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Soil persistence - picloram and dicamba

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The depth in the soil profile of weed root kill, subsequent emergence of the roots in treated areas, concentration of picloram and dicamba at various soil depths, and the concentration essential for activity are all factors important to initial as well as repetitive herbicide treatments.

Four research plots were established in May of 1980 in Fremont, Sheridan, Johnson and Crook counties to measure the soil persistence and concentration of picloram and dicamba under different soil types and precipitation patterns. Soil samples were obtained from 8, 16 and 24 inch soil depths approximately 4, 8 and 16 weeks following application.

Under all soil types and precipitation patterns, the concentration of dicamba and picloram was highest in the top 8 inches of soil. The highest concentration of picloram from a 2 1b ai/A application, was under the highest rainfall recorded and the highest organic matter level. From the data accumulated it appears that organic matter is the most important factor in picloram persistence.

Dicamba persistence did not follow the same pattern. The highest concentration of dicamba was measured in the soil with the lowest organic matter and lowest precipitation.

Two years after application, regardless of rate, picloram concentration in 24 inches of soil was very low. Only 0.097 ppm of picloram was measured in the top 8 inches of soil, two years following application.

Analyses of soil for dicamba and picloram was performed by the Wyoming Department of Agriculture, Division of Laboratories.

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WEED SCIENCE

CROP OR WEED Herbicide Residual
EXPERIMENT Persistence of picloram and dicamba
LOCATION Hallam Ranch - Fremont County

APPLICATION METHOD Hand VOL/A _____ GAL [XX] FULL COVERAGE [ ] BAND _____ INCHES
PLOT SIZE 21.5 x 258 ft REPLICATIONS 2
DESIGN Complete random
EQUIPMENT Fert. spreader NOZZLE _____ PSI _____
PREPLANT DATE _____ HOUR _____
SURFACE SOIL MOISTURE _____ IN SUBSOIL MOISTURE _____ IN
SURFACE SOIL CONDITION - CLODS _____ SURFACE PLANT MATERIAL _____
POSTEMERGENCE DATE May 23, 1980 HOUR 5:00 to 6:30 p.m.
SURFACE SOIL MOISTURE Dry IN SUBSOIL MOISTURE wet IN
CROP STAGE/HEIGHT _____ CROP CONDITION _____
WEEDS STAGE/HEIGHT _____

INCORPORATION DATE _____ IMPLEMENT _____
HOURS AFTER HERBICIDE APPLICATION _____ DEPTH _____ IN
WEATHER AIR TEMP. 63 F RELATIVE HUMIDITY 79 % WIND NW MPH 4-6
SKY partly cloudy SOIL TEMP.: SURFACE 62 F 1" 63 F 2" 64 F 4" 65 F
SOIL TEXTURE _____ SAND ___% SILT ___% CLAY ___% O.M. ___% PH ___
CROP PLANTING DATE _____ VARIETY _____ ROW WIDTH _____ IN
SEED DEPTH _____ IN SOIL MOISTURE FOR SEED _____ TILTH/CLOD SIZE _____ IN
SEEDBED PREPARATION _____ STUBBLE OR TRASH _____
POST-PLANTING TILLAGE _____
IRRIGATION _____
PREVIOUS CROP grass forage PREVIOUS PESTICIDES none
EVALUATIONS DATE/DATA 28, 54, 114 days after treatment: core sampled
HARVEST DATE/DATA _____
FACTORS AFFECTING THE EXPERIMENT

Total precipitation 0.82 inch from 5/23 to 9/14 (6/20-0.15"; 7/15-0.40"; 8/11-0.57"; 9/14-0.82"). Plots located on shallow soil above sandstone layer.

RESULTS

Concentration of picloram and dicamba was greatest in the top 8 inches of soil and decreased as soil depth increased.

Table 56. Picolinic acid and dicamba concentration at three soil depths. Hallam Ranch. Fremont County. 1980.

Treatment[1]	Rate ai/A	Days After Treatment	Sample Depth (inches) 0-8	8-16	16-24
			(ppm)		
picloram	1.0	28	0.201	0.049	0.005
		54	0.173	0.036	0.006
		114	0.146	0.015	0.044
picloram	2.0	28	0.106	0.024	0.004
		54	0.490	0.051	0.021
		114	0.167	0.012	0.007
dicamba	6.0	28	1.020	0.057	0.032
		54	2.080	0.046	0.003
		114	2.610	0.047	0.009
dicamba	8.0.	28	1.720	0.306	0.028
		54	2.500	0.434	0.016
		114	2.620	0.118	0.053
	Soil Texture		SL[2]	SL	L
	Sand (%)		55.2	55.2	47.2
	Silt (%)		30.6	31.6	39.6
	Clay (%)		14.2	13.2	13.2
	Organic Matter (%)		2.2	1.1	0.0
	pH (paste)		7.3	7.5	7.7

[1]Treatments made May 23, 1980.
[2]SL = sandy loam; L = loam.

