Disturbance and recovery in leaf-litter nitrogen input in hinoki cypress forests affected by severe typhoons in 2004

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Aboveground litterfall is a major component of nitrogen input to forest soils. In hinoki cypress forests, leaf litter of hinokl cypress occupies 50-90% of total litterfall. When hinoki forests suffer an attack of a large typhoon, a large amount of leaf-litter nitrogen is supplied to soil due to strong wind. When typhoons affected the forest, leaf in the crown may decrease and the leaf-litter N also decrease. The effects of typhoon attacks would depend on topography, slope aspect, tree height and the forest management such as the intensity of thinning. In the present study, we investigated the leaf-litter dynamics for 5 years in 8 hinoki cypress forests. We aimed to determine if 1) leaf-litter N increase by the attacks of typhoons, 2) leaf-litter N decrease in the next year of attacks of typhoon and 3) effects of typhoons depends on the topography or thinning practices.

We selected 6 hinoki cypress forests and study plot ($400m^2$) was established; TNG(1150m in elevation), FMY(710m), KC(20m) in Kochi Prefecture and HC1(200m), HC2(180m) and HC3(140m) along a slope in Kamigamo University forests in Kyoto City. In TNG and FMY, two adjacent study plots were established. In one plot, 50% of trees were cut and in the other plot no trees were cut. Litterfall was collected every month by using litter traps for 5 years from July 2002 to July 2007. Litter was divided into leaf and other organs. Dry weight and nitrogen concentration of leaf litter were measured.

Annual leaf-litter N before typhoon attacks (2002-3) in un-thinned 6 forests ranged from 0.66 to 2.54 g m^{-2}. When typhoons attacked in 2004, annual leaf-litter N ranged from 1.19-5.05 g m^{-2} and increased from that in 2002-3 by 0.95-1.99 fold. The effect of typhoons is severer in the upper slope in Kyoto and in higher elevation (TNG) than lower elevation (FMY). Annual leaf-litter N after typhoon attacks (2005-6) ranged from 0.94-3.03 g m^{-2} and increased from that in 2002-3 by 0.76-1.43 fold with a mean of 1.14 fold. Although hinoki trees shed larger mount of N when the typhoons attack, this may not lead to decrease of annual leaf-litter N in the following year. The results suggest recover of leaf-litter N after typhoon attacks are rapid probably due to increase in new leaf production.

When compared between thinned and un-thinned plots in Kochi, annual leaf-litter N in 2004 in the thinned plots increased from that in 2002-3 by 1.74-2.62 whereas those in the control plots by 1.09-1.99 fold. The results suggest that the effects of typhoons in 2004 were severer in the thinning plots. Annual leaf-litter N in 2005-6 in the thinned plots increased from that in 2002-3 by 0.97-1.41 fold whereas those in the control plots by 0.95-1.19 fold. The results suggest that recovery of leaf-litter N in the thinned plots were rapid as well as in the control plots.