THE EFFECT OF CHLORMEQUAT ON CEREAL AND MAIZE CROPS IN THE MANAWATU

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Summary

The application of chlormequat to spring-sown wheat caused a marked reduction in straw height and significant increase in yields in the 1968-9 season but repeated work in the 1969-70 season did not produce such marked differences. The use of chlormequat on maize did not affect plant height and yields were also unaffected.

INTRODUCTION

CHLORMEQUAT is a plant growth regulant which produces unusual and varied responses in a wide range of plant species. As an extension to overseas and limited New Zealand work, two trials on spring-sown wheat and one trial on maize were carried out in the Manawatu and Wanganui areas during the past two seasons.

EXPERIMENTAL

TRIAL 1: EFFECT OF CHLORMEQUAT, PHOSPHATE AND NITROGEN ON WHEAT

Plots of Raven wheat at 3 bu/acre were drilled on September 12, 1968, into a paddock previously cropped for four consecutive years. Soil type was Kairanga silt loam.

Treatments were: Chlormequat 0 + 1.5 lb (all rates in active ingredient per acre) applied at Feekes stage 5; serpentine-superphosphate 0, 300 and 600 lb/acre applied at drilling; and calcium ammonium nitrate 0, 75 and 150 lb/acre applied at Feekes stage 3.

The trial was of factorial design with 18 treatments and 4 replications. (The plot size was 2½ chains long and 4 ft 6 in. wide — i.e., 9 coulter spaces each 6 in. apart.)

TRIAL 2: EFFECT OF CHLORMEQUAT, NITROGEN AND ORGANOPHOSPHATE ON WHEAT VARIETIES

Plots of wheat were drilled on September 4, 1969, into Ohakea silt loam ploughed out of old pasture. Plot size was the same as in Trial 1.

The trial was of factorial design with 18 treatments and 4 replications.

Treatments were: Raven and Opal Wheat at 3 bu/acre. Chlormequat 0 + 1.5 lb applied at Feekes stage 5; calcium ammonium nitrate 0 + 4 cwt/acre applied at Feekes stage 3; organophosphate 0 + 1 lb disulfoton granules at sowing plus 2 sprayings with demeton-S-methyl at 3 oz.

**TRIAL 3: EFFECT OF PLANT POPULATIONS, PLANT SPACING AND
CHLORMEQUAT ON YIELDS OF MAIZE VARIETIES**

Plots of KC3 (80 day) and PX610 (110 days) maize were hand-sown on October 24, 1969, into Kairanga silt loam situated in the Waitotara Valley.

Plant spacings (in in.) were $10\frac{1}{2} \times 30 = 21,460$ plants per acre
 $7\frac{1}{2} \times 30 = 27,880$ plants per acre
 $15 \times 15 = 27,880$ plants per acre
 $10\frac{1}{2} \times 15 = 42,920$ plants per acre

The rate of chlormequat was 1.5 lb.

The trial was of factorial design with 16 treatments and 4 replications. Plot size was 7 ft 6 in. $\times$ 33 ft. Chlormequat was applied on November 10, 1969, when the maize plants were 12 in. to 18 in. high. However, as no visible effects on the plants had occurred after a six-weeks lapse, it was suspected that a heavy downpour which occurred shortly after spraying had washed the chlormequat off the leaves. A further application of chlormequat was therefore made at the same rate on December 23 when the plants had reached a height of 30 to 36 in.

RESULTS

TRIAL 1

During the vegetative stage of growth, the visible effect of phosphate applied at drilling was nil but the effects of nitrogen were obvious with much taller and darker green plants than for "no nitrogen". A much more obvious effect, however, was caused by chlormequat. All chlormequat plots were shorter and darker (blue-green) coloured with wider leaves and a sturdier appearance. When the stage of stem extension (Feekes stage 10) had been reached, all plants sprayed with chlormequat were much shorter than the unsprayed plots, even where nitrogen was applied.

Table 1 shows yield data and straw height measurements taken at harvesting on February 10, 1969. Yields are adjusted to 15% moisture as chlormequat treatments were lower in moisture by 1% at harvest.