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WEED SCIENCE

CROP OR WEED Herbicide Residual
EXPERIMENT Persistence of picloram and dicamba
LOCATION Richardson Ranch - Sheridan County

APPLICATION METHOD Hand VOL/A _____ GAL [XX] FULL COVERAGE [ ] BAND _____ INCHES
PLOT SIZE 21.5 x 258 ft REPLICATIONS 1
DESIGN Complete random
EQUIPMENT Fert. spreader NOZZLE _____ PSI _____
PREPLANT DATE _____ HOUR _____
SURFACE SOIL MOISTURE _____ IN SUBSOIL MOISTURE _____ IN
SURFACE SOIL CONDITION - CLODS _____ SURFACE PLANT MATERIAL _____
POSTEMERGENCE DATE May 28, 1980 HOUR 10:00 a.m. to 1:00 p.m.
SURFACE SOIL MOISTURE Dry IN SUBSOIL MOISTURE intermediate IN
CROP STAGE/HEIGHT _____ CROP CONDITION _____
WEEDS STAGE/HEIGHT _____

INCORPORATION DATE _____ IMPLEMENT _____
HOURS AFTER HERBICIDE APPLICATION _____ DEPTH _____ IN
WEATHER AIR TEMP. 70 F RELATIVE HUMIDITY 48 % WIND NE MPH 0-2
SKY partly cloudy SOIL TEMP.: SURFACE 84 F 1" 80 F 2" 83 F 4" 73 F
SOIL TEXTURE _____ SAND ____ % SILT ____ % CLAY ____ % O.M. ____ % PH ____
CROP PLANTING DATE _____ VARIETY _____ ROW WIDTH _____ IN
SEED DEPTH _____ IN SOIL MOISTURE FOR SEED _____ TILTH/CLOD SIZE _____ IN
SEEDBED PREPARATION _____ STUBBLE OR TRASH _____
POST-PLANTING TILLAGE _____
IRRIGATION _____
PREVIOUS CROP grass forage PREVIOUS PESTICIDES none
EVALUATIONS DATE/DATA 26, 54, 117 days after treatment: core sampled
HARVEST DATE/DATA _____
FACTORS AFFECTING THE EXPERIMENT

Total precipitation 1.91 inches from 5/28 to 7/21 (5/30-0.91"; 6/23-1.85; 7/21-1.91"). Plots located on rocky soil area.

RESULTS

Concentration of picloram and dicamba was greatest in the top 8 inches of soil; decreased as depth increased.

Table 57. Picolinic acid and dicamba concentration at three soil depths. Richardson Ranch. Sheridan County. 1980.

Treatment[1]	Rate lb ai/A	Days After Treatment	Sample Depth (inches) 0-8	8-16	16-24
			(ppm)		
picloram	1.0	26	0.357	0.081	0.383
		54	0.341	0.063	0.080
		117	0.991	0.048	T2
picloram	2.0	26	0.924	0.026	0.029
		54	0.173	0.029	0.062
		117	0.481	0.015	T
dicamba	6.0	26	0.867	0.120	0.020
		54	0.550	0.017	0.014
		117	0.380	0.046	0.013
dicamba	8.0	26	2.580	0.047	0.051
		54	3.850	0.027	0.011
		117	0.299	0.015	0.005
	Soil Texture		CL[3]	CL	CL
	Sand (%)		23.2	23.2	27.2
	Silt (%)		46.0	38.0	42.0
	Clay (%)		30.8	38.8	30.8
	Organic Matter(%)		2.6	1.7	1.8
	pH (paste)		6.6	6.5	7.5

[1]Treatments made May 28, 1980.
[2]T = Trace: dicamba, less than 0.002 ppm; picloram, less than 0.003 ppm.
[3]CL = clay loam.

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CROP OR WEED Herbicide Residual
EXPERIMENT Persistence of picloram and dicamba
LOCATION Copps Ranch - Johnson County

APPLICATION METHOD Hand VOL/A _____ GAL [XX] FULL COVERAGE [ ] BAND _____ INCHES
PLOT SIZE 80 x 100 ft REPLICATIONS 1
DESIGN Block
EQUIPMENT Fert. spreader NOZZLE _____ PSI _____
PREPLANT DATE _____ HOUR _____
SURFACE SOIL MOISTURE _____ IN SUBSOIL MOISTURE _____ IN
SURFACE SOIL CONDITION - CLODS _____ SURFACE PLANT MATERIAL _____
POSTEMERGENCE DATE May 29, 1980 HOUR 1:00 to 3:00 p.m.
SURFACE SOIL MOISTURE Damp IN SUBSOIL MOISTURE intermediate IN
CROP STAGE/HEIGHT _____ CROP CONDITION _____
WEEDS STAGE/HEIGHT _____

