

## 学位論文要旨 Dissertation Abstract

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学位論文題目： Allelopathic potential and allelopathic substances of three  
Title of Dissertation medicinal plants in Bangladesh  
( Bangladesh産薬用植物3種のアレロパシ-活性とアレロパシ-物質)

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Dissertation Abstract

Allelopathy is a biological phenomenon, in which one plant directly or indirectly interferes with the growth and development of other plants through the release of allelochemicals. This phenomenon creates consideration as an alternative tool for eco-friendly management of weeds in a sustainable way. Much effort has gone into searching for potential allelochemicals from medicinal plants, which appear to be promising sources of secondary metabolites. In the present study, three medicinal plants comprising *Swietenia mahagoni* L. (Meliaceae), *Coccinia grandis* L. (Cucurbitaceae) and *Cassia alata* Linn. (Caesalpiniaceae) were used to assess their allelopathic potential and to identify allelopathic substances.

The aqueous methanol extracts of *S. mahagoni* seeds were examined on seedling growth of four dicotyledonous plants; cress, alfalfa, rapeseed, lettuce, and three monocotyledonous plants; barnyard grass, timothy and foxtail fescue at six concentrations (1, 3, 10, 30, 100, and 300 mg dry weight equivalent extract/mL). The suppression activity of *S. mahagoni* seed extracts was concentration-dependent. Concentrations required for 50% inhibition ( $I_{50}$ ) of seedling growth of test plants were also differed. Concentration-dependent and species-specific growth inhibitory effects of the seed extracts of *S. mahagoni* suggest that this plant may possess growth inhibitory substances and therefore, might have possibility to be used in the biological weed management option.

The extracts of *C. grandis* were examined for its effect on the seedling growth of cress, alfalfa, rapeseed, lettuce, barnyard grass, timothy, foxtail fescue, and Italian ryegrass at different concentrations. The growth inhibitory effect of the extracts on the test plant species varied and depended on extract concentration. The  $I_{50}$  values of the shoots and roots of the test plant species were 6.3–220.8 and 4.8–80.9 mg dry weight equivalent extract/mL of *C. grandis*, respectively. These results suggest that *C. grandis* may have allelopathic potential and might be useful in developing a bio-herbicide in an eco-friendly management system.

The effect of aqueous methanol extracts of *C. alata* on the seedling growth of alfalfa, cress, lettuce, rapeseed, broccoli, cabbage, radish, barnyard grass, foxtail fescue, Italian ryegrass, and timothy was examined. The level of inhibition of the extracts corresponded to concentration and varied among the test species. After bioassay-guided separations of the extracts, two active substances were isolated and characterized as rutin and syringone. These two active substances significantly inhibited the seedling growth of cress and foxtail fescue. The range of  $I_{50}$  values of rutin and syringone for the seedling growth of cress and foxtail fescue were 129.5–417.8 and 160.1–466.5  $\mu\text{M}$ , respectively. These results indicate that the two identified growth inhibitory substances from *C. alata* may be responsible for its allelopathic properties.

From another active fraction of silica gel column of the *C. alata* leaf extract, two active compounds were also isolated through several chromatographic steps and identified using spectral data as (+)-rhododendrol and 3-hydroxy- $\alpha$ -ionone. These two active compounds significantly inhibited the seedling growth of cress in a concentration-dependent manner. The required concentrations for 50% growth inhibition of cress seedlings were 192.0–296.1  $\mu\text{M}$  for (+)-rhododendrol and 132.4–195.3  $\mu\text{M}$  for 3-hydroxy- $\alpha$ -ionone. These results suggest that these two growth inhibitory substances also might have responsibility for the allelopathic activity of *C. alata* leaves.

The results of three medicinal plants have shown the growth inhibitory activity on the seedling growth of the test plant species, indicates their allelopathic potential. Four putative allelochemicals were isolated and identified from the leaf extracts of *C. alata*, have shown inhibitory activities on the seedling growth of the test plant species. Those findings may provide an insight into managing weeds to replace the common practice of using synthetic herbicides.