อิทธิพลของภูมิอากาศเฉพาะแห่งมีผลต่อการย้ายปลูกไลเคน ณ อุทยานแห่งชาติเขาใหญ่

The influences of microclimate on lichen transplantation at Khao Yai National Park

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บทคัดย่อ: การย้ายปลูกไลเคน ณ อุทยานแห่งชาติเขาใหญ่ เป็นการศึกษาเพื่อเปรียบเทียบการเจริญของไลเคนในต่างระบบนิเวศ ทิศทาง และภูมิอากาศเฉพาะแห่ง โดยเก็บตัวอย่าง *Parmotrema tinctorum* (Despr. ex Nyl.) Hale จากป่ารุ่นสอง ย้ายปลูกไปยัง ป่าดิบชื้น ป่าดิบแล้ง ป่าดิบเขา และป่ารุ่นสอง ใช้เอ็นตกปลายึดทัลลัสให้ติดกับต้นไม้ ในทิศเหนือ ทิศใต้ ทิศตะวันตก และทิศตะวันออก จากระดับโคนต้นไปจนถึงเรือนยอดห่างกันระดับละ 1.5 เมตร ติดตามการเจริญในทุกหกเดือน ติดตามการตายและวัดภูมิอากาศเฉพาะแห่งทุกสองเดือน พบว่าสองเดือนแรกทัลลัสที่ระดับเรือนยอดเริ่มเกาะติดกับเปลือกไม้และพบการตายที่โคนต้น เมื่อติดตามการเจริญในหกเดือนแรกพบว่า ทัลลัสมีการเจริญเพิ่มขึ้นส่วนใหญ่พบที่ระดับกลางต้นถึงเรือนยอดและมีอัตราการตายเพิ่มขึ้นที่ระดับโคนต้น เมื่อเปรียบเทียบการเจริญของไลเคนในแต่ละระบบนิเวศ จากจำนวนตัวอย่างทั้งหมดในแต่ละป่า พบว่าไลเคนในป่าดิบเขาสามารถเกาะติดกับเปลือกไม้และเจริญได้ดีที่สุด คิดเป็นร้อยละ 58 รองลงมาคือป่ารุ่นสองร้อยละ 51 ป่าดิบแล้งร้อยละ 9 ป่าดิบชื้นร้อยละ 3 ตามลำดับ จากข้อมูลภูมิอากาศเฉพาะแห่งพบที่ระดับโคนต้นมีความเข้มแสงต่ำประมาณ 11 - 27 μmol $m^{-2}s^{-1}$ ที่ระดับกลางต้นถึงเรือนยอดมีความเข้มแสงประมาณ 50 - 699 μmol $m^{-2}s^{-1}$ แสดงว่าความเข้มแสงมีผลต่อการเจริญและการตายของไลเคน จากการสังเกตพบว่าไลเคนด้านทิศเหนือของต้นไม้ในป่ารุ่นสองมีการเจริญน้อยกว่าทิศอื่นๆ แต่ในระบบนิเวศอื่นไม่พบความแตกต่างด้านทิศทาง

Abstract: The objectives of transplanting lichens at Khao Yai National Park are to studies method of transplantation, influence of microclimate on lichen establishment, and to compare lichen growth rates among ecosystems, which have different microclimate. The lichen *Parmotrema tinctorum* (Despr. ex Nyl.) Hale was collected from the Secondary forest and transplanted to Tropical rain forest, Dry evergreen forest, Lower montane rain forest, and Secondary forest. Transplantation were performed by attaching fragment of thallus on bark with nylon fishing line at four aspects (N, S, W, and E) of trees at every 1.5 m from the base to canopy. Growths of the transplanted lichens were measured every six months. Microclimate and mortality rates were recorded every two months. After two months transplanted lichens at the canopies seem to attach on bark, but died at the bases. After six months, lichens from mid trunks to canopies started to grow died at the lower level. Approximately 58% of the transplanted materials in the Lower montane rain forest survived and grow, whereas, those in the Secondary forest, the Dry Evergreen Forest and the Tropical Rain Forest had survival rates of 51%, 9%-and 3% respectively. Microclimatic record showed that light intensity was as low as 11 - 27 μmol m^{-2} s^{-1} at the bases of most trunks, with higher intensity up to 50 – 699 μmol m^{-2} s^{-1} from mid trunks up to the canopies. Light intensity has the highest influence on growth rate of lichens. North-facing tree trunks from the Secondary forest show that lichens grows less than the other sides. These differences were not observed in the other ecosystems.

