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Effects of elevated CO2 on nitrogen cycling in soil and alfalfa leaves

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Increased atmospheric CO_2 concentration will have an significant impact on the nitrogen cycle of terrestrial ecosystems. The elevation of atmospheric CO_2 has become an inevitable trend, and nitrogen is the most important factor affecting plant growth. But it is rare to explore the effect of CO_2 on nitrogen cycle by measuring the value of $\delta^{15}N$. The $\delta^{15}N$ value as a comprehensive indicator of the nitrogen cycle of the ecosystem, which can not only clarify the migration and transformation of nitrogen, but also effectively indicate the nitrogen limit and nitrogen open level of the ecosystem. Our experiment selected alfalfa (C3 plant) as the research object, then investigated the response of nitrate nitrogen, ammonia nitrogen and absorbable nitrogen to the elevated CO_2 concentration in soil and alfalfa leaves under ambient and elevated atmospheric CO_2 (500 and 700ppm) in open top chambers. The ^{15}N isotope value was determined by bacterial denitrification , and ^{15}N-gas chromatography (GC-MS) were applied to further analyze the effect of elevated CO_2 concentration on nitrogen cycling in soil and plant leaves. The increase of CO_2 concentration led to the decline of various inorganic nitrogen levels in soil, and the $\delta^{15}N$ in the soil also showed a certain downward trend, but always maintained a positive value. The nitrogen level and $\delta^{15}N$ values in alfalfa leaves did not change significantly, showing a small increase. It indicates that there are different degrees of nitrogen loss in the leaves under the influence of different concentrations of CO_2. These results are closely related to the fractional distillation of nitrogen isotopes caused by microorganisms in the process of nitrogen morphologic transformation. We briefly reviewed the changes of nitrogen content in soil and plant leaves under elevated CO_2, providing new insights into the nitrogen cycle of soils and plants under high CO_2 concentrations. It also provides a scientific basis for the protection of soil and plants under the greenhouse effect.