

Isolation and Structure Elucidation of Algicidal Compounds from the Brown Algae, *Dictyota dichotoma*

Ji Yeon Kim · Fumito Ishibashi* · Young Je Cho
Pukyong National University, Korea · Nagasaki University, Japan

Introduction

Marine organisms are known to produce unique secondary metabolites, some of which have important biological and pharmaceutical activities (Faulkner, D.J., 1984). Many of algae metabolites are biologically active and potentially useful. The significance of seaweed as a source for biologically active natural products is well known.

The genus *Dictyota* is represented by more than 40 species, thus being the richest genus of the family *Dictyotaceae* (Siamopoulou P. et al., 2004). The brown algae *Dictyota dichotoma* is a member of this family, which has been extensively studied for secondary metabolites.

D. dichotoma is known to produce diterpenoids possessing various types of carbon frameworks such as dolabellane ; 3,4-epoxy-7,18-dolabellatriene (Amico V. et al., 1980), bicyclic ; dictyotin A, B and C (Ishitsuka M. et al., 1990), perhydroazulene ; isopachydictyol A (Duran R. et al., 1997), xenicane ; neodictyolactone (Siamopoulou P. et al., 2004).

Screening of the algicidal activity of methanol (10 μ l/mL) and water extract solution (40 μ l/mL) of seaweeds collected at the coast of Nagasaki Prefecture on the HAB (harmful algal bloom) phytoplanktons, *Heterosigma akashiwo*, *Olisthodiscus luteus*, *Karenia mikimotoi* and *Fibrocapsa japonica* showed that *D. dichotoma* had potent algicidal activity (Alamsjah M. A. et al., 2005).

In this study, isolation and structure elucidation of the algicidal principles of the brown alga *D. dichotoma* will be described.

Material and Method

Dictyota dichotoma was collected from intertidal area of the coast of Nagasaki prefecture, Japan in April 2005. Air-dried *D. dichotoma* was extracted twice with EtOH at room temperature for 3 days. The filtered EtOH extract solution was evaporated under reduced pressure. The extract was chromatographed on Diaion[®]HP-20 eluted successively with MeOH (25, 50, 75, 100%) and finally acetone to yield 5 fractions.

The 100% MeOH elute was active against *H. akashiwo*. The active fraction was then subjected to reversed-phase HPLC (Cosmosil 5C18-MS-II, 2.5cm i.d. x 25cm) eluting with 80% CH₃CN

to yield three active compounds.

Their chemical structures were elucidated on the basis of spectroscopic information including 2D NMR. Algicidal activity of compounds was assessed according to the method previously described by Alamsjah M. A. et al., 2005.

Result and Discussion

In this study, we wish to describe the structures of one new diterpene having a perhydroazulene skeleton and two known diterpenes, dictyolactone and sanadaol.

The algicidal activities of the three diterpenes isolated from *Dictyota dichotoma* were compared with that of α -linolenic acid which has been previously isolated as one of the active principles of *Ulva fasciata* using three different red-tide microalgae, *Heterosigma akashiwo*, *Karenia mikimotoi* and *Alexandrium catenella*. The activity of the diterpenes on the Raphidophyta *H. akashiwo* was rather lower than that of α -linolenic acid (100% at $2\mu\text{g/mL}$), however they were found to be active (90-100% at $20\mu\text{g/mL}$) even against toxic dinoflagellates, *K. mikimotoi* and *A. catenella*, insensitive to α -linolenic acid.

Reference

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