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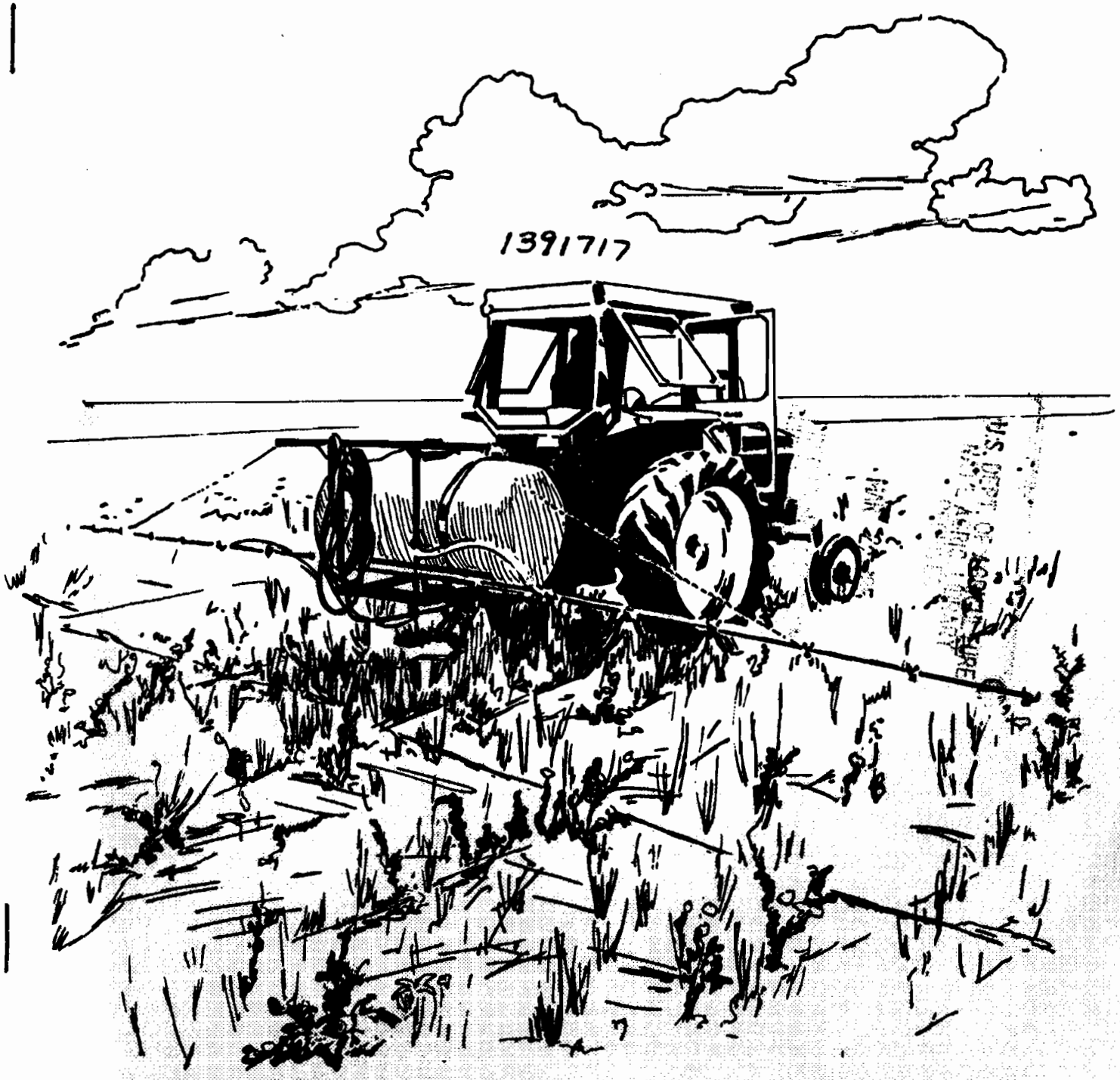

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LEXONE/SENCOR AND CLEAN PHYTOTOXICITY TO WINTER WHEAT[3]

