SWEET CORN HYBRID TOLERANCE TO MESOTRIONE

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Introduction

Mesotrione is the active ingredient in the broadleaf herbicide Callisto, which is labeled for use in field and seed corn. Mesotrione is also an ingredient in the preemergence herbicides Camix and Lumax, which are also labeled for use in field and seed corn. Camix is a premix of s-metolachlor and mesotrione and Lumax is a premix of s-metolachlor and mesotrione and atrazine. It would be desirable to have mesotrione labeled for use in sweet corn because there are many limitations with the currently labeled broadleaf herbicides (see "Life after Bladex in Sweet Corn"). However in field experiments, Callisto has occasionally injured some sweet corn hybrids when applied postemergence. Because mesotrione is a pigment inhibitor, the injury that is observed is a bleaching or whitening of leaves in the whorl of the plant. The injury is most noticeable about a week after the application. To obtain full weed control in field corn, the Callisto label specifies that crop oil concentrate plus a nitrogen additive be used. However, a couple of previous experiments indicated that the amount of postemergence injury from Callisto could be substantially reduced if the nitrogen additive was omitted and only crop oil concentrate was used as the adjuvant. In 2002, we conducted experiments to determine if mesotrione could be safely applied to sweet corn with different application methods and adjuvants and the range in tolerance among sweet corn hybrids.

Field Experiments

Two experiments were conducted. The first experiment evaluated preemergence and postemergence mesotrione applications to five sweet corn hybrids at the Arlington Agricultural Research Station (Table 1 and 2). Mesotrione was applied preemergence as the Camix and Lumax premixes. No chlorosis or stunting were observed on the hybrids at emergence (data not shown). The lack of injury is similar to previous experiments with preemergence applications of mesotrione to sweet corn at Arlington. Mesotrione was applied postemergence toV3-4 stage sweet corn as Callisto using three different adjuvant combinations and tank mixtures with either atrazine or Accent. Similar to previous years, mesotrione injured some hybrids when crop oil concentrate (COC) and 28% UAN were used in combination as adjuvants. GH2684 had the most chlorosis, but chlorosis was also observed on Super Sweet Jubilee and Bonus. The visual injury was minimal on all three hybrids by 23 days after application. In contrast, none of the hybrids were injured when Callisto was applied using only crop oil concentrate. Frequently, less crop injury occurs when non-ionic surfactant (NIS) is used as an adjuvant as compared to crop oil concentrate. In this experiment, GH2684 had significantly less injury when non-ionic surfactant was used in place of crop oil concentrate when 28% UAN was still in the mixture. Super Sweet Jubilee and Bonus also had less injury at 8 days after application. None of the five hybrids were injured when atrazine or Accent were included as tank mix partners when crop oil concentrate was the only adjuvant.

The experiment was maintained under weed free conditions through the application of a preemergence herbicide treatment (Dual II Magnum + atrazine or the mesotrione premix) and minor additional hand weeding and machine harvested for sweet corn yield. The yields were less

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than normal and somewhat variable because of the droughty conditions during most of July. There were no statistical differences in sweet corn yields within a hybrid although yields differed among hybrids (Table 2). It is probably most important to note that GH2684 had a good yield when treated postemergence with Callisto + COC + 28% UAN, which was the treatment that

Table 1. Chlorosis ratings of five sweet corn hybrids at 8 and 23 days after postemergence applications of mesotrione.

			Chlorosis rating									
			GH2547		GH2684		GH7749		Bonus		SS Jubilee	
Treatment	Rate	Timing	8 d	23 d	8 d	23 d	8 d	23 d	8 d	23 d	8 d	23 d
	(product/a)		---------- (%) ----------									
Dual II Mag+atrazine	1.7 pt+1.5 pt	Pre	0	0	0	0	0	0	0	0	0	0
A12909 (Camix)	2.26 qt	Pre	0	0	0	0	0	0	0	0	0	0
A12854 (Lumax)	2.8 qt	Pre	0	0	0	0	0	0	0	0	0	0
Dual II Mag+atrazine Callisto+COC+28%	1.7 pt+1.5 pt 3 oz+1%+2.5%	Pre Post	0	0	14	5	0	0	2	0	7	1
Dual II Mag+atrazine Callisto+NIS+28%	1.7 pt+1.5 pt 3 oz+0.25%+2.5%	Pre Post	0	0	3	0	0	0	0	0	5	2
Dual II Mag+atrazine Callisto+COC	1.7 pt+1.5 pt 3 oz+1%	Pre Post	0	0	0	0	0	0	0	0	0	0
Dual II Mag+atrazine Callisto+atrazine+COC	1.7 pt+1.5 pt 3 oz+1.5 pt+1%	Pre Post	0	0	0	0	0	0	0	0	0	0
Dual II Mag+atrazine Callisto+Accent+COC	1.7 pt+1.5 pt 3 oz+0.5 oz+1%	Pre Post	0	0	0	0	0	0	0	0	0	0
LSD (0.10)			NS	NS	2	1	NS	NS	2	NS	2	1

Table 2. Yields of five sweet corn hybrids following preemergence or postemergence applications of mesotrione.

