THE RESPONSE OF WILD OATS TO CLIMATE CHANGE

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Human activities are causing changes in the chemical composition of the Earth's atmosphere. Climate modelling studies indicate that an equilibrium doubling of carbon dioxide (CO_2) will cause global mean surface temperatures to increase by 1.5?C-4.5?C and these temperature changes will be accompanied by changes in precipitation patterns (1). A changing climate could impact upon Australia's agricultural sector in a negative manner if there is an increase in the distribution and abundance of annual weeds.

MATERIALS AND METHODS

Plants from six Australian near-isogonic lines of wild oat spanning 12?of latitude were grown in two controlled environment growth chambers under either ambient (357 ppmv) or elevated (480 ppmv) CO_2. Pots were watered by weight to either field capacity, -0.1 MPa or -1.0 MPa. Each line by water treatment was replicated twice. Temperature was set at 20?1?C day / 16?1?C night with a 12 hour square-wave photoperiod. Relative humidity was 70-90%.

RESULTS AND DISCUSSION

Seed production averaged across all lines and water treatments was approx. 27% higher for the elevated CO_2 plants (Table 1). As the seed is the basic unit of the population for wild oat plants, greater seed numbers could indicate a potential for an increase in population numbers. Plant dry-weights were 45% higher and physiological maturity was attained 7 days earlier for elevated CO_2 plants (Table 1). Wild oats have remained a problem because their seed shatters before the crop is harvested. Earlier maturation times for wild oats, assuming present crop maturation rates, would mean that wild oats will continue to reseed themselves with less seed being removed with the harvested crop. Although elevated CO_2 plants had better water-use efficiencies, their total water use was higher as a consequence of greater leaf area development - 39% more leaf area. This could be a major factor controlling the future distribution and abundance of wild oats; under climate change modelling studies indicate that in much of Australia's winter cereal growing regions warmer temperatures, higher evaporation rates and reduced precipitation will result in less soil water being available.

Table 1. Effects of CO_2 enrichment on seed production, plant dry-weight and days to maturity. Values have been averaged across lines and water treatments.

	Ambient CO_2 (357 ppmv)	Elevated CO_2 (480 ppmv)
Seeds/plant	626	794
Plant dry-weight (g)	21.7	31.5
Days to maturity	116	109

REFERENCES

1. Houghton, J.T., Jenkins G.J. and Ephraums, J.J. Eds. 1990. Climate Change - The IPCC Scientific Assessment. 365 pp. (Cambridge University Press: Cambridge).