ALLELLOCHEMICALS FROM BRASSICA SPP. (CANOLA) RESIDUES: EFFECTS ON OTHER PLANTS AND CEREAL FUNGAL PATHOGENS.

by Alan C Umbers, B. Rur. Sc. (Hons).

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ABSTRACT

*Brassica* spp. have been reported as showing allelopathic activity against other plants and fungi, with both living material and residues shown to be active. Glucosinolate breakdown products have been implicated in many of these allelopathic effects.

Canola is a popular crop in Australia, with evidence of increased crop yields and freedom from fungal root diseases in cereals grown following canola. This supports canola’s potential as an inhibitor of pathogens.

It was hypothesised that allelopathic activity against other plants and fungi is due to compounds produced from canola residues, notably glucosinolate breakdown products.

The experiments reported here supported the hypothesis that glucosinolate breakdown products can be phytotoxic to a number of indicator plant species. Indoleacetylnitrile (IAN), indoleacetylmethanol (IAM) and phenylethylamine (PEA) were shown to inhibit germination and early growth, with IAN being the most active. These compounds were found, using HPLC, to be present in canola residue leachates and their concentration estimated.

With both the leachates and compounds, very low concentrations (for example, 1µM) frequently caused inhibition, with higher concentrations (for example, 10µM) causing stimulation to growth, with highest concentrations (for example, 0.1mM) causing great inhibition. This effect is discussed.

Canola residue leachates were shown to have antifungal activity, both *in vivo* and *in vitro*. Leachates were most active against *Gaeumannomyces graminis var tritici* (Ggt), with lower and more variable activity against Rhizoctonia and Pythium. The compounds identified as phytotoxic showed no antifungal activity in this work, indicating that different compounds were involved in the antifungal activity. Recent work (Angus *et al.* 1994) supports the idea of alternate glucosinolate breakdown products as being involved in the antifungal activity from canola residue leachates.

The antifungal compounds, notably those against Ggt, were thought to be volatile. Reduction of pathogen infection in wheat in pots was up to 80% for Ggt, with subsequent increases in dry weights of 16.7%. Wheat germination in the presence of Pythium was lifted by up to 100%. Rhizoctonia damage in wheat was reduced 22.5% in one experiment and 54% in another.

Canola is, thus, seen as capable of producing phytotoxic compounds, active against germination and early growth of plants. Residue leachates are seen to be active against cereal fungal pathogens, making canola a valuable crop to be grown in cereal rotations.