THE ALLELOPATHIC PROPERTIES OF SUNFLOWER,

HELIANTHUS ANNUUS L.

by

SHIRLEY ANNE FRASER Bachelor of Rural Science

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Department of Agronomy & Soil Science, University of New England, ARMIDALE. New South Wales, 2351, Australia.

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PREFACE

I certify that this thesis has not previously been submitted for any degree and is not being currently submitted for any other degree.

I certify that all sources and help received in the preparation of this thesis have been acknowledged.

Shirley Anne Fraser.



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SUMMARY

Allelochemicals which may have allelopathic effects on other plants, including others of the same species, are released from many plant types including the North American weed or wild biotype sunflower. Both living plants and decaying debris have been shown to release these allelochemicals. Allelopathic responses have been noted in horticultural and agricultural plant communities.

Workers in North America have documented allelotoxic activity in the biotype sunflower, which enables it to be a strong competitor in old-field succession. Many workers suggest that this type of activity is common in weed species, but that it has been bred out of types developed into crop plants to improve yields, and the harvested product.

Experiments were carried out on an Australian naturalised biotype sunflower which showed little evidence for allelopathic activity, however, experiments on an unreleased hybrid cultivar sunflower showed, unexpectedly, consistent allelopathic properties in petri dish trials from living, dried and senesced leaf material. Similar, but less restricting activity was found in the male parent line of the hybrid.

Gas chromatographic/mass spectrometric analyses of leaf wash solutions of the three sunflower types indicated that many organic compounds were common to all types. The hybrid and its parent generally had more compounds, and at higher concentrations than the Australian biotype. An ion mass of 127 was particularly noted; it may belong to the naphthyl group.

Leaf surface structures were examined under both light and

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scanning electron microscopy. Glandular trichomes were found on all three sunflower types, but much more abundantly on the hybrid. These may be storage sites for the leaf allelochemicals.

The evidence found for allelopathic activity in the hybrid cultivar is discussed in the context of allelochemicals as agents which may contribute to the defence and/or competitive ability of those plants which possess them in active concentrations, and that their presence may be an heritable factor.

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