Methodology: The foliose lichen *Parmotrema tinctorum* (Despr. ex Nyl.) Hale was collected from the secondary forest. Thalli near the edges, which comprise of active growing zones, were cut into pieces of about 2-3 cm^2 for transplantation. A total of twelve host trees were selected

from the Tropical rain forest (TRF), the Dry evergreen forest (DEF), the Lower montane forest (LMF) and the Secondary forest (SF). The transplanted materials were attached on bark of 3 host trees at each site by using monofilament nylon fishing line. A total of about 560 thalli were transplanted on four aspects, North, South, East and West, of trunks at 1.5 m intervals from the bases to the canopies. Mortality was observed every two months, growths of the thalli were measured every six months. Light intensity, temperature and relative humidity were recorded at the transplanted zone, at 10 minute intervals for 24 hours in every two months by using Data Logger Campbell 21X and Li-1400.

Result, Discussion and Conclusion: *P. tinctorum* is commonly found in every ecosystem in Thailand, as well as at Khao Yai Nation Park (Boonpragob et al. 1998). Transplanted *P.tinctorum* show different survival rates among ecosystem, levels and aspects of transplantation. Figure 2 shows different in microclimate during early morning at the base, middle and canopy, where lichens were transplanted at the TRF and LMF. Producing organic matter by photosynthesis for growth of lichens occurs when thalli are saturated with moisture, after thalli dried out they become inactive (Coxson and Kershaw 1983). Lichens lost moisture content fast because they lack of protective layer. In natural habitat lichens are active in early morning when thalli absorbed and saturated with atmospheric moisture during the night. Therefore, light intensity during early morning, before thalli dried out, is important factor for survival and growth of lichens. Most lichens achieved their maximum photosynthetic rate at light intensity 200 – 400 µmol m^{-2} s^{-1} (Nash 1996). This study shows that survival of the transplanted lichens occurred above the middle of the trunk, where light intensity is over 130 µmol m^{-2} s^{-1} in early morning. Light at this level is slightly lower than the maximum level of light for photosynthesis. However, it is sufficient for producing organic matter to support lichen growth. The base of the trunk received only 6 umol m^{-2} s^{-1} of light during the same period. This level of intensity is too low to support photosynthesis, and thus the lichens are unable to survive.

In general the N-facing aspect is moist then the S-facing aspect due to inclination of the earth. Growths of the transplanted lichens on N-facing aspect of stems grow less than the other aspects, whereas the other forests show no differences. This is because the latter forests are mature forests with dense vegetation. Shading each other causes heterogeneity of light pattern on stem. These factors override natural phenomena of N – S microclimatic differences. This observation, however, demonstrate that lichen establishment prefer dryer cycle of microclimate on the N-facing stem. Figure 1 shows that cool and moist climate at the LMF favor lichen establishment more than warmer and drier climate of the other two sites. This is due to higher temperature at the TRF, DEF, and SF causes greater rate of respiration leave less organic matter for growth.

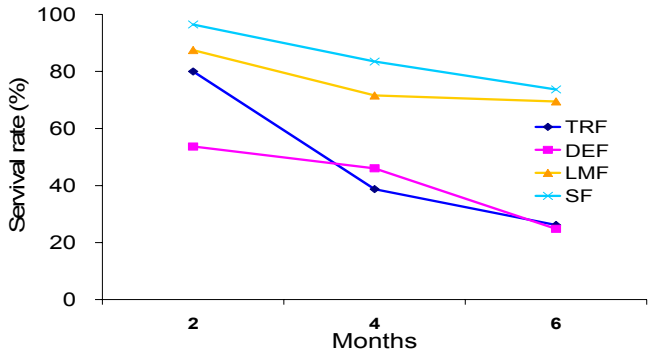

Figure 1: Survivals rate of transplanted lichens in different forest types.

