SWEET CORN HERBICIDE TOLERANCE AND RECOMMENDATIONS

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Sweet corn weed management can be challenging because of the limited number of postemergence herbicides, the potential for these herbicides to cause injury, and the weed spectrum to be controlled. Currently, Callisto and Impact are labeled for use in sweet corn while Laudis is nearing registration and Status is being evaluated for postemergence use in sweet corn. Sweet corn hybrids have had limited evaluation to determine tolerance to Impact and Laudis. We are not aware of any public testing to determine the tolerance of sweet corn hybrids to Status. Therefore, three field studies and one greenhouse study were conducted to evaluate hybrid tolerance to Status, Impact and Laudis applied postemergence.

Multi-State Hybrid Tolerance Evaluation

The first study evaluated hybrid tolerance to Impact and Status in 2007 experiments with a strip-plot arrangement and a single replication at sites in Oregon, Minnesota, Wisconsin, Illinois, New York, and Delaware. Hybrids were planted in 20 ft long single-row plots and hybrid order was randomized among sites. Seed companies entered hybrids to be evaluated for each herbicide treatment. Treatments are listed below:

Impact at 1.5 fl oz/a + 1% v/v crop oil concentrate (COC) + 8.5 lbs ammonium sulfate (AMS) / 100 gal water.
Status at 10 oz/a + 2 pt/a COC + 8.5 lbs AMS / 100 gal water.

Herbicide rates were twice the labeled or anticipated labeled rate to differentiate among tolerant and susceptible hybrids. Herbicides were applied at the V3 growth stage. Crop injury ratings were taken at 3, 7, and 14 days after treatment (DAT). For all evaluations, a 0 to 100% scale was used to evaluate injury with 0% representing no injury and 100% representing total plant chlorosis, all plants leaning, or all plants exhibiting leaf wrapping.

Full-Season Hybrid Evaluation

The second study was designed as a preliminary study to determine the potential need for future hybrid tolerance testing to Laudis and if Status affected late-season sweet corn development. This 2007 study had a strip-plot arrangement with a single replication at sites in Minnesota, Wisconsin, New York, and Delaware. Twenty-eight hybrids were planted in 20-ft long single-row plots and hybrid order was randomized among sites. Treatments are listed below:

Laudis at 6 fl oz/a + 1% v/v COC + 8.5 lb AMS / 100 gal water.
Status at 10 oz/a + 2 pt/a COC + 8.5 lb AMS / 100 gal water.
Nontreated control.

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Herbicide rates were twice the labeled or anticipated labeled rate to differentiate among tolerant and susceptible hybrids. Crop injury ratings were taken at 3, 7, and 14 DAT. For all evaluations, a 0 to 100% scale was used to evaluate injury with 0% representing no injury and 100% representing total plant chlorosis, all plants leaning, or all plants exhibiting leaf wrapping. Green husk yields were taken at crop maturity.

Illinois Disease Nursery

The third field study (Illinois disease nursery) was conducted in 2007 by Dr. Jerald Pataky at the University of Illinois. Hybrid tolerance of 249 sweet corn hybrids was determined from postemergence applications of Callisto and Laudis. Treatments are listed below:

Callisto at 6 fl oz/a + 1% v/v COC + 3.6% v/v urea ammonium nitrate (UAN).
Laudis at 6 fl oz/a + 1% v/v COC + 2% v/v UAN.

Herbicide rates were twice the labeled or anticipated labeled rate to differentiate among tolerant and susceptible hybrids. Treatments were applied at the V4-V5 growth stage. Crop injury ratings were taken at 7 DAT. Crop injury was rated from 0 to 10 with 0 representing no injury, 5 representing moderate injury, 9 representing severe injury, and 10 representing dead plants. Injury was then transformed to a percentage.

Greenhouse Evaluation of Hybrid Tolerance

A greenhouse study was conducted at the University of Wisconsin to determine the tolerance of six sweet corn hybrids to increasing rates of Callisto, Impact, and Laudis. The six sweet corn hybrids evaluated were Cahill, Dynamo, GH 2042, How Sweet It Is, Marvel, and Merit. Each herbicide was applied at 0.5, 1, 2, 4, 8, and 16x the labeled or anticipated labeled rate. The 1x herbicide rates were Callisto at 3 fl oz/a + 1% COC, Impact at 0.75 fl oz/a + 1% COC + 3 pt/a 28% UAN, and Laudis at 3 fl oz/a + 1% COC + 3 pt/a 28% UAN. Treatments were applied with a single track sprayer at the V3 to V4 growth stage. Crop injury was evaluated at 7 and 14 DAT.