INCORPORATION DATE _____ IMPLEMENT _____
HOURS AFTER HERBICIDE APPLICATION _____ DEPTH _____ IN
WEATHER AIR TEMP. 57 F RELATIVE HUMIDITY 100% WIND N MPH 0-4
SKY cloudy SOIL TEMP.: SURFACE 64 F 1" 63 F 2" 63 F 4" 61 F
SOIL TEXTURE _____ SAND ___% SILT ___% CLAY ___% O.M. ___% PH ___
CROP PLANTING DATE _____ VARIETY _____ ROW WIDTH _____ IN
SEED DEPTH _____ IN SOIL MOISTURE FOR SEED _____ TILTH/CLOD SIZE _____ IN
SEEDBED PREPARATION _____ STUBBLE OR TRASH _____
POST-PLANTING TILLAGE _____
IRRIGATION _____
PREVIOUS CROP _____ PREVIOUS PESTICIDES _____
EVALUATIONS DATE/DATA 26, 54, 117 days after application: core sampled
HARVEST DATE/DATA _____
FACTORS AFFECTING THE EXPERIMENT

Total precipitation 4.80 inches from 5/29 to 9/23 (6/24-1.24"; 7/22-1.42"; 8/29-2.52"; 9/23-4.80"). Light sprinkle at time of application. Plots located on deep soil in draw bottom.

RESULTS

Concentration of picloram and dicamba was greatest in the 0-8 inch soil level and decreased as soil depth increased.

Table 58. Picolinic acid and dicamba concentration at three soil depths. Copps Ranch. Johnson County. 1980.

Treatment[1]	Rate lb ai/A	Days After Treatment	Sample Depth (inches) 0-8 (ppm)	8-16 (ppm)	16-24 (ppm)
Picloram	1.0	26	0.117	T[2]	T
		54	0.301	0.017	0.009
		117	0.062	0.016	T
Picloram	2.0	26	0.541	0.059	T
		54	1.010	0.148	0.018
		117	0.547	0.070	0.017
dicamba	6.0	26	0.521	0.005	T
		54	1.030	0.005	0.008
		117	0.424	0.145	0.004
dicamba.	8.0	26	1.000	0.009	0.007
		54	0.319	T	T
		117	0.504	0.042	0.009
	Soil Texture		L[3]	L	L
	Sand (%)		39.2	37.2	37.2
	Silt (%)		38.0	40.0	42.0
	Clay (%)		22.8	22.8	20.8
	Organic Matter (%)		2.9	2.6	1.5
	PH (paste)		7.6	7.5	7.5

[1]Treatments made May 29, 1980.
[2]T = Trace: dicamba, less than 0.002 PPM; Picloram, less than 0.003 ppm.
[3]L = loam.

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CROP OR WEED Herbicide Residual
EXPERIMENT Persistence of picloram and dicamba
LOCATION Driskill Ranch - Crook County

APPLICATION METHOD Hand VOL/A _____ GAL [XX] FULL COVERAGE [ ] BAND _____ INCHES
PLOT SIZE 21.5 x 258 ft REPLICATIONS 2
DESIGN Complete random
EQUIPMENT Fert. spreader NOZZLE _____ PSI _____
PREPLANT DATE _____ HOUR _____
SURFACE SOIL MOISTURE _____ IN SUBSOIL MOISTURE _____ IN
SURFACE SOIL CONDITION - CLODS _____ SURFACE PLANT MATERIAL _____
POSTEMERGENCE DATE May 15, 1980 HOUR 9:00 to 11:00 a.m.
SURFACE SOIL MOISTURE Dry to 1 IN SUBSOIL MOISTURE intermediate IN
CROP STAGE/HEIGHT _____ CROP CONDITION _____
WEEDS STAGE/HEIGHT _____

INCORPORATION DATE _____ IMPLEMENT _____
HOURS AFTER HERBICIDE APPLICATION _____ DEPTH _____ IN
WEATHER AIR TEMP. 67 F RELATIVE HUMIDITY 42 % WIND N MPH 0-2
SKY partly cloudy SOIL TEMP.: SURFACE 65 F 1" 62 F 2" 55 F 4" 52 F
SOIL TEXTURE _____ SAND ___ % SILT ___ % CLAY ___ % O.M. ___ % PH ___
CROP PLANTING DATE _____ VARIETY _____ ROW WIDTH _____ IN
SEED DEPTH _____ IN SOIL MOISTURE FOR SEED _____ TILTH/CLOD SIZE _____ IN
SEEDBED PREPARATION _____ STUBBLE OR TRASH _____
POST-PLANTING TILLAGE _____
IRRIGATION _____
PREVIOUS CROP rangeland PREVIOUS PESTICIDES none
EVALUATIONS DATE/DATA 28, 57,113 days after treatment: core sampled
HARVEST DATE/DATA _____
FACTORS AFFECTING THE EXPERIMENT

Total precipitation 6.09 inches from 5/15 to 9/23 (6/12-1.45"; 7/11-2.90"; 7/31-3.48"; 9/5-5.44"; 9/23-6.09").

