（第３号様式）(Form No. 3)

学 位 論 文 要 旨
Dissertation Abstract

氏名：
Name　Thang Lam Lun

学位論文題目：
Title of Dissertation　Evaluation of Allelopathic Activity and Identification of Allelopathic Substances in Myanmar Medicinal Plants (ミャンマー在来薬用植物のアレロパシー活性とアレロパシー物質の同定)

学位論文要旨：
Dissertation Abstract

Weeds compete with the main crops and reduce the growth, yield, and quality of agricultural products to some extent. One of the most common methods of reducing weed damage is the use of chemical herbicides. Due to the side effects that chemical herbicides on human health and the environment, there is a need to replace biocompatible and low-risk herbicides. Utilization of potential allelopathic plants and their bioactive substances (secondary metabolites) are of great interest as an alternative way to reduce the reliance on synthetic herbicides in weed elimination for their biodegradability. Many studies have reported that medicinal plants are one of the promising sources of secondary metabolites and some of them have been reported to have allelopathic activity.

This research, therefore, has focused to evaluate the allelopathic potential plants and to isolate potent allelochemicals from Myanmar medicinal plants. Three medicinal plants were used in this research: *Plumbago rosea* Linn. (Plumbagonaceae), *Polygonum chinense* L. (Polygonaceae), and *Acmella uliginosa* (Sw.) Cass (Asteraceae). The aqueous methanol extracts of *P. rosea* stems, *P. chinense* plant, and *A. uliginosa* plants showed significant inhibitory effects on the seedling growth of the representative test plants (cress, lettuce, alfalfa, barnyard grass, Italian ryegrass, and timothy). The effectiveness of the inhibition was proportional to each extract concentration. The susceptibility to the extraction of the test plants varied in the tested species. The extract obtained from the 300 mg dry weight of *P. rosea*, *P. chinense*, and *A. uliginosa* completely inhibited the shoot and root growth of the six tested plants except for the shoot growth of barnyard grass. Considering the concentration required for 50% growth inhibition (I_{50} values) of all the extracts, the extracts of *P. rosea* stems, had the strongest inhibitory activity followed by the extracts of *P. chinense* and *A. uliginosa* with values in the range between 0.87-33.5, 1.46-35.09 and 2.47-56.79 mg dry weight

equivalent extracts/mL, respectively. The inhibitory activities of these three medicinal plant extracts suggest that these plants may have allelopathic potential and may contain allelopathic substances.

The aqueous methanol extracts of each medicinal plant were isolated and purified through a series of chromatography. Bioassay-guided fractionations resulted in the isolation of six inhibitory substances and identified as 7,3′,4′-tri-*O*-methyl dihydroquercetin, and 7,4′,5′-tri-*O*-methylampelopsin from the stem extracts of *Plumbago rosea* and dehydrovomifoliol, (-)-3-hydroxy-*β*-ionone, 3-hydroxy-7,8-dihydro-*β*-ionone and loliolide from the whole plant extracts of *Polygonum chinense*. The biological activities of the isolated compounds were determined by the cress seedlings at different concentrations. The isolated compounds (7,3′,4′-tri-*O*-methyl dihydroquercetin, and 7,4′,5′-tri-*O*-methylampelopsin) from the stem extracts of *Plumbago rosea* significantly suppressed the shoot and root growth of cress compared with the control. Based on the I_{50} values of the two compounds, 7,4′,5′-tri-*O*-methylampelopsin (0.07 mM to 0.21 mM) had stronger activity on the root and shoot growth of cress than 7,3′,4′-tri-*O*-methyl dihydroquercetin (0.24 mM to 0.59 mM). The other four compounds isolated from the *Polygonum chinense* plant extract significantly inhibited the cress growth compared with the control. Comparing the I_{50} values of these four isolated compounds, (-)-3-hydroxy-*β*-ionone (0.05 to 0.07 mM) had the most inhibition activity on the cress seedlings followed by loliolide (0.25 to 0.47 mM), 3-hydroxy-7,8-dihydro-*β*-ionone (0.42 to 1.29 mM) and dehydrovomifoliol (1.7 to 2.58 mM). In addition, the other growth inhibitory substances were also isolated from the plant extracts of *A. uliginosa*, which are required to purify and characterize and may have value in weed control in the natural-based system.

In this research, three medicinal plants have shown inhibitory activity against the growth of the six representative test plants, indicating that these medicinal plants may contain allelopathic substances. Six potential inhibitory substances were isolated from *Plumbago rosea* and *Polygonum chinense* extracts and these substances also exhibited inhibitory effects on the growth of cress plants. Therefore, the findings of this study suggest that the plant residue of these medicinal plants, and their plant extracts could be utilized as soil additive materials for weed management options and their inhibitory substances could be utilized as natural sources of bioactive substances for the development of bioherbicides.