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ABSTRACT

'Vona' and 'Centurk', two winter wheat (Triticum aestivum L.) cultivars that are commonly grown in dryland farming areas in eastern Colorado, were treated with 0.33 pounds per acre of Lexone/Sencor [4-amino-6-tert-butyl-3-(methylthio)-as-triazine-5(4H)-one] alone and in combination with Glean [2-chloro-N-[[(4-methoxy- 6-methyl-1, 3,5-triazin-2-yl)amino]carbonyl]benzenesulfonamide] at rates of 1/4, 1/2, and 1 ounce per acre. Lexone/Sencor reduced grain yields of both cultivars, with yield losses ranging from 24 to 45%. The yield component reduced most by Lexone/Sencor was the number of wheat heads per square yard. Lexone/Sencor should not be applied postemergence in the spring for downy brome (Bromus tectorum L.) control where Vona and Centurk winter wheat cultivars have been seeded in eastern Colorado. Glean applied alone reduced grain yields of Vona in one year, indicating that under some environmental conditions, Vona may be susceptible to injury by Glean.

INTRODUCTION

Downy brome has remained a troublesome weed in winter wheat grown in eastern Colorado. It generally germinates in the fall following precipitation, but it also can germinate and become established in late winter or early spring (7). Tillage has been the standard method for controlling downy brome (12), but with the advent of reduced and no-till cropping which eliminated mechanical control methods, the severity of downy brome infestations has increased (5, 8). Thus, the application of selective postemergence herbicides is the most feasible control method to reduce downy brome competition in no-till winter wheat.

Lexone/Sencor selectively controls downy brome when applied post-emergent to winter wheat, and is registered for downy brome control in winter wheat in Oklahoma, Kansas, and Montana (12). Peeper (8) stated that downy brome can be controlled selectively in winter wheat with Lexone/Sencor by seeding relatively tolerant wheat cultivars, and by avoiding high pH soils, applications prior to tillering, and heavy irrigation after application. Runyan et al (9) also reported that differential tolerance to Lexone/Sencor existed among 15 winter wheat cultivars. Two of these cultivars, Vona and Centurk, are widely grown in eastern Colorado (4). When Lexone/Sencor was applied at 0.4 kg/ha to Vona and Centurk at the fully tillered growth stage, Vona grain yield was reduced 50% while the grain yield of Centurk was not affected (9).

Glean controls broadleaf weeds in winter wheat (6, 11). It also is effective for chemical fallow, usually being spring-applied before the boot growth stage of winter wheat (2). In Montana, tank mixtures of

Glean and Hoelon [2-[4-(2,4-dichlorophenoxy) phenoxy]propanoic acid] applied postemergence reduced grain yields in durum wheat (Triticum durum Desf.) by 17 to 22%, while application of either herbicide alone to durum wheat did not affect grain yields (1,3) Thus, synergistic phytotoxicity may occur with some Glean-herbicide mixtures. Because Lexone/Sencor may be spring-applied to control late-germinating downy brome in winter wheat, and because Glean can also be applied in early spring for chemical fallow, this study was conducted to determine if Lexone/Sencor and/or Lexone/Sencor-Glean combinations are phytotoxic when spring-applied to winter wheat.

MATERIALS AND METHODS

Vona and Centurk winter wheat were planted with a hoe drill in rows spaced 13 inches apart, at 45 pounds per acre on October 9, 1982, and September 26, 1983, at Akron, Colorado. The soil was a Platner loam (Aridic Paleustoll), composed of 37% sand, 47% silt, and 16% clay, and containing 1.3% organic matter. The soil pH was 7.4. Nitrogen was applied at 50 pounds per acre in September of each year before planting. A randomized complete block design with four replications was used. Individual plots were 12 feet wide and 24 feet long, and these plots were hand-weeded as needed to prevent weed competition. Rainfall data for each cropping season are given in Table 1.

