9 Plant Decomposition and Enzyme Activities in Subalpine Marshes

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To access the change of enzyme activities with decomposition process in subalpine marshes, losses of dry mass of the aboveground (*Carex utriculata*, *Nuphar luteum* ssp. *polysepalum*, and *Ranunculus aquatilis* var. *capillaceus*) and belowground (*Nuphar luteum* ssp. *polysepalum*) materials of dominant species and enzyme activities (alkaline phosphatase, β-glucosidase, and β-xylosidase) were examined with litterbag technique and fluorogenic method. Average mass losses of *Carex* leaves, *Nuphar* leaves, *Ranunculus* shoots, and *N.* rhizome over 267 days were 33.7, 82.4, 97.0, and 67.1 %, respectively. Total carbon content showed continuous increase with time in *Carex* leaves and *Nuphar* rhizome and showed increase until about 100 days and decrease thereafter in *Nuphar* leaves and *Ranunculus* shoots. Nitrogen content increased continuously only in *Nuphar* leaves and rhizome and showed increase until about 30 days and decrease thereafter in others. Minimum/maximum enzyme activities of phosphatase-glucosidase- xylosidase in *Carex* leaves, *Nuphar* leaves, *Ranunculus* shoots, and *N.* rhizome during the study period were 442/2120 392/1516 21/92, 70/283-20/350-3/30, 65/282-41/164-1/10, and 39/265-540/1334 39/104 μmole/hr/gDW, respectively. Phosphatase activity was the highest in *Nuphar* leaves and glucosidase and xylosidase activities were high in *Nuphar* leaves and rhizome. Enzyme activities in *Nuphar* leaves and rhizome and *Ranunculus* shoots did not show conspicuous change with time but glucosidase and xylosidase activities in *Carex* leaves increased with time. One way ANOVA test showed significant effects of litter type on all enzyme activities and of study site on phosphatase activity in *Nuphar* leaves and *Carex* leaves and glucosidase activity in *Carex* leaves. Regression analysis showed the significant relationship between cumulative enzyme activities (log value) and mass loss. This study showed very high enzyme activities in the early stage of decomposition compared with in the late stage of decomposition in other studies but the same relationship between cumulative enzyme activity and mass loss.

Keywords: decomposition, wetlands, enzyme activity, Nuphar, Carex, Ranunculus