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Growth of Fagus in transition zones of forest and soil on the western slope of Mt. Chokai, northern Japan

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A wide transition zone for forest structure is expected to distribute on the gentle slope of western side of Mt. Chokai ,Yamagata prefecture, northern Japan (N39˚05'57", E140˚02'55"). The annual mean temperature and total precipitation at summit (2,059 m asl.) are 0.5˚C and 3,285mm, respectively. The parent materials of the soils are weathered Andesite associated with non-tephric loess deposits transported from continental China. Representative sites were selected in forests of *Quercus mongolica* and *Fagus crenata* to examine characteristics of transition zones of vegetation and soil in the western slope of Mt. Chokai with concern on the growth of *Fagus* in transition zones.

Surveys on vegetation profile and projection diagram of canopy for each site (10×10m plots) were carried out in 7 sites selected along altitudinal sequence on the western slope of Mt. Chokai; Ch1-7: 550-1,100m asl.. Growth rate of *Fagus* was estimated by the measurement of tree rings from increment core samples. Timber volume of *Fagus* at each point was calculated based on diameter of breast height; DBH as an indicator of tree biomass. Soil profiles were observed at the above 7 sites and soil samples were collected from each horizon. As for soil analyses, soil pH (H_2O, KCl, NaF) values were measured by the glass electrode method in the suspension mixture of soil with a 2.5 times volume of H_2O or 1N KCl and 50 times volume of 4% NaF. Pyrophosphate, acid oxalate and dithionite-citrate extractable Al (Alp, Alo, Ald), Fe (Feo, Fed) and Si (Sio, Sid) were measured by ICP-AES. The content of exchangeable Al (Al_{EX}) was obtained by titration of extract with 1N KCl. Sclerotia formed by species of *Cenococcum*, ectomycorrhizal fungi, were collected for grains of diameter larger than 0.5mm from wet samples. Sclerotia content was obtained by weight (mg g^{-1} soil).

Due to intensive base leaching under extremely high precipitation and the mineralogical properties, Ah and Ae horizons of all profiles had low soil pH values (3.4-4.6 in H_2O) and a high content of exchangeable Al (0.20-1.09g kg^{-1} soil), which could restrict nutrient uptake and growth of trees. From observation of forest structures of each site, transition zone was approximately 750m by horizontal distance including Ch3-5 (710-780m asl.). The DBH of *Fagus* was more than 45cm at Ch3,4, and the timber volume of *Fagus* was the largest at Ch3, followed by Ch4, and the smallest at Ch7, followed by Ch6. Among the entire 7 sites, the growth rate of *Fagus* was the largest at Ch3 where soil pH value was above 4.0 and exchangeable Al content was relatively low. The oldest and highest *Fagus* was observed at Ch4, where content of exchangeable Al was high (1.0 g kg^{-1}) . While, *Fagus* at Ch3,5 and 7 had almost same age. Sclerotia content in soils was much larger in transition zone (Ch3,4) than in podzolic soils (Ch6,7) beneath the dwarfed *Fagus* forest. The activity of mycorrhizae was suggested to be one of the important factors for the growth of *Fagus* in transition zone.