

CHAPTER 1

INTRODUCTION

Lichens are symbiotic organisms composed of a fungal partner or called “mycobiont” and one or more algae, photosynthetic partners, called “photobiont” (Nash, 2008a, p. 1). The photobiont is mainly essential for lichens growth and survival because it produces carbohydrates which are transferred to the fungal partner to utilize for living and metabolizing secondary compounds. These compounds or so called lichen products, are different from those produced by other organisms. The lichens produce them for self-protection against extreme environment, insect, invertebrates and other natural enemies (Elix & Stocker-Wörgötter, 2008). Lichen products are novel biological resources and have potential for multiple uses. Conversely, lichens grow extremely slowly in nature because their photosynthesis is limited by water and nutrients derived from the atmosphere (Green, Nash, & Lange, 2008, pp. 152-181).

Many studies reported that climate change, air pollution, and adverse human activities are threatening natural habitats of lichens, which could possibly lead to extinction. Rare species and endemic species are particularly at risk of extinction by global warming (Aptroot, 2009; Aptroot & van Herk, 2006; van Herk, Aptroot, & van Dobben, 2002). Furthermore, Scheidegger and Werth (2009) reported that loss of lichen species has been mainly caused by habitat encroachment, which obviously reduces lichen population in

present situation. In addition, changes in environmental factor (e.g. light intensity, temperature and humidity) could limit dispersal and growth of vegetative propagule of lichens. Therefore, conservation and enhanced production of lichens from adverse affects are ultimately necessary for sustainable utilization of this biological resource.

Presently, 1700 species of lichens have been discovered in Thailand (unpublished). Study at Khao Yai National Park reveals that the Tropical Rain Forest (TRF) has the highest number of species among the all ecosystems explored including Dry Evergreen Forest (DEF), Lower Montane Forest (LMF) and Secondary Forest (SF). Some species are commonly found in every forest, while many species are specific to certain habitats and ecosystems. *Relicina subconnivens* is one of the lichens that only found in TRF, and *Parmelinella chouzoubae* only specific to LMF (Ramkhamheang University, Faculty of Science, Department of Biology, Lichen Research Unit, 2004). In addition, growth rates of lichens vary in different ecosystem (Nimitr Osathanon, 2002). Distribution and survival of tropical lichens under environmental change especially climate change is not known.

Transplantation of lichens is a common practice uses for several purposes i.e. air pollution studies, increase production, habitat recruitment, and responding to microclimate (Antoine & McCune, 2004; Caldiz, 2004; Canters, Schöllerj, Ott, & Jahns, 1991). Transplantation of thallus fragment for conservation was successful in Boral forest (Ledén, Pettersson, Bergsten, & Lundmark, 2004). It reveals factors that limit dispersal in this forest

Despite of being sensitive to atmospheric and climatic factors, nevertheless, lichens are able to grow in wide variety of substrates, e.g. soil, rock, bark, decorticated wood, and leaves (Seaward, 2008, p. 278). Recruitment of appropriate substrates for specific purpose of transplantation is necessary. In natural habitat lichens distribute by means of spore and vegetative propagules known as isidia, soredia and thallus fragment. However, the later strategy seems to be more advantage over another due to photobiont and mycobiont set off together. These propagules start to grow where environment is suitable (Ahmadjian, 1973, pp. 565-579; Hilmo & S astad, 2001; Scheidegger, 1995; Scheidegger & Werth, 2009; Seaward, 2008; Seymour, Crittenden, & Dyer, 2005).

This study examined adaptive capacities of lichens from the cool and the warm habitats under changing climate. It furthermore explored the possibilities of using vegetative propagules of lichens for transplantation in various condition including natural and artificial habitats.

Objectives

1. To discover effects of changing microclimate on site-specific species of lichens.
2. To locate appropriate microclimate in various ecosystems for lichen propagation.
3. To find suitable artificial substrates for growing lichens.

Hypothesis

1. Site-specific species have adapted to proper environment and cannot survive in other ecosystems.
2. Microclimate under canopy at various levels along trunks of host tree differently affected germination and growth of the transplanted isidia, soredia and thallus fragment.
3. Microclimate on different aspects orientation of tree trunks affects establishment and growth of thallus fragment, isidia and soredia after transplantation.
4. Physical property of artificial substrates influences establishment, survival and growth of the transplanted vegetative propagules of lichens

Word Definitions

Artificial substrates: Man made materials; for example, plastic net, rubber tile, metal plate and glass bottle.

Isidia: A structure of vegetative reproduction presents within some lichens. Isidia grows out from upper surface of thallus. They have corticated, which are usually a columnar structure, consisting of fungal hyphae and algal cells. They are fragile structures and may break off and distributed by wind, animals, and splashing raindrops.

Lichen transplantation: Transferring part of lichen thallus or vegetative propagules to new condition or habitats.

Microclimate: Climatic condition on specific small scale, which is different from the whole landscape.

Site-specific species: Species which grows specifically in a particular habitat or ecosystems, and generally cannot be found in other ecosystems.

Soredia: Lichen vegetative propagule, with powdery appearance, compose of algae and surrounded by fungal hyphae. Fungal hyphae make up the basic body structure of lichen. The soredia are released through openings in the upper cortex of the lichen thallus. They are then disperse and establish into new lichen in appropriate environment.

Thallus fragment: Piece of thallus that tears out from lichens. It is able to germinate into new thallus under suitable condition.

Vegetative propagule: Parts of lichen thallus or structure that capable to grow into new lichen without producing sexual spore. It is generally includes thallus fragment, isidia and soredia.

Advantage of This Study

This study is an applied lichen physiology and ecology to enhance our understanding on factors that govern species existence, community structure, production and adaptation under different natural environment. It further provides information as follow:

1. Adaptive capacity of lichens from cool and warm habitats in other types of climate.
2. The influences of microclimate and other environmental factors which superimposed on survival and growth of transplanted lichens in various ecosystems.
3. Appropriate technique for transplantation of lichens to conserve species and enhancing production for sustainable utilization.