Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 12 *Keeping up with Research*

Article 58

1982

Herbicides for Use on High pH Soils in the Wheat Fallow System in Southwest Kansas (1982)

Charles A. Norwood

Recommended Citation
Norwood, Charles A. (1982) "Herbicides for Use on High pH Soils in the Wheat Fallow System in Southwest Kansas (1982)," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 12.
https://doi.org/10.4148/2378-5977.7295

AES Keeping Up With Research 65

November 1982

Herbicides for Use on High pH Soils in the Wheat Fallow System in Southwest Kansas

Charles A. Norwood
Garden City Branch Experiment Station

Reduced tillage for dryland wheat involves the substitution of herbicides for tillage during the fallow period. Proper management of reduced tillage systems results in increased retention of straw, decreased erosion, increased retention of precipitation, and increased yield.

Proper selection and use of herbicides will result in good weed control during fallow while minimizing the risk of injury to the subsequent crop. Injury to wheat will occur only from the misuse of herbicides. Most residual herbicides currently used in the wheat fallow system were not initially developed for wheat, so particular attention must be paid both to the selection of the herbicides and the amount applied.

Persistence of the herbicide depends on rainfall, soil moisture, texture, organic matter, and pH. Low soil moisture, coarse texture, low organic matter, and high pH will increase the persistence of herbicides. In western Kansas, injury to wheat occurs most frequently on high pH soils. Such soils contain significant amounts of calcium carbonate and are low in organic matter.

AGRICULTURAL EXPERIMENT STATION
Kansas State University, Manhattan
John O. Dunbar, Director

Table 1. Precipitation at the Garden City Experiment Station 1976-1981.

	Year						
Month	1976	1977	1978	1979	1980	1981	73 yr Avg.
				-inches-			
January	0.02	0.35	0.16	0.99	0.88	0.11	0.34
February	0.06	T	0.83	0.03	0.63	0.09	0.56
March	0.55	0.25	0.80	2.54	1.92	1.58	0.93
April	3.98	6.03	0.09	1.21	1.86	0.96	1.67
May	1.32	5.41	6.08	2.55	5.71	3.87	2.92
June	0.12	0.13	4.53	1.51	1.57	0.28	2.92
July	0.96	1.72	0.83	4.45	0.50	4.00	2.43
August	0.91	4.80	1.10	4.99	2.80	2.36	2.32
September	2.66	0.55	0.36	0.16	0.04	2.27	1.56
October	0.73	0.73	0.07	1.76	0.10	0.48	1.22
November	0.05	1.00	0.92	0.22	0.08	1.31	0.70
December	T	0.13	1.05	0.57	0.12	0.08	0.40
Total	11.36	21.10	15.82	20.98	16.21	17.39	17.97

Fallow ppt:	
1976-1977	24.00
1977-1978	23.35
1979-1980	28.02
1980-1981	16.88
73 yr. Avg.	22.72

This experiment was conducted to study the effects of herbicides on weed control, crop injury, and yield of wheat grown in a wheat fallow system on a typical high pH soil.

Procedure

The soil type was a Colby silt loam with a pH of 8.0, free carbonates in the surface, and an organic matter content of 1.5%. Herbicide applications were made in July or August of each year to the stubble remaining after that year's wheat crop. Weeds emerging prior to application were controlled by contact herbicides that were mixed with the residual herbicide or by tillage before application if the weeds were large. In addition, some herbicides were applied the following spring, either to untreated stubble or to stubble treated the preceding summer.

Precipitation occuring over the entire period is given in Table 1.

Results

The results from several studies initiated after harvest during the period 1976-1981 are reported.

Results from 1976 and 1977. Weed control ratings were not recorded for the study initiated in 1976, but ratings made on June 12, 1978 for the study initiated in 1977 are given in Table 2. Weeds present were volunteer wheat, Russian thistle, redroot pigweed, and kochia. Since control was similar for each species, individual ratings were not made. Weeds were just beginning to grow and there was little difference between the three treatments. Injury (% stand reduction) and yield of the 1978 and 1979 wheat crops are also included in Table 2.

Considerable injury from the 1.0 lb rate of atrazine and 0.8 lb atrazine + 1.6 lb cyanazine occurred to the 1978 wheat, while only slight injury resulted from the lower rate of atrazine + cyanazine. A significant reduction in yield resulted only from the 1.0 lb rate of atrazine in 1978. No injury or yield reduction occurred in 1979. The lower yields in 1979, as compared to 1978, can probably be attributed to late emergence and minimal growth due to a lack of adequate topsoil moisture during the fall of 1978.

