

3B - 2: The ecological roles of lichens in diverse ecosystems

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THE EFFECTS OF ATMOSPHERIC POLLUTANTS IN BANGKOK PUBLIC PARKS ON THE PHYSIOLOGICAL PROCESSES OF THE LICHEN *PARMOTREMA TINCTORUM* (NYL.) HALE

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The capacity of lichens to absorb and accumulate atmospheric pollutants, and their physiological responses has been used to monitor air quality extensively. However, this aspect is less studied in the tropics where rain is intense and where industrialization and urbanization are now expanding apace. Accordingly, the objectives of this study were to assess air quality in Bangkok public parks by investigating the effects on physiological processes by air pollutants absorbed and accumulated in transplanted lichens. The lichen *Parmotrema tinctorum* (Nyl.) Hale was gathered from an unpolluted control site at Khao Yai National Park and transplanted into ten public parks in Bangkok. Transplantation was also conducted at the control site and a rural area at Ban Sang. The photosynthetic rate, chlorophyll content, chlorophyll a fluorescence, and phaeophytin were measured before transplantation, and then 45, 140, and 210 days after transplantation. The amounts of the fluoride ion (F⁻), chloride ion (Cl⁻), nitrate ion (NO₃⁻), sulfate ion (SO₄²⁻), phosphate ion (PO₄³⁻) and oxalate ion (C₂O₄²⁻) absorbed and accumulated in the thalli of the lichens were analyzed at the aforementioned periods. The results show that the photosynthetic capacity of the transplanted lichens at all polluted sites substantially declined, particularly after 140 days of transplantation. Correspondingly, the amounts of ionic air pollutants increased in the thalli. However, 210 days after transplantation the photosynthetic rates of the lichens obviously recovered, while the amounts of ionic substances in the thalli decreased. This was a consequence of the heavy rain that occurred during this period. Applications of the Pearson product-moment correlation coefficient method yielded high positive correlations between photosynthesis, chlorophyll a fluorescence, and chlorophyll content. However, negative correlations were found to hold between chlorophyll degradation and all air pollutants, with the exception of C₂O₄²⁻. The rates of the photosynthesis and chlorophyll a fluorescence parameters for the transplanted lichens exhibited the highest negative correlations with Cl⁻, NO₃⁻ and F⁻ which ranged from 0.897 to 0.64. Lower levels of negative correlations were shown for SO₄²⁻ and PO₄³⁻. This study demonstrated diverse air quality at ten Bangkok public parks assessed by lichens.

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