Lexone/Sencor at 0.33 lbs per acre alone and in combination with Glean at 1/4, 1/2, and 1 ounce per acre was applied to tillered wheat on April 21, 1983 and April 28, 1984. The herbicides were applied in 30 gallons per acre of spray solution at 65 pounds per square inch with a tractor-mounted sprayer equipped with hollow-cone nozzles. Rainfall in the two week period after application was 2.1 inches in 1983 and 1.7 inches in 1984.

The response of winter wheat to the herbicides was assessed 5 weeks after application. Crop tolerance was estimated visually, using a rating scale of 0 = no injury and 100 = death of all plants. Other data taken included the date at which at least 50% of the plant heads were 1 inch above the flag leaf collar, plant height at maturity, grain yields, and test weights. Grain was harvested from an area 5 feet by 16 feet in 1983 and from four 1-yard rows in 1984. Yield components were determined by counting all heads in two rows 1 yard long, and by determining the number of kernels/head and kernel weight

from 20 heads that were selected at random. Data collected were subjected to an analyses of variance, and differences between means were determined at the 5% level of significance (10).

RESULTS AND DISCUSSION

Vona winter wheat response. Phytotoxicity was visually evident in 1983 for all treatments with Lexone/Sencor, but in 1984, Vona was injured visually only where Lexone/Sencor was applied alone (Table 2). However, plant height and grain yields were reduced by all Lexone/Sencor treatments in both years, when compared to non-treated Vona. The only treatment affecting test weight in either year was when Lexone/Sencor was applied alone in 1984.

No visual injury was observed in either year where Glean was applied alone (Table 2), however, plant height was reduced in 1984 by the 1/2 ounce per acre rate of Glean. Grain yields were reduced by Glean at all three rates when applied alone in 1983, but only the high rate of Glean (1 ounce per acre) reduced grain yields in 1984. Test weight was not affected by any Glean treatment in either year. The addition of the high rate of Glean (1 ounce per acre) appeared to be antagonistic to Lexone/Sencor activity on Vona, as grain yields of the Lexone/Sencor + Glean (0.33 pound + 1 ounce per acre) treatment were significantly higher than the Lexone/Sencor-alone treatment in both years.

The yield component most affected by Lexone/Sencor injury was the number of heads per square yard (Table 3) as the Lexone/Sencor treatments in both years significantly reduced the number of heads per square yard. The reduction in number of heads per square yard contributed to the yield reduction caused by Glean when applied alone at the two lower rates in 1983. In 1984, Glean applied alone at 1 ounce per acre reduced grain yields, even though no significant differences in yield components occurred.

Centurk winter wheat response. Significant visual injury occurred with the Lexone/Sencor + Glean treatments in 1983, but only Lexone/Sencor alone induced visual injury in 1984 (Table 4). Plant height was significantly reduced by only one Lexone/Sencor + Glean combination (0.33 pound + 1 ounce per acre) in 1983, and by only Lexone/Sencor alone in 1984. All treatments with Lexone/Sencor significantly reduced grain yields in both years. When Glean was applied alone, no agronomic variable was affected in either year. Centurk appears to be more tolerant of Glean than Vona, as Glean at 1 ounce per acre significantly reduced Vona grain yield in both years (Table 2) while not affecting Centurk grain yield in either year (Table 4). Also, the antagonistic effect of the 1 ounce per acre rate of Glean on Lexone/Sencor injury found with Vona did not occur with Centurk, again, indicating a difference in cultivar response.

Reduced heads per square yard explained the Lexone/Sencor-induced grain loss with Centurk in 1984 (Table 5), as was found with Vona. However, in 1983, only Lexone/Sencor + Glean at 0.33 pound + 1 ounce per acre significantly reduced heads per square yard compared to the non-treated Centurk. The yield loss induced by Lexone/Sencor alone resulted from reduced number of kernels/head and 100-kernel weight while reduced heads per square yard and 100- kernel weight explain the yield loss induced by Lexone/Sencor + Glean at 0.33 pound + 1/2 ounce per acre. Glean applied alone did not affect any yield component in either year.

