RESPONSE OF WHEAT TO SIMAZINE HERBICIDE AT VARIOUS LEVELS OF NITROGEN

MUHAMMAD ANWAR CHAUDHRY & MOHAMMAD ASLAM*

Application of simazine (2-chloro-4, 6-hins ethly laminos-triazine) alone or in combination with nitrogen decreased the seedling density, thus adversely affecting both the grain and straw yield. However, a significant increase in 1000-grain weight was observed at 0.5 lb. a.m. simazine per acre, at all nitrogen levels.

INTRODUCTION

Simazine (2-chloro-4,6-bis ethylamino-s-triazine) is an herbicide with the unusual property that at sub-lethal levels it increases the growth and nitrogen content of certain plant species (Ries, *et al* (1967). Bartley (1957), Freney (1965) and Ries, *et al* (1963) observed that the herbicide simazine increased the growth and nitrogen content of tolerant plant species. This effect was neither due to a lack of weed competition (Freney, 1965; Ries and Gast, 1965; Ries, *et al*, 1963) nor to the additional nitrogen made available by the metabolism of the herbicide (Ries and Gast, 1965). In corn and rye these responses to simazine occurred in plants grown with nitrate but not in plants grown with ammonia as the source of nitrogen and were greatest when nitrate was at sub-optimal levels (Ries, *et al*, 1967; and Tweeny and Ries, 1967).

Recently Vergara, *et al* (1970) observed that simazine application to flooded soils at flowering time increased the per cent protein in the rice grain, however, it was accompanied by a decrease in grain yield which can be attributed to increased sterility. This decrease in grain yield consequently lowered the total grain protein production per crop. In the light of the above observations this study was, therefore, undertaken to investigate the responses of wheat to simazine at various levels of nitrogen.

MATERIALS AND METHODS

These investigations were carrid out at the Agronomy Research Farm, University of Agriculture, Lyallpur during the year 1971-72. The wheat variety Mexi-Pak-65 was sown on a well-prepared field previously under sorgham. A seed rate of 40 seers to an acre was used. The field was

*Department of Agronomy, Faculty of Agriculture, University of Agriculture, Lyallpur.

fertilized with a basal dose of phosphorus and potash at the rates of 50 lb. P_2O_5 and 25 lb., K_2O per acre, respectively.

The nitrogen in the form of urea @ 0 lb., 25 lb., 50 lb. nitrogen per acre and simazine 0 lb. a.m., 0.m., 0.5 lb. a.m., 1.0 lb. a.m. per acre, were applied before sowing the crop. The experiment was laid out in a randomized block design having four replications with the net plot size of 1/72.6 acre. All other agronomic practices were uniform for all the treatments. Seedling density, phytotoxic effect on the main crop, 1000-grain weight and yield of both, grains and straw were recorded. The data were analysed statistically by the analysis of variance method. When a significant 'F' value was obtained for the treatments effects, Duncan's Multiple Range Test at 5 per cent probability was applied to the treatment means.

RESULTS AND DISCUSSION

Simazine (2-chloro-4, 6-bis ethylamino-s-triazine) is used as an herbicide at rate of 1 to 4 kg/ha. active ingredient. It is also used as a soil sterilant at rates of 5 to 10 kg/ha. At rates lower than 1 kg/ha. simazine has been found to increase the growth and protein content of several crops (Ries, *et al.* 1967). However, the present study showed that the application of simazine alone or in combination with nitrogen affected the seedling density adversely (Table 1). The application of nitrogen as urea alone also decreased the seedling density significantly. The decrease in the seedling density by simazine was probably due to its absorption by the seed, which may have affected the germination process. However, the decrease in the seedling density by nitrogen application alone is not understandable.

No pronounced effect of the herbicide on the crop was observed after the seedling emergence (visual observations). In all treated and untreated plots the seedlings were healthy. But after the first irrigation, given about a month after sowing, a considerable burning of the aereal parts of the plants was observed. The effect was quite apparent at higher rates of the simazine However, 6-7 days after the irrigation, the crop recovered from this harmful effect and the plants became healthy.

The present study showed that the application of simazine increased 1000-grain weight when applied at sub-lethal doses. The increase was more significant at 0.5 lb. simazine per acre (Table 2). This increase in the grain weight was not large enough to have any influence on the final grain yield (Table 3). Vergara, *et al.* (1970) stated that simazine delays leaf senescence, which may contribute to longer photosynthetic activity of leaves. Consequently,

more starch was synthesised in the simazine treated plants which may have contributed to heavy grains.

Simazine application to wheat crop decreased the grain yield per acre (Table 3). This descrease resulted from the high sterility of the plants and poor seedling density. This observation is in conformity with the views of Vergara, *et al* (1970). Ries, *et al* (1970) also observed no increase in the yield of the grains as a result of simazine application. Plant growth, as measured by the straw yield, was also reduced with the increasing rate of simazine (Table 4). It seems that wheat plant is affected differently by simazine than corn in which case the growth increased on simazine application (Ries and Gast, 1965 and Tweedy and Ries, 1967).

TABLE 1: *Effect of simazine and nitrogen applications on the seedling density (I) of wheat.*

Simazine rates (lb./acre)	Nitrogen rates (lb /acre)			Average
	0	25	50	
0	97.5 a	79.0 cd	96.0 a	90.83 A
0.5	95.0 ab	80.7 cd	80.7 cd	85.50 B
1.0	94.0 ab	76.2 d	86.5 bc	85.58 C
Average	95.50 a_1	78.66 c_1	87.75 b_1	

($_1$) Average of 12 - 2" x 2" area observation.
Duncan's Multiple Range Test at 5 per cent probability was applied.
Any two means not sharing a letter in common differ signicantly.

TABLE 2: *Effect of simazine and nitrogen applications on the 1000-grains weight (gm.)*

Simazine rates (lb./acre)	Nitrogen rates (lb./acre)			Average
	0	25	50	
0	30.8 c	31.5 bc	31.0 c	31.1 B
0.5	32.7 ab	33.8 a	32.8 ab	33.0 A
1.0	31.3 bc	31.3 bc	31.8 bc	31.4 B
Average	31.5	32.1	31.8	N.S.

Duncan's Multiple Range Test at 5 per cent probability was applied. Any two means not sharing a letter in common differ significantly.

N.S. : Nonsignificant at 5 per cent probability.

TABLE 3. *Effect of simazine and nitrogen applications on the grain yield (maunds per acre)*

Simazine rates (lb./acre)	Nitrogen rates (lb./acre) 0	25	50	Average
0	51.98 a	58.15 a	60.79 a	57.26 A
0.5	33.48 bc	32.59 bc	37.88 b	35.24 B
1.0	24.66 c	29.95 bc	30.83 bc	28.48 C
Average	37.00	40.19	42.19 N.S.	

Duncan's Multiple Range Test 5 per cent probability. Any two means not sharing a letter in common differ significantly.

N.S. : Nonsignificant at 5 per cent probability.

TABLE 4. *Effect of simazine and nitrogen applications on the straw yield (maunds per acre)*

Simazine rates (lb./acre)	Nitrogen rates (lb./acre)			Average
0	96.91 a	103.96 a	103.96 a	101.3 A
0.5	63.43 bc	64.31 bc	68.72 b	65.2 B
1.0	50.22 c	57.26 bc	56.38 bc	54.0 C
Average	69.6	74.8	76.6 N.S.	

Duncan's Multiple Range Test at 5 per cent probability. Any two means not sharing a letter in common differ significantly.

N.S. : Nonsignificant at 5 per cent probability.

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