TABLE 1: HARVEST DATA, TRIAL 1

<i>Treatment (lb)</i>	<i>Yield (centals/acre)</i>	<i>Height (in.)</i>
No phosphate	37.8 bA	34.0 a
Phosphate 300	39.6 aA	33.8 a
Phosphate 600	38.7 abA	34.1 a
No nitrate	35.3 cC	32.5 cC
Nitrate 75	39.2 bB	33.8 bB
Nitrate 150	41.7 aA	35.6 aA
No chlormequat	36.8 bB	42.4 aA
chlormequat 1.5	40.7 aA	25.5 bB

The application of chlormequat decreased plant height by 41.5% and produced a significant yield increase of 3.9 centals per acre (6.5 bu). As no lodging occurred on any plots in the trial, the value of chlormequat in preventing lodging was unknown but, judging by the shortness of the

straw and generally sturdier appearance of treated plots; the indications were that lodging would be less likely to occur. Excessive shortening of the straw focuses attention on two important aspects:

- (1) There is a reduction in the straw/grain ratio. This would be an advantage if it prevented lodging or reduced excessive straw and a disadvantage if the straw became so short that the crop could not be harvested efficiently.
- (2) Weed spraying has to be of a very high standard as secondary weed invasion might well compete with the crop owing to its reduced competitive ability resulting from a reduction in canopy during the ripening stages of the crop.

TRIAL 2

Measurements of crop height were taken at two stages of growth, the first being at the pre-boot stage (Feekes stage 9) and the final one just prior to harvest at Feekes stage 11/4. As in Trial 1, the wheat plants had increased growth and darker foliage where nitrogen was applied but no significant effect on straw height occurred. Yield data and plant heights are given in Table 2.

TABLE 2: YIELDS AND PLANT HEIGHTS, TRIAL 2

<i>Treatment</i>	<i>Yield (centals/acre)</i>	<i>Height (in.)</i>	
		13/11/69	12/1/70
No nitrate	46.2 a	20.4 bA	32.0 a
Nitrate 4 cwt	46.1 a	21.1 aA	32.3 a
No chlormequat	45.1 bA	23.3 aA	35.1 aA
chlormequat 1.5 lb	47.2 aA	18.2 bB	29.1 eB
No organophosphate	40.2 bB	20.5 a	31.6 bB
Organophosphate 1 lb	52.1 aA	20.9 a	32.7 aA
Opal	41.6 bB	18.8 bB	31.3 bB
Raven	50.7 aA	22.7 aA	32.9 aA

The main effects in this trial show that chlormequat reduced straw height by 17% and increased yields by 2.1 centals per acre (3.5 bu). No significant interactions occurred between chlormequat and other treatments. The small effect from chlormequat could possibly be attributed to the drought conditions that prevailed throughout the trial period.

TRIAL 3

No visible effect from chlormequat application occurred. Sample harvesting for silage production was carried out when the cobs had reached the dent stage. No significant reduction due to chlormequat occurred.

The KC3 plots were harvested for grain production on April 14, 1970 and the PX610 plots on May 4. The yield data in Table 3 show that, although plant spacing and populations had a significant effect on grain yields, the effect of chlormequat application did not reach significance on yields. Unpublished data from this trial also showed that chlormequat did not significantly affect plant or cob numbers, cobs per plant, percentage of stalk break, or moisture percentage of the two varieties. Data did, how-

TABLE 3: YIELDS OF SHELLED GRAIN (ADJUSTED TO 15% MOISTURE)

Main Effect	Yield (centals/acre)
Plant spacings (in):	
10½ × 30	80.9 cC
7½ × 30	89.2 cC
15 × 15	103.2 bB
10½ × 15	116.8 aA
Min. sign. diff.	—
chlormequat:	
None	100.7 a
1.5 lb	94.4 a
Min. sign. diff.	6.7
Varieties:	
KC3	84.4 bB
PX610	110.7 aA
Min. sign. diff.	—
CV% Individual treatments	13.7

ever, show that chlormequat had a slightly adverse effect on all the above. The general reduction in yields, etc., was about 6% which was not significant.

DISCUSSION

Chlormequat applied to spring-sown wheat increased yields and reduced straw height to a greater extent in a normal moist season than under drought conditions that prevailed in Trial 2. Maturity appeared to be slightly advanced on chlormequat sprayed wheat in Trial 1 but this is opposite to overseas experience (Humphries *et al.*, 1968). As the stage at which chlormequat should be applied does not, according to overseas work, appear to be critical, both weed control with hormone preparations and chlormequat applications may be combined to reduce application costs (Humphries *et al.*, 1968).

Although no lodging occurred in these trials, the main benefit reported from overseas is in the prevention of lodging which can cause drastic yield reductions. The commercial introduction of lodging resistant, short strawed, high yielding wheat varieties will, however, reduce the necessity for resorting to chemicals to shorten wheat straw.

Chlormequat applied to both early and late varieties of maize did not have an effect that reached significance on silage production or grain yields.

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REFERENCE

Humphries, E. C. *et al.*, 1968: *Field Crop Extracts*, 21 (2).