poncho-Beta Apron XL Thiram T-22	60-8 gm ai 0.42 ml 4.8 gm ai 10g	34848	31625	29.8	8432
Poncho-Beta T-22 MSU 341-16-5 (Bp)	60-8 gm ai 10gm	31799	28750	28.4	8174
Flsd 0.05		5009	4988	4.1	1154

Table 3. Results of the 2010 Sidney Sugarbeet Insecticide/Fungicide Seed Treatment Trial

Treatment	Rate/seed unit (100,000 seed=1kg)	stand @45 days post plant 43560 seeds planted/A	Final Stand Plants/A	Ton/A	Recoverable sucrose lb/A
untreated		40874	35320	43.1	11637
NipSit	60 gm. ai	34049	31581	42.5	11402
Poncho-Beta	60-8 gm. ai	24103	36990	43.6	11639
Cruiser	60gm. ai	34921	32888	42.3	11568
NipSit Thiram Allegiance-FL	60 gm ai 4.8 gm ai O.15 gm ai	32234	33759	47.7	11640
Poncho- Beta Tachigaren Dynasty MSU 341-16-5 (Bp)	60-8 gm ai 20 gm product 2.5 ml product 10 gm	31726	34086	45.4	11642
Poncho-Beta Stamina	60gm. Ai 0.5 ml	35647	36409	42.3	11645
Poncho-Beta Stamina	60gm. Ai 0.75 ml	29693	32852	42.1	11300
Poncho-Beta Stamina Tachigaren	60-8 gm. Ai 0.5 ml 20 gm product	37534	36409	44.8	11646
Poncho-Beta Stamina Tachigaren	60gm. Ai 0.75 ml 20 gm product	37534	31436	43.2	11173
Poncho-Beta Stamina Acquire	60-8 gm. Ai 0.5 ml 20.7 ml product	37752	34993	41.9	10294
Poncho-Beta Stamina Acquire	60-8 gm. Ai 0.75 ml 20.7 ml product	34340	33178	35.0	11648
Cruiser Maxim Apron XL Dynasty	60 gm ai 0.1 ml product 0.42 ml 2.5 ml product	32815	34957	42.8	11992
Poncho-Beta Apron XL Thiram Yara Teprosyn ZN/P	60-8 gm ai 0.42 ml 4.8 gm ai	31581	34739	44.3	11649
Poncho-Beta Apron XL Thiram Yara Teprosyn MN	60-8 gm ai 0.42 ml 4.8 gm ai	39277	34739	44.0	11262
Poncho-Beta Apron XL Thiram T-22	60-8 gm ai 0.42 ml 4.8 gm ai 10g	34993	34775	44.4	11650
Poncho-Beta T-22 MSU 341-16-5 (Bp)	60-8 gm ai 10gm	28532	34230	41.7	11650
Flsd 0.05		11.2	3049	4.0	1037

Table 4. Percentage stand establishment 14 days after planting in pasteurized or pathogen inoculated soil

Treatment	Rate/seed unit (100,000 seed=1kg)	Pasteurized soil	*Pythium ultimum*	*Rhizoctonia solani* isp IV	*Aphanomyces cochlioides*	*Fusarium oxysporum betae*
untreated		88	70	4	66	80
NipSit	60gm. ai	74	67	0	94	80
Poncho-Beta	60 gm. ai	84	60	24	80	66
Cruiser	60gm. ai	100	95	24	100	80
NipSit Thiram Allegiance-FL	60 gm ai 4.8 gm ai O.15 gm ai	80	100	14	92	98
Poncho- Beta Tachigaren Dynasty MSU 341-16-5 (Bp)	60 gm ai 20 gm 2.5 ml 10 gm	100	75	80	76	88
Poncho-Beta Stamina	60gm. Ai 0.5 ml	82	80	20	70	86
Poncho-Beta Stamina	60gm. Ai 0.75 ml	66	76	22	82	78
Poncho-Beta Stamina Tachigaren	60 gm. Ai 0.5 ml 20 gm	100	71	50	74	70
Poncho-Beta Stamina Tachigaren	60gm. Ai 0.75 ml 20 gm	90	91	32	96	70
Poncho-Beta Stamina Acquire	60gm. Ai 0.75 ml 20.7 ml	86	78	18	94	66
Poncho-Beta Stamina Acquire	60 gm. Ai 0.5 ml 20.7 ml product	100	95	2	80	64
Cruiser Maxim Apron XL Dynasty	60 gm ai 0.1 ml 0.42 ml 2.5 ml	90	96	94	82	54
Poncho-Beta Apron XL Thiram Yara Teprosyn ZN/P	60 gm ai 0.42 ml 4.8 gm ai	74	93	60	100	66
Poncho-Beta Apron XL Thiram Yara Teprosyn MN	60 gm ai 0.42 ml 4.8 gm ai	90	84	28	90	70
Poncho-Beta Apron XL Thiram T-22	60 gm ai 0.42 ml 4.8 gm ai 10g	76	85	10	94	72
Poncho-Beta T-22 MSU 341-16-5 (Bp)	60 gm ai 10gm	96	64	0	74	78
Flsd 0.05		8	4.5	7	11	12