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Stoichiometry character of larch forests in China

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Ecological stoichiometry studies the chemical balance and their coupling relationships of carbon (C), nitrogen (N), phosphorus (P) and other elements in ecological processes, and plays an important role in revealing the mechanisms underlying biogeochemical cycles and ecosystem functions. This study focused on cold temperate coniferous forests, i.e. larch forests, and explored its stoichiometry character in China and how plant community structure and environmental factors affect the CNP stoichiometry of its soil and different organs of constructive species. The results following: (1) The needle and twig N:P ratios of larch species were less than 10, and the N:P ratio of cone was less than 14, indicating that constructive species growth was limited by N in Chinese larch forest. There were significant differences in the CNP stoichiometry characteristics among different organs of the constructive species. Although CNP stoichiometric characteristics of cone were significantly correlated with the C and N contents and C:N ratio of shallow soils, the reproductive organs had greater internal stability of the element stoichiometry than needle and twig, which were more easily affected by soil stoichiometry. (2) Altitude is an important factor affecting soil CNP stoichiometry in larch forests. And, the C and N contents, and C:N, C:P and N:P ratios in different soil layers significantly increased with the stand age, indicating that the growth of larch forests is conducive to the accumulation of soil nutrients. (3) Climatic factors were the main factors for the C content of twig, the N content of cone, and the N:P ratios of all organs in larch forests. Topographic factors were the main factors affecting needle C and N contents. The larch forest type was the main factor affecting cone C content, C:N and C:P ratios. Community factors were the main factors affecting the C:N ratio of soil and P content of cone. The relationships between CNP stoichiometric characteristics of different organs of constructive species and community factors were mainly reflected in average tree height and stand density, while the relationships between soil CNP stoichiometric characteristics and community factors were mainly reflected in stand age. This study elucidated the CNP stoichiometric characteristics of larch forests in China, and revealed the important influence of community factors on the stoichiometry of larch forests. These results will help to understand the adaptation and evolution process of alpine forest ecosystem to nutrient environment.