Results

Multi-state hybrid tolerance evaluation.

In the multi-state evaluation, 58 of the 87 Impact-treated hybrids had 1% or less chlorosis at 7 DAT (data not shown). No hybrid exceeded 5% chlorosis when treated with Impact. Of the 42 hybrids, which were tested for tolerance to both Impact and Callisto in this same trial, 60% of the hybrids had intermediate, sensitive, or highly sensitive responses to Callisto whereas none of the hybrids responded to Impact (Figure 1). All 72 hybrids treated with Status had lodging of at least 10% of the plants within the plot at 3 DAT (data not shown). Stunting of at least 10% occurred in 43 of the 72 hybrids by 14 DAT. At least 10% general leaf wrapping occurred in 42 of 72 hybrids.

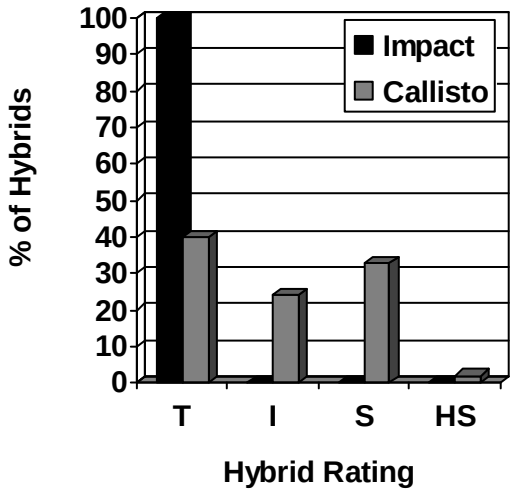

Figure 1. Classification of 42 sweet corn hybrids following treatment with a 2x rate of Impact or Callisto. Hybrid ratings are T = tolerant, I = intermediate, S = sensitive, and HS = highly sensitive.

Full-Season Hybrid Evaluation

In the full-season hybrid evaluation, Merit was the only hybrid of the 28 hybrids that had significant injury from Laudis and was killed. Merit was the only hybrid to have a yield reduction compared to the nontreated control when treated with Laudis (Table 1).

Table 1. Sweet corn yields of 28 hybrids following treatment with a 2x rate of Laudis with yield expressed as a percentage of the nontreated control of the same hybrid.

Hybrid	Yield (%)	Hybrid	Yield (%)	Hybrid	Yield (%)	Hybrid	Yield (%)
GSS 2008	113	Overland	104	Cahill	97	Passion	95
GSS 2914	112	DMC 21-84	103	Argent	96	Celestial	94
Dynamo	110	Delectable	102	Early Gold	95	CSUWP1-7	93
Trinity	109	How Sweet It Is	101	GH 2042	95	Suregold	93
Legacy	108	Temptation	99	Basin R	95	GH 4927	91
Hollywood	107	Rocker	99	Mystique	95	SS Jubilee Plus	89
GH 2547	106	GSS 1477	98	GH 9597	95	Merit	**0**

LSD (0.05) = 18

Status caused greater than 10% lodging for 27 of the 28 hybrids in the study (data not shown). At least 10% stunting occurred in 17 of 28 hybrids at 14 DAT while leaf wrapping was observed on 23 of 28 hybrids at 30 DAT. Status reduced the yield of 11 of 28 hybrids as compared to the nontreated control of the same hybrid (Table 2).

Table 2. Sweet corn yields of 28 hybrids following treatment with a 2x rate of Status with yield expressed as a percentage of the nontreated control of the same hybrid.

Hybrid	Yield (%)	Hybrid	Yield (%)	Hybrid	Yield (%)	Hybrid	Yield (%)
GH 2547	107	Legacy	95	GH 4927	82	Overland	77
Delectable	106	How Sweet It Is	91	Early Gold	82	Passion	77
Temptation	101	DMC 21-84	88	CSUWP1-7	80	Hollywood	72
GSS 2008	100	GSS 2914	87	Argent	80	Suregold	70
Dynamo	100	GSS 1477	86	GH 9597	80	Mystique	68
Rocker	98	Basin R	86	Cahill	79	SS Jubilee Plus	63
Trinity	97	Celestial	84	GH 2042	79	Merit	0

LSD (0.05) = 18

Illinois Disease Nursery

Laudis killed or severely injured 7 of 249 hybrids evaluated in the Illinois disease nursery (Figure 2). No injury was observed in the other 241 hybrids. Differential tolerance was observed, as expected with Callisto. Injury ranged from no injury to severe chlorosis.