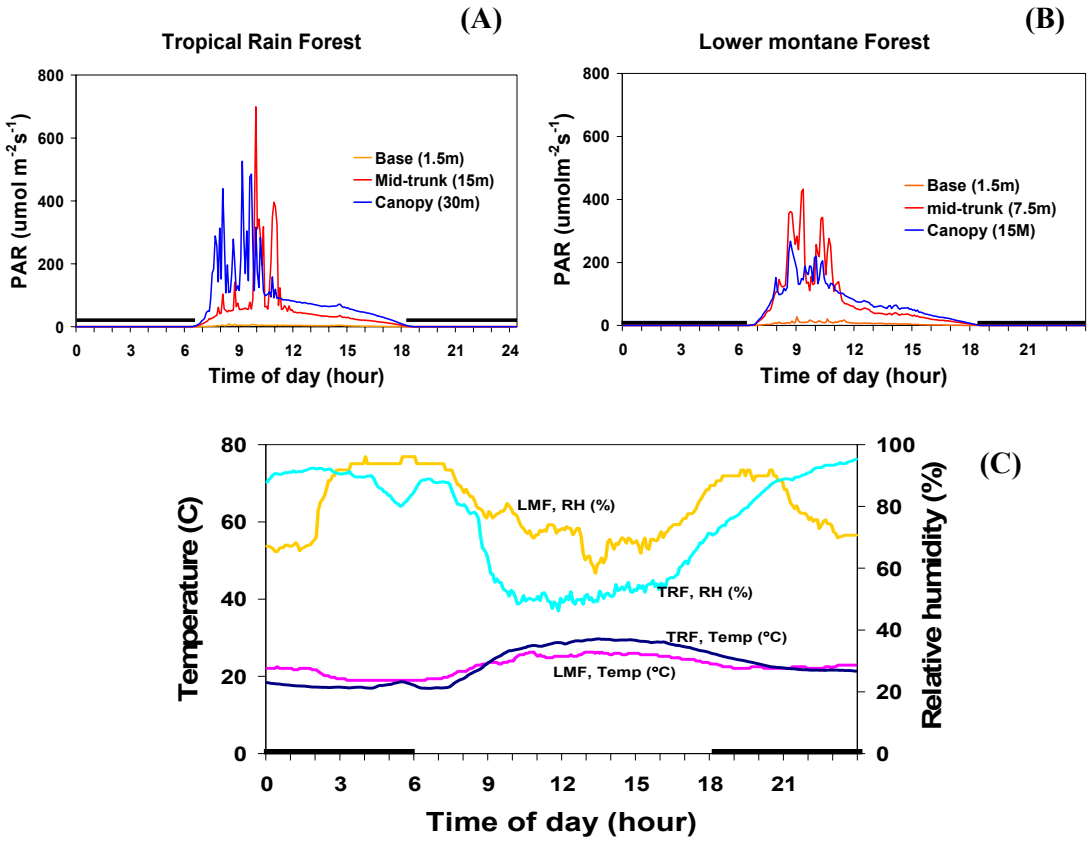

Figure 2: Comparative of vertical microclimate (canopy, mid-trunk, and base of trees), these data recorded at the trees for transplanted lichens. (A) Light intensity of Tropical rain forest, TRF (B) Light intensity of Lower montane forest and, LMF (C) Temperature and Relative humidity in mid-trunk of both forests.

Acknowledgement: I am grateful to Mr. Wetchasart Polyiam, Miss Nongyao Chaikom, Mr. Nimitr Osathanon and Mr. Prathom Ruatreaw for their assistance in fieldwork. A number of colleagues at Lichen Research Unit, Ramkhamhaeng University. We are grateful to the officers and staff at Khao Yai National Park for their kind cooperation.

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Keyword: Lichen transplantation, Microclimate, Growth rate, Ecosystem