# Variation in Cytotoxicity and Antitumor Activity among Samples of the Moss *Claopodium crispifolium* (Thuidiaceae)[1]

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*Nine samples of the moss* Claopodium crispifolium *were collected for large-scale fractionation to isolate antitumor agents. Each sample was active in the P388 Lymphocytic leukemia and KB cell culture, bioassays commonly used to guide the fractionation procedure. Notable variation in the test results among the samples led to re-examination of the voucher samples to determine possible causes. A blue-green alga,* Nostoc *cf.* microscopium, *was found to be common on the moss leaves in samples with the best activity. We propose that* Nostoc *cf.* microscopium, *or perhaps closely associated organism(s), could be the direct source of the bioactivity, or that the bioactivity could also be a result of allelopathy.*

During 1957–1981, the National Cancer Institute (NCI) tested extracts from about 35,000 species of plants for tumor inhibitory effects in laboratory rodents and cell culture assays. Extracts from about 10% of the species showed significant activity in one or more bioassays. The active agents isolated, as guided by the NCI bioassay results, represented many classes of compounds (Hartwell 1976; Suffness and Douros 1979).

Our paper describes collection data and bioassay test results of one active species, the moss *Claopodium crispifolium* (Hook.) Ren. & Card. (Thuidiaceae). While it is generally recognized that activity can depend on the ecological conditions and methodology in sampling a species, few examples have been published. One purpose of this paper is to provide such an example; we propose a reason for the variability of biological activity data. Second, this paper was prompted by the discovery of antitumor activity in samples of a moss; the chemistry of biological active agents in the Bryophyta is generally unknown, although biological activity is clearly evident (Spjut et al. 1986).

*Claopodium crispifolium* (Fig. 1) has a northwestern North American range (Lawton 1971) typical of many higher plants (e.g., *Taxus brevifolia*); it also occurs in the high mountains of Japan (Noguchi 1964; Watanabe 1972). It often grows mixed with other mosses, but occasionally forms pure carpets over extensive areas on stones, logs, stembark less than 1 m above the tree base, and rootbark at the

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