THE EFFECT OF MANAGEMENT PRACTICES IN A CONTINUOUS WHEAT ROTATION ON WEED POPULATIONS

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Abstract

A five year field study was conducted at five locations in West Central and North West Saskatchewan to determine the effect of cropping practices on weed populations in a continuous wheat rotation. Fall tillage, normal stubble height, tall stubble and varying fertility levels (N and P) did not directly influence populations of grassy and broadleaved weeds.

In general, there was no significant differences between the herbicide combinations on grassy and broadleaved weed populations at any of the five sites. Diclofop methyl (Hoegrass) applied as a tank mix with bromoxynil (Torch) or as a separate application with chlorsulfuron (Glean) or Bromoxynil/MCPA (Buctril M) and Triallate (Avadex BW) applied in the fall, followed by 2,4-D amine in the spring all reduced weed populations significantly.

Yield increases from the application of Hoegrass plus Glean, Hoegrass/Torch, Hoegrass plus Buctril M and Avadex + 2,4-D were 21, 22, 19 and 15% respectively.

Materials and Methods

In 1982, a continuous wheat rotation was initiated at Kindersley, Scott, Lashburn, Mervin and Loon Lake. The site at Kindersley is located on a Brown soil while the sites at Scott, Lashburn, Mervin and Loon Lake are located on Dark Brown, Black, Black-Grey Transition and Grey-Wooded soils respectively. The design of the experiment was a split-split plot with four replications. Main plots were stubble treatments, sub plots herbicide

combinations and sub-sub plots fertility levels. Factors and levels tested are show below.

FACTOR	LEVEL
Stubble management	1. fall tillage, cultivated following harvest.
	2. normal height stubble.
	3. tall stubble.
Herbicide treatments	1. untreated
	2. Hoegrass (0.70 kg/ha) and Glean (0.02 kg/ha) separate application.
	3. Hoegrass (0.70 kg/ha)/Torch (0.35 kg/ha) tank mix.
	4. Hoegrass (0.70 kg/ha) + Buctril M (0.56 kg/ha), separate application to normal height and tall stubble treatments. Avadex BW (1.4 kg/ha) granular to fall tillage + 2,4-D amine (0.42 kg/ha) in crop.
Fertility levels	1. 0 - N, 0 - P_2O_5
	2. 40# N/acre broadcast 20# P_2O_5 seed placed.
	3. 80# N/acre broadcast 40# P_2O_5 seed placed.

Granular Avadex BW was applied with a Gandy applicator to stubble treatments after October 1 and incorporated with a field cultivator. All other herbicide treatments were applied post emergent to the crop and weeds with a plot sprayer applying a total volume of 100 l/ha and operating at 275 Kpa. In herbicide treatments two and four, Hoegrass was applied first followed by either Glean or Buctril M at no less than five day intervals. In treat-

ment three Hoegrass and Torch were applied simultaneously as a tank mixture.

Weed counts at all locations were taken from a M^2 area of each plot in mid July to correspond to the results obtained in the Saskatchewan Weed Survey (Thomas,1979). The dominant weed species at each location are indicated in Table 1.

Table 1 Dominant Weed Species By Location

Scott	Kindersley	Lashburn	Mervin	Loon Lake
Lambs'-quarters Stinkweed Wild buckwheat Russian thistle Wild oats Green foxtail	Wild mustard Wild oats Stinkweed Cow cockle	Lambs'-quarters Wild buckwheat Stinkweed Wild oats	Stinkweed Shepherd's purse Corn spurry	Shepherds' purse Wild oat Corn spurry Narrow-leaved hawk's-beard

Anaylsis carried out on the data are summarized in Table 2.

Table 2. Summary of Statistical Significance From Analysis of Variance for Management Practices on Weed Population in a Continuous Wheat Rotation at five locations 1983-86.

	Weed Density		
Source	Grassy	Broadleaved	Total
Stubble	N.S.	N.S.	N.S.
Herbicide	* *	* *	* *
S X H	N.S.	N.S.	N.S.
Fertilizer	N.S.	N.S.	N.S.
S X F	N.S.	*	N.S.
H X F	N.S.	N.S.	N.S.
S X H X F	N.S.	* *	*

* Significant at 5% probability level
** Significant at 1% probability level
N.S. Not significant

Results and Discussion

Over all locations and years stubble treatments were not a significant factor on populations of grassy or broadleaved weeds. At all locations there was a trend toward higher densities of both weed types where the stubble was tilled

in fall as compared to populations in the standing stubble treatments.