Crop management system. Runyan et al (9) reported that in Oklahoma, spring-applied Lexone/Sencor at 0.4 pound per acre reduced grain yields of Vona 50%, while not affecting Centurk grain yields. In our

study, both varieties were severely injured by spring-applied Lexone/Sencor at 0.33 pound per acre either alone or in combination with Glean. Yield losses ranged from 24 to 45% for both varieties. Peeper (8) and Runyan et al (9) reported that the amount of precipitation received after application may affect Lexone/Sencor phytotoxicity to winter wheat. Lexone/Sencor-induced stand reductions of winter wheat were greater when 1.4 inches of precipitation fell within 4 days after application than when 0.2 inches of precipitation occurred within 2 weeks after application (9). In our study, over 1.6 inches of rain fell within 2 weeks after application in both years, but this amount of rainfall is not unusual for the Akron area, as shown by the 75-year average recorded at the study site (Table 1). Thus, spring-applied Lexone/Sencor for control of downy brome does not appear to have enough crop selectivity in eastern Colorado if Vona or Centurk are grown.

Glean at 1/4 and 1/2 ounce per acre is spring-applied to winter wheat prior to the boot growth stage to control broadleaf weeds during the cropping season and for the following fallow season (2). In Montana, Glean was found to be synergistic in causing crop injury to durum wheat when combined with Hoelon (3). In our study, Glean did not increase Lexone/Sencor phytotoxicity to either variety, but at the highest rate, 1 ounce per acre, Glean reduced Lexone/Sencor injury to Vona (Table 2), thus possibly being antagonistic to Lexone/Sencor activity at this high rate for this particular cultivar. However, because of Lexone/Sencor toxicity to the two cultivars, a tank- mix of Lexone/Sencor and Glean would not be feasible for a spring application to these two cultivars.

Table 1. Precipitation during the two cropping seasons and 75-year average at Akron, Colorado.

Cropping Season	Sep-Dec.	Jan.-Mar.	Apr.	May	June	Total
	(inches)					
1982-83	3.8	2.5	3.2	1.9	3.4	14.8
1983-84	2.2	2.6	1.7	2.3	3.2	12.0
75-year average	3.2	1.4	1.8	3.0	2.5	11.9

Table 2. Effect of Lexone/Sencor, Glean, and Lexone/Sencor-Glean combinations on Vona winter wheat in 1983 and 1984.

Treatment	Rate	Cropping Year							
		1983				1984			
		Visual injury[a]	Plant height	Grain yields	Test weight	Visual injury[a]	Plant height	Grain yield	Test weight
	(pounds per acre)	(percent)	(inches)	(bushels per acre)	(pounds per bushel)	(percent)	(inches)	(bushels per acre)	(pounds per bushel)
Lexone/Sencor	0.33	13	22.9	21.8	59.7	8	29.5	28.7	54.2
Glean	1/4 ounce	0	26.0	35.3	69.1	3	31.0	42.2	57.8
Glean	1/2 ounce	0	26.2	32.3	59.6	3	30.3	40.3	59.4
Glean	1 ounce	0	25.4	34.2	60.2	1	31.3	38.7	59.1
Lexone/Sencor + Glean	0.33+1/4 ounce	13	23.5	25.0	60.5	0	29.1	30.0	58.5
Lexone/Sencor + Glean	0.33+1/2 ounce	10	21.7	28.5	60.5	0	29.7	33.5	58.7
Lexone/Sencor + Glean	0.33+1 ounce	16	21.9	29.0	60.0	1	30.4	34.7	58.4
Control	—	0	26.6	39.8	59.9	0	32.4	45.5	59.0
LSD 0.05		7	2.0	4.3	NS	7	1.6	6.0	2.1

[a] Wheat injury ratings were 0 = no injury and 100 = death of all plants.

a Wheat injury ratings were 0 = no injury and 100 = death of all plants.

Table 3. Yield component data for Vona winter wheat treated with herbicides in 1983 and 1984.

