

学位論文要旨 Dissertation Abstract

氏名 : ICHSAN NURUL BARI
Name

学位論文題目 : Allelopathy of *Cerbera manghas*, *Filicium decipiens* and
Title of Dissertation *Anredera cordifolia* from Indonesia
(インドネシア産 *Cerbera manghas*、*Filicium decipiens*、*Anredera cordifolia* のアレロパシー)

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The possible utilization of allelochemicals has been investigated for pest control. Numerous bioactive substances from plants were screened for pesticides, including herbicides, rodenticides, insecticides, fungicides, etc. The present study examined three Indonesian plants comprising sea mango (*Cerbera manghas*), fern tree (*Filicium decipiens*) and Madeira-vine (*Anredera cordifolia*). The three plants are known as medicinal plants locally and the allelopathic potential of the plants were unknown yet.

In the first experiment, the allelopathic effects of sea mango leaf extract on the growth of seedlings were assessed. Monocot species (barnyard grass, foxtail fescue, Italian ryegrass, and timothy) and dicot species (alfalfa, garden cress, lettuce and rapeseed) were used as test plants. The elongation of seedlings was measured to assess the allelopathic effect. The results showed that the seedling elongation varied depending on the test plant and the extract concentration. The inhibition of seedling elongation increased along with the increase of the sea mango leaf extract concentration in all test species. The IC_{50} value showed that 8.50-32.30mg and 4.26-34.67mg dry weight equivalent extract mL^{-1} of sea mango inhibited seedling elongation by 50%, for shoots and roots respectively. The result indicated that sea mango leaf might have allelopathic substances.

The second experiment was aimed to reveal fruit of sea mango as a repellent for *Rattus argentiventer*. T-maze (a simple arena for animal cognition experiments) consisted of two rooms where *R. argentiventer* chose control or treatment room for taking food and beverage, was used. The tendency of *R. argentiventer* in choosing the room was observed over 12d. Metabolic cage (laboratory equipment with a spherical faeces-urine separator) was used for accessing the effects of sea mango fruits on metabolic parameters (the amount of food, beverage, faeces and urine) and daily biological activities (the time spent for resting, foraging and locomotion). *R. argentiventer* tended to avoid sea mango fruits,

which indicated that it took the food and beverage from the room without sea mango fruit as priority. The treatment of sea mango fruit caused metabolic disorder as indicated by the decrease of food and beverage intake by *R. argentiventer* and the significant decrease of its body weight, while the daily activities disorders were indicated by spending more time for locomotion and less time for foraging and resting. In conclusion, sea mango fruits have an effect as a repellent for *R. argentiventer*.

In the third experiment, the allelopathic effects of fern tree leaf extract on the growth of seedlings were assessed. The methods were following the first experiment above. Result showed that the inhibition of seedling growth of all test plants was also concentration dependent and the sensitivity of each test plant varied to the extract of fern tree leaves. Result of IC_{50} value calculation concluded that seedling growth of all test plants inhibited 50% at the concentration 9.71-31.72mg and 6.68-33.10mg dry weight equivalent extract mL^{-1} for shoots and roots, respectively. These results suggested that fern tree possess allelopathic substances.

The fourth experiment was aimed to access the allelopathic effects of Madeira-vine leaf extract on the growth of seedlings that were assessed. The methods were following the first experiment above. The result indicated that each test plant species showed different sensitivity to the extract, but generally, the seedling development were more inhibited when the concentration of extract increased. The IC_{50} value showed that 4.61-38.31 and 3.45-48.19mg dry weight equivalent extract mL^{-1} of Madeira-vine leaf inhibited seedling elongation by 50%, for shoots and roots respectively. The results indicated that Madeira-vine leaf might have allelopathic substances.

Madeira-vine was the priority plant material for isolation and identification of allelopathic substances due to its IC_{50} value. Madeira-vine was stronger inhibition than sea mango and fern tree. Isolation of active substance was purified through several chromatographies including separation, silica gel column, Sephadex LH-20, reverse phase C_{18} and HPLC. The active substance was characterized by HRESIMS, determined by 1H and ^{13}C NMR spectroscopy and specific rotation of compound. The isolated compound, 3-hydroxy- α -ionone was one of the active substances that responsible for the allelopathic effects. The IC_{50} value showed that for inhibiting 50% seedling development of garden cress, 35.60 and 38.03 μM of substance concentration were required for shoots and roots, respectively. While, for barnyard grass, 41.00 and 53.24 μM of substance concentration were required for shoots and roots, respectively.