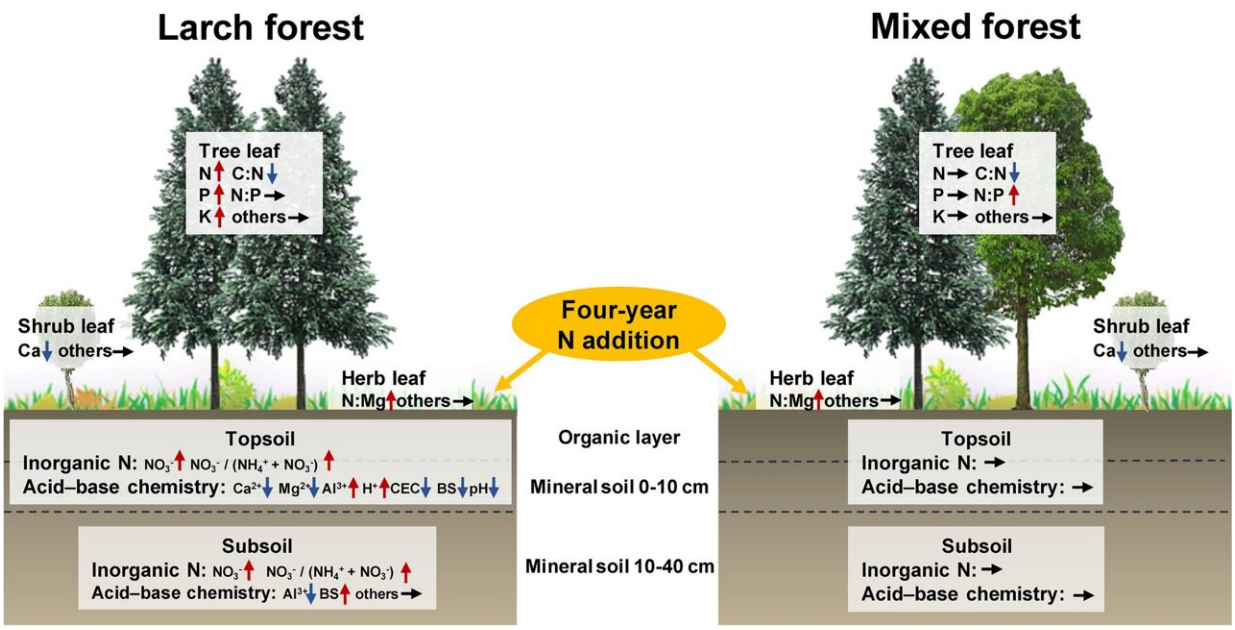
Nitrogen pollution is less harmful to mixed forests, study shows

May 13 2024, by Zhang Nannan



A conceptual diagram illustrating the effect of four-year N addition on soil chemical properties and leaf nutrients in a larch forest and an adjacent larch-broadleaf mixed forest. Credit: *Plant and Soil* (2024). DOI: 10.1007/s11104-024-06677-9

In a study published in the journal *Plant and Soil*, researchers from the

Institute of Applied Ecology of the Chinese Academy of Sciences have shown that mixed larch and deciduous forests are more resistant to soil acidification—a decrease in soil pH—than pure larch forests.

This finding suggests that mixed forests, which contain a variety of tree species, may be a more effective forest management strategy to combat soil acidification.

Human activities such as the burning of fossil fuels and the use of chemical fertilizers have led to high levels of nitrogen deposition, the transfer of nitrogen from the atmosphere to the Earth's surface, in many regions of the world; this process may cause soil acidification and plant nutrient imbalances.

While air pollution control measures are being implemented, overall levels of nitrogen deposition remain relatively high in some parts of China. Previous research has focused primarily on nitrogen-deficient temperate forests, leaving the response of nitrogen-rich forest ecosystems and the regulatory role of tree species composition unclear.

The researchers conducted the new study by setting up simulated nitrogen deposition experiments in larch (Larix Kaempferi) forests and mixed larch-deciduous forests in Qingyuan County, Liaoning. Over four years, they analyzed the effects of nitrogen addition on soil and tree leaves.

The researchers found that nitrogen addition increased the nitrate nitrogen content of larch forest soil, decreased the exchangeable base cations and pH in the litter layer and mineral soil surface, and increased the exchangeable hydrogen and aluminum ions in the soil, leading to soil acidification in these layers.

In addition, nitrogen addition reduced the carbon-to-nitrogen ratio of larch needles in the pure larch forests. In contrast to the larch forests, the mixed forest did not show any significant changes in soil inorganic nitrogen content, pH, or nutrient content in the leaves of the dominant tree species as a result of nitrogen addition.

This study provides valuable insights into the management of forest ecosystems. The results suggest that in the northeastern regions of China, establishing mixed forests may be a better forest management practice to prevent soil acidification under conditions of increased nitrogen deposition. By understanding the traits of different forest tree species, we can better manage our forest ecosystems to address environmental challenges.

More information: Meixia Gao et al, Higher resistance of larch-broadleaf mixed forests than larch forests against soil acidification under experimental nitrogen addition, *Plant and Soil* (2024). DOI: 10.1007/s11104-024-06677-9

Provided by Chinese Academy of Sciences