# Effects of urea application on the forest floors in limestone and serpentinite soils in the Kanto region, Japan

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Urea applications have been done in different habitats in acidic soils, which are common to Temperate and Subtropical Zones, in order to examine nitrogen cycling mechanism after disturbance by nitrogen enrichment. In Japan, most terrestrial plant communities are established on acidic soils since acidic soils distribute widely whole areas of Japanese archipelago. For example, pH and moisture content as well as $NH_4$-N concentration rise rapidly after urea application on forest floors in acidic soils. While, the soil pH returns to the control level (non-urea application level) within 7 months whereas $NH_4$-N concentration and water content decline slowly to the control level for 1-2 years after the urea application. Successional occurrence of a group of fungi was observed following the urea application and they were defined as ammonia fungi (a chemoecological group of fungi; Sagara 1975). The early phase ammonia fungi occur during high pH, high $NH_4$-N concentration, and high water content whereas the late phase ammonia fungi occur during the latter two factors still somewhat higher than the control. Based on the observation described above, a sudden increasing of $NH_4$-N associating with that of pH have been speculated as the essential factors for the occurrence of ammonia fungi (Yamanaka 1995; Suzuki *et al.* 2002, 2003; He & Suzuki 2004, etc.). However, nitrogen enrichment has not yet been done in the terrestrial plant communities established on alkaline soils such as limestone and serpentinite soils which distribute in Japanese archipelago. Therefore, we applied 800 g/m$^2$ of urea on the forest floor near Nippara (Consisting of a layer of re-transferred limestone soil deposited on the siliceous base and its clayey deposited layer; Okutama region, Japan) and that along the Mineoka trail (Consisting of serpentinite base and its clayey deposited layer; Kamogawa region, Japan) in the end of March in 2016. We examined the changes in mycobiota and physicochemical factors (soil temperature, water content, pH, and inorganic nitrogen concentrations) in the forests after the urea application. pHs of the non-urea- treated soils (LF and HA horizons) of the former and the latter were ca. 8 and ca. 10, respectively. $NH_4$-N concentration and moisture content of the soils rapidly increased in the urea plots of both sites and then gradually declined. The declining of $NH_4$-N concentration in the alkaline soils was quicker than that of $NH_4$-N concentration in acidic soils. In contrast, soil pH of the alkaline soils showed no significant changes as far as one year after urea application. After urea application, $NO_2$-N concentrations of HA horizons in the alkaline soils increased remarkably comparing with those of HA horizons in acidic soils subsequent to urea treatment. The difference in nitrification ability could be one of characteristics of the alkaline soils. The ammonia fungi recorded in urea-treated acidic soils, such the early phase ammonia fungi *Amblyosporium botrytis*, *Pseudombrophila petrakii*, *Coprinopsis echinospora* and *Lyophyllum tylicolor,* and late phase ammonia fungi *Calocybe constricta* and *Hebeloma spoliatum* were observed in the alkaline soils by the urea application, but not collected any fungal species specific to the alkaline soils. From the above results, it was suggested that disturbance due to a large amount of $NH_4$-N is mainly responsible for the propagation of ammonia fungi irrespective of presence and absence of rapid rising of pH.

Keywords: ammonia fungi, alkaline soils, Limestone, Serpentinite, pH, anmmonium nitrogen

 