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Effects of Allelochemicals from *Pinus rigida* on the Isozyme Band Patterns of Callus and Seed Germination

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The seeds of *Raphanus sativus* var. *hortensis* for. *acanthiformis* and *Cassia mimosoides* var. *nomame* and callus induced from the root of *Glycine max* were used for test of allelochemicals from *P. rigida*. The treatment of the chemical substances reduced both fresh and dry weights of callus of *Glycine max*. The activity of peroxidase of treated callus was stimulated, while the activity of esterase was inhibited. During the germination of plants, the treatment of extracts from *P. rigida* changed the banding patterns of proteins and activities of hydrolytic enzymes. At the late stage of germination of *R. sativus* var. *hortensis* for. *acanthiformis*, the treatment suppressed the expression of 24KD and 60KD proteins. The treatment induced new isozyme bands of peroxidases from both plants, especially it increased peroxidases activity in the cathodic region. But it reduced the number of isozyme bands of esterases. But activities in the cathodic region of esterase from *R. sativus* var. *hortensis* for. *acanthiformis* and activities in the anodic region from *C. mimosoides* var. *nomame* were stimulated. The activity of amylase from *R. sativus* var. *hortensis* for. *acanthiformis* was stimulated by the extract, but there were no effects in *C. mimosoides* var. *nomame*.

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Allelochemical Analysis : Stimulatory and Inhibitory Effects on Seed Germination and Seedling Growth

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The extracts of selected plants and analyzed phenolic compounds were used to study the allelopathic effects on seed germination and seedling growth. The results of analyzing the aqueous extracts of seven species by HPLC identified 15 phenolic compounds including caffeic acid. Among them, protocatechuic acid was detected at 65.87ppm and 6.84ppm, in *Erigeron canadensis* and *Pinus rigida*, respectively. And the extract of *P. rigida* showed the most inhibitory effect on seed germination rates. The extract of *P. rigida* leaves significantly inhibited germination and radicle growth of *Raphanus sativus* var. *hortensis* for. *acanthiformis* in direct proportionate concentration. However, germination of *Cassia mimosoides* var. *nomame* was stimulated by the treated extracts at the same concentrations, but root growth was inhibited at high concentrations. Excepting chlorogenic acid, eleven of the twelve phenolic compounds inhibited the germination of *R. sativus* var. *hortensis* for. *acanthiformis*. In the case of *C. mimosoides* var. *nomame*, some phenolic compounds such as chlorogenic acid, vanillic acid, protocatechuic acid, salicylic acid, caffeic acid, ferulic acid and scopoletin stimulated germination while the others reduced it.