Lodging in barley - can plant growth regulators prevent it?

B.J. Read

Agricultural Research Institute, Wagga Wagga 2650

Lodging is a common problem in barley, especially in crops sown early on high- fertility land. The growth regulator chlormequat, CCC, was found to be effective in shortening stems and reducing lodging in wheat but it was generally ineffective in barley (1,2). The recent development of other growth regulators and their commercial use in Europe (3), has created interest in the possibility of using them to reduce lodging in Australian barley crops.

Methods

Two split-plot trials were sown in mid July, 1981, one on pre-irrigated very fertile land at Leeton Agricultural Research Station, and the other on long fallow at the Agricultural Research Institute, Wagga Wagga. In each trial the varieties Clipper, Lara and Cantala were sown as main plots; the Wagga trial also contained Golden Promise, a short-strawed European variety, and Forrest, a tall variety. Sub-plot treatments were growth regulator chemicals, 'Helestone' (chlormequat + additives) applied at 21/2-3 leaf stage at the rate of 3 L ha ^{1}, 'Terpal' (ethephon + meviquat chloride) applied at jointing (2 or 3 nodes) at the rate of 2.5 L ha and 'Ethrel' (ethephon) applied at flagging at the rate of 1 L ha^{-1} and a nil chemical control. All chemicals were applied with a hand-held gas powered small boom. The Leeton trial received three spring irrigations; spring rainfall at Wagga Wagga was below average (September, 33.1 mm, October, 20.3 mm, November, 17.7 mm). Trials were assessed for lodging and grain yield,and plant height was measured at Wagga only.

Results and Discussion

At Leeton lodging after stem elongation was severe (score 5.3) in all treatments except 'Ethrel' (score 1.1). The mean yield at Leeton was 5.2 t ha^{-1}, and there were no significant differences between treatment yields.

At Wagga there was no lodging and mean yield was 2.2 t ha^{-1}. Yield and height are shown below. 'Helestone' and the control were not significantly different in yield or height. In each column, treatment means followed by the same letter are not significantly different.

	Clipper	Lara	Golden Promise	Forrest	Cantala	Mean
Yield (t ha^{-1})						
Nil	2.44a	2.47a	2.04a	2.67a	2.40a	2.41a
Terpal	2.01b	2.11b	1.91a	2.41b	2.14b	2.12b
Ethrel	2.21b	1.75c	0.69b	2.14c	2.37a	1.83c
Height (cm)						
Nil	63.5a	66.2a	48.0a	83.8a	62.0a	64.7a
Terpal	59.3a	58.5b	41.5b	76.0b	56.5a	58.4b
Ethrel	54.3b	57.3b	39.5b	60.0c	46.7b	51.6c

These two trials represent opposite extremes for barley cultivation; they have shown that two of the growth regulators can reduce straw height, and one can markedly reduce lodging. In the late sown dryland trial the shortening of the straw was associated with a yield reduction and there was an indication that this could have been due to a delay in maturity. In lodging prone crops, sown early or irrigated, there may not necessarily be any yield penalty associated with the shortened straw. There is an obvious need to extend this work to find the optimum application rates and growth stages for Australian conditions. However, the situation with barley now is comparable to that of wheat in the 1960's (4), when the genetical solution to lodging problems was seen as a better alternative to the chemical one.

1. Zinser, H. 1968. Euphytica 17, Supplement 1:215-238.

2. Barrett, D.W.A., Meens, B.E. and Mees, C.C. 1967. J. Agric. Sci., Camb. 68:39-46.

3. Batch, J.J. 1981. Outlook on Agriculture 10:371-378.

4. Syme, J. 1968. Aust. J. Experimental Agric. and An. Hus. 30:574-577.