Treatment	Rate	Yield Components, 1983			Yield Components, 1984		
		Heads per square yard	Kernels per head	1000-Kernel weight	Heads per square yard	Kernels per head	1000-Kernel weight
	(pounds per acre)	(number)	(number)	(ounce)	(number)	(number)	(ounce)
Lexone/Sencor	0.33	107.2	43.3	0.85	227.4	33.0	1.07
Glean	1/4 ounce	162.3	45.3	0.90	316.4	31.2	1.02
Glean	1/2 ounce	162.3	36.0	0.96	284.6	30.1	1.11
Glean	1 ounce	167.3	42.3	0.88	313.1	28.9	1.08
Lexone/Sencor + Glean	0.33+1/4 ounce	120.7	44.7	0.87	242.7	30.4	1.10
Lexone/Sencor + Glean	0.33+1/2 ounce	117.2	51.0	0.87	278.1	29.0	1.12
Lexone/Sencor + Glean	0.33+1 ounce	120.7	49.0	0.89	284.6	29.9	1.08
Control	—	178.6	47.0	0.86	337.2	33.1	1.10
LSD 0.05		16.0	8.4	0.09	49.3	NS	0.08

Table 4. Effect of Lexone/Sencor, Glean, and Lexone/Sencor-Glean combinations on Centurk winter wheat in 1983 and 1984.

Treatment	Rate	Cropping Year							
		1983				1984			
		Visual injury[a]	Plant height	Grain yields	Test weight	Visual injury[a]	Plant height	Grain yield	Test weight
	(pounds per acre)	(percent)	(inches)	(bushels per acre)	(pounds per bushel)	(percent)	(inches)	(bushels per acre)	(pounds per bushel)
Lexone/Sencor	0.33	10	25.0	19.6	58.1	10	28.5	24.5	52.5
Glean	1/4 ounce	3	26.8	26.9	59.7	0	31.5	42.0	58.7
Glean	1/2 ounce	1	26.9	27.9	59.9	3	30.9	42.0	59.3
Glean	1 ounce	1	26.4	26.1	59.9	1	30.0	38.6	57.6
Lexone/Sencor + Glean	0.33+1/4 ounce	18	25.4	19.1	58.0	8	29.9	29.7	57.2
Lexone/Sencor + Glean	0.33+1/2 ounce	21	25.0	16.5	58.4	1	29.3	31.4	59.2
Lexone/Sencor + Glean	0.33+ 1 ounce	28	23.6	16.4	58.4	3	29.4	29.6	58.1
Control	—	0	27.4	26.3	59.7	0	31.3	44.6	58.2
LSD 0.05		18	3.6	6.6	0.9	8	2.1	9.9	2.1

[a] Wheat injury ratings were 0 = no injury and 100 = death of all plants.

[a] Wheat injury ratings were 0 = no injury and 100 = death of all plants.

Table 5. Yield component data for Centurk winter wheat treated with herbicides in 1983 and 1984.

		Yield Components, 1983			Yield Components, 1984		
Treatment	Rate	Heads per square yard	Kernels per head	1000-Kernel weight	Heads per square yard	Kernels per head	1000-Kernel weight
	(pounds per acre)	(number)	(number)	(ounce)	(number)	(number)	(ounce)
Lexone/Sencor	0.33	120	34.7	0.87	199	36.7	1.00
Glean	1/4 ounce	127	38.7	0.96	367	32.3	.99
Glean	1/2 ounce	156	34.3	1.00	363	32.0	1.02
Glean	1 ounce	133	43.3	0.95	309	31.6	1.00
Lexone/Sencor + Glean	0.33+1/4 ounce	81	53.7	0.89	244	31.1	1.00
Lexone/Sencor + Glean	0.33+1/2 ounce	99	46.0	0.89	274	31.0	1.01
Lexone/Sencor + Glean	0.33+1 ounce	72	49.7	0.89	259	33.5	1.00
Control	—	127	41.3	1.00	347	34.5	1.01
LSD 0.05		47	12.8	0.08	59	3.6	NS

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