Vol. X (1-4), 1973.

RESPONSE OF MEXI-PAK WHEAT TO TIME AND RATES OF APPLICATION OF 2, 4-D

M. ASHRAF RANDHAWA AND A.G. KAUSAR*

The herbicide 2,4-D applied at the recommended rate had no significant harmful effect on the yield of Mexi-Pak. The yield was, however, reduced when the herbicide was applied at 4 and 16 times the recommended rate. Spraying 2,4-D at the time of heading significantly reduced the number of grain formed, but had no effect on the weight and volume of grain when spraying was done at 16 times the recommended rate. Higher rates of application of 2,4-D significantly reduced the number, weight and volume of grain. There was an increase in the volume of 100 grains which was significant at 4 times the rate of application. The weight of the grain increased when the herbicide was used at the recommended rate and decreased at the rates of application higher than recommended.

INTRODUCTION

2,4-Dichlorophenoxyacetic acid (2,4-D) is an effective selective herbicide for the control of dicot weeds in wheat. It is generally considered a safe herbicide when used after 5-leaf stage and before the boot stage of wheat (Eryer & Elliott, 1953). However, varietal differences in response to rates and formulations of 2,4-D in cereals and flax have been reported (Buckley, 1947; Kush, 1947; Tandon, 1949; Wolfe and Viehmeyer, 1947). A variety of abnormalities appears in wheat as a result of treatment with 2,4-D before the plant attains 3 leaf stage or when the plant is in boot or heading stage (Myers, 1953).

Kausar and Ali (1959, 1971) reported the response of local wheat varieties to the rate and time of application of 2,4-D. Marked morphological abnormalities comprising narrowing and rounding up of leaves, deformation of ears and formation of empty florets were observed in wheat plants sprayed before the 3 leaf stage, particularly at higher rates of application of the herbicide. A gradual reduction in yield was observed as the rates of application higher than recommended were used, particularly in sprayings done before the 3-leaf stage.

*Department of Plant Pathology, Faculty of Agriculture, University of Agriculture Lyallpur.

The present investigation was undertaken to study the effect of varied dosages of 2, 4-D sprayed at four different stages of growth of Mexi-Pak wheat, to ascertain safe time to spray the herbicide for the control of weeds.

MATERIALS & METHODS

The field experiment reported in this paper was laid out in Square No. 22/25 of Agri. Univ., Lyallpur Estate, during three wheat seasons, 1968-69, 1969-70&1970-71. The experiment was laid out in a split plot design with four reaplications. Application of 2, 4-D at four different stages of growth formed the main plots, whereas the four rates of application of the herbicide formed the sub-plots. Each sub-plot consisted of 3 rows of Mexi-Pak wheat, 18 feet long, spaced 1 foot apart.

2, 4-D at the rate of zero, 4 and 16 pints per 100 gallons of water was sprayed 4,6,1, 8 and 10 weeks after emergence and at boot stage. For zero rate of application, wheat plants were sprayed with water only and this treatment served as untreated check. As the object of the investigation was to study the response of Mexi-Pak wheat to varied dosages of herbicide at different stages of its growth, a weed free condition was maintained.

Observations on the number of tillers and ears, and yield of grain were taken during the three years of the experiment. Observations on the number and weight of grain in five ears and volume of 100-grain were taken during 1969-70. The data so obtained were analysed by analysis of variance for the statistical interpretation of the results

RESULTS AND DISCUSSION

F values for time of application and rates in respect of tillering and earing were non-significant. This indicated that time and rate of application of the herbicide did not have significant influence on tillering and earing of wheat. However, significant F value for rates in respect of yield showed that rate of application of the herbicide significantly influenced the yield of grain during the three years of the trial. Non-significant interaction between rate and time of application indicated that the effect of rate of application was similar in sprayings made at different times.

Effect of rates of application on yield of grain

The effect of rates of application of 2, 4-D on yield of grain of Mexi-Pak during three years of the trial is given in Table 1.

Spraying the herbicide at the rate of 1 pint per acre did not significantly reduce the yield of Mexi-Pak as compared to the check. The reduction was significant when herbicide was applied at 16 pints per acre during the three years of trial. The reduction was non-significant when herbicide was applied at 4 pints per acre during 1968-69 and 1970-71, but was significant during 1969-70.

TABLE 1. *Effect of rate of application of 2,4-D on the yield of grain of Mexi-Pak.*

Rates	Yield of grain (lb/acre) during		
	1968-69	1969-70	1970-71
Untreated Check	4266a	4037a	3440a
1 pint/acre	4199a	3707ab	3719a
4 pints/acre	3586a	3518b	3433a
16 pints/acre	2303b	2948c	2403b
L.S.D. 5%	1227	393	284
L.S.D. 1%	1763	528	461

Effect on number, weight and volume of grain

F value for time of application in respect of number of grains was significant, whereas F values for weight and volume were non-significant. F values for rates in respect of number, weight and volume were significant.

