

Title: Effect of Salicylate on Wheat Resistance to Orange Wheat Blossom Midge – 2015.

Objective: To evaluate the efficacy of Salicylate for the control of OWBM in susceptible and resistant spring wheat cultivars.

Materials and Methods:

Spring wheat varieties containing the Sm1 gene for resistance to the orange wheat blossom midge are available to aid in their control. However, some damage is incurred prior to the synthesis of the active compound. This study was designed to determine if treatment with salicylate prior to larval feeding could upregulate the Sm1 gene and shorten the lag phase. This study was established as a split plot design with three replications. Egan, a cultivar with resistance to the OWBM, and McNeal, a non-resistant cultivar were the whole plot treatments. Salicylate was applied to both varieties at three rates and at three wheat growth stages. Salicylate was applied at 0, 21, and 42 g ai/A when wheat was at the late boot stage, 50% headed, and 50% flowering growth stages.

Results:

The study site experienced severe drought and low midge pressure. As a result, any treatment effects that might have been present were largely masked by these environmental conditions. However, a few treatment effects were detected, and were largely associated with the differences between the two spring wheat varieties. Spring wheat yields averaged 23.6 bu/A, with McNeal producing slightly higher yields than Egan (24.0 and 23.2 bu/A, respectively). Egan had greater protein and higher falling numbers, but McNeal had higher test weight and greater thousand kernel weight. There were trends in the data which indicated a slight reduction in height, yield and test weight as rates of salicylate increased ($P > F$ 0.4162, 0.1139, and 0.0519, respectively), while protein tended to increase ($P > F = 0.1148$). However, the timing of salicylate treatments had no impact on any of the variables measured.

Summary:

Record breaking drought and low midge populations prevented an accurate assessment of salicylate for improving crop resistance against the wheat midge.

Table 1. Materials and Methods - Sm1 Salicylate - 2015

Seeding Date:	5/6/2015	Harvest Date:	8/12/2015
Julian Date:	125	Julian Date:	224
Seeding Rate:	80 lb/A	Soil Type:	Somers Silty Clay Loam
Previous Crop:	Spring Wheat	Fertilizer (PP):	23-55-30-22
Tillage:	Conventional	Fertilizer (TD):	1.4Zn-200N
Irrigation:	None	Pesticide:	None

PP: pre-plant, TD: top dress

Table 2. Main effect of application timing

	HT	LOD	YLD ¹	PRO ²	TWT ¹	TKW ¹	FN	OWBM
	in	%	bu/A	%	lb/bu	g	sec	no/ spk
Late Boot	21.1	0.0	23.5	17.4	53.5	24.4	521.2	0.0
50% Heading	31.9	0.0	23.5	17.6	53.6	24.8	526.7	0.0
50% Flowering	20.8	0.0	23.9	17.3	53.9	25.1	526.5	0.0
LSD	ns	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.4284	1.0000	0.9314	0.7382	0.5950	0.4983	0.6398	0.7849

Table 3. Main effect of treatment rate

	HT	LOD	YLD ¹	PRO ²	TWT ¹	TKW ¹	FN	OWBM
	in	%	bu/A	%	lb/bu	g	sec	no/ spk
Untreated Check	31.5	0.0	24.5	17.1	54.0	25.0	524.9	0.0
Salicylic acid 21 g ai/A	21.3	0.0	23.6	17.5	53.6	24.5	526.1	0.0
Salicylic acid 42 g ai/A	21.0	0.0	22.7	17.7	53.5	24.8	523.4	0.0
LSD	ns	ns	ns	ns	0.4	ns	ns	ns
Pr>F	0.4162	1.0000	0.1139	0.1148	0.0519	0.4177	0.9195	0.6380

Table 4. Main effect of variety

	HT	LOD	YLD ¹	PRO ²	TWT ¹	TKW ¹	FN	OWBM
	in	%	bu/A	%	lb/bu	g	sec	no/ spk
Egan	20.7	0.0	23.2	18.0	53.0	23.7	533.1	0.0
McNeal	28.6	0.0	24.0	16.8	54.4	25.8	516.6	0.0
LSD	ns	ns	0.7	0.4	0.3	0.6	10.8	ns
Pr>F	0.2797	1.0000	0.0205	0.0001	0.0001	0.0001	0.0048	0.1510

HT; height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, OWBM: orange wheat blossom midge, ns: nonsignificant

¹adjusted to 13% moisture, ²adjusted to 12%

Table 5. Effect of application timing and rate of treatment

	HT	LOD	YLD ¹	PRO ²	TWT ¹	TKW ¹	FN	OWBM
	in	%	bu/A	%	lb/bu	g	sec	no/ spk
Check								
Late Boot	21.2	0.0	25.3	17.0	53.8	24.8	523.2	0.0
50% Heading	52.8	0.0	24.6	17.1	54.1	25.3	523.1	0.0
50% Flowering	20.5	0.0	23.8	17.1	54.0	25.0	528.3	0.0
Salicylic acid 21 g ai/A								
Late Boot	21.3	0.0	23.3	17.3	53.6	24.3	517.9	0.0
50% Heading	21.5	0.0	24.0	17.6	53.4	24.3	530.6	0.1
50% Flowering	21.2	0.0	23.7	17.5	53.8	24.8	529.8	0.1
Salicylic acid 42 g ai/A								
Late Boot	20.8	0.0	22.0	17.9	53.1	23.9	522.3	0.0
50% Heading	21.3	0.0	21.9	17.9	53.4	24.8	526.5	0.0
50% Flowering	20.8	0.0	24.1	17.2	54.0	25.6	521.5	0.1
LSD	ns	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.4536	1.0000	0.4226	0.6385	0.4195	0.5898	0.8834	0.3361