RESULTS

Concentration of picloram and dicamba was greatest in the top 8 inches of soil; decreased as depth increased.

Table 59. Picolinic acid and dicamba concentration at three soil depths. Driskill Ranch. Crook County. 1980.

Treatment[1]	Rate lb ai/A	Days After Treatment	Sample 0-8	Depth (inches) 8-16 (ppm)	16-24
picloram	1.0	28	0.374	0.039	0.024
		57	0.320	0.107	0.026
		113	0.398	0.019	T[2]
picloram	2.0	28	0.807	0.122	0.051
		57	0.608	0.119	0.055
		113	0.670	0.059	0.014
dicamba	6.0	28	1.480	0.086	0.014
		57	0.854	0.015	0-009
		113	0.068	0.005	T
dicamba	8.0	28	1.500	0.022	0.084
		57	1.630	0.126	0.047
		113	1.340	0.086	0.033
	Soil Texture		SL[3]	SL	SL
	Sand (%)		75.2	79.2	75.2
	Silt (%)		13.6	10.6	14.6
	Clay (%)		11.2	10.2	10.2
	Organic Matter (%)		3.1	0.8	0.6
	pH (paste)		7.7	7.8	7.8

[1]Treatments made May 15, 1980.

[2]T = Trace: dicamba, less than 0.002 ppm; picloram, less than 0.003 ppm.

[3]SL = silty loam.

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CROP OR WEED Herbicide Residual
EXPERIMENT Persistence of picloram
LOCATION Driskill Ranch - Crook County

APPLICATION METHOD Aerial VOL/A _____ GAL [XX] FULL COVERAGE [ ] BAND _____ INCHES
PLOT SIZE 60 x 1320 ft REPLICATIONS 1
DESIGN _____
EQUIPMENT Weatherly airplane NOZZLE _____ PSI _____
PREPLANT DATE _____ HOUR _____
SURFACE SOIL MOISTURE _____ IN SUBSOIL MOISTURE _____ IN
SURFACE SOIL CONDITION - CLODS _____ SURFACE PLANT MATERIAL _____
POSTEMERGENCE DATE May 26, 1978 HOUR _____
SURFACE SOIL MOISTURE _____ IN SUBSOIL MOISTURE _____ IN
CROP STAGE/HEIGHT _____ CROP CONDITION _____
WEEDS STAGE/HEIGHT _____

INCORPORATION DATE _____ IMPLEMENT _____
HOURS AFTER HERBICIDE APPLICATION _____ DEPTH _____ IN
WEATHER AIR TEMP. _____ F RELATIVE HUMIDITY _____ % WIND _____ MPH _____
SKY _____ SOIL TEMP.: SURFACE _____ F 1" _____ F 2" _____ F 4" _____ F
SOIL TEXTURE loam SAND 45.2% SILT 37.6% CLAY 17.2% O.M. 2.0% pH 6.9
CROP PLANTING DATE _____ VARIETY _____ ROW WIDTH _____ IN
SEED DEPTH _____ IN SOIL MOISTURE FOR SEED _____ TILTH/CLOD SIZE _____ IN
SEEDBED PREPARATION _____ STUBBLE OR TRASH _____
POST-PLANTING TILLAGE _____
IRRIGATION _____
PREVIOUS CROP rangeland PREVIOUS PESTICIDES none
EVALUATIONS DATE/DATA May 14, 1980: core sampled
HARVEST DATE/DATA _____
FACTORS AFFECTING THE EXPERIMENT

Plots on a deep soil covered with native grass.

RESULTS

Two years after application, regardless of rate, picloram concentration in 24 inches of soil was very low.

Table 60. Picolinic acid concentration at three soil depths, two years after application. Driskill Ranch. Crook County. 1980.*

Treatment[1]	Rate lb ai/A	Sample 0-8	Depth (inches)[2] 8-16	16-24
			(ppm)	
picloram	2.0	0.007	0.038	T[3]
picloram	3.0	0.097	0.004	0.010

[1]Treatments made May 26, 1978.
[2]Sampled May 14, 1980.
[3]T = Trace; less than 0.003 ppm.