The interaction between time and rates of application in respect of weight and volume of grain were non-significant. However, F value for interaction between time and rate of application in respect of number of grains was significant, indicating a differential respect of rate to time of application.

Spraying 2,4-D at the time of heading (about 10 weeks after emergence significantly reduced the number of grains formed as compared to the number developed in wheat plants sprayed 4,6 and 8 weeks after emergence. However, time of spraying did not significantly influence the weight and volume of grain.

The rate of application of 2, 4-D significantly influenced the number, weight and volume of grain. The interaction between time and rate of application was non-significant for weight and volume of grain. This indicated that the influence of rates on the weight and volume of grain was similar, irrespective of the time of application.

However, the interaction between time and rate of application of herbicide was significant for number of grains. There was a significant reduction in number of grains when spraying was done at the rate of 16 pints per acre

at the time of heading (Table 2). However, there was no significant reduction when the herbicide was sprayed at 1 and 4 pints per acre. On the other hand, there was a significant increase in the number of grains when 2,4-D was applied at the rate of 1 pint per acre, 4 weeks after emergence as compared to spraying 6 weeks after emergence.

TABLE 2. *Effect of time and rate of application of 2,4-D on the number of grains of Mexi-Pak.*

Time of application after emergence	Number of grain at rates of application/acre.				
	16 pints	4 pints	1 pint	Check	Average
4 Weeks	368.5a	358.5a	438.2a	359.5a	381.2a
6 Weeks	329 8a	377 2a	343 2b	395.2a	361.4a
8 Weeks	349.0a	387.5a	394.0a	344.7a	368.8a
10 Weeks	233.5b	366.0a	374.2a	338.5a	320.6b
Average	220.2	364.2	387.5	359.5	
L.S.D. 5%	70.4	70.4	70.4	70.4	28.5
L.S.D. 1%	101.4	101.4	101.4	101.4	38.73

The L.S.D. for rates was 35.2 and 50.6 at 5 & per cent levels of significance, respectively.

The influence of rate of application of 2,4-D on the weight and volume of grain is given in Table 3. The volume of 100-grain increased with sprays at 1, 4 and 16 pints per acre. However, the increase was significant only at 4 pints per acre. The weight of grain increased when the herbicide was sprayed at 1 and 4 pints per acre, but the increase was significant only when the herbicide was used at 1 pint per acre. The weight of the grain was reduced when the herbicide was applied at 16 pints per acre, but the reduction was non-significant.

TABLE 3. *Effect of rate of application of 2,4-D on the weight and volume of grain.*

Rate (pints per acre)	Weight of grain (gm)	Volume of 100-grain (ml)
Check	12.59a	256.9a
1 pint	13.97b	265.5a
4 pints	13.42 ab	304.4b
16 pints	11.79ab	270.0a
L.S.D. 5%	1.02	28.75
L.S.D. 1%	1.37	38.57

LITERATURE CITED

Buckley, G.F.H. 1947. Varietal differences in corn hybrids in tolerance to 2,4-D Proc. Fourth Ann. North Central Weed Control Conf. 235.

Eryer, J.D., and J.G. Elliott. 1953. The effect of 2,4-D amine on clean cereal crops. Proc. British. Weed Control Conf. 1953:37-52.

Kausar, A.G., and R. Ali. 1959. Response of wheat varieties to different rates and time of application of 2,4-D. Abst. Pak. Assoc. Adv. Sci. 11th Conf. Agri. Sec. 11 : 50.

Kausar, A.G., and R. Ali. 1971. Response of wheat varieties to rates and time of application of 2,4-D. Pak. Jour. Agr. Sci. 8 : 23-31.

Kush, A.G. 1947. Varietal differences in crop tolerance to 2,4-D. Proc. Fourth Ann. North Central Weed Control Conf. 219. 219.

Myers, M.H. 1953. Abnormalities produced by early applications of MCPA & 2,4-D to cereal crops and their pre-and post-heading examination. Proc. British Weed Control Conf. 1953:63-70.

Tandon, R.K. 1949. The response of flax to rates and formulations of 2,4-Dichlorophenoxyacetic Acid. Agron. Jour. 41:213-218.

Wolfe, H., and G. Viehmeyer. 1947. A study ot differential response on varieties of barley to varied dosages of three types of 2,4-D. Proc. Fourth Ann. North Central Weed Control Conf. 238.