			Sweet corn yield				
Treatment	Rate	Timing	GH2547	GH2684	GH7749	Bonus	SS Jubilee
	(product/a)		---------- (ton/a) ----------				
Dual II Mag+atrazine	1.7 pt+1.5 pt	Pre	4.6	4.1	6.2	7.9	5.5
A12909 (Camix)	2.26 qt	Pre	5.6	6.4	5.9	6.8	6.4
A12854 (Lumax)	2.8 qt	Pre	6.1	5.3	5.3	7.6	6.4
Dual II Mag+atrazine Callisto+COC+28%	1.7 pt+1.5 pt 3 oz+1%+2.5%	Pre Post	5.3	6.9	4.9	8.0	6.5
Dual II Mag+atrazine Callisto+NIS+28%	1.7 pt+1.5 pt 3 oz+0.25%+2.5%	Pre Post	5.4	8.8	4.2	6.4	6.5
Dual II Mag+atrazine	1.7 pt+1.5 pt	Pre	6.8	4.8	5.3	8.2	5.5

Callisto+COC	3 oz+1%	Post					
Dual II Mag+atrazine	1.7 pt+1.5 pt	Pre	6.6	6.6	5.3	7.6	5.2
Callisto+atrazine+COC	3 oz+1.5 pt+1%	Post					
Dual II Mag+atrazine	1.7 pt+1.5 pt	Pre	6.5	5.8	4.3	7.0	5.3
Callisto+Accent+COC	3 oz+0.5 oz+1%	Post					
LSD (0.10)					NS		

caused the most visual injury. Super Sweet Jubilee and Bonus also had strong yields after this treatment even though they also had some injury. Overall, these results support previous observations and suggest that preemergence applications of mesotrione may have little risk of injury across a range of sweet corn hybrids. The results also support previous reports that the degree of injury from postemergence applications can be significantly reduced or eliminated on sensitive hybrids by eliminating 28% UAN as an additive.

The second experiment at Arlington evaluated the hybrid tolerance of 22 sweet corn hybrids when Callisto was applied postemergence with crop oil concentrate as the adjuvant (Table 3). The Callisto was applied at the labeled and twice the labeled rate and the response was compared to nontreated sweet corn of that hybrid. The sweet corn was in the V2-3 stage of growth at treatment, which is earlier than the experiment described above. At the field use rate of 3 oz/a, Callisto only caused 10% or greater chlorosis in three hybrids at 6 days after application and this injury diminished to 2% by 14 days after application. Over half of the hybrids were uninjured or had insignificant (#2%) injury at the 3 oz/a rate. Most of the hybrids had noticeable injury at 6 days after the double rate was applied and seven hybrids exceeded 20% chlorosis. Even with this level of injury, chlorosis ratings were below 10% for all but one hybrid by 14 days after the application. This experiment was not harvested for yield.

Table 3. Chlorosis ratings of 22 sweet corn hybrids 6 and 14 days after postemergence application with Callisto with crop oil concentrate at 1% as compared to nontreated sweet corn of that hybrid.

	Callisto rate			
	3 oz/a		6 oz/a	
Hybrid	6 days	14 days	6 days	14 days
	(%)			
Marvel	0	0	5	2
Polaris	5	2	18	5
Suregold	5	1	21	2
Rustler	1	0	5	2
HMX 8392S	1	0	9	1
HMX 0393S	2	0	7	2
Dynamo	10	2	25	6
FMX 516	0	0	8	1
HMX 7384	2	1	9	3
GH 2041	6	2	30	7
GH2298	7	1	26	5
GH7749	0	0	3	1
GH9299	2	1	1	1
GH1861	11	2	23	5

GH 2547	1	0	5	0
610	0	0	2	1
ACX 623	2	1	12	3
GG 214	2	1	7	2
GG 202	13	2	29	6
Asgrow 1	6	3	17	10
Asgrow 2	2	0	8	2
Super Sweet Jubilee	6	1	25	8
LSD (0.10)	3	1	3	1

This second experiment demonstrates the rapid onset of symptoms and recovery of sweet corn when injured from postemergence Callisto applications. Doubling the Callisto rate more than doubled the level of chlorosis in many hybrids. It also illustrates that detectable chlorosis is still possible on several hybrids even when Callisto is applied with crop oil concentrate as the only adjuvant. The greater degree of injury in this experiment as compared to the first may be a result of growth stage and weather conditions. In this second experiment, the sweet corn was smaller and the temperature was about 6E F cooler when treated than in the first experiment.

Conclusion

Mesotrione is a broadleaf herbicide that would control many of the problematic broadleaf weeds in sweet corn. Similar to previous years, preemergence applications have exhibited excellent safety to several sweet corn hybrids. Postemergence applications of mesotrione have caused temporary chlorosis of several sweet corn hybrids. The degree of injury can be lessened by using crop oil concentrate as the only adjuvant, but injury can still occur on sensitive hybrids. Yield results from this experiment and previous years suggest that even moderate levels of injury from postemergence applications will not cause significant yield loss. Overall, it is recommended that mesotrione be used primarily as a preemergence treatment, either as Camix or Lumax, in sweet corn to minimize the risk of injury and still receive effective weed control. If a postemergence application is required, minor injury may be expected, but the potential can be minimized by avoiding over application (e.g. overlaps, etc.) and by not using 28% UAN as an adjuvant. The response of all hybrids tested by universities and industry also needs to be summarized to determine if there are any hybrids where postemergence applications should be avoided entirely.