There was no significant effect of fertilizer on populations of either grassy or broadleaved weeds at any location or all locations combined over the 1983 - 1986 period. There were however, individual years where the fertilizer effect was highly significant on the grassy weed population. At Scott, in 1986, grassy weed densities/m^2 (wild oats and green foxtail) for the zero, medium and high fertility levels were 50, 9 and 4 respectively. These results might be the consequence of the optimum growing conditions which prevailed in the Scott area throughout the 1986 growing season. Above normal precipitation through May, June and July resulted in an extremely competitive wheat crop which responded well to increasing fertility levels. The heavy early season growth and abundant tillering on the fertilized plots appeared to suppress the germination and/or the development of wild oats and green foxtail.

Weed densities fluctuated widely between locations and years. (Table 3). In general total weed populations on untreated plots tended to increase as the length of the rotation extended. The extremely dry spring conditions in 1985 and 1986 at Kindersley resulted in major declines in weed numbers when compared to the populations recorded in earlier years. Delayed seeding due to wet soil conditions at Lashburn in 1986 reduced the population of weeds to 15/m^2 from 129 the previous year. However, at Scott, Mervin and Loon Lake weed populations increased several fold between 1983 and 1986.

Table 3 Total Weed Density on Untreated Plots in a Continuous Wheat Rotation.

Location	Grassy and Broadleaved Weeds/m^2				
	1983	1984	1985	1986	1983-86
Scott	81	397	166	452	297
Kindersley	100	149	34	34	79
Lashburn	68	60	129	15	68
Mervin	7	69	370	173	155
Loon Lake	9	68	86	376	135

All herbicide combinations significantly reduced populations of both grassy and broadleaved weeds when calcualted over all locations and years (table 4). Treatments containing Hoegrass reduced grassy weed populations from 93 to 96% compared to reductions for the Avadex treatment of 73%. The lower level of control with Avadex is largely the result of green foxtail at the Scott location. Reductions in broadleaved weed densities were 96, 92, 98 and 87% for Glean, Torch, Buctril M and 2,4-D respectively.

Table 4. Effect of Herbicides on Weed Populations at all locations, 1983-1986.

Herbicide treatment	Weeds/m^2		
	Grassy	Broadleaved	Total
No herbicide	26	107	133
Hoegrass + Glean	1	4	5
Hoegrass/Torch	2	9	11
Hoegrass + Buctril M	1	2	3
Avadex + 2,4-D	7	14	21
LSD (0.05)	9	23	23

Wheat yields were significantly increased by all herbicide treatments (table 5). Application of Hoegrass plus Glean, Hoegrass/Torch and Hoegrass plus Buctril M all increased yields approximately 350 - 400 kg/ha while the yield increase from Avadex plus 2,4-D was 268 kg/ha compared to the untreated check, Hoegrass plus Glean, Hoegrass/Torch, Hoegrass plus Buctril M and

Avadex plus 2,4-D increased yields by 21, 22, 19 and 15% respectively. The lower yield increase from the Avadex plus 2,4-D treatment is largely the result of the limited efficacy of 2,4-D on several broadleaved weed species.

Table 5. Effect of Weed Control Treatment on Yield of Wheat in a Continuous Wheat Rotation at all locations, 1983-86.

Treatment	Yield (kg/ha)	% of Untreated
Untreated	1784	100
Hoegrass + Glean	2165	121
Hoegrass /Torch	2178	122
Hoegrass + Buctril M	2129	119
Avadex + 2,4-D	2052	115
LSD (0.05)	50	

Summary

Stubble management does not appear to be a major factor in determining weed population levels. In isolated years, fall tillage influenced spring weed germination and increased incrop weed densities the following summer. Tall stubble which traps additional snow melt water in years with sufficient snowfall might encourage the germination and establishment of increased densities of both grassy and broadleaved weeds.

No significant effects from varying fertility levels were noted when locations and years were combined. However, decreasing populations of wild oats and green foxtail were noted under high fertility levels in years when moisture conditions were near optimum. These results were attributed to the highly competitive nature of the wheat established when neither nutrients or moisture are limted. There is an indication however, that under conditions of drought stress (i.e. Scott, 1984) high fertility levels may encourage increased populations of broadleaved weeds.

All herbicide treatments reduced weed populations and increased wheat

yields. However, wheat yields from Avadex plus 2,4-D treatments were significantly lower than yields of the other three herbicide combinations due primarly to the failure of 2,4-D to control some broadleaved weed species.

References

Thomas, Gordon A. 1979. Weed Survey of Cultivated Land in Saskatchewan Ag. Can. Res. Stn. Regina, Sask.