Table 6. Effect of application timing and variety

	HT	LOD	YLD ¹	PRO ²	TWT ¹	TKW ¹	FN	OWBM
	in	%	bu/A	%	lb/bu	g	sec	no/ spk
Egan								
Late Boot	20.4	0.0	23.3	17.8	53.0	23.5	526.4	0.0
50% Heading	21.1	0.0	22.8	18.1	52.8	23.4	535.6	0.0
50% Flowering	20.4	0.0	23.5	18.0	53.1	24.0	537.1	0.0
McNeal								
Late Boot	21.8	0.0	23.7	17.0	54.0	25.2	515.9	0.0
50% Heading	42.7	0.0	24.1	17.0	54.4	26.1	517.9	0.1
50% Flowering	21.2	0.0	24.2	16.5	54.7	26.2	515.9	0.1
LSD	ns	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.4118	1.0000	0.5437	0.3703	0.1814	0.4151	0.6917	0.2130

HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, OWBM: orange wheat blossom midge, ns: nonsignificant

¹adjusted to 13% moisture, ²adjusted to 12%

Table 7. Effect of treatment rate and variety

	HT	LOD	YLD ¹	PRO ²	TWT ¹	TKW ¹	FN	OWBM
	in	%	bu/A	%	lb/bu	g	sec	no/ spk
Egan								
Untreated Check	20.7	0.0	24.5	17.5	53.5	24.1	531.4	0.0
Salicylic acid 21 g ai/A	21.0	0.0	23.2	18.1	52.9	23.3	536.4	0.0
Salicylic acid 42 g ai/A	20.3	0.0	21.9	18.3	52.7	23.6	531.4	0.0
McNeal								
Untreated Check	42.3	0.0	24.6	16.7	54.5	26.0	518.3	0.0
Salicylic acid 21 g ai/A	21.7	0.0	24.1	16.8	54.4	25.6	515.9	0.1
Salicylic acid 42 g ai/A	21.7	0.0	23.4	17.0	54.3	25.9	515.5	0.1
LSD	ns	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.4060	1.0000	0.2903	0.4796	0.2222	0.8449	0.8413	0.5795

HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, OWBM: orange wheat blossom midge, ns: nonsignificant

¹adjusted to 13% moisture, ²adjusted to 12%

Table 8. Effect of application timing, treatment rate and variety

	Height		Lodging		Yield ¹		Protein ²		TWT ¹		TKW ¹		FN		OWBM	
	inches		%		bu/A		%		lb/bu		g		sec		no/spk	
	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal
	check															
Late Boot	20.7	21.7	0.0	0.0	25.7	24.9	16.9	17.1	53.7	53.8	24.3	25.4	524.1	522.3	0.1	0.0
50% Heading	21.0	84.7	0.0	0.0	23.8	25.3	17.8	16.5	53.3	54.8	23.9	26.7	534.6	511.6	0.0	0.1
50% Flowering	20.3	20.7	0.0	0.0	23.9	23.7	17.7	16.5	53.3	54.8	24.0	26.0	535.5	521.0	0.0	0.0
	Salicylic acid 21 g ai/A															
Late Boot	20.7	22.0	0.0	0.0	23.3	23.3	17.8	16.7	53.0	54.2	23.4	25.2	536.6	499.2	0.0	0.0
50% Heading	21.3	21.7	0.0	0.0	23.5	24.5	18.1	17.1	52.6	54.2	22.7	25.8	531.5	529.8	0.1	0.1
50% Flowering	21.0	21.3	0.0	0.0	22.9	24.4	18.4	16.6	52.9	54.7	23.7	25.8	541.0	518.7	0.0	0.1
	Salicylic acid 42 g ai/A															
Late Boot	20.0	21.7	0.0	0.0	20.9	23.1	18.6	17.2	52.2	54.0	22.9	25.0	518.5	526.2	0.0	0.0
50% Heading	21.0	21.7	0.0	0.0	21.2	22.5	18.5	17.3	52.6	54.1	23.7	25.9	540.7	512.3	0.0	0.0
50% Flowering	20.0	21.7	0.0	0.0	23.8	24.4	17.9	16.5	53.2	54.7	24.4	26.8	534.9	508.1	0.0	0.2
LSD	ns		ns		ns		ns		ns		ns		ns		ns	
Pr>F	0.4324		1.0000		0.3365		0.5002		0.3449		0.8856		0.2147		0.6929	

TWT: test weight, TKW: thousand kernel weight, FN: falling number, OWBM: orange wheat blossom midge, ns: nonsignificant

¹adjusted to 13% moisture, ²adjusted to 12%