FURTHER STUDIES ON A POPULATION OF BARLEY GRASS HORDEUM LEPORINUM SSP. GLAUCUM STEUD TOLERANT TO PARAQUAT

R.B. WARNER

ICI Australia Operations Pty Ltd
Merrindale Research Station
Croydon, Vic. 3136

Abstract. The initial work which identified the tolerance to paraquat of a population of northern barley grass, *Hordeum leporinum* ssp. *glaucum* Steud (hereinafter referred to as *H. glaucum*) from a lucerne paddock near Willaura in Victoria's western district has been reported (Warner and Mackie 1983).

Subsequently the tolerance has been shown to be inherited. Seed collected from the original plants was germinated and grown until well tillered and sprayed with 100-1600 g ha^{-1} of paraquat in 200 L ha^{-1} containing the recommended wetting agent. Plants of *H. glaucum* established from seed collected from plants at Avon, S.A., which had not previously been sprayed with paraquat were also sprayed. Despite severe initial scorch (up to 95%) and death of most of the tolerant plants at the 800 and 1600 g ha^{-1} rates, 33 and 16% respectively of the plants recovered fully and set viable seed. At the lower rates less than 40% of the plants died and the initial scorch was also lower with a maximum rating of 40%. The susceptible plants were completely killed by 100 g ha^{-1} of paraquat. Another population from Bordertown was susceptible to 200 g ha^{-1} of paraquat, the lowest rate tested (S. Powles, personal communication, 1984). The tolerance of the Willaura biotype is thus high but *H. glaucum* itself is as susceptible as *H. leporinum*.

The tolerant biotype can be controlled with the newer post emergence grass killers including fluazifop-butyl. Plants of the tolerant *H. glaucum* grown outside in pots were completely killed by 125 g ha^{-1} of fluazifop-butyl containing the recommended level of wetter.

Preliminary investigations into the biochemical basis of the tolerance of the Willaura biotype have shown that the tolerant biotype possesses significantly higher levels of catalase** and peroxidase*** enzymes and a significantly lower level of super oxide dismutase*** than the susceptible Avon strain (Mackie 1983). This enzyme picture is similar to that found in a strain of tobacco selected for paraquat resistance, (Hughes 1981). However the absolute differences in enzyme levels between the tolerant and the susceptible barley grass strains are not sufficient in themselves to explain the high level of tolerance of the Willaura strain. Fuerst et al (1984) have proposed that the reason for the high tolerance to paraquat of a biotype of horseweed *Conyza linifolia* is due, based on chlorophyll fluorescence quenching experiments, to exclusion of paraquat from chloroplasts by reduced penetration and/or by compartmentation. This mechanism will need to be tested in the tolerant barley grass biotype.

The tolerant barley grass is believed to be restricted to the one property. The original paddock has been ploughed up but in a nearby paddock in its third year of lucerne the tolerant barley grass predominates following the unsuccessful use of paraquat/diquat in 1983. In surrounding unsprayed paddocks the tolerant barley grass recognised by its more upright habit and narrower, bluer leaves, occurs naturally at 1-3% of the grass component.

Investigations into the occurrence, biochemical basis of the tolerance and control of the tolerant barley grass are being actively pursued by the Victorian Department of Agriculture, the Waite Research Institute and ICI.

REFERENCES

Fuerst, E.P., Dodge, A.D., Nakatani, H.Y., and Arntzen, C.J. 1984. Abstract 227, 1984 meeting Weed Science Society of America, February 8-10, 1984.

Hughes, K.W. and Holton, R.W. 1981. Abstract 44 In Vitro 17 (3) : 185.

Mackie, M.E. 1983. B.Agr.Sc. Thesis, Latrobe University.

Warner, R.B. and Mackie, W.B.C.M. 1983. Australian Weeds Research Newsletter, 31 : 16.