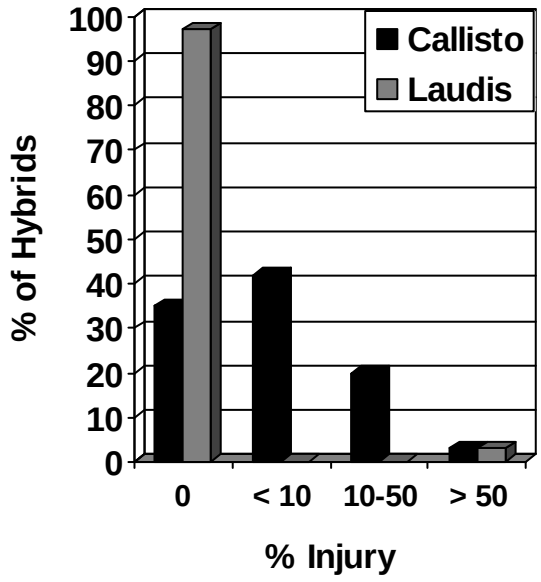

Figure 2. Frequency distribution of injury for 249 sweet corn hybrids treated with 2x rates of Laudis and Callisto at the Illinois disease nursery in 2007.

Greenhouse Evaluation of Hybrid Tolerance

Laudis killed Merit in the greenhouse evaluation at all rates, but did not cause more than 1% chlorosis among the other five hybrids regardless of rate (Table 3). Callisto caused greater than 20% chlorosis on five of six hybrids when evaluated with a rate as high as 16x. However, the hybrids did recover. Impact caused greater than 20% chlorosis for two of six hybrids and the hybrids also recovered.

Table 3. Rate of Callisto, Impact, and Laudis to cause 20% chlorosis (CHL_{20}) at 7 days after treatment in the greenhouse. The 1x herbicide rates were Callisto at 3 fl oz/a + 1% COC, Impact at 0.75 fl oz/a + 1% COC + 3 pt/a 28% UAN, and Laudis at 3 fl oz/a + 1% COC + 3 pt/a 28% UAN.

Hybrid	Callisto CHL_{20}	Impact CHL_{20}	Laudis CHL_{20}
Cahill	3.3x	> 16x	> 16x
Dynamo	2.5x	> 16x	> 16x
GH 2042	1.2x	5.5x	> 16x
How Sweet It Is	6x	> 16x	> 16x
Marvel	> 16x	> 16x	> 16x
Merit	1x	4.2x	< 0.5x

Conclusions

Status

Status caused significant injury to most hybrids that were tested. Typical injury included lodging, stunting, and leaf wrapping. A yield reduction was observed for 11 of 28 hybrids when treated with a 2x rate of Status. Status will not be labeled for use in sweet corn in 2008. BASF is considering the potential of lower use rates in sweet corn.

Impact

Sweet corn hybrids exhibited excellent tolerance to Impact. Many sweet corn hybrids had greater tolerance to Impact than Callisto. Rotational intervals restrict planting soybean at the 0.75 fl oz/a rate and snap beans the year after applications of Impact, which may limit the use of Impact in some crop rotations.

Laudis

A federal Laudis label is expected for 2008. Sweet corn hybrid tolerance is excellent for all hybrids tested except for homozygous sensitive hybrids such as Merit. Many sweet corn hybrids had greater tolerance to Laudis than Callisto. Anticipated rotational restrictions on the Laudis label will allow peas, potatoes, and snap beans to be planted 10 months after application. This will allow greater rotational flexibility to major processing crops than Callisto or Impact.

Accent and Callisto

Field research has been conducted for 3 years to determine the postemergence tolerance of 185 and 179 sweet corn hybrids to Accent and Callisto applications, respectively. The tolerance of the field-tested hybrids was classified as tolerant, intermediate, sensitive, or highly sensitive and the ratings are available from the authors. Guidelines to manage the risk of Accent or Callisto injury of specific sweet corn hybrids based on their tolerance have been developed to supplement guidelines on the label provided by DuPont for Accent or Syngenta for Callisto. Accent Q will be

available from DuPont starting in 2009. Accent Q contains the safener isoxadifen, which is also present in Laudis and Status. At this time, no evaluations have been conducted to determine the increased sweet corn hybrid tolerance when using Accent Q relative to Accent.

The decision on whether to use Accent, Callisto, Impact, or Laudis depends on several factors such as hybrid tolerance to the herbicide, herbicide efficacy on the targeted weed spectrum, rotational crop flexibility, and herbicide price. By considering all of these factors, sweet corn producers may improve their weed management while reducing the risk of injuring their sweet corn or rotational crops and maintaining profit potential.