Extended Abstract

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Plant Growth Inhibitory Activity of Goniothalamus andersonii Bark Incorporated with Soil on Selected Plants

Yoshiharu Fujii

Department of International Environmental and Agricultural Sciences, Graduate School of Agriculture, Tokyo University of Agriculture and Technology, Fuchu, Tokyo, Japan

Abstract

Phytotoxic effects of soil incorporation with Goniothalamus andersonii bark powder against Cucumis sativus (cucumber), Trifolium repens (white clover), Lactuca sativa (lettuce) and Lolium perenne (perennial ryegrass) were evaluated under the greenhouse condition for possible utilization as weed suppression. The growth of tested plants was reduced significantly after 14 days of incorporation where the degree of inhibition was dose dependent. A monocotyledonous plant, L. perenne was greatly inhibited by 94.8% when exposed to the bark powder concentration of 2% (w/w). After 21 days of incorporation, the length and fresh weight of both root and shoot part of tested plants were decreased significantly. These results indicate that G. andersonii bark has great inhibitory activity against various tested plants, suggesting that the bark powder is very beneficial as a natural herbicide in weed control management.

Introduction

Allelopathy is defined as the interaction between plants, including microorganisms which have detrimental or beneficial effects through the release of chemical compounds into the environment [1]. The liberation of secondary metabolites into the environment by living or dead plant tissue occurs through several ways namely volatilization, root exudation, leaching and decomposition of plant residues in soil [1,2]. This will interfere with the growth and development of neighboring plants or other organisms.Excessive use of synthetic herbicides has been negatively affected human health and the environment as well as rapid development on herbicide-resistant weeds [3,4]. The application of herbicides is being prevented due to the effect of its residue, non-target toxicity and long-term perseverance in soil [5]. Therefore, the demand for natural herbicide is increasing as it is ecologically friendly and easily biodegradable The use of plant residue with allelopathic properties incorporated into soil known as one of the alternatives in weed management. The weed germination and growth can be inhibited by various applications of allelopathic crops and allelochemicals as extracts, mulches and residues [6]. The retardation of seed germination and individual plant growth inhibition are adversely affected by soil incorporation or surface application, such as mulch of allelopathic crop residues. This phenomenon resulted in the reduction of weed community density and vigor as a whole [7]. The effective and success use of cover crops as mulches or incorporated into soil to control weeds has been reported in several literatures.

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Keywords

Phytotoxic effects; Soil incorporation; Goniothalamus andersonii; Lolium perenne; Weed control.

Discussion

The bark powder of G. andersonii incorporated into soil found to possess phytotoxic effects against C. sativus, T. repens, L. sativa and L. perenne. This was attributed to the allelochemicals including goniothalamin released by this plant residue into soil hampering the growth and biomass of tested plants. However, their inhibition rates were different depending on the species tested, the dosage of bark powder applied as well as the period of incorporation.

Conclusion

Phytotoxicsubstances exuded from *G. andersonii* bark through the incorporation with soil significantly reduced the growth and biomass of *C. sativus*, *T. repens*, *L. sativa* and *L. perenne*. The suppression effect proved that this plant has great potential as a bioherbicide for weed management.

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E-mail: yfujii@cc.tuat.ac.jp

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