Evaluating Potential of Mesotrione Carryover to Snap Bean
(2010 final research report)

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Introduction:
Mesotrione-based herbicide products (Lumax, Lexar, and Callisto) have been very popular with corn (field and sweet) growers due to consistent weed control performance. One issue that has limited mesotrione use in vegetable rotation systems has been an eighteen month rotation restriction for many vegetables. Growers and extension personnel have inquired about reducing the amount of time needed to rotate to vegetable crops, specifically snap beans (*Phaseolus vulgaris*). Without a reduced rotation restriction, growers cannot legally use mesotrione products and then plant snap beans the following year. Syngenta is interested in reducing the rotational restrictions of Callisto, Lumax, Lexar, and Camix provided local data demonstrates there is good snap bean safety.

Objective:
Evaluate low rates for potential snap bean injury (rates that simulate herbicide carryover).

> Overall project objective: Provide data to reduce the rotation between application of mesotrione-containing products and planting snap beans to less than twelve months.

Work Statement:
Field studies were conducted in 2010 in Pennsylvania (Rock Springs, Centre Co.) and Delaware (Georgetown, Sussex Co.) to simulate the carryover effect of mesotrione-products on several varieties of snap bean. The soil at Rock Springs was silt loam, and at the Delaware site, a loamy sand. Lumax, Lexar, and Camix were sprayed at 0.02, 0.15, 0.3, and 0.6X the normal use rate (Lumax – 2.5 qt/A; Lumax – 3 qt; Camix – 2 qt; Callisto – 3 fl oz/A) to simulate a range of potential carryover levels one year after application. Herbicides were applied PRE at time of snap bean planting in early June. Based on greenhouse assays, three or four snap bean varieties were selected for the field studies, two exhibiting low tolerance ('Envy' and 'Dart') to mesotrione and two exhibiting medium to high tolerance ('Caprice' and 'Slenderpak') were planted. Studies were arranged in a randomized complete block design with three replications. All plots were treated with POST herbicides to eliminate weed competition. Visual snap bean phytotoxicity evaluations were taken periodically throughout the growing period. Plots were hand harvested and final yields calculated.

In addition to these studies, a complementary, two-year, field study is being conducted that evaluates actual carryover affects of Lumax and Lexar on several snap bean varieties at three different locations in Pennsylvania and Delaware.

Results:
In Pennsylvania, across all varieties no more than 3% injury was observed at the 0.02X herbicide rate prior to harvest. At the 0.15X rate, Envy had 50-57% injury while Caprice and Slenderpak injury ranged from 17-28%. All varieties at the 0.3 to 0.6X rates had 35-93% injury. Yields for Envy were significantly different for

all treatments at the three higher rates (0.15, 0.3, and 0.6X). In most cases, for Caprice and Slenderpak, yields were only significantly different from the check at the 0.6X rate. However, there were trends towards decreased yields with increased herbicide rate. In Delaware, the snap beans were terminated and replanted after one month since the majority of treatments caused severe injury. Even after replanting, significant injury was observed in the three highest rates in Caprice and Slenderpak at maturity. Only the highest rate caused greater that 20% injury to Envy and Dart. Yields were not collected due to rhizoctonia that was observed in the snap beans at lower rates, confounding yield data.

Summary:

In summary, across both trials, from this preliminary trial data it appears that crop injury can be attributed primarily to mesotrione and not necessarily the atrazine component of these products. Also, a number of factors can influence snap bean injury from mesotrione carryover including, variety, herbicide rate, soil type, and climatic conditions. This study only simulated herbicide carryover, but will complement ongoing two-year trials. After the data is collected and analyzed from the two-year field study (next year), all of the research data will be provided to Syngenta to determine if there is enough convincing information and confidence to reduce the snap bean rotation restrictions for Lumax, Lexar, and Callisto.

Budget (divided across two locations):

Summer hourly labor:	$3000
Farm supplies for plot layout and maintenance:	$850
Travel:	$150
Total:	$4000

Table 1. Effect of simulated herbicide carryover on snap bean injury, height, and yield at Centre, Co, PA*

Treatment	Rate	'Envy" Injury (8/2/10)	'Envy" Height (8/2/10)	'Envy' Yield (8/3/10)	'Caprice" Injury (8/2/10)	'Caprice" Height (8/2/10)	'Caprice' Yield (8/3/10)	'Slenderpak' Injury (8/2/10)	'Slenderpak' Height (8/2/10)	'Slenderpak' Yield (8/3/10)
		%	inches	Ton/A	%	inches	Ton/A	%	inches	Ton/A
Untreated check		0	18.0	3.37	0	16.0	4.04	0	17.3	3.66
Lumax	60% of use rate	88	5.3	0.04	72	8.3	0.36	73	10.0	0.52
Lumax	30% of use rate	68	9.7	0.35	48	10.7	3.12	57	13.3	1.66
Lumax	15% of use rate	50	13	1.57	22	14.3	4.03	23	15.7	3.64
Lumax	2% of use rate	2	18.3	4.56	1	17.0	5.11	2	17.0	3.88
Lexar	60% of use rate	90	3.7	0.02	79	7.3	0.26	76	10.3	0.62
Lexar	30% of use rate	52	12.7	0.79	47	11.0	2.55	50	12.7	1.72
Lexar	15% of use rate	57	10.7	1.55	17	15.0	4.76	17	17.0	3.82
Lexar	2% of use rate	1	18.0	3.58	2	16.3	5.00	1	18.3	4.11
Camix	60% of use rate	93	1.0	0	73	9.7	1.03	80	8.0	0.25
Camix	30% of use rate	79	9.3	0.17	35	12.7	3.87	43	14.3	2.17
Camix	15% of use rate	57	14.3	0.70	23	14.3	3.84	28	15.3	3.07
Camix	2% of use rate	2	14.3	4.66	2	17.3	5.25	3	16.7	3.75
Callisto	100% of use rate	83	8.0	0.02	57	11.7	2.15	73	8.7	0.62
LSD (P=0.05)		15	6.0	1.22	12	2.1	1.30	11	2.5	1.46

Snap beans were planted and sprayed on 6/8/2010.

* Late season crop injury ratings and average plant height measurements taken 8/2/2010; snap beans harvested 8/3/2010.

Table 2. Effect of herbicides on weed control, crop injury, and yield in sweet corn at Sussex Co., DE, 2010*.

Treatment	Rate	'Envy" Injury (8/9/10)	'Caprice" Injury (8/9/10)	'Slenderpak' Injury (8/9/10)	'Dart' Injury (8/9/10)
		%	%	%	%
Untreated check		0	0	0	0
Lumax	60% of use rate	26	99	88	52
Lumax	30% of use rate	17	48	74	12
Lumax	15% of use rate	27	45	34	7
Lumax	2% of use rate	10	14	6	12
Lexar	60% of use rate	39	90	71	26
Lexar	30% of use rate	19	42	68	12
Lexar	15% of use rate	16	41	31	9
Lexar	2% of use rate	9	16	7	6
Camix	60% of use rate	13	84	63	13
Camix	30% of use rate	17	50	31	19
Camix	15% of use rate	3	7	7	3
Camix	2% of use rate	19	28	28	15
Callisto	100% of use rate	34	93	100	28
LSD (P=0.05)		19	17	27	17

Soybeans were planted 6/8/2010 and sprayed on 6/9/2010; snap beans were then terminated and replanted on 7/6/2010.
* Late season crop injury ratings taken 8/9/2010; no snap bean yield data due to rhizoctonia that was observed in the snap beans at lower rates, confounding yield data.