Results from 1979 and 1980. In 1979 the studies were expanded to include more rates and times of application. Herbicides applied during the sum-

Table 2. Weed control during fallow, stand reduction, and yield of winter wheat as affected by herbicides and tillage. 1978-1979.

Herbicide	Rate	Weed Control 1979[1]	Stand Reduction 1978	Stand Reduction 1979	Yield 1978	Yield 1979
	lb/A (a.i)	-%-	-%-		-Bu/A-	
Atrazine	1.0	— 55	32	0	24	20
Atrazine + Cyanazine	0.5 + 1.1	— 40	2	0	34	21
Atrazine + Cyanazine	0.8 + 1.6	— 60	40	0	30	24
Tillage only	————	— 100	0	0	37	19
LSD .05		— 16	19	—	10	NS

[1]Applied July 13, 1977, rated June 6, 1978

Table 3. Weed control during fallow as affected by herbicides and tillage. 1980.

Herbicide	Rate	Date Rated: May 5 Grasses	May 5 Broad-leaves	June 10 Grasses	June 10 Broad-leaves	June 25 Grasses	June 25 Broad leaves
	lb/A (a.i.)			-% Control-			
Atrazine[1]	0.5	82	100	33	30	T[3]	
Atrazine[1]	0.8	100	100	42	30	T	
Atrazine[1]	1.0	99	99	50	57	T	
Atrazine + Cyanazine[1]	0.8 + 1.6	100	100	50	70	T	
Cyanazine[2]	2.4	82	100	100	63	13	
Metribuzin[2]	0.5	87	100	80	87	33	
Atrazine[1] + Cyanazine[2]	0.5 + 2.4	90	100	70	73	13	
Atrazine[1] + Cyanazine[2]	0.8 + 2.4	98	100	73	77	43	
Atrazine[1] + Cyanazine[2]	1.0 + 2.4	93	100	80	70	43	
Tillage only	————	62	92	T		T	
LSD (.05)		15	4	24	25	19	

[1]Applied August 20, 1979
[2]Applied April 22, 1980
[3] Indicates tillage used for weed control

Table 4. Weed control during fallow as affected by herbicides and tillage. 1981.

Herbicide	Rate	Date Rated: May 21 Grasses	May 21 Broad-leaves	June 18 Grasses	June 18 Broad-leaves	July 13 Grasses	July 13 Broad-leaves	August 5 Grasses	August 5 Broad-leaves
	lb/A (a.i.)				- % Control -				
Atrazine[1]	0.5	93	100	67	53	T		T[3]	
Atrazine[1]	0.8	97	100	63	73	47	40	T	
Atrazine[1]	1.0	98	100	57	73	40	57	T	
Atrazine + Cyanazine[1]	0.8 + 1.6	99	100	67	85	40	53	T	
Cyanazine[2]	2.4	98	100	80	100	77	53	T	
Metribuzin[2]	0.5	96	100	97	87	83	60	T	
Atrazine[1] + Cyanazine[2]	0.5 + 2.4	96	100	70	100	53	77	T	
Atrazine[1] + Cyanazine[2]	0.8 + 2.4	100	100	100	100	90	93	87	92
Atrazine[1] + Cyanazine[2]	1.0 + 2.4	100	100	100	98	90	100	85	90
Atrazine[1] + Metribuzin[2]	1.0 + 0.5	100	100	95	100	85	70	80	80
Tillage only	————	40	50	T		T		T	
LSD (.05)		4	0	25	15	32	15	NS	NS

[1]Applied August 11, 1980
[2]Applied April 29, 1981
[3]Indicates tillage used for weed control

Table 5. Stand reduction and yield of winter wheat as affected by herbicides and tillage. 1981-1982.

