Genetic variability of wheel cactus (*Opuntia robusta* Wendl.) in southern Australia: implications for weed spread and biological control

Jeanine Baker[1], Mike Keller[1] and Christopher Preston[1,2]
[1] School of Agriculture, Food and Wine, University of Adelaide, PMB 1, Glen Osmond, South Australia 5064, Australia
[2] CRC for Australian Weed Management, PMB 1, Glen Osmond, South Australia 5064, Australia
Email: jeanine.baker@adelaide.edu.au

Summary Wheel cactus (*Opuntia robusta* H.L. Wendl.) is a native of Mexico but is forming monocultures in semi-arid regions of southern Australia. Anecdotally, strains of biological control agents that have previously been successful in controlling other invasive *Opuntia* species have not been effective against wheel cactus. However, given the long lived seed bank and cost of conventional control, biological control would be the preferred option.

Wheel cactus has been introduced several times to Australia for ornamental or fodder use. This suggests wheel cactus would have significant genetic variation. To our knowledge, there has been no assessment of the genetic diversity of wheel cactus populations in Australia. This study investigated the genetic diversity of wheel cactus in selected areas in South Australia using fluorescent AFLP techniques.

Tissue samples (N = 21) for DNA extraction were collected at random from populations (N = 10) growing in the Flinders Ranges, Peterborough and Mid-Murray region of South Australia. The location of each population was recorded with a GPS. AFLP profiles were recorded using two dimer primers, Mse + CC and Pst AC, which provided 218 loci for scoring and which were analysed for Nei's (1972) genetic diversity using Popgene 1.3.1 software (Yeh *et al.* 1997). The genetic diversity values, including two related, but outlier, species, coast cholla (*Opuntia prolifera* Engelmand) and carrion plant (*Stapelia hirsuta* Linn.) were used to develop dendograms showing the relationship between the ten populations.

Preliminary analyses indicate high levels of gene flow or relocation of vegetative parts over large geographical distances and the presence of many different genotypes within as well as between the ten populations examined. Genotypes observed from individuals collected in the mid-Murray region of South Australia were also observed in individuals collected at Angorichina, South Australia. The distance between these two populations is approximately 300 km, providing further evidence that there is no relationship between AFLP genotype and geographical location.

Wheel cactus was introduced into Australia with early settlement. There is a history of multiple introductions and deliberate human mediated movement, particularly in semi-arid regions where the species was used in gardens and as a stock fodder in drought. This, combined with animal- and flood-mediated seed and vegetative dispersal, is likely to account for the apparent high levels of gene flow between geographically isolated populations in South Australia. Examination of additional samples will provide further information about the genetic diversity present in populations of wheel cactus in southern Australia and assist in targeting more effective biotypes of biological control agents.

Keywords Wheel cactus, biological control.

ACKNOWLEDGMENTS

Parachilna and Blinman Community and the Animal and Plant Control Commission of SA.

REFERENCES

Nei, M. (1972). Genetic distance between populations. *American Naturalist* 106, 283-92.

Yeh, F.C., Yang, R-C., Boyle, T., Ye, Z-H. and Mao, J.X. (1997). 'POPGENE, the user-friendly shareware for population genetic analysis'. (Molecular Biology and Biotechnology Centre, University of Alberta, Canada).