

Effects of different fractions of *Rheum palmatum* root extract and anthraquinone compounds on herbicidal, fungicidal, and insecticidal activities

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[Introduction]

This study was conducted to evaluate suppression of crop pathogens, the acaricidal activities against the two-spotted spider mite (*Tetranychus urticae*) and the weed control efficacy of solvent fractions of *Rheum palmatum* extract. In addition, determined the inhibitory activities of the main bioactive substances of *Rheum palmatum* (aloe-emodin, emodin, chrysophanol and physcion) against crop pathogens.

[Materials and Methods]

We selected an ethanol extract of *Rheum palmatum* from 38 agricultural materials for this study. We determined the effects of solvent fractions of *Rheum palmatum* extract on control of crop diseases (rice blast, cucumber powdery mildew etc.), insect (two-spotted spider mite), and weeds. In addition, we analyzed anthraquinone contents in solvent fractions by HPLC and determined the effects of anthraquinone compounds on suppression rates of aforementioned crop diseases, insects, and weeds.

[Results and Discussions]

The suppression rates of 5% ethylacetate and BuOH fractions against *Pyricularia oryzae* were 70% and 52%, respectively. However, the other fractions (including hexane) showed very little suppression of rice blast. Moreover, *Colletotrichum coccodes*, *Bortyitis cinerea*, *Rhizoctonia solani*, and *Phytophthora capsici* were suppressed by 61%, 47, 58, and 91% in response to treatment with the 5% ethylacetate fraction of *Rheum palmatum*, respectively, compared with the control. The ethylacetate and BuOH fractions were also confirmed in greenhouse trials of rice seedlings infected by *Pyricularia oryzae*. The ethylacetate and BuOH fractions of *Rheum palmatum* ethanol extract were shown to have the potential for control of powdery mildew and weeds, but not to have acaricidal activities against the two-spotted spider mite. The suppression rates of *Pyricularia oryzae* and *Phytophthora capsici* increased with increasing concentrations of chrysophanol, emodin, aloe-emodin, and rhein, but these extracts had no effect on cucumber powdery mildew or two-spotted spider mites. The anthraquinone levels in the ethylacetate fraction were much higher than in the BuOH fraction. Thus, the higher suppression of rice blast and *Phytophthora capsici* of the ethylacetate fraction observed in this study may be related to higher levels of anthraquinone substances in the ethylacetate fraction than the BuOH fraction.

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