Herbicide	Rate	Stand Reduction		Yield	
		1981	1982	1981	1982
	lb/A (a.i.)	-%		-Bu/A-	
Atrazine[1]	0.5	0	0	13	40
Atrazine[1]	0.8	3	0	15	35
Atrazine[1]	1.0	15	0	18	35
Atrazine + Cyanazine[1]	0.8 + 1.6	11	0	13	33
Cyanazine[2]	2.4	0	0	13	40
Metribuzin[2]	0.5	0	0	14	40
Atrazine[1] + Cyanazine[2]	0.5 + 2.4	0	0	16	38
Atrazine[1] + Cyanazine[2]	0.8 + 2.4	0	0	15	38
Atrazine[1] + Cyanazine[2]	1.0 + 2.4	0	0	13	34
Tillage only	———	—	—	13	38
LSD (.05)		9	—	NS	NS

[1]Applied August 20, 1979; August 11, 1980
[2]Applied April 22, 1980; April 29, 1981

mer of 1979 and the spring of 1980, along with the resulting weed control ratings, are given in Table 3, while results from the 1980-81 fallow period are presented in Table 4. Grassy weeds present during both fallow periods were mainly volunteer wheat and some witchgrass. Broadleaved weeds included Russian thistle, kochia, and redroot pigweed, along with light infestations of prostrate pigweed and tansy mustard.

There were relatively few broadleaves present in any treatment on the first rating date of each year and all herbicides gave nearly perfect control. Grassy weed control exceeded 80% in 1980 and 90% in 1981 for all herbicides on the first rating date. Infestation of both grasses and broadleaves became more severe by the second rating date and the control given by several of the treatments diminished. The 0.5 lb rate of atrazine gave control only until early to mid-June in both years. The 1.0 lb rate of atrazine gave better control of broadleaves in 1980; in 1981 both the 0.8 and 1.0 lb rates gave better control than the 0.5 lb rate of atrazine. Control of witchgrass and volunteer wheat did not differ between rates of atrazine in either year.

The tank mix containing 0.8 lb atrazine and 1.6 lb cyanazine gave better control of broadleaves in 1980 than 0.8 lb atrazine alone, but a significant difference did not occur in 1981. In other studies the main advantage of the atrazine + cyanazine tank mix has been better control of volunteer wheat following harvest than with atrazine alone, particularly in years of above average rainfall.

Good control was obtained with spring applications of cyanazine or metribuzin to previously untreated stubble. However, season-long control was not obtained since the plots required tillage between wheat harvest and winter freeze.

The best and longest lasting weed control in both years was obtained with atrazine applied after wheat harvest followed by cyanazine or metribuzin the next spring. In 1981, control with 0.5 lb atrazine followed by cyanazine lasted into July, while at the higher rates of atrazine, control lasted into August. Weed control lasted longer into the fallow period of 1981 than 1980, probably because of different distribution of rainfall (only 0.28 in occurred in June 1981, Table 1).

As with the 1978-79 study, injury from atrazine occurred in only 1 of the 2 years (Table 5). A slight reduction in stand resulted from 0.8 lb atrazine in 1981 while a somewhat greater stand reduction resulted from the 1.0 lb rate of atrazine and the atrazine + cyanazine tank mix. The reduction in stand was considerably less than that occurring in 1978, and no measurable reductions in yield occurred. Yields in 1981 were the lowest of the 4 years because of a freeze which occurred when the wheat was heading.

New Herbicides. New herbicides for reduced tillage are being developed by the various chemical

companies. One recently labeled herbicide is chlorosulfuron (Glean), manufactured by Du Pont. The results obtained so far indicate that chlorosulfuron gives weed control that lasts at least as long as atrazine. Chlorosulfuron was developed for cereal grains and will not injure wheat. Its main weakness seems to be a lack of control of volunteer wheat during fallow. A comparison of chlorosulfuron with other currently labeled herbicides will be published at a later date.

Conclusions

Atrazine or a cyanazine + atrazine tank mix applied in July or August following wheat harvest generally gave good weed control until at least mid-June of the following year. Following atrazine with cyanazine or metribuzin the next spring gave the longest period of weed control. Cyanazine and metribuzin applied in the spring to stubble not treated the preceding summer also gave good weed control, but necessitated tillage between harvest and winter freeze.

Stand reductions due to atrazine carry-over occurred in 2 of the 4 years of this study, while a reduction in yield occurred in only 1 year. However, all plots having a stand reduction were weedy, often causing problems at harvest, and necessitating tillage for weed control immediately following harvest. Thus, on a high pH soil, such as the one in this study, the rate of atrazine used should not exceed 0.5 lb. active ingredient in order to minimize the possibility of injury.

Contribution 82-605-s, Department of Agronomy.

Agricultural Experiment Station, Manhattan 66506

KSU KANSAS STATE UNIVERSITY

Keeping up With Research 65